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GEOPHYSICS, ASTRONOMY AND SPACE

No. 393

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I. ASTRONOMY

News

SCIENTISTS BEGIN STUDIES WITH THE "RATAN-600" RADIO TELESCOPE

Moscow PRAVDA in Russian 19 Jan 77 p 6

[Article by V. Pankratov, "Uranus Begins Communicating"]

[Summary] Work has been completed on construction of the world's largest reflector radioastronomical telescope of the USSR Academy of Sciences. The first thing that strikes the eye is the aluminum concave reflector dishes forming a "wall." There are 895 such "dishes." Each such dish is a rectangle. It is almost 7 1/2 meters high and two meters wide. The dish is supported by a metal beam. It enables the dish to be turned about its horizontal and vertical axes and it can be moved forward. On the back side of the rectangle there are 276 points for adjusting the surface in order that the dish can be imparted the necessary concavity. Each of the four sectors of the radio telescope can be used as an independent telescope. Zelenchukskaya station was selected as the "RATAN" site because the Caucasus Mountains curve about it. It is scarcely possible to visualize a better protection against industrial interference. And the site itself is pressed gravel. The thickness of this layer is tens of meters. This is important because the foundation of the telescope is stable against terrestrial oscillations. Contact with Uranus has been established. The most important information on the universe is obtained with radio telescopes which have the maximum area of the collecting surface. For the "RATAN" it attains tens of thousands of square meters. Any sector of the sky can be investigated due to the annular design of the radio telescope, the ability to change its configuration. The "RATAN" received the first radio signal from space on 12 July 1974; since then there have been more than 2,000 communication contacts. Workers have formulated a special program for electronic computers and the time of accumulation of signals has been increased to one or two minutes. Specialists have undertaken a detailed study of the fine radio-structure of the sun, which will make it possible to understand the stages in the initial development of our star. This sort of investigation will help weathermen in giving more precise weather forecasts. Special attention is being devoted to Jupiter. It was possible to detect the radio

emission of some of its satellites. Their size is close to the dimensions of the earth. Work has begun on study of our Galaxy, especially the center, the most mysterious part. It has been found that the earlier prevailing ideas concerning the center of the Galaxy are inadequately precise and some are even erroneous. In particular, there has been no confirmation of the point of view of western scientists who contend that there is an enormous ultramassive body at the center of the Galaxy. Its center is surrounded by a quite uniform, homogeneous region of ionized hydrogen. The radio-astronomers are working hand-in-hand with astronomers using optical instruments. At a distance of forty kilometers from the "RATAN," at an elevation of over 2,000 meters, is the world's largest optical telescope with a mirror having a diameter of six meters. Both telescopes are part of the Special Observatory USSR Academy of Sciences. They have common research programs.

[218]

Abstracts of Scientific Articles

SOLAR PHENOMENA PRECEDING POWERFUL GEOEFFECTIVE PHENOMENA ON EARTH

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977
1A137

[Abstract of article by M. M. Kobrin, A. I. Korshunov, S. I. Arbuzov, V. V. Pakhomov, Yu. V. Tikhomirov and V. M. Fridman; Moscow, SIMPOZ. KAPG PO SOL-NECHNO-ZEMN. FIZ., TBILISI, 1976, Ch. 1, TEZISY DOKL., "Manifestation in Solar Radio Emission of Fluctuating Instabilities on the Sun Preceding the Occurrence of Powerful Geoeffective Phenomena"]

[Text] The state of instability prior to chromospheric flares is indicated by quasiperiodic pulsations (QPP) of solar centimeter radioemission. It follows from the observations of 1970-1974 that several days before proton flares there are QPP with characteristic times of 30-60 minutes and with amplitudes of several percent from the radiation of the quiet sun. QPP are manifested particularly clearly in the difference in radio emission fluxes at two close frequencies. QPP were also observed in bursts accompanying proton flares. After a proton flare the amplitude of QPP with periods $T > 30$ min is sharply reduced, whereas the amplitude of QPP with $T < 20$ min changes smoothly, not exhibiting a direct correlation with proton flares. Before nonproton flares there is no increase in radio emission pulsations. The authors examine the possible mechanisms of preflare instability and the modulation of solar radioemission. They point out the possibility of the existence of QPP in other ranges of the solar wave radiation and also in the solar wind. It is shown that it is possible to predict geoeffective phenomena on the sun on the basis of observations of QPP and differences in the radioemission fluxes at close frequencies at a wavelength of $\lambda = 3$ cm. [276]

SOLAR PROTONS IN EARTH'S NEIGHBORHOOD

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977
1A133

[Abstract of article by S. T. Akin'yan, V. V. Fomichev and I. M. Chertok; Moscow, SIMPOZ. KAPG PO SOLNECHNO-ZEMN. FIZ., TBILISI, 1976, CH. 1, TEZISY DOKL., 1976, pp 6-8, "Determination of Parameters of Solar Protons in the Earth's Neighborhood from Radioemission Bursts"]

[Text] On the basis of data on microwave radiobursts the authors set forth the basic principles of a quantitative description of proton flares, making it possible to compute when, in what number, and what protons reach the earth's neighborhood. The following points are new in the proposed method: the authors demonstrate the fundamental importance of taking into account the characteristics of meter radiobursts, from which it is possible to estimate the effectiveness of the emergence of particles into interplanetary space; the article gives a sequential analysis of the dependence of the parameters of proton fluxes and the nature of their correlation with radio bursts in the centimeter and meter ranges on the heliographic longitude of the flare; also illustrated is the possibility of evaluating the exponent of the energy spectrum of protons on the basis of data on radio bursts. In addition to determining the maximum fluxes of protons, the method provides for an evaluation of the time parameters of particles, this making it possible to compute the time profiles of the particle fluxes.
[276]

GEOMAGNETIC ACTIVITY AND SITUATION AT CENTER OF SOLAR DISK

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977
1A128

[Abstract of article by Ya. Galenka; Moscow, SIMPOZ. KAPG PO SOLNECHNO-ZEMN. FIZ., TBILISI, 1976, CH. 1, TEZISY DOKL., 1976, pp 24-26, "Geomagnetic Activity and the Situation at the Center of the Solar Disk"]

[Text] This paper gives the results of a comparison of the situation at the center of the solar disk and the morphology of geomagnetic activity. It was found that the entire range of phenomena at the center of the sun in the low latitudes can be divided into five groups determining geomagnetic activity: 1) spots (in the absence of variable filaments); 2) flocculi (in the absence of spots and variable filaments); 3) undisturbed space; 4) undisturbed filament; 5) variable filament. These manifestations of solar activity cause the following four classes of geomagnetic disturbance: 1) state of rest; 2) low activity; 3) moderate activity ($K_p \sim 2$); 4) increased

activity (disturbances of a pulsed nature, sporadic storms). A transition from group (1) to group (5) in solar activity leads to a gradual increase in geomagnetic activity, that is, to a successive transition from class (1) to class (4) in geomagnetic conditions. It is noted that prior to a period of geomagnetic rest or a decrease in magnetic activity at the center of the sun there is a strong stable magnetic field. The presence of unstable (usually weak) magnetic fields is accompanied by an increase in geomagnetic activity. It is concluded that detailed observations of manifestations of solar activity make it possible to carry out a detailed and systematic comparison of the situation on the sun and the geomagnetic activity situation. Bibliography of five items.
[276]

CHARACTERISTICS OF SOLAR ACTIVE REGIONS AND PROTON EVENTS

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977
1A129

[Abstract of article by V. V. Kasinskiy, Ye. V. Ivanov and V. N. Obridko; Moscow, SIMPOZ. KAPG PO SOLNECHNO-ZEMN. FIZ., TBILISI, 1976, CH. 1. TEZISY DOKL., 1976, pp 3-5, "Index of Compactness of Solar Active Regions and Characteristics of Proton Events"]

[Text] A study was made of the dependence of the intensity of proton events on the heliolongitude of a flare and on the compactness of a spot group generating this flare. There was found to be an east-west asymmetry in the distribution of flares over the disk with a maximum in the region of heliolongitudes 30-60°W. Analysis of the dependence of the index δ on heliolongitude and on the compactness of the spot groups (δ is proportional to the flux of solar protons and the length of time required for them to reach the earth) made it possible to draw the following conclusions: the most powerful particle fluxes arrive from compact groups from the sun's central meridian or from the eastern heliolongitudes; for less compact spot groups the most powerful events are observed after flares in the zone of heliolongitudes 30-60°W; several strong events were observed after flares at the central meridian in powerful groups with low compactness; as a rule, at the core of these groups there was a δ -configuration of the magnetic field; local maxima with the mean index δ for heliolongitudes 20-40 and 60°E, and also at the western and eastern limbs are attributable to the nonradial ejection of particles from the sun. Bibliography of four items.
[276]

AUTOMATING PROCESSES OF STILL AND MOTION PICTURE PHOTOGRAPHY IN ASTRONOMY

Moscow REFERATIVNYY ZHURNAL 51. ASTRONOMIYA, OTDEL'NYY VYPUSK in Russian No 10, 1976 10.51.120

[Abstract of article by M. B. Kerimbekov and Ch. A. Efendiyev; Moscow, SOLNECHNYYE DANNYYE, No 2, 1976, pp 98-102, "Experience in Automating the Processes of a Motion Picture (Still) Photographic Survey in Astronomical Observations"]

[Text] The authors propose a system which makes it possible to increase the effectiveness of a motion picture survey of different phenomena on the sun due to selection of the moment of the best image quality. An image of the sun is constructed simultaneously in the frame window of a motion picture camera and on the photocathode of a photomultiplier. On the slit the image is scanned by a rotating prisma. With the exceeding of the signal amplitude above the selected level the electronic part of the system produces a pulse which triggers the motion picture camera. The apparatus uses the RFK-1M and "Kiev" motion picture cameras. The time constant for triggering the entire system is ~ 0.1 sec. During observations under unfavorable conditions 17% of the frames were good. This possibly indicates that an improvement in image quality occurs during a time much shorter than 0.1 sec. A second system was also developed for automating the process of a motion picture survey in white light. In this system the image is constructed on a TV tube of the dissector type. If the number of pulses (granules) in a scanned line exceeds a stipulated limit (~ 30 under excellent conditions) the system triggers the motion picture camera.

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STRUCTURE OF SOLAR MAGNETIC FIELD AND BRIGHTNESS OF PROMINENCES

Moscow REFERATIVNYY ZHURNAL 51. ASSTRONOMIYA, OTDEL'NYY VYPUSK in Russian No 10, 1976, 10.51.460

[Abstract of article by V. S. Bashkirtsev; Moscow, ISSLED. PO GEOMAGNET-IZMU, AERON. I FIZ. SOLNTSA, No 38, "Nauka," 1976, pp 239-241, "Comments on an Article by G. Ya. Smol'kov 'Changes in Orientation of Magnetic Field Structure and Brightness of a Prominence in the Early Stage of its Activation'"]

[Text] Without allowance for instrumental polarization and without compensation of radial velocities on a magnetograph it is impossible to obtain reliable information on magnetic fields and prominences. Accordingly, the discussion of the structure and change in the magnetic field in the early stage in activation of a prominence undertaken by G. Ya. Smol'kov (RefZh Astr, 1976, 4.51.366) is incorrect. The determined change in magnetic field

strength probably reflects the temporal variation of the degree of instrumental circular polarization and not the real change in conditions in a prominence. In response to Bashkirtsev Smol'kov notes that for measuring the magnetic field in prominences it is necessary to use definite approximations. At the Sayan Observatory of the Siberian Division of the Institute of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation the field strength is measured using the centers of gravity of the σ -components. A qualitative analysis of the line profiles confirmed the possibility of measuring the field by such a method without taking into account the instrumental polarization since the principal contribution to the effect is introduced by magnetic splitting of the line. With respect to the work criticized by Bashkirtsev, its principal result is establishing the fact of appearance of alternating changes in structure of a prominence long prior to the onset of its activation. Bibliography of 21 items.
[300]

BACKGROUND OF GAMMA RADIATION OF THE QUIET SUN

Moscow PIS'MA V ASTRONOMICHESKIY ZHURNAL in Russian Vol 3, No 1, 1977 pp 26-27

[Article by B. M. Kuzhevskiy, Scientific Research Institute of Nuclear Physics, Moscow State University, "Radioactive Nuclei and the Background of Gamma Radiation of the Quiet Sun"]

[Abstract] Since the period of half-decay of nuclei can be considerable, an equilibrium content of radioactive nuclei should be established on the sun; this in turn causes the existence of some background solar gamma radiation. Assume that $N_i(t)$ is the number of nuclei i on the sun. Then the change is determined by the following equation:

$$\frac{dN_i}{dt} + \lambda_i(t)N_i = A_i(t)$$

where $\lambda_i(t)$ characterizes the rate of decrease of nuclei i . It is determined by the following processes: 1) acceleration of nuclei at the time of a flare and their escape into the interplanetary medium; 2) destruction of nuclei due to nuclear reactions during a flare; 3) transport into the corona and escape in the solar wind; 4) transport into the depth of the convective zone; 5) decay of radioactive nuclei. The decrease in radioactive nuclei on the sun is determined for the most part by their decay rate, especially if the period of half-decay does not exceed several years, A_i is the rate of generation of particles of the species i . On this basis it is shown that the long-lived radioactive nuclei formed in the solar atmosphere during flares can be the cause of the gamma radiation of the quiet sun. The possible flux of the gamma quanta with $0.5 \leq E \leq 3$ MeV is $10^{-7} \leq F_\gamma < 10^{-5}$

cm⁻².sec⁻¹. Since the background gamma radiation of the sun is determined as the effect of decay of radioactive nuclei, whose number is dependent on A_1 , the intensity of this background should vary appreciably in dependence on solar activity.
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NONEQUILIBRIUM STATE AND MOMENT OF INERTIA OF VENUS

Moscow PIS'MA V ASTRONOMICHESKIY ZHURNAL in Russian Vol 3, No 1, 1977 pp 28-29

[Article by V. N. Zharkov and A. P. Trubitsyn, Institute of Physics of the Earth, "Scale of the Nonequilibrium State and Determination of the Moment of Inertia of Venus"]

[Abstract] Venus is evidently the most nonequilibrium planet in the solar system. It is impossible to find the Venusian moment of inertia on the basis of observational data. The fact that the quadrupole gravitational moment J_2 of Venus is virtually completely created by the nonequilibrium distribution of density in the planet makes it possible to estimate the scale of shearing stresses in its interior. In the case of a solid, homogeneous planet the maximum stresses are attained at its center and equal 43 bar:

$$\tau_2 = 1/2 g \rho R (J_2 - J_2^0) \approx 43 \text{ bar},$$

where g is the acceleration of gravity at the planetary surface, ρ is its density, J_2^0 is the hydrostatic value of the quadrupole moment (for Venus $J_2^0 \sim q \sim 10^{-7}$). Venus, evidently, the same as on the earth, has a fluid core. In this case the shear stresses are squeezed into the solid mantle of Venus and increase several times. Accordingly, the shearing stresses in the Venusian interior have values of about 100 bar. This result was somewhat unexpected due to the fact that the outer layer of Venus seemingly should be more heated than the lithospheric layer of the earth due to the high temperature of the Venusian surface. The estimate is an indirect indication that this planet should have an outer rigid lithospheric mantle with a thickness of about a hundred kilometers.
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SOLUTIONS OF RESTRICTED ELLIPTICAL THREE-BODY PROBLEM

Moscow PIS'MA V ASTRONOMICHESKIY ZHURNAL in Russian Vol 3, No 1, 1977 pp 41-42

[Article by M. V. Kurchanova, Moscow State University, "Estimate of the Difference in Solutions of the Precise and Averaged Restricted Elliptical Three-Body Problem"]

[Abstract] The author examines the plane restricted elliptical problem of three bodies. It is assumed that the material points m_1 and m_2 move in Keplerian ellipses with an eccentricity ε and mean motion ω about their common center of inertia O ; the author uses a coordinate system xOy with its origin at O , rotating in the plane of motion m_1 and m_2 with the angular velocity ω . It is assumed that $m_1 + m_2 = 1$, $m_1 = \mu$, $\omega = 1$; then $m_2 = 1 - \mu$, the gravitational constant $f = 1$. With this formulation of the problem the author has obtained an estimate of the difference in solutions of the precise and averaged restricted elliptical three-body problem, whose accuracy increases with a decrease in the ratio of the masses of the gravitating bodies and the distance of the orbit of a passively gravitating point from the center of inertia of massive bodies.

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II. METEOROLOGY

News

PAPERS ON CLOUD PHYSICS AND ARTIFICIAL MODIFICATION

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977
1B44K

[Abstract of collection of articles; Leningrad, FIZIKA OBLAKOV I AKTIVNYKH VOZDEYSTVIY (Cloud Physics and Artificial Modification), edited by T. N. Gromova and Yu. A. Dovgalyuk, TRUDY GL. GEOFIZ. OBSERV., No 372, Gidro-meteoizdat, 1976, 136 pages]

[Text] This collection of articles presents the results of studies of the physics of clouds and artificial modification carried out at the Main Geophysical Observatory and at other scientific institutions. Most of the articles are devoted to theoretical and experimental investigations of the processes of formation of convective clouds and the precipitation from them, the electrification of cloud particles and also artificial modification of clouds for the purpose of extinguishing forest fires by artificial precipitation. Contents: D. D. Stalevich, T. S. Uchevatkina -- "Selecting the Level for the Introduction of a Reagent for the Modification of Developing Convective Clouds"; V. T. Lenshin, Ye. P. Budilova, "Evaluation of the Intensity of Atmospheric Convection in the Description and Forecasting of Conditions for the Formation of Precipitation"; T. A. Pershina, N. S. Shishkin -- "Investigation of the Charged Crystalline Fog in the Field of a Coronal Discharge Between Freezing Droplets"; M. A. Khimach, G. A. Chikirova, N. S. Shishkin -- "Charging of Large Water Droplets in a Flow of a Droplet and Crystalline Fog Charging in the Region of a Coronal Discharge"; M. A. Khimach, G. A. Chikirova -- "Investigation of Charging of Droplets of Solutions of Some Surface-Active Substances"; N. N. Burchuladze, V. A. Grachev, V. S. Grafov, T. N. Gromova, V. Ya. Nikandrov, T. A. Persina -- "Experimental Apparatus for Investigating the Electrification of Freezing Droplets"; S. P. Girs, Yu. A. Dovgalyuk, L. S. Ivlev, Yu. A. Makhalov, O. A. Odintsov, V. K. Solomatin, V. A. Strakhov -- "Influence of Change in Relative Humidity on the Electrical and Structural Characteristics of an

Aerosol"; S. P. Girs, A. K. Zhebrovskiy, V. I. Stebin -- "Electron Microscope Investigations of the Structure of Ice"; V. G. Morachevskiy, N. A. Dubrovich, A. G. Popov -- "Processes of Heterogeneous Ice Formation and Energy of Adsorption"; B. Z. Gorbunov, K. P. Kutsenogiy -- "Influence of Dispersivity of Aerosols on Their Ice-Forming Activity"; I. I. Gayvoronskiy, T. N. Gromova, B. I. Zimin, T. V. Lobodin, I. A. Skorodenok, N. M. Toropova, "Results of Modification of Thunderstorm Clouds on the Basis of Data from a Complex Monitoring of Their Electric Activity"; Ye. V. Orenburgskaya, Yu. P. Sumin -- "Evaluation of the Frequency of Recurrence of Conditions Favorable for the Extinguishing of Forest Fires by Artificial Precipitation Over the Territory of Krasnoyarskiy Kray"; G. N. Prokhorova -- "Evaluation of the Distribution of Cumulonimbus Clouds Over Fire-Vulnerable Areas of Tyumen'skaya Oblast"; G. I. Osipova -- "Peculiarities of the Vertical Distribution of Relative Humidity in the Atmosphere and its Influence on the Precipitation-Forming Clouds Over the Northern Regions of the European Territory of the USSR."

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Abstracts of Scientific Articles

ENERGY SCALE IN SOLAR-GEOPHYSICAL PHENOMENA

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977
1A23

[Article by E. I. Mogilevskiy; Tbilisi, SIMPOZ. KAPG PO SOLNECHNO-ZEMN. FIZ., 1976. Ch. I. TEZISY DOKL., 1976, pp 32-33, "On the Problem of the 'Large Energy Scale' ($E \geq 10^{27}$ erg) in Solar-Geophysical Phenomena"]

[Text] A study was made of the effectiveness of weak stochastic effects arising during interaction between the earth and geoeffective corpuscular streams which are generated in active regions on the sun. If it is assumed that the description of the earth-atmosphere dynamic system is under the influence of determined and stochastic forces, the system of equations is reduced to solution of an equation of the Einstein-Fokker type for the probability density of the state of the system. An examination of solution of the Einstein-Fokker equation indicates that in the case of relatively weak stochastic forces their effectiveness would be small. However, the proofs of the real existence of effects from solar corpuscular streams in meteorological phenomena known from the literature indicate the existence of quite large relative stochastic forces. The article examines a model of a "large energy scale" ($E \geq 10^{27}$ erg) in which a geoeffective solar stream is a sequence of radially moving large-scale ($L \geq 10^{12}$ cm) magnetoplasma elements. The interaction between magnetic fields and these elements can lead to the transfer to the earth of an energy exceeding by three orders of magnitude the total energy of a geomagnetic storm. With such an energy transfer in dependence on the geometric conditions of an encounter between the earth and an element there can be an acceleration or slowing of the earth's diurnal rotation. In this case the earth's atmosphere receives (or imparts to the earth) an additional rotational moment.

[276]

RADIOMETRIC MEASUREMENTS OF ATMOSPHERIC MOISTURE CONTENT

Moscow IZVESTIYA AKADEMII NAUK SSSR, FIZIKA ATMOSFERY I OKEANA in Russian Vol 13, No 1, 1977 pp 102-105

[Article by A. T. Yershov and V. M. Plechkov, Institute of Physics of the Atmosphere and Gor'kiy Scientific Research Radio Physics Institute, "Evaluation of the Accuracy of Radiometric Measurements of Moisture Content of the Atmosphere Using Data from the GATE-74 Expedition"]

[Abstract] The authors have endeavored to estimate the accuracy in determining the total moisture content in the atmosphere on the basis of aerological and radiometric measurements. The analysis is based on use of the results of simultaneous aerological and radiometric measurements carried

out aboard the "Akademik Kurchatov" during the GATE-74 experiment in the summer of 1974 in the tropical Atlantic. Weather conditions in the work region were characterized by great stability. Measurements were made at 0600, 1200, 1800 and 2400 GMT. Comparison of aerological and radiometric determinations of atmospheric moisture content were made using the results of 129 series of measurements carried out from late June through mid-August. It was found that the mean square value of variations of moisture content was 0.45 g/cm^2 , which was about 13% of the mean moisture content $\bar{Q}$. The mean square error in determining moisture content on the basis of aerological data was about 0.40 g/cm^2 (about 11% of $\bar{Q}$); the corresponding error in radiometric data was about 0.31 g/cm^2 (about 8% of $\bar{Q}$). All the experiments indicate that for conditions with few clouds radiometric methods for determining atmospheric moisture content are more accurate than aerological methods.

[228]

ACTINOMETRIC RADIOSONDE OBSERVATIONS ANALYZED

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977
1B52

[Abstract of article by N. A. Zaytseva; Moscow, TRUDY TSENTRAL'NOY AEROLOGICHESKOY OBSERVATORII, No 117, 1976, pp 138-146, "Actinometric Radiosonde Observations of Atmosphere"]

[Text] The first Soviet actinometric radiosonde, the ARZTsAO (ARZ-1) was constructed in 1961. Using the ARZ-1 radiosonde it was possible to measure long-wave radiation of the earth and atmosphere at nighttime. In 1963 the radiosonde was introduced into the network; at the present time the actinometric radiosonde network consists of 15 stations in the territory of the USSR. In 1963-1967 extensive material was obtained from these soundings. The measurements of long-wave radiation during daytime are complicated by the presence of short-wave radiation and the necessity for eliminating it. The method for measuring long-wave radiation against a background of short-wave solar radiation is based on the fact that each sensing surface of the instrument is designed in the form of two surfaces situated in the same plane and covered with different materials having a high reflectivity in the region of the short-wave part of the spectrum and a sharply different emissivity (absorptivity) in the long-wave region. Bibliography of eight items.

[276]

RADAR OBSERVATION METHODS DISCUSSED

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977
1B75

[Abstract of article by A. A. Chernikov; Moscow, TRUDY TSENTRAL'NOY AEROLOGICHESKOY OBSERVATORII, No 117, 1976, pp 60-73, "Radar Observation Methods and Their Future Prospects"]

[Text] At the Central Aerological Observatory specialists have constructed apparatus for the automatic collection and processing of radar data on precipitation which is used successfully for measuring precipitation using a MRL-2 radar. Observatory workers have developed a radar method for sensing the distribution of the intensity of turbulence, exerting the greatest effect on aircraft, in clouds and precipitation. Information on the extent and location of zones of dangerous turbulence is obtained using radars of the MRL type in a standard scanning regime. A method has been proposed and put into practice for measuring small-scale vertical flows in the atmosphere. Important results were obtained in investigating the polarization characteristics of cumulonimbus clouds. The studies made up to the present

time can undoubtedly serve as a basis for creating a network meteorological radar of a new generation.

[276]

FREQUENCY RADIOSONDE FOR "METEORIT" RADAR

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977
1B51

[Abstract of article by A. F. Kuzenkov, A. N. Yegorov and L. N. Vakhtomov; Moscow, TRUDY TSENTRAL'NOY AEROLOGICHESKOY OBSERVATORII, No 117, 1976, pp 126-133, "Frequency Radiosonde for the 'Meteorit' Radar"]

[Text] The article cited above gives the principal results of the development of a frequency radiosonde which in the future should replace the now used RKZ-5. The new radiosonde was fabricated in tube and transistor variants. Theoretical investigations of the telegraphic manipulation of frequency show that in comparison with the amplitude of manipulation the signal-to-noise ratio in the telemetric channel can be increased by a factor of three. In addition, tracking of the frequency sonde in range is accomplished independently of the transmission of meteorological information since there are no pauses in the radiation. An increase in noise immunity makes it possible to allow parallel operation of the telemetric channel and systems for measuring coordinates and range. At the present time the transistorized variant has a low radiation power, an order of magnitude less than the tube radiosonde. However, this shortcoming may not be so important and even useful: there is less irradiation of servicing personnel; there is a lesser influence of superhigh frequencies on operation of the measuring unit, which is extremely significant when using tube radiosondes, and finally, there is a lesser weight of the battery supplying current and the sonde as a whole (200 g instead of 1.6 kg). The authors report successful solution of the problem of creating adequately stable transistorized circuits for the measuring oscillator and also an electronic commutator replacing the electromechanical commutator employed in the RKZ-5 radiosonde. Bibliography of five items.

[276]

EVOLUTION OF INTRATROPICAL CONVERGENCE ZONE

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977
1B372

[Abstract of article by N. G. Davydova, M. Nedelka and S. Slaby; Leningrad, "TROPEKS-74. TRUDY MEZHDUVED. EKSPEDITSII PO PROGRAMME MEZHDUNAR. ATLANTICH. TROPICH. EKSPERIMENTA, T. I, Gidrometeoizdat, 1976, pp 155-176, "Evolution of the Intratropical Convergence Zone in Relation to Macrosynoptic Processes"]

[Text] On the basis of aerosynoptic and satellite data a study was made of evolution of the intratropical convergence zone (ICZ) in connection with macrosynoptic processes over the Atlantic. The authors determined the periods of intensive and blurred ICZ for each stage in the expedition. The article gives the positions of the northern and southern boundaries of the ICZ each 2.5° in longitude from 17.5 to 35°W for each day. The authors have established the mean, maximum and minimum durations of intensive and blurred ICZ. It was possible to determine the mean width of the ICZ (distance between its northern and southern boundaries), which in the first and second phases of the observations was about 350 km, and in the third phase -- 500 km. The width of intensive ICZ is usually less than for blurred ICZ. The periodicity of accentuation and destruction of the ICZ is related to the evolution of the subtropical anticyclones, which to a considerable degree is determined by the nature of the pressure field of the upper troposphere. Thus, there is confirmation of a correlation of processes of accentuation and destruction of the ICZ and large-scale atmospheric processes. The hypothesis is advanced that the zone of high temperature of the water surface situated within the ICZ is a warm easterly equatorial counter-current and the boundaries of the ICZ are associated with the boundaries of this current. Bibliography of five items.
[276]

PREDICTING CONDITIONS FOR THE FORMATION OF PRECIPITATION

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977
1B317

[Abstract of article by V. T. Lenshin and Ye. P. Budilova; Leningrad, TRUDY GEOFIZ. OBSERV., No 372, 1976, pp 13-21, "Evaluating the Intensity of Atmospheric Convection in the Description and Prediction of Conditions for the Formation of Precipitation"]

[Text] The intensity of atmospheric convection is an unambiguous function of instability and air humidity, the values of which evidently differ in different synoptic situations. A physical-statistical analysis established an objective index of the intensity of intracloud convection, having the form of the ratio of the actual intensity of convection to the critical value of the intensity at which there is a transition of individual well-developed cumulonimbus clouds in the course of the day in the region (in a radius up to 150 km from the radiosonde point). The computation model for the values of the index of intensity of atmospheric convection is relatively simple and can be used in preparing a routine forecast of the development of disordered mesoscale atmospheric convection over a stipulated area for a period of 12 to 15 hours in advance, in formulating field experiments for stimulating and redistributing precipitation, and also in detecting the prognostic criteria of especially dangerous phenomena, such

as abundant precipitation, hail, squalls, etc. Bibliography of 10 items.
[276]

RECEPTION AND STORAGE OF AEROLOGICAL DATA DURING GATE PROGRAM

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977
1B11

[Abstract of article by V. A. Antsyovich; Leningrad, "TROPEKS-74. TRUDY MEZHDUNAR. EKSPEDITSII PO PROGRAMME MEZHDUNAR. ATLANTICH. TROPICH. EKSPERIMENTA. T. 1, Gidrometeoizdat, 1976, pp 695-704, "Automatic Reception and Storage of Aerological Sounding Data Under GATE Conditions"]

[Text] During the GATE period, specialists aboard the scientific research vessel "Prof. Zubov", using a "Minsk-22" electronic computer, carried out routine processing of aerological telegrams from all ships. They processed data only for standard pressure levels up to 100 mb. A semiautomatic system was developed in which an electronic computer ensured the reception, monitoring of the syntactical constructions and storage of telegrams and man carried out systematic control of the information and its correction. After the input and primary filtering (discrimination of aerological information) of the punched tape there was an analysis of the correctness of the syntactical constructions. Erroneous summaries were subjected to manual checking for the purpose of writing correction operators. At the same specialists carried out an interpretive checking of the information. For facilitating the interpretive checking the author proposed a cycle of climatic monitoring designed on the basis of TROPEKS-72 aerological data. Also given are the parameters of the system and the time expenditures. It is feasible to use the system when receiving from 30 to 200 telegrams. The relatively low level of routineness is attributable to shortcomings of the "Minsk-22" electronic computer. Bibliography of three items.

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III. OCEANOGRAPHY

Abstracts of Scientific Articles

NONSTATIONARY CASES OF OCEANOGRAPHIC PROCESSES

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977
1V175

[Abstract of article by S. M. Solodova, I. Ye. Timchenko and S. I. Khlopushina; Sevastopol', MOR. GIDROFIZ. ISSLED., No 2(73), 1976, pp 68-78, "Prediction of Nonstationary Random Oceanographic Processes"]

[Text] The authors propose an algorithm for the prediction of nonstationary oceanographic processes. The article gives the theoretical considerations serving as a basis for formulating a program written in ALGOL language making it possible for each time series to carry out three stages in the iterative modeling and prediction of the values of time series for different institutions. The article presents a block diagram of this program. It then describes numerical computations carried out for three nonstationary time series of water temperature constructed using data from the Scripps Institute of Oceanography and data from French measurements in the Gulf of Lyons. The results, cited in the form of tables and figures, confirm the possibility of modeling of nonstationary random oceanographic processes on an electronic computer. The proposed method makes it possible to assimilate new data arriving in the course of computations and rectify the predicted values using corrections of the weighting functions. Bibliography of three items.

[276]

DEVICE FOR STABILIZING CAPSULE TOWED UNDER WATER

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977
1V19

[Abstract of patent by A. L. Tuchinskiy and V. A. Belov, Special Experimental-Design Bureau of Commercial Fishing; Moscow, Author's Certificate USSR, No 498203, published 8 April 1976, "Device for Stabilizing Capsule Towed Under Water"]

[Text] This patent describes a device for the longitudinal stabilization of a capsule [gondola] towed under water: on the free end of the towing cable, in a fixed position, at an angle to it, there is attached a rod on which a slide is mounted which can be moved or fixed in position and to which flexible ties are attached. Such a design ensures simultaneously a transverse stabilization of the moving gondola.
[276]

PATENT FOR DEVICE FOR SAMPLING FLUIDS

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977
1V22P

[Abstract of patent by B. P. Zhizhchenko, N. N. Vorob'yeva, B. I. Khomyakov and V. S. Tsvetkov, All-Union Scientific Research Institute of Natural Gases; Moscow, Author's Certificate USSR No 476480, published 29 March 1976, "Device for Sampling Fluids"]

[Text] The device described in this patent is intended for sampling water in a study of the gas regime of natural waters and has the housing of a sampling chamber with opening and closing valves. The chamber is supplied with a rod with a floating piston on the end and a cutoff device with a drive executed in the form of a regulated rod with a supporting "foot." The cutoff device consists of a destructible glass ampule and the regulated rod is outfitted with a tiny hammer for destruction of the ampule when the "foot" impacts against the bottom. The chamber is evacuated before being lowered. The chamber has a compensation chamber for excluding an increase in pressure within the chamber when it is being brought to the surface.
[276]

PROCESSING OF MULTIRAY HYDROACOUSTIC NOISE SIGNALS

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977
1V32

[Abstract of article by A. V. Pinchuk; Moscow, TRUDY 2-y NAUCH.-TEKHN. KONF. PO INFORM. AKUSTIKE, 1976, pp 72-75, "Spatial-Temporal Processing of Multiray Hydroacoustic Noise Signals"]

[Text] The results of investigation of the influence of multiray propagation on the correlation properties of signals received by a vertical antenna consisting of 50 equally spaced detectors are given. The author examines the functional diagram of the experiment; a block diagram of processing of experimental data is given; the cross-correlation functions of the signals are analyzed. A study was made of the dependence of the angles of

arrival of signals with maximum focusing on the depth of the sound detectors. The experimentally obtained spatial-temporal characteristics of the sound signals are compared with the results of computations. Bibliography of four items.

[276]

ONE-DIMENSIONAL THREE-PARAMETER SPECTRA OF SEA WAVES

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977 1V87

[Abstract of article by G. Sager; Berlin, GERLANDS BEITR. GEOPHYS., 85, No 3, 1976, pp 221-228, "Determination of the Parameters of One-Dimensional Three-Parameter Spectra of Sea Waves"]

[Text] Earlier the author proposed a two-parameter and then also a three-parameter model for describing the one-dimensional frequency spectra of sea waves:

$$S(\omega) = \frac{A}{(\omega - \omega_0)^m} e^{-B \frac{g^n}{U^n} \frac{1}{(\omega - \omega_0)^m}}.$$

Here U is wind velocity (or reduced velocity), ω is frequency, g is the acceleration of gravity; A, B and ω_0 are spectral parameters, m and n are constants. Also examined are the relationships between the spectrum parameters, on the one hand, and the dispersion, frequency of the maximum and spectral density -- on the other. Also cited are examples of computation of the parameters of the spectrum on the basis of observational data. Bibliography of five items.

[276]

INTERNAL GRAVITATIONAL WAVES IN FLOW OF STRATIFIED FLUID

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977 1V94

[Abstract of article by A. M. Suvorov and L. V. Cherkasov; Sevastopol', MOR. GIDROFIZ. ISSLED., No 1(72), 1976, pp 16-25, "Free Internal Gravitational Waves in a Flow of Stratified Fluid with a Velocity Shear"]

[Text] The authors have investigated a plane, horizontally unbounded flow of an ideal incompressible continuously stratified fluid with a constant depth. In an unperturbed state the density and velocity of flow are exponential functions of depth. Within the framework of the linear theory of

propagation of internal gravitational waves in the flow of a fluid with a vertical velocity shear the process is described by a generally accepted system of equations. A dispersion expression is derived and investigated and the corresponding internal waves are described. Bibliography of 13 items.

[276]

STATISTICAL CHARACTERISTICS OF SEA WAVES

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977
1V28

[Abstract of article by G. S. Gurevich; Tomsk, IV VSES. SIMPOZ. PO LAZERN. ZONDIR. ATMOSFERY. TEZISY DOKL., 1976, pp 127-131, "Laser Method for Determining Some Statistical Characteristics of Sea Waves"]

[Text] A study was made of the possibility of determining some statistical characteristics of sea waves, especially the mean square height of waves, by means of laser ranging of the sea surface from aircraft and satellites. Accordingly, a study was made of the dependence between the characteristics of a nonstationary random process describing the intensity of a laser pulse reflected from a random sea surface and the characteristics of sea waves. The principal theoretical result is: the intensity of the reflected pulse as a function of time, averaged from the records, is associated with the joint distribution of the rises and tilts of the sea surface determined at a single point. The principal practical result is a computation formula for the mean square height of the waves.

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SATELLITE DETERMINATION OF SEA-ATMOSPHERE CHARACTERISTICS

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977
1V29

[Abstract of article by B. A. Nelepo and V. S. Suyetin; Sevastopol', MOR. GIDROFIZ. ISSLED., No 2(73), 1976, pp 61-67, "Discrimination of Variations in the Characteristics of the Sea Surface and Atmosphere on the Basis of the Thermal Radioemission Measured from a Satellite"]

[Text] This paper describes a method for checking the nondegeneration of the Jacobi matrix of temperature radiobrightness remotely measured from an artificial earth satellite. The authors use the procedure of evaluating the linear functional dependence between several variables from a sample of measurements at a number of points. The admissibility of the linear

approximation of the investigated dependence for real variations of water temperature in the ocean, the parameters of cloud cover and water vapor in the atmosphere follows from a special numerical analysis carried out by the authors. An important peculiarity of the method is the possibility of interpreting the observations without use of the laws of formation of radiation. However, it is necessary that the errors in observation be independent and have a normal distribution for all measurements. By analyzing the data obtained from an artificial earth satellite, "Kosmos-243," in a specific example it was possible to demonstrate the possibilities of the method and demonstrate the applicability of the proposals advanced. Bibliography of seven items.

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IV. TERRESTRIAL GEOPHYSICS

News

REPORTS AT INTERNATIONAL GEOLOGICAL CONGRESS

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977
1G8K

[Abstract of collection of articles; Moscow MEZHDUNARODNYY GEOLOGICHESKIY KONGRESS. XXV SESSIYA. DOKLADY SOVETSKIKH GEOLOGOV. GEOFIZICHESKIYE IS-SLEDOVANIYA ZEMNOY KORY (International Geological Congress. Twenty-Fifth Session. Reports of Soviet Geologists. Geophysical Investigations of the Earth's Crust), USSR Geology Ministry, National Committee of Geologists of the Soviet Union, "Nedra," 1976, 159 pages]

[Text] The series of articles in the collection gives a generalization of concepts about geophysical fields in the Pacific Ocean area. The data are analyzed from the point of view of tectonics of lithospheric plates. A number of articles give the results of study of the structure of the earth's crust by geophysical methods over the territory of the Soviet Union. The authors describe the structure of the Baykal rift zone to a depth of about 200 km. Also described is the block-layered structure of the earth's crust on the Siberian platform. Information is given on the structure of the earth's crust in the mountainous southern margin of Siberia. Included is a variant of a statistical model of the earth's crust in the territory of Turkmenia. Some reports give the results of seismic investigations along the profile from the Black to the Kara Seas. The collection includes a description of seismogenic structures of the lithosphere characterized by a definite complex of geophysical criteria. A series of communications relates to the physical properties of rocks and to their use in the interpretation of geophysical data. A number of articles are devoted to a description of the present-day status of geophysical methods for studying the earth's crust. A description is given of the use of the dynamics of seismic waves for describing the ancient history and present nature of geological processes. The authors also discuss methods for holographic transformations, a new complex of geophysical investigations of boreholes, geophysical investigations used in the search for and

exploration of minerals in the territory of Siberia. The effectiveness of electric prospecting in the search for petroleum and gas deposits is analyzed. There is a description of the results of geophysical investigations in a study of the deep structure of ore regions in Kazakhstan.
[276]

NAVIGATION-HYDROGRAPHIC SYMPOSIUM IN POLAND

Moscow REFERATIVNYY ZHURNAL 52. GEODEZIYA I AEROS"YEMKA, OTDEL'NYY VYPUSK No 10, 1976 10.52.25

[Abstract of article by Wiktor Grygorenko; Warsaw, POL. PRZ. KARTOGR., 1975 (1976), 7, No 4, p 187, "Second Navigational-Hydrographic Symposium at Gdynia on the Subject 'Problems in Marine Cartography,' 2-3 June 1975"]

[Text] The article discusses general problems of marine cartography, methods for determining the geographic coordinates of points on different ellipsoids, automation of surveys of the sea floor and some aspects of the photogrammetric method for determining the depth of shore scarps. Also examined are the possibilities of using marine cartography in radar, in the study of physical parameters of the sea, and in climatology.
[314]

Abstracts of Scientific Articles

GEOLOGICAL-GEOMORPHOLOGICAL INTERPRETATION OF SPACE PHOTOGRAPHS

Moscow REFERATIVNYY ZHURNAL 52. GEODEZIYA I AEROS"YEMKA, OTDEL'NYY VYPUSK in Russian No 10, 1976 10.52.170DEP

[Abstract of article by Yu. N. Pankrat'yev and Yu. S. Apostolov; Kalinin, MATERIALY 8-y NAUCH. KONF. SEKTS. GEOD., GEOL. I RAZVEDKI TORF. MESTOROZHD., Kalinin Polytechnic Institute, 1975, pp 91-95 [Manuscript deposited at the All-Union Institute of Scientific and Technical Information, 31 May 1976, No 1950-76DEP]

[Text] The authors note the singularity of the information contained on space photographs, coverage and natural generalization of the image of the earth's landscapes. The authors analyze the stereoscopic perception of the earth's surface shown on space photographs and reveal a number of difficulties arising in the interpretation of some geomorphological and geological features. The conclusion is drawn that it is necessary to study the psychophysiological factors in perception and construction of a spatial model in the interpretation of space photographs.

[314]

NUMERICAL METHODS FOR DETERMINING RELIEF CORRECTIONS

Moscow REFERATIVNYY ZHURNAL 52. GEODEZIYA I AEROS"YEMKA, OTDEL'NYY VYPUSK in Russian No 10, 1976 10.52.63

[Abstract of article by Iv. Stanoyev and D. Damyanov; Sofiya, GEOD., KARTOGR., ZEMLEUSTR., 16, No 1, 1976, pp 19-23, "Optimality of Some Numerical Methods for Determining Relief Corrections"]

[Text] For the purpose of selecting the optimum program and effective use of electronic computers for determining the relief correction to the results of gravimetric observations under specific terrain conditions the authors carried out an analysis of some initial formulas, used in actual

practice and the employed computation techniques. The article evaluates the influence exerted on the correction by elementary sectors of the terrain (100 x 100 m, 200 x 200 m or more) in dependence on the height of a rectangular prism and the distance from the gravimetric station in the near and distant zones with the use of precise and approximate formulas modeling local relief. The results of the analysis are represented by graphs and are analytically expressed by the coefficients of expansion into a Maclaurin series. Bibliography of eight items.

[314]

PROFILE NETWORK FOR AIRBORNE GRAVIMETER SURVEY OF OCEAN AREAS

Moscow REFERATIVNYY ZHURNAL 52. GEODEZIYA I AEROS"YEMKA, OTDEL'NYY VYPUSK in Russian No 10, 1976 10.52.64

[Abstract of article by V. Ye. Mogilevskiy; Moscow, MATERIALY III NAUCH. KONF. ASPIRANTOV I MOLODYKH UCH., Moscow University, Geology Faculty, "Geophysics" Section, 1976, pp 180-184, "Optimum Network of Profiles in a Regional Airborne Gravimeter Survey of Ocean Areas" [Manuscript deposited at the All-Union Institute of Scientific and Technical Information, 21 June 1976, No 2273-76DEP]]

[Text] An attempt is made, using the mathematical approach of the theory of random processes and fields, to construct an optimum network of profiles for regional airborne gravimeter investigations of ocean areas. The selected optimality criterion was the accuracy of the mean values of the gravity field obtained as a result of the survey within the limits of some regions. It is shown that the optimum work method in this sense is determined by the formulated problems (the dimensions of the regions for which it is necessary to obtain the averaged field values), the work region (the postulated nature of the local gravity field), and the state of the method (real survey errors). The article gives examples confirming this conclusion.

[314]

DETERMINING NATURE OF DISCONTINUITIES IN EARTH'S CRUST

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977 1D168

[Abstract of article by T. M. Lin'kova and B. Ye. Shcherbakova; Moscow, SOSTOYANIYE I PERSPEKTIVY RAZVITIYA METODOV POPERECH. I OBMEN. VOLN V SEYS-MORAZVEDKE, 1976, pp 8-26, "On the Problem of Determining the Nature of Discontinuities in the Earth's Crust (Using Data from the Exchange Transmitted Waves Method)"]

[Text] This paper gives the results of a study of the dynamic characteristics of exchange transmitted PS waves forming on discontinuities of different nature: thick and thin-layered models of media, including a thin layer with increased and decreased velocities, a transitional layer with different laws of the distribution of velocities, an inhomogeneous layer with different combinations of layers with reduced and increased velocities. The authors have analyzed the form of the record, the amplitudes and spectra of PS and P transmitted waves, the dependence of the ratio of the amplitudes of the PS and P waves on the angle of incidence of the P wave on the boundary of the layer, frequency and velocity differentiation of the medium. The determined patterns can be used for determining the possible structure of the exchange boundary. Bibliography of seven items.
[276]

CONTINUOUS SEISMIC PROFILING ON WATER-COVERED AREAS

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977
1D176P

[Abstract of patent by A. G. Dlugach and V. L. Mirandov, Moscow Geological Prospecting Institute; Moscow, Author's Certificate USSR, No 1982378, published 20 January 1976, "Device for Continuous Seismoacoustic Profiling in Areas Covered by Water"]

[Text] The patent describes a device for continuous seismoacoustic profiling in areas covered by water which contains a source and receiver of elastic pulses set up in the water and attached to the opposite sides of a ship and a source of compressed air. For reducing the level of multiple reflections in the water layer, at the receiver input the device is supplied with a vertical nonuniformly perforated tube, one of whose ends is attached over the side at the ship's prow and which is connected to the source of compressed air.
[276]

"ZEMLYA-73" INSTRUMENT COMPLEX DESCRIBED

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977
1G105

[Abstract of article by A. N. Mozzhenko and V. P. Danilin; Moscow, SOSTOYANIYE I PERSPEKTIVY RAZVITIYA METODOV POPERECH. I OBMEN. VOLN B SEYSMO-RAZVEDKE, 1976, pp 3-7, "'Zemlya-73' Instrument Complex"]

[Text] A report is given on the development and production of an improved apparatus of the "Zemlya" type. It is designed for a regional study of the structure of the earth's crust and upper mantle by means of registry of earthquakes. The apparatus makes it possible to register the vertical and two horizontal components of ground oscillations. Registry on magnetic tape is accomplished with a rate of its movement of 1 mm/sec. With a relatively small consumption of electric power by the apparatus it is possible to have continuous registry for a period of two days without changing the magnetic tape and the sources of electric power. In order to increase the dynamic range of registry to 70 db each component is registered in two tracks with different levels. In order to obtain seismograms for processing the primary records are reproduced with an increased rate of motion of the magnetic tape: 15, 20, 30 and 40 mm/sec by choice. The total amplification of the complex of recording and reproducing apparatus attains $5 \cdot 10^5$ with a level of characteristic noise $0.5 \mu V$, related to the input by a 1 megohm resistance.

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EFFECT OF GRAVITATIONAL WAVES ON EARTH AND SUN

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977
1G117

[Abstract of article by A. A. Shpital'naya, G. Ya. Vasil'yeva and N. S. Pystina; Moscow-Leningrad, DINAMIKA I EVOLYUTSIYA ZVEZDN. SISTEM (SER. "PROBL. ISSLED. VSELENNYOY") 1975, pp 129-137, "Possibility of the Effect of Gravitational Waves on Activity of the Earth and Sun"]

[Text] This article gives an analysis of series of chromospheric flares and earthquakes over one and the same time interval. The authors have determined the ecliptic geo- and heliocentric longitudes of points on the celestial sphere onto which the epicenters of earthquakes and flares are projected. The histograms of the number of instances of flares and earthquakes in fixed longitude intervals in the course of the year revealed a high correlation (0.5-0.7) in the absence of a correlation of the time series. The hypothesis is expressed that earthquakes and flares are manifestations of the effect of absorption of gravitational waves of cosmic origin by the sun and the earth, sporadically focused on the sun and on the earth by the solar system, playing the role of a gravitational antenna. The discrepancy between the theoretical and observed flux can be caused by the focusing effect. Bibliography of 27 items.

[276]

STUDY OF SURFACE SEISMIC WAVES IN AZERBAIDZHAN

Baku IZVESTIYA AKADEMII NAUK AZERBAIDZHAN, SSR, SERIYA NAUK O ZEMLE in Russian No 4, 1976 pp 101-106

[Article by A. M. Aliyev, Z. A. Akhadova, E. R. Aliyeva and A. S. Sarkisova, "Investigation of Surface Seismic Waves in the Region of the Triangle of Stations 'Kirovabad'-'Goris'-'Nakhichevan'"]

[Abstract] At the three seismic stations Kirovabad, Goris and Nakhichevan' in the Lesser Caucasus specialists selected 14 clear records of Rayleigh and Love waves from distant earthquakes with a magnitude not less than 5. This article gives data on the phase velocities of these waves on the basis of records for eight remote earthquakes along the path Goris-Nakhichevan', four along the path Goris-Kirovabad and two along the path Nakhichevan'-Goris. The stations and the epicenter of these earthquakes lie on one and the same arc of a great circle. Table 1 gives the basic data on these earthquakes. Figures 1 and 2 show characteristic records of Rayleigh and Love surface waves from the Aleutian and Prince Edward Islands. On the basis of the phase velocities of Rayleigh and Love surface waves it was possible to compute the phase velocities for the intervals between two stations. For refining the theoretical dispersion curves of surface waves the authors used tables of partial derivatives for the parameters of the phase velocity medium of surface waves. The parameters of the cross section of the earth's crust, used in computing the partial derivatives, were selected in accordance with the results obtained in seismic sounding carried out earlier. Figures 3, 4, 5 show the dispersion curves for phase velocities of Rayleigh and Love waves. It is shown that the theoretical curves agree well with the observed curves and the models cited in the article best reflect the true structure of the crust in the discussed region.

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MECHANISM OF DEVELOPMENT OF SHALLOW EARTHQUAKES

Moscow IZVESTIYA AKADEMII NAUK SSSR, FIZIKA ZEMLI in Russian No 12, 1976 pp 38-48

[Article by G. M. Avchyan, N. A. Belyayevskiy and M. K. Polshkov, USSR Geology Ministry and All-Union Scientific Research Institute of Geophysical Prospecting Methods, "On One Mechanism of the Development of Shallow Earthquakes and Their Precursors"]

[Abstract] In this paper it is shown that shallow earthquakes can be a result of a sudden decrease in the pore pressure of a hydrodynamically isolated sector of the earth's crust. Increased pore pressure is caused by elastic compression of rocks in the considered sector under the influence of recent differentiated tectonic movements. Preparation of an earthquake in time occupies three periods. 1) Slow compression of rocks, leading to an increase in pore pressure at the focus and formation of microfissures. 2) A rapid decrease in pore pressure at the focus, compression of rocks at the focus, saturation and dilatation of the rocks surrounding the focus, a decrease in their strength. 3) The destruction process, when the effective pressure attains the breaking point of rocks at the focus. During the first period there is an increase in the velocity of the longitudinal and transverse waves at the focus, a decrease in the ratio v_p/v_s , a decrease in conductivity and an insignificant decrease in the magnetic field. During the second period the v_p/v_s ratio increases, the v_p and v_s velocities change irregularly with a general tendency to a decrease, there is increased pore pressure in the rocks lying above the focus, an increase in their conductivity, an increase in the discharge of water, gas and petroleum in boreholes, an increase and then a decrease in the content of inert gases at the earth's surface and in ground water. [229]

MAPS OF SEISMIC ACTIVITY OF ARMENIAN PLATEAU

Yerevan IZVESTIYA AKADEMII NAUK ARMYANSKOY SSR, NAUKI O ZEMLE in Russian No 5, 1976, pp 81-86.

[Article by N. K. Karapetyan and Zh. O. Maukyan, Institute of Geophysics and Engineering Seismology Academy of Sciences Armenian SSR, "Maps of Seismic Activity of the Armenian Plateau"]

[Abstract] The authors obtained the A_{10} values (mean long-term seismic activity) for the area of the Armenian Plateau between $\lambda = 40-49^\circ$ and $\varphi = 38-42^\circ$ with an area of 277,500 km². It is shown that the A_{10} value differs in different parts of this territory. Therefore, for obtaining a more precise and regional picture of seismicity it is necessary to study the spatial distribution of the frequency of recurrence of earthquakes and construct an isoline map of seismic activity. Thus, maps of seismic activity show isolines of the mean frequency of recurrence of earthquakes with a definite seismic energy. Maps of seismic activity for the entire investigated area were constructed for the periods 1952-1967 (before the Zangezurskoye earthquake) and for the years 1952-1968. The seismic activity maps were constructed in three variants: 1) without repeated tremors, 2) with repeated tremors, 3) taking into account the percentage of excluded repeated tremors. Corresponding maps for these variants are reproduced as Figures 1-3. On the maps for the variant in which repeated tremors were not excluded there is naturally an increase in seismic

activity at the sites of major earthquakes, accompanied by repeated tremors with $K \geq 10$. On those maps constructed with allowance for the percentage of excluded repeated tremors the distorting influence of repeated tremors is to some degree smoothed. A comparison of the maps constructed without repeated tremors on the basis of observations for 1952-1967 and for 1952-1968 revealed that the Zangezurskoye earthquake did not cause significant changes in the spatial distribution of seismic activity in the investigated area.

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TRANSVERSE DIFFUSION FROM BOUNDARY OF GEOMETRIC SHADOW

Novosibirsk GEOLOGIYA I GEOFIZIKA in Russian No 10, 1976 pp 130-139

[Article by K. D. Klem-Musatov, Institute of Geology and Geophysics Siberian Department USSR Academy of Sciences, "Transverse Diffusion from the Boundary of the Geometric Shadow"]

[Abstract] The author investigated the field of a diffracted wave arising with presence in the medium of the edge of a reflecting-refracting boundary. The velocity of propagation of the diffracted wave is assumed to be constant. The object of investigation is only that part of space, the boundary layer, which belongs to the immediate neighborhood of the boundary of the geometric shadow of some regular (straight, reflected, transmitted) wave. The study was limited only to the principal, most intensive part of the field which corresponds to the asymptotic value of an integral of the Cauchy type and which is expressed mathematically through the Fresnel integral. It is shown that the field of the diffracted wave can be represented in the form of superposing of two components, one of which corresponds to the Fresnel-Kirchhoff approximation, whereas the second refines this approximation.

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EFFECT OF WIND ON RADIO MEASUREMENTS IN AGRICULTURAL SURVEYS

Moscow REFERATIVNYY ZHURNAL 52. GEODEZIYA I AEROS"YEMKA, OTDEL'NYY VYPUSK in Russian No 10, 1976 10.52.217

[Abstract of article by V. A. Pervago; L'vov, NAUCH. TR. L'VOV. S.-KH. INTA, 1975, 58, pp 120-123, "On the Problem of the Influence of the Wind on the Accuracy of Radio Measurements Made for Horizontal Control of Agricultural Surveys"]

[Text] A study was made of the influence of wind velocity on the dependence of the refractive index of radio waves on altitude. The investigation was based on the results of balloon soundings of the atmosphere carried out at the Main Geophysical Observatory, the Central Aerological Observatory and the Ukrainian Scientific Research Hydrometeorological Institute in different climatic zones of the USSR. Soundings were carried out in different seasons (January, June-September) at individual times of the day and around-the-clock. The refractive index was determined for heights of 2, 25, 50, 75, 100, 150, 200, 250, 300, 400 and 500 m. The experimental material was divided into three groups on the basis of wind velocities 0-2, 2-4 and more than 4 m/sec. For each of the groups the author obtained a dependence in the form $\delta \Delta n = dh^n$, where $\delta \Delta n_i = \Delta n_i - \Delta n_0$; Δn_0 is the refractive index at a height of 2 m above the ground surface; Δn_i is the refractive index at the i-th height; d and n are the determined coefficients (see table). On the basis of the collected data the conclusion is drawn that wind velocity exerts no influence on the vertical profile of the refractive index.

Group	d	m_d	n	m_n	Mean wind velocity, m/sec
1	-0.3029	± 0.0939	0.7220	± 0.009	0-2
2	3156	51	7075	17	2-4
3	2772	60	6948	30	more than 4

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CHARACTERISTICS OF LASER RADIATION REFLECTED BY WATER SURFACE

Moscow REFERATIVNYY ZHURNAL 52. GEODEZIYA I AEROS''YEMKA, OTDEL'NYY VYPUSK in Russian No 10, 1976 10.52.54

[Abstract of article by A. I. German, A. P. Tikhonov and A. Ye. Tyabotov; Moscow, TRUDY GOS. GIDROLOG. IN-TA, No 237, 1976, pp 76-81, "Results of Field Investigations of the Degree of Polarization of Laser Radiation Reflected by a Water Surface in Dependence on Waves"]

[Text] A model of a lidar has been developed for measuring the degree of polarization of laser radiation reflected from a water surface. The model consists of a generator of the sounding radiation, a unit for measuring the polarization and integral characteristics of the reflected radiation, a control and monitoring unit and a sensing and signal registering unit. The generator of the sounding radiation is a ruby laser ($\lambda = 0.6943 \mu\text{m}$) operating in a modulated regime. The crystallographic axis of the ruby is situated at an angle of 90° to its optical axis, which ensures obtaining plane polarized light. The power of the lidar radiation is 2 MW, pulse duration is 30 nsec, beam divergence is $10'$. Synchronization of operation of all the units is accomplished using a FEK-09 photocell registering the sounding (reference) signal. The reflected radiation is received by a

detector with two channels, at whose input there are polaroids oriented at angles of 0 and 90° to the polarization plane of the main radiation. The angle of the field of view of the detector was 1°. The degree of polarization of the received signal is determined by the expression $P = (I_{II} - I_I) / (I_{II} + I_I)$, where I_{II} and I_I are the intensities registered by channels with parallel and crossed polaroids respectively. Measurements of the degree of polarization of radiation reflected from the water surface (in some cases also from the surface of broken ice) were made from an IL-18 aircraft and from the earth. Measurements from an aircraft were made over the Black, Caspian, Aral, Kara and White Seas at different seasons of the year. The lidar was installed in the interior of the aircraft and radiated energy through a side window with a quartz pane. Using a dielectric mirror the radiation was deflected downward (flight altitude 0.5-10 km, the angles of inclination of the incident ray were 90, 80, 70 and 60°). The signals were registered using a S1-11 high-speed wide-band oscillograph and a FARM-2M camera. Measurements from the ground were made near Feodosiya with inclinations of 4-25°. It was established that the degree of polarization P decreases with an increase in the degree of waves W of the reflecting surface and with a decrease in the inclination α of the incident ray. For example, when $W = 1-2$ units ($\alpha = 90^\circ$) $P = 90\%$ and when $W = 5-6$ units P decreases to 50%. Similarly, when $\alpha = 90^\circ$ ($W \leq 2$ units) $P = 80\%$, whereas when $\alpha = 5^\circ$ $P = 40\%$. The article notes the differences in the degree of polarization P for different seas and for the surfaces of water and broken ice. With one and the same level of waves for the Black Sea P is greater than for the Caspian Sea. The P values for broken ice are much less than for water.

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V. UPPER ATMOSPHERE AND SPACE RESEARCH

News

CONCLUSION OF CONFERENCE ON DIRECT SATELLITE BROADCASTING

Moscow IZVESTIYA in Russian 15 Feb 77 p 3

[TASS Report: "Space and Television"]

[Text] Geneva, 14 February. The World Administrative Conference on Satellite Television Broadcasting has concluded its work here. The conference lasted five weeks. At the conference there were developed for the first time the technical bases for carrying out direct television broadcasting using artificial satellites. Delegations from 111 countries took part, including delegations from the USSR, the Ukrainian SSR and the Belorussian SSR, as well as representatives from 12 international organizations. [4]

WORK OF USSURIYSK OBSERVATORY DISCUSSED

Moscow IZVESTIYA in Russian 18 Feb 77 p 4

[TASS Report: "Solar Activity Increases"]

[Text] Ussuriysk. Astronomers at the Ussuriysk Observatory of the USSR Academy of Sciences Far Eastern Research Center are watching the development of a new cycle of solar activity. Hundreds of photographs have been obtained and thousands of meters of film have been used. Analysis of the pictures has shown that solar activity is gradually increasing. Thus, while 24 groups of spots were observed during the last six months of last year, 11 have already been registered since January of this year. Moreover, almost all are located in the high latitudes of the sun.

Candidate of Physical and Mathematical Sciences V. Chistyakov, head of the Ussuriysk Station of the Solar Service, commented: There is reason to believe that the new cycle of solar activity will turn out to be more

powerful than the previous one. This prediction is based on an established principle -- when the first spots of the new 11-year cycle appear in the higher latitudes of the sun, the power of the cycle will be greater.

The awakening of the sun is indicated not only by an abundance of spots, but also by an increase in radio waves and activation of chromospheric processes. The solar patrol of the most eastern observatory in the Soviet Union is diligently standing watch and identifying the peculiarities of this new cycle. [5]

REPORT ON COSMONAUTS' FIRST POSTFLIGHT DAY

Moscow PRAVDA in Russian 27 Feb 77 p 3

[TASS Report: "The First Day on the Ground"]

[Text] Baykonur, 26 February. Baykonur warmly greeted the heroes of the latest stellar voyage, Viktor Gorbalko and Yuriy Glazkov. An airplane brought them in a two-hour flight from the landing site to the Hotel "Kosmonavt." The first medical examination took place. The cosmonauts felt fine.

They had their first supper on the ground. Of course, it was under the control of the doctors. After their space menu an abrupt shift to terrestrial food is not recommended. By the way, the cosmonauts' schedule has many such restrictions in it, as they were reminded by General A. A. Leonov, who arrived with the cosmonauts from the landing site. During the first days it is recommended that the cosmonauts not engage in strenuous movement, especially in the morning after waking. The habit of weightlessness is persistent -- everything seems heavier than usual to them.

However, the cosmonauts are not complaining of heaviness in the legs which is characteristic of the first hours after "the return of the organism to earth." On Saturday the cosmonauts strolled the hallways of the hotel, visited the doctors, and went outside to take a walk on the snowy paths through a park surrounding the hotel. But this was only ten minutes in all. The doctors would not permit them more time.

The first day of rest for the crew on the ground has ended. Tomorrow, as A. A. Leonov announced, the cosmonauts will have meetings with medical specialists and engineers. These will be the first pages in the report on the second expedition aboard the "Salyut-5" orbital station. [4]

TASS ANNOUNCES LAUNCHING OF "KOSMOS-895"

Moscow PRAVDA in Russian 28 Feb 77 p 2

[TASS Report: "'Kosmos-895'"]

[Abstract] The artificial earth satellite "Kosmos-895" was launched in the Soviet Union on 27 February 1977. The satellite was inserted into an orbit with the following parameters:

- initial period, 97.2 minutes;
- apogee, 648 kilometers;
- perigee, 613 kilometers;
- orbital inclination, 81.2 degrees.

PROJECT DIRECTORS COMMENT ON "SALYUT-5" EARTH STUDIES

Moscow PRAVDA in Russian 16 Feb 77 p 3

[Article by K. Kondrat'yev and A. Buznikov, "The View of Earth from Orbit"]

[Text] The cosmonauts V. Gorbatko and Yu. Glazkov are continuing to carry out the scientific flight program for the "Salyut-5" station. An important part of this program is a study of the optical characteristics of the atmosphere and natural features on the surface of the earth. For these investigations a group of specialists from Leningrad State University has designed a spectral apparatus. In the article which follows the directors of the experiment tell about its objectives and the possibilities of the practical use of the results.

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With each new launching of space vehicles ever-increasing attention is being devoted to the investigation of our own planet. This tendency is determined by the necessity for a broadly based study of the environment and the earth resources on a global scale for their best use in the interests of mankind. In presenting a report at the 25th Congress CPSU, Comrade L. I. Brezhnev noted: "Soviet scientists should not lose from sight the problems of the environment and world population which recently have been more and more acute. The improvement in the socialistic use of nature and the development of an effective demographic policy is an important task in the entire complex of the natural and social sciences."

The enormous scales of economic activity, the limitations on existing natural resources and the close interrelationship of many processes and phenomena on our planet require from science the formulation of a unified concept of the use of nature. There are few well-tested ground methods here. Thus, a new science, space geography, appeared; the subject of its study has become the entire earth and the method is remote space sensing.

It is based on the registry of the electromagnetic radiation escaping from earth into space by means of photographic and spectral apparatus carried aboard a spaceship or an orbital station. Photographs of the earth taken by cosmonauts by means of different kinds of apparatus will serve as an important means for investigating the natural resources of our planet. The great importance of space photographs is that in them there is a high spatial resolution, they transmit color well and make it possible to obtain images in quite narrow, most informative ranges of wavelengths of electromagnetic radiation. A space survey of the earth has already made it possible to refine maps of different geographical regions, discover new geological structures and solve a number of interesting problems in the field of oceanology, hydrology of the land and glaciology.

A great volume of information on the state of the environment can be obtained from space by using spectral research methods. The basis of these is the property of different natural features to give a specific spectrum of reflection of solar radiation characteristic only for a specific feature. For these investigations the orbital station "Salyut-5" carried a manual RSS-2M spectrograph. It registers the brightness of a feature at each wavelength of reflected light. One obtains a sort of set of photographs, an array of which constitutes the spectrum. Deserts, forest, water, different kinds of lands and the vegetation cover have their characteristic reflection spectra.

Now experimental catalogues of these are being created which will be of assistance to specialists in identifying the type and state of land features on the basis of space images. This will help in developing methods for monitoring the state of forests (including the creation of a forest inventory) and water resources (in particular, swampiness). It is becoming possible to solve successfully those problems associated with land melioration, determine the degree of maturity of sown crops and estimate the crop yield. In other words, spectral and photographic investigations from space have opened the way to the development of a number of large scientifically practical plans of interbranch importance.

It is well known that the intensive productive activity of man is reflected in the physical properties and chemical composition of the atmosphere. For example, our air ocean is becoming more dust-filled. Extremely tiny particles suspended in the air (so-called aerosols) are collected in global layers and change its transparency, heat regime and the nature of circulation. The study of this phenomenon is helped by observations of the cosmic glow, registry of the brightness spectra of the atmosphere near the twilight and daytime horizons.

For this reason the scientific program for the "Salyut-5" orbital station included spectrographic studies of the twilight and daytime horizons of the earth. Space spectrometry not only affords a possibility for judging the degree of contamination of the atmosphere as a result of human activity, but also possibly establish whether this is related to changes in the climate of our planet.

A promising direction in investigation of the environment is the measurement of polarization of the light reflected by the earth. It was found, for example, that a water surface covered by a petroleum film polarizes the solar radiation returned by it into space far more strongly than does pure water. Such measurements are also of interest for evaluating the state of the cloud cover and the moisture content of the surface layer of ground. The RSS-2M spectrograph at the disposal of the "Salyut-5" crew makes it possible to carry out measurements of both the brightness and also the measured degree of polarization of sunlight reflected by different natural features.

When a study is made of soils, the vegetation cover or waves and a petroleum film on the ocean surface from aboard a spaceship, the atmosphere introduces definite distortions of their optical characteristics measured from space. In order to take into account these distortions, so-called coordinated experiments "spaceship-aircraft-ground expedition" with a synchronous program of observations are carried out. Such measurements, playing a control role, are carried out over preselected "key" sectors of the land and sea. The singular catalogues of spectra prepared in this way help in the proper interpretation of communications received from orbit.

The contribution of space geography to the storehouse of knowledge about our native planet is becoming greater with each new manned flight. In this connection it must be emphasized that the maximum success in the implementation of scientific and national economic space programs is attained when there is an optimum combination of reliable automatic equipment and a cosmonaut-operator in charge of control of ship systems. The role of the cosmonaut-researcher aboard a long-lived orbital station used for multiple purposes is important in that he can rapidly analyze the conditions, independently adopt a solution, give preference to investigation of precisely that object for which the most favorable observation conditions exist. In short, a highly qualified specialist aboard a space laboratory is a guarantee of a high effectiveness in the use of complex equipment in solving a wide variety of problems affecting the national economy.

Each flight into space yields not only new results, but also raises new problems. The great number of problems requiring study means that space ecology and the methods adopted in this work are in the experimental stage of development. And the successes which it has achieved today are only precursors of tomorrow's far weightier successes.

Cosmonautics serves for solution of practical problems -- such is the nature of the present stage in research. Each new penetration of man into circumterrestrial space is increasing his authority over the forces of nature and is serving for the progress of all mankind.

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NOTES ON "SALYUT-5" ATMOSPHERE REPLACEMENT SYSTEM

Moscow PRAVDA in Russian 24 Feb 77 p 6

[Article by A. Pokrovskiy, "Preparing for the Return"]

[Text] Now has come the day when the "Tereki" reported:

"The program of scientific research aboard the station has been fully executed."

It goes without saying that this communication was not unexpected: at the control center day after day specialists have monitored the work of V. Gorbatko and Yu. Glazkov, have helped them with advice and in other ways, and finally, knew that everything was going precisely in conformity to the schedule prepared on earth. And nevertheless we involuntarily think: how was it possible to do so much as the cosmonauts accomplished during their sixteen days in space?

A multizonal survey of the earth's surface and observations of a series of celestial objects in the IR range, monitoring of the precipitation of crystals from solution, fixing of sprouts of Crepis and technical operations, medical investigations and visual observations of our planet, adjustment work, including with a digital computer -- this is the diverse activity of V. Gorbatko and Yu. Glazkov not only as widely qualified researchers, but also as the celestial housekeepers of a flying space laboratory. This is also confirmed by the final experiment which they carried out.

This operation is called in brief: "Atmosphere Replacement."

In the case of prolonged flights, a year or more, there may be a need for a complete or partial replacement of the atmosphere.

There are supplies of air aboard the station. They are stored in special cylinders under high pressure. They are completely adequate for completely refilling the entire volume of the station. However, they are intended for more than this. The air can be used together with an electro-mechanical system for orienting the station. It can also be used for ventilation, if there is need for this. That is why this system is said to be multifunctional.

It seems natural that for replacement of the air the pressure in the compartments must first be reduced to zero and then again raised to the necessary level. But then it is necessary to also protect the instruments and human occupants against exposure to a vacuum. However, the placement of instrumentation into some sort of "spacesuit" means a reduction of the station's payload. But Soviet designers have found another way. They have so designed the positioning and operation of valves in the system that the air released into space is immediately replaced by new air from the cylinders.

Such an operation was carried out for the first time on a manned vehicle. Here at the center we observed its course on the screens of television sets. Excitement and attention reigned when Yu. Glazkov, by command, opened the appropriate valves and the space vacuum began to suck out the vital gas with a hiss. V. Gorbatko worked reliably at the other end of the station. The air released by him from the cylinders moved as an invisible wall through the compartments without allowing the pressure to drop below the admissible level. However, this problem could also be solved automatically. Even a partial replacement of the atmosphere confirmed the accuracy of the computations. The system functioned faultlessly.

Looking at how competently the cosmonauts carried out their final experiment, it can be said with assurance that they maintained a high performance. This is also confirmed by Doctor of Medical Sciences I. D. Pestov.

"The crew," he states, "adapted rapidly to weightlessness conditions and successfully carried out the first flight operations. All this created the prerequisites for a good working mood. And in actuality, V. Gorbatko and Yu. Glazkov began to work in space at a high tempo, somewhat surpassing the schedule. We even began to worry whether they would be able to maintain their strength over a long period of time. However, good sleep, adherence to physical exercises and good conditioning enabled them to carry out the entire program."

Both the reports of the cosmonauts and the objective telemetric indices indicate that the "Tereki" even now are in good form. For example, according to data from the on-board instrument for measuring body mass, both the commander and the ship's engineer lost approximately two kilograms of weight, as predicted. This occurred for the most part due to body loss of fluid.

Now the "Tereki" are preparing to deal with terrestrial conditions. They will be assisted in this by a vacuum chamber which intensifies the outflow of blood to the legs, simulating the effect of terrestrial gravitation, and the "Pingvin" suit which puts a load on the muscles.

Thus, the program of scientific and technological experiments aboard the station has been completed. V. Gorbatko and Yu. Glazkov still must carry out responsible final operations.
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GROUND SIMULATION OF "SALYUT-5" FLIGHT

Moscow PRAVDA in Russian 15 Feb 77 p 6

[Article by A. Pokrovskiy, "Brother of the 'Salyut-5'"]

[Text] Simultaneously with the launching of the "Salyut-5" still another station was put into orbit. Only this did not occur at the cosmodrome, but in a quiet workroom at an enterprise, the place where the station was developed, where the cast twin of the "Salyut-5" is set up.

Stepping in here, you immediately enter into circumterrestrial orbit, the parameters of which completely coincide with the "Salyut-5" orbit. And everyone who is here has "gone into space" together with V. Gorbatko and Yu. Glazkov, although they have not abandoned their native earth.

That which we see on the screens of domestic television sets is only an insignificant part of the information arriving from space. And if it is remembered that aboard the "Salyut-Soyuz" space complex there are about 2,000 different instruments which transmit a mass of data to the earth it becomes clear what volume of work is being done each minute during the orbital flight. The two cosmonauts are unable to orient themselves in this sea of information or draw the proper conclusions from it. They are assisted by the people on the ground and electronic computers.

There are many of them. There are those who keep watch at the Flight Control Center and at the observation interpretation posts. There are numerous specialists at scientific institutes who prepared the experiments. Finally, there are the stand-ins, the backup men for V. Gorbatko and Yu. Glazkov.

But there are also other people who with equal purposefulness prepared for the flight of the "Soyuz-5." These are the "test pilots," or if you please, the "doubles" for the cosmonauts. They are not twins by external appearance, but because, being aboard the ground mockup of the "Salyut-5," they carry out the same operations as are carried out in space. There are several of them and in turn they occupy the seats of the commander and the ship's engineer. And although their ship does not move from place, everything here, other than the vacuum and weightlessness, are the same as on the real flight.

In the mockup there is a duplication of all the operations performed in space and there is careful "playing through" of each day's work program for the "Salyut-5." There is a rigorous checking to see how the instrumentation behaves when performing stipulated operations on a real time scale.

What occurs? The ground analogue adds still another communication link: Flight Control Center - mockup. Here, indeed, there is the same expenditure of power as in orbit; all the mechanisms perform the same operations. Thus, a possibility is created for judging the situation on board not only from the long rolls of telemetric tape, but also, so to speak, visually, under the conditions most closely approaching those in space.

Space is space -- anything can happen when carrying out the next experiment. Therefore, it is always necessary to be ready to find rapidly the reason for possible malfunctioning and to send the necessary recommendations into orbit. Naturally, with the assistance of the specialists working simultaneously with the terrestrial cosmonauts.

This is especially important when the space station already a long time has been operating in orbit. But like every machine, it requires adjustment work. This is also first carried out with the mockup. Here at the center we have become witnesses of the adjustment work carried out by the "Salyut-5" crew, in particular, with one of the on-board electronic computers. First of all the terrestrial crew handles the matter. They perform the operations so as to free the way to the computer and select the necessary tools from the set which exists on the "Salyut-5." And they even make recommendations on means for securing the crew, since they will have to work under weightlessness conditions. As a result, V. Gorbatko and Yu. Glazkov received detailed instructions on the execution of the most responsible operations.

And now a communication comes from space: the work has been successfully completed and the crew has not encountered unforeseen difficulties. The same was true for the adjustment work on other station systems.

In orbit the cosmonauts V. Gorbatko and Yu. Glazkov are carrying out experiment after experiment. And the crew of the mockup has also gotten deep into the work. The terrestrial flight of the "Salyut-5" is continuing.
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COMMENTS ON "SALYUT-5" PHOTOGRAPHY AND BIOLOGICAL EXPERIMENTS

Moscow PRAVDA in Russian 17 Feb 77 p 3

[Article by A. Pokrovskiy, "The View From Above"]

[Text] Here is how the cosmonauts see our planet from aboard the "Salyut-5"! Professor N. P. Lavrov has spread out on the table a series of portraits of the earth made from space. We see inaccessible mountain ridges, blue oceans, forests and river deltas. Specialists see far more on them.

Even from the birth of aviation it was noted that a view of the earth from above provides much additional information. Now approximately four million square kilometers are now covered annually in our country on the orders of cartographers, workers in forestry and agriculture, seamen and the plotters of new routes for aerial surveys.

For example, photographs from space have enabled geologists to examine faults in the earth's crust earlier not noted: regions of probable mineral deposits and the first portrait of the earth "at full scale," made by one of the "Zonds" from a distance of approximately 80,000 kilometers, and meteorologists have discovered a second, earlier unknown equatorial cloud layer.

The use of a spectrozonal survey makes it possible in a single frame to take in the most diversified information for scientists in different fields of specialization. For example, spectrozonal color photography of a mountain region is of interest to geologists, glaciologists, workers in agriculture and forestry -- each in his own way.

The camera in space has demonstrated several unexpected possibilities of the optical system. Depending on the angle of the survey and the angle of illumination of the water surface by the sun it can look down for several tens of meters into the water layer. Thus, the first expedition on the "Salyut-5" photographed the underwater relief of a number of coastal zones and graphically represented the processes of terrestrial life.

But after all, the earth's face does not just change by itself. It is also changed by man. To register these changes in time is an important task in cartography. Until now it has been assumed that maps, and there are dozens of types of them, those for different purposes, must be revised each eight to ten years. The rates of technical progress have forced a shortening of these times. And here again it is impossible to get by without cosmonautics and its broad possibilities for regularly photographing one and the same sectors.

Figures also help in the understanding of this part of the investigations. Aboard the "Salyut-4" the cosmonauts P. Klimuk and V. Sevast'yanov photographed 5.6 million square kilometers of the territory of the USSR. According to the calculations of experts, the use in the national economy of the information contained in these photographs can give a savings of 50 million rubles.

But indeed this is only one part of the scientific program carried out by V. Gorbatko and Yu. Glazkov. In particular, they not only are studying the earth from the altitude of their flight, but are also investigating how the representatives of the flora and fauna of our planet appear from space orbit. At the center it is possible to become familiar with the method of these experiments. A scientific specialist of the Institute of General Genetics USSR Academy of Sciences L. R. Pal'mbakh here is carrying out control experiments parallel with the investigations carried out on the station.

Stored in a special thermostat are ampules with the eggs of loach -- an extremely unpretentious and common river fish. It can be seen how tiny fish emerge from the eggs. The very same thing occurred in space, but scientists assume that the development of living organisms under different

conditions will be different. In particular, the absence of gravity should be reflected in the vestibular apparatus. Its structure is similar in all vertebrates and this means that this is a good model for comparison and drawing conclusions.

L. R. Pal'mbakh has six test tubes filled with fungi. Two of them are in the light and four are in the darkness. In the first the fungi have the height of a matchbox. And the cosmonauts report that with them near the window the fungi are doing well and are gathering to form caps. The difference in their structure will be determined later.

The scientists are awaiting with impatience until the seeds and sprouts of Crepis return to their laboratories. A weed in our fields, it has proven extremely useful to science. V. Gorbato and Yu. Glazkov took part of the supply of seeds with them, whereas some of them were on the "Salyut-5" from the beginning of the flight, eight months. Their careful comparative analysis will make it possible to note the influence which space exerts on the living organism at the cell level.

In short, aboard the "Salyut-5" specialists are carrying out saturated, diversified scientific investigations.

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NOTES ON "SALYUT-5" LIFE SUPPORT SYSTEMS

Moscow IZVESTIYA in Russian 22 Feb 77 p 5

[Article by A. Ivakhnov, "In the Space Home"]

[Text] "It is interesting, what did they have to eat today?"

Well, here at the table at which we conversed were extracts from the ship's log. Breakfast: turkey, cheese, bread, curds with cranberry puré, bisquit, coffee with milk. Dinner: millet soup, assorted meats, chocolate, pastila. Supper: beef tongue, juice, candied fruit. An appropriate array of vitamins was added to the ration.

"The menu is highly varied," said the specialists to us. "The different dishes are repeated after several days. But the cosmonauts themselves can vary their diet."

All the crews have commented favorably on space food. In addition to taste qualities and compactness it is characterized by still another important property; these foods can be stored for a long time at ordinary room temperature.

The specialists told us about the life support system of the orbital station. In orbit the "Salyut-5" is exposed to temperatures from -150° Celsius to $+130^{\circ}$. These temperature differentials are withstood, first of all, by the thermal insulation of the station, which like a sheepskin coat enshrouds its entire volume from the outside. Second, aboard the station there is a heat-regulating system; it automatically maintains the stipulated temperature in all the station compartments.

In short it can be said that in a terrestrial home the most comfortable temperature for us is, let's say, $19-20^{\circ}$ Celsius, whereas in orbit, during a quite prolonged flight, this temperature is sometimes too low.

In space, in the opinion of our crews which have already flown, the most comfortable temperature is $23-25^{\circ}$.

A very important process on an orbital station is monitoring the composition of the atmosphere, its constant renewal. Data on the air composition aboard the "Salyut-5" are systematically transmitted to the earth.

The station carries regeneration capsules which absorb carbon dioxide and release oxygen. In addition, each day special filters drive all the air in the station out and purify it from all impurities. Both V. Gorbatko and Yu. Glazkov report that the air in their space home is remarkable.

The cosmonauts drink the water present on board the station with satisfaction. It was poured into space tanks from the Moscow water lines. However, silver ions have been added to it for long-term preservation. This gives something like the famed nonspoilage "holy water" whose properties in the old days excited the imagination of believers.

The entire station consists of functional zones which are insulated from one another. For example, there is a zone in which the cosmonauts eat; in addition to food, there is storage of eating utensils and napkins for wiping the hands.

Concentrated in the working compartment are all the principal control panels for the station and systems for its communication with the earth. Many similar devices are situated in the most different corners of the "Salyut-5" and we can say that the "Terek" can converse with the earth from any point on the station.

Aboard the station there is a zone for medical research, a physical exercise zone with a treadmill, a sanitary unit in a space version in which one finds razors, mirrors, hygienic napkins, toothbrushes, toothpaste and all other things which are usually found in bathrooms.

The press has already reported on the terrestrial analogue of the station. It is operating now when the station is in flight. But in the stage of creation of the station there was a so-called medical model in which

the test subjects lived without going out for a long time and checked the reliability and convenience of the selected systems. All their comments were then taken into account in the design and furnishing of real spacecraft. As we learned, Yuriy Glazkov was a test subject in such a medical model, working in it for a long time, and the developers and creators of the life support systems now consider him to be their man in orbit.

Both cosmonauts during the time of their television report on their life have repeatedly noted that on the "Salyut-5" there is everything necessary for both work and rest.

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APPLICATIONS OF COMPUTERS IN SPACE PROGRAMS

Moscow IZVESTIYA in Russian 18 Feb 77 p 4

[Article by V. Zolotukhin and L. Chesalin, "Computers in the Service of Cosmonautics"]

[Text] Space research and electronic computer technology are closely interrelated. Moreover, the problems of investigation of space require the development of such broad and diversified computation systems that they have become a powerful stimulus to computer system development. At the request of the editors, the role of electronic computers in space research has been described by the deputy director of the Space Research Institute USSR Academy of Sciences Professor V. Zolotukhin and the head of a laboratory at this institute, Candidate of Physical and Mathematical Sciences L. Chesalin.

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The first use of electronic computers in space research was its use for ballistic and trajectory computations. Even before the launching, as a rule, also before the construction of the spacecraft, a preliminary investigation is carried out of the general nature of the problem and choice of a trajectory, determination of the most convenient time and direction of the launching, and evaluation of the energy characteristics of the flight. The volume of computations in this work is so great that it can be carried out only with high-capacity electronic computers.

After launching of a spacecraft it is necessary to evaluate its real orbit on the basis of the first data from the ground measurement stations in order to issue, in case of necessity, instructions for trajectory correction. A peculiarity of these computations is that they are required very urgently -- even a small delay can make them unnecessary. And here the assistance of the "electronic brain" is indispensable.

Finally, in processing the experimental results the need arises for tying-in the collected data to definite points in space. The requirements for routineness are not so great here but there is a considerable increase in the volume of computations and machines have taken this routine work on their shoulders.

Another use of electronic computers in space research is the modeling of real situations. In many cases the purpose of such work can be the checking of some theory when the available data do not make possible a direct evaluation of its correctness and there must be an "inspection" of many variants.

In flight, in the case of appearance of so-called nonstandard situations, decisions must sometimes be adopted in such short time intervals that man is not in any condition either to evaluate the conditions or even react to them. The correctness of the solution can govern the fate of the experiment as a whole and sometimes the life of people. In this case the role of the electronic computers, cut into the control circuit, is difficult to overevaluate.

There is no doubt but that with each passing year the role of automatic systems in the control of space vehicles will increase. Probably, after some time it will be possible to expect the launching of objects on which electronic computers will be able to control independently many investigations at great distances from the earth, receiving from the experimenter only brief recommendations and returning the most highly valuable scientific information.

Finally, electronic computers play a decisive role in the ground processing of measurement data obtained by means of space vehicles. For example, from the "Salyut-4" orbital station so much information was transmitted to the earth that converted to a typewritten text this amounts to more than 700,000 pages filled with columns of figures.

By 1979 the volume of information received from space should increase in comparison with the present time by a factor of 10 (without taking into account data on natural resources) primarily due to investigations in the field of exoatmospheric astronomy and solar-terrestrial relationships.

The total processing of the results of telemetric measurements for each spacecraft usually requires several years and is divided into three stages — preliminary, primary and secondary. And in each of them the use of electronic computers plays a decisive role.

For example, in the primary processing stage there is a restoration of the measured values of physical parameters and an elimination of the errors associated with inaccuracies in operation of the instrumentation, the presence of gaps in the transmission of data to the earth, etc. The

processes of both preliminary and primary processing are extremely time-consuming and in particular require manual work. However, the recent creation of a system of standardized programs for electronic digital computers made it possible to a considerable degree to standardize this work and thereby reduce the total processing time.

A considerable part of the information received from space is photographs or phototelevision images, including photographs of the earth's surface taken from aboard a spaceship. For processing these images it is usually necessary to use an electronic computer. Using them it is possible to eliminate different kinds of pulsed interference, eliminate geometric and technical distortions, etc. Computers are also employed for automated interpretive processing of photographs, discriminating and identifying individual formations on a photograph, and tying-in images to definite geographic coordinates. Automated processing assumes particularly great importance with the creation of a service for remote sensing of natural resources from aboard satellites, manned ships and orbital stations of the "Salyut" type. The volumes of information used for these purposes are so great that its manual processing is virtually impossible.

As an illustration of the scale of the work which must be carried out on earth after taking photographs, it is sufficient to mention that one photograph, covering an area of 100 x 100 km, with a resolution of 10 meters, contains about 100 million units of information. This is only one photograph. But in experiments on the "Soyuz-22," for example, just in the course of one week it was possible to obtain more than 2,000 photographs with this resolution, each of which covers a sector of the earth's surface measuring 115 x 165 km.

The simplest variant of analysis of space videoinformation on an electronic computer is one in which the computer must process an ordinary black-and-white image. It determines the brightness of terrestrial features photographed from space and converts this into corresponding digits, the values of which are dependent on the optical density of the image on a photograph. Obtaining the digital code of a photograph, the electronic computer carries out the most different operations with it: draws lines corresponding to one and the same brightness, outlines elements of one and the same type, and computes their areas. These operations are primary for further special and quantitative interpretation of data on natural resources on the earth. Programs are now being developed for the automatic identification of different terrestrial formations on a space photograph.

Thus, in solution of the problem formulated by the Twenty-Fifth Party Congress, broadening research on use of space vehicles in studying the earth's natural resources, space and computer technology must work hand in hand.

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PROGRESS OF SOVIET STRATOSPHERIC OBSERVATORY

Leningrad LENINGRADSKAYA PRAVDA in Russian 26 Jan 77 p 4

[Unsigned article, "To the Secrets of the Sun"]

[Text] Ten years ago the first Soviet automatic stratospheric observatory, created on the initiative of Pulkovo astronomers, rose into the stratosphere.

What was the main purpose of launching of this observatory, laying the beginning of Soviet balloon astronomy? Due to disturbances in the earth's atmosphere the telescopes do not make it possible to distinguish small details on the solar surface. In addition, the atmosphere holds back in its upper layers cosmic particles, X- and UV radiation, and its lower layers -- almost all the IR radiation. Therefore, the question arose of transporting telescopes beyond the limits of the earth's atmosphere.

During the past decade a flying stratospheric observatory has been launched four times. A large telescope was present at an altitude of 20 km (mirror diameter one meter). The observatory carried a spectrograph, photographic, television and electronic apparatus, a telecontrol and tele-measurement system.

Now work has been completed on the scientific processing of observational data. It was possible to obtain a great number of photographs and spectrograms. The director of the Pulkovo Observatory, Corresponding Member USSR Academy of Sciences V. A. Krat, and a senior scientific specialist at the observatory, Candidate of Physical and Mathematical Sciences V. N. Karpinskiy, familiarized N. Osipov, correspondent of LENINGRADSKAYA PRAVDA, with the results of the processing.

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"Most solar problems are associated with the fine structure of the sun," stated V. N. Karpinskiy. "The fundamental processes on it are concentrated within individual formations with diameters from 50 to 500 km. The interaction of these 'cells' of the solar organism causes the entire diversity of solar activity phenomena. On the basis of the elements of fine structure it is possible to judge the relationship between the solar atmosphere and its deep layers, the processes of transport of so-called solar matter, and different types of energy from the deep layers into the atmosphere and into interplanetary space."

"Fundamentally new possibilities for observations have been discovered due to the creation of the stratospheric observatory, making it possible to study physical conditions in formations with diameters of less than 150 km. With respect to the complexity and power of the apparatus, our observatory considerably surpasses everything attained by modern science

and engineering. Among the most important scientific results is the discovery in the quiet, inactive photosphere of an inhomogeneity of the structures, differing from one another with respect to temperature. It was found that the mean brightness of the solar surface is significantly dependent on the total balance of energy in light and dark formations. All this changes the point of view concerning the role of fine structure in solar activity processes."

"A discovery of primary scientific importance is the inclination of photospheric structures, expanding upward. It was possible to discover earlier unobserved, especially small (to be sure, by solar scales!) so-called subgranular structures."

"Everything which V. N. Karpinskiy mentioned also pertains to sunspots," continued Corresponding Member USSR Academy of Sciences V. A. Krat. "But in sunspots the elements of inhomogeneity have a completely different form. In the penumbra these are exceptionally narrow, light and dark filaments, seemingly 'detaching' from the spot nucleus. In the nucleus itself there are chains of light points with a very high temperature, in some cases exceeding by 1,000° the mean temperature of the 'quiet' photosphere."

"It became obvious that the former scientific concepts concerning the solar magnetic field, based on observations from ground observatories, do not reflect the true picture. Everything indicates that inhomogeneity of the photosphere is maintained by a strong magnetic field. This field, evidently, is characterized by the presence of singular magnetic arcs capable of rising upward into the chromosphere and into the solar corona, carrying with them fluxes of particles, part of the magnetic field, this reaching the earth and even the large planets. The planets are seemingly submerged in this constantly expanding magnetic field, which is of particularly great importance for the problem of the relationship between solar and terrestrial phenomena."

"There are still many unsolved problems relating to the structure of the sun and solar activity," said Professor V. A. Krat in conclusion. "There is no doubt but that in the course of new flights of the stratospheric observatory we will obtain new valuable data. Indeed, a knowledge of the peculiarities of physical processes on the sun is of exceptional scientific and practical importance; how these processes transpire governs the state of the earth's magnetic field, radiation conditions, radio wave propagation, and many other phenomena."

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RESULTS OF TECHNICAL EXPERIMENTS ON "SALYUT-5"

Moscow PRAVDA in Russian 20 Feb 77 p 3

[Article by V. Avduyevskiy, Corresponding Member USSR Academy of Sciences, Professor S. Grishin and Professor L. Pimenov, "Toward Orbital Factories of the Future"]

[Text] On the "Salyut-5" station the cosmonauts B. V. Volynov and V. M. Zholobov carried out a cycle of technological experiments with the set of instruments "Kristall," "Potok," "Sfera," and "Reaktsiya." They pursued two objectives: testing the corresponding instrumentation directly under space conditions and using it for obtaining new data. The results of the experiments and also the presently available materials from laboratory investigations of samples returned by the cosmonauts make it possible to draw the conclusion that both problems have been solved successfully.

For experiments aboard the station "Salyut-5" experts constructed a special set of instruments making it possible to investigate different physical processes under conditions of reduced gravitation: hardening and crystallization, heat and mass exchange, and others.

The technological experiments carried out by B. V. Volynov and V. M. Zholobov were executed within the framework of a unified research program. This makes provision for use of manned space stations and ships and automatic probes launched on high-altitude rockets.

The first important result of the experiments carried out under the "technological program" on the "Salyut-5" station was that there was a checking of the performance of some types of instruments, a study of the peculiarities of their functioning, which was impossible to study completely on the earth and accumulation of experience in carrying out such investigations. Now it is possible to compare how the instruments operate under conditions of brief and prolonged weightlessness, on high-altitude rockets and on an orbital station. In particular, heating devices of the type used in the "Reaktsiya" instrument were tested in March and December 1976 during the launching of high-altitude rockets. The complexity here is that the investigated samples are in a state of weightlessness for only 10-15 minutes and in a short time it is not only necessary to heat them, but also cool them rapidly so that they will harden prior to entry of the descent module into the dense layers of the atmosphere. Aboard an orbital station there are no such restrictions and therefore the regimes of the heating devices can be varied in a wide range.

Another problem arising in the course of testing of the instruments is also associated with ensuring the computed heat regimes. As is well known, in the case of reduced gravitation there is in general no convective heat exchange or its role is small. In addition, in space there can

be a change in the conditions for heating the investigated samples due to a deterioration of their thermal contact with the heater in the absence of gravity ("Sfera" instrument). For these reasons the data obtained by the crew of the "Salyut-5" station make a useful contribution to study of the peculiarities of heat exchange under microgravitation conditions.

Now we will proceed to a characterization of the preliminary scientific results of the technological experiments during the time of the first expedition aboard the "Salyut-5."

The first of the formulated problems was an investigation of the peculiarities of growth of crystals from solution or a melt under conditions when due to the absence of gravity the transfer processes in a fluid have primarily a diffusional character. Most of the investigations were carried out using the "Kristall" instrument.

In the course of the experiment, lasting 24 days, for the first time crystals of aluminum-potassium sulfate were obtained from an aqueous solution and delivered to the earth. These crystals grew on a nucleus and in the volume occupied by the solution. A preliminary analysis revealed that the crystals cultivated in space contain large gas-fluid inclusions. This is evidently attributable to the fact that aboard the station Archimedes force and convection are inoperative. Under terrestrial conditions these factors ensure degassing of the solution.

Close results were obtained from an attempt to obtain a metalloceramic alloy in March 1976 during launching of a high-altitude rocket. Then a technological preparation from a mixture of aluminum and glass was used; this was subjected to fusion using the heat from an external heating source. As a comparison similar experiments were carried out under terrestrial conditions. Comparison made it possible, in particular, to draw the conclusion that if in a "terrestrial" sample of the alloy the density of the gas inclusions is minimum in its lower part and increases considerably upward, in the "cosmic" sample the gas inclusions are distributed more uniformly. This difference, as in the "Kristall" experiment, is evidently associated with the absence of the buoyancy of gas bubbles in a fluid in space. The effect of increased capture of gas-fluid inclusions in the crystallization process from solutions and melts must be taken into account when cultivating crystals under microgravitation conditions.

The next "technological" problem was a study of the effect of surface attraction forces. Using the "Potok" instrument it was found that under microgravitation conditions the process of fusing of gas bubbles present in a fluid is considerably drawn out. The peculiarities of flow of fluid from one volume to another under the influence of surface attraction forces were demonstrated in the example of a melt of a manganese-nickel solder ("Reaktsiya" instrument). As shown by an investigation

of the samples of soldered tubes returned from space, the fluid solder flowed along the capillary gap from a large annular cavity into a smaller cavity. Under weightlessness conditions the radius of curvature of the free surface of the fluid is determined by the angle of wetting and the dimensions of the cavity. With this taken into account, the dimensions of the cavity were selected in such a way that the pressure drop ensured a flow of the melt. The experiment carried out on the "Salyut-5" station confirmed these ideas.

The purpose of the third experimental study was an investigation of the process of containerless hardening of liquid metal using the "Sfera" instrument.

A preliminary analysis of the samples of Wood's alloy, delivered from aboard the station, revealed the following. Their configuration was ellipsoidal and the surface has a complex relief. The microstructure of the sample is identical in its entire cross section. A metallographic investigation revealed that with remelting of the initially homogeneous material and its crystallization under microgravitation conditions its uniformity deteriorated. For materials of the Wood's alloy type this leads to an increase in the actual melting point. A similar phenomenon of deterioration of the homogeneity of the alloy was observed in the "Universal Stove" experiment. This was carried out in 1975 within the framework of the "Soyuz-Apollo" experiment. A detailed mechanism of the phenomenon still awaits explanation.

The next specific problem was a study of the processes of soldering and fusion of metals ("Reaktsiya" instrument). The soldered samples obtained in orbit underwent laboratory investigations. In general, a metallographic analysis indicated a good quality of the soldered seam. However, in individual places it contains individual spherical pores. The microstructure of the seam has well-expressed small equiaxial grains, at the same time that the seam obtained using such an instrument on the earth has a dendritic structure. These differences were probably caused by some difference in the cooling regimes (convection is absent in space). According to data from a microroentgenostructural analysis, the components of the solder under space conditions are distributed somewhat more uniformly. The soldered seams obtained under conditions of reduced gravitation are azimuthally uniform. On earth this is prevented by gravity.

The samples delivered from orbit were tested for vacuum density and mechanical strength. It was found that the joints soldered in space have complete tightness, surpass similar terrestrial samples with respect to a number of indices and are equal to them in strength.

All this makes it possible to conclude that the method for soldering tubular connections by means of external heat sources, tested by the first "Salyut-5" crew, can find use when carrying out technological operations aboard spacecraft.

The program for the second expedition aboard the "Salyut-5" station includes a continuation of the technological experiments. The cosmonauts V. V. Gorbatko and Yu. N. Glazkov have proceeded to their implementation. Investigations are being carried out with the "Diffuziya" instrument and experiments with the "Kristall" instrument are continuing.

Thus, before our eyes we have seen laying of the foundation of the cosmic production of new materials -- a promising direction in man's activity in space.

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NOTES ON "KRISTALL" EXPERIMENT ON BOARD "SALYUT-5"

Moscow TRUD in Russian 20 Feb 77 p 3

[Article by A. Sadovnikov, "Crystals in Space"]

[Text] Space crystals. Only recently scientists only dreamed of the attractive possibility of obtaining them in space. The absence of weight and convection are favorable conditions for obtaining perfect crystals with a surprising number of properties unattainable on earth.

Germanium and silicon semiconductor materials, the same from which transistors, thyristors, radio circuits and other parts are made, require the most rigorous sterility. Even small foreign impurities can impair the physical properties: mechanical, electrical and optical characteristics. For example, per billion germanium atoms there cannot be more than one atom of impurity. Silicon is still more sensitive to outsiders.

Scientists are inclined to feel that the industrial production of monocrystals in space and their use in the creation of integrating circuits is laying the foundation for a "new era" in microelectronics. On their basis it will be possible to create microcomputers with a high speed and an enormous memory volume and information-logical systems of unprecedented power. On a single platelet of ultrapure crystal with an area of a square centimeter it will be possible to record up to a million units of this information. This greatly improves the characteristics of modern electronic and cybernetic instruments and will make it possible to raise the question of creating devices which in their information capacity approach that of the human brain (approximately 10 billion information units).

The first expedition on the "Salyut-5" carried out a series of highly important technological experiments, including under the name "Kristall." Its purpose is obtaining crystals from a sterile aqueous solution of aluminum-potassium sulfate. Two crystals were grown and delivered to

the laboratories of scientists for thorough analysis. Before departing from the station, the cosmonauts Boris Volynov and Vitaliy Zholobov introduced into one of the thermostat crystallizers still another nucleus -- a tiny crystal. This is the "germ" on which the crystal is "born" and grows.

Viktor Gorbatko and Yuriy Glazkov have collected a "harvest" -- under weightlessness conditions there was formation of a massive crystal and a great number of miniature crystals with the size of a pea which have very distinct facets. These are so-called spontaneous crystals which do not grow on a nucleus but directly in the solution.

Exclaiming at their jewel-like beauty, Viktor Gorbatko in one of the communication sessions stated:

"The beauty of the cosmic 'gems' is surprising. One gets the impression that someone purposely cut them, subjected them to grinding and polishing: the configuration is geometrically true and the plane of the facets is reproachless."

What was found from the investigations of crystals returned to the earth? They have a true configuration with distinct facets. However, there are surprises. Microscopic investigations have revealed a great number of gas bubbles and fluid uniformly distributed through the entire volume of the crystal.

For the scientists such inclusions for the time being are a mystery. In interpreting the structure and properties of the crystals grown under weightlessness conditions, specialists want to know whether they have discovered here rich prospects for obtaining in space materials with pre-stipulated properties.

"'Tereki,' all is clear about the crystals. And when will you collect the harvest of crystals?" asks the earth.

"The crystals are growing vigorously. True, there are still no 'caps' but the stems are growing longer not from day to day, but hour-by-hour," reports Viktor Gorbatko in a happy voice.

"Well, upon return home we will relieve you of the space mushrooms," jokes the earth.

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COSMONAUTS PREPARE FOR DESCENT

Moscow IZVESTIYA in Russian 26 Feb 77 p 1

[Article by A. Ivakhnov, "Outstanding Finish"]

[Text] Maps are hung conspicuously in the meeting hall at the Flight Control Center on the wall behind the flight director. Meteorological maps similar to those which are now published in our newspaper, but far more detailed; there are physical maps, on which for the territory of Northern Kazakhstan one can see some rectangles, red arrows and tiny flags. At the very middle of the wall there is a placard on which a curve beginning at the upper left corner smoothly descends to the lower right corner where one sees a parachute with a tiny sphere where the lines meet. The landing date for the "Soyuz-24" is marked boldly...

A session of the state commission has just ended here. They summarized the preliminary results of work of the "Soyuz-24"- "Salyut-5" complex and adopted a resolution concerning the completion of the space experiment. Everyone is in a good mood: the flight is going normally and in all its stages there has been faultless operation of all the Flight Control Service and the command-measuring complex scattered over the country. The main words of praise were spoken in an address of the cosmonauts V. Gorbatko and Yu. Glazkov.

And still another important conclusion was drawn by the commission: the "Salyut-5" is a reliable base platform for carrying out scientific and technological experiments. All its systems performed excellently in orbit.

A day before the landing, during a communication television session, the "Tereki" thanked the General Secretary of the Central Committee CPSU L. I. Brezhnev for the telegram which Leonid Il'ich dispatched in congratulating the cosmonauts on the occasion of Soviet Army Day.

Their last workday in orbit began in the middle of the third night. V. Gorbatko and Yu. Glazkov ended their work in mothballing the station and carried out the last communication session from aboard it. Then, as they told it, before the road home, in accordance with the Russian custom, they sat for a minute in the working compartment of the station. While flying over the Far East, the "Tereki" passed into the transport ship "Soyuz-24" and closed the transfer hatches. They checked the tightness of the cavity separating the ship and station, put on anti-g suits (they applied pressure to the lower part of the body so that during descent accelerations the blood would not pour from the head), and got into their spacesuits. Then they put into the integrator the command transmitted from the earth for carrying out descent operations.

They closed the hatch behind them, the hatch through which they passed from the living compartment of the ship into the descent module, and checked its airtightness.

From his control panel V. Gorbatko gives a command for undocking. In the rays of the setting sun (this occurs over Ussuriysk, where it is now evening) the ship slowly floats away from the station...

Still another revolution. Over Argentina the ship emerges from the shadow. V. Gorbatko and Yu. Glazkov check its orientation in the necessary direction, relying in this case on a landmark visible amidst the expanses of the Atlantic -- South Georgia Island.

The ship is flying over the Gulf of Guinea, where it is now tracked by our scientific ship "Kegostrov." The engine has been fired! After several minutes there is a separation of the ship's compartments and the descent vehicle continues its path along the planned trajectory. It plunges ever deeper into the dense layers of the atmosphere, it is enveloped by red-hot plasma and communication with the cosmonauts ceases. And only the radar waves reflected by the vehicle give information to the people on the trajectory covered.

Finally, the search group reports that communication has again been established with the "Tereki." At an altitude of 10 km a small braking parachute and then the tiny canopy of the main parachute extends out.

The flight has ended. Hello, native earth!
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NOTES ON DEVELOPMENT OF QUANTUM AMPLIFIERS

Moscow SOVETSKAYA ROSSIYA in Russian 6 Feb 77 p 4

[Article by G. Pankov, "A Voice from Distant Stars"]

[Excerpt] During recent years radioastronomy has made it possible to detect extremely "dark" phenomena and processes in the universe, has made many discoveries which can be categorized as remarkable, and at times outstanding. In distant space it has been possible to discover the "visiting cards" of extraterrestrial life -- the spectral lines of organic molecules.

An inconceivable multitude of "voices," billions of noises fill infinite space. The shy voices of the stars and constellations come to us from the depths of the eons, from eternity. And here on earth human reasoning converts these voices into some intelligible form, into a picture, in such a way that the researcher can read, see and understand the powerful

processes which are associated with the growth, life and development of the universe. But to discriminate the necessary information from the chaos of noise is a problem which is a hundred times more complex, than (for example) using a magnetic recorder to register the fluttering of a butterfly flying at the center of a roaring waterfall.

Hearing the unheard, detecting the voices from remote distances of interest to the researcher, is made possible by the use of modern radio receivers used in systems for remote space communication. The most important thing here for the developers of new instrumentation is the problem of response, one of the most "sensitive" problems in radioelectronics.

Earlier in radioastronomy it was most common to use apparatus operating on radio tubes and semiconductor crystals. But such apparatus has a serious shortcoming: this equipment itself generates noise and therefore it is not capable of keeping the received ultrafaint signals. And hearing the whispering of stars is a delicate matter.

The discovery of the quantum amplifier principle by N. G. Basov, A. M. Prokhorov and C. Towns, as well as the generation of electromagnetic oscillations, was the basis for creating apparatus of a new type -- virtually "noiseless." But then this was only a principle which had to be embodied in reality. Only a grain from which one hoped to grow a garden.

It was unknown how the new principle could be used in creating quantum amplifiers with the required parameters. And most importantly, it was necessary to make industrial samples of the promising instruments for prolonged operation with remote space communication antennas and in the work of radioastronomical observatories.

Years passed. Scientists found effective materials for the amplifiers. They were ruby paramagnetic crystals. The amplifiers were created and the goal was achieved. The response of the receiving equipment was increased by a factor of 10, which made it possible to obtain fundamentally new results of great scientific importance.

Now it is possible to glance into the future of space research. For example, it is proposed that a radio telescope be installed aboard artificial earth satellites, and also directly on the moon. They can, let's say, operate as a pair with a ground complex and carry out joint investigations with it.

The work of Soviet scientists, the creators of quantum amplifiers, was rewarded by the Gold Medal of the All-Union Exhibition of Achievements in the National Economy; it was demonstrated at the Soviet industrial exhibit in London. The group of creators of promising devices was awarded the USSR State Prize for 1976.

"Quantum amplifiers," states one of the prizewinners, Doctor of Physical and Mathematical Sciences A. A. Manenkov, "were created on the basis of the latest achievements in quantum electronics, the physics of crystals, low-temperature engineering and superconductivity. And the fact that our quantum amplifiers are deemed the best in the world and the fact that they came into use earlier here than anywhere else once again confirms the leading role of Soviet science and engineering."
[275]

WORK OF "KASPIY" SCIENTIFIC CENTER DESCRIBED

Moscow PRAVDA in Russian 28 Feb 77 p 4

[Article by L. Tairov, "What Can Be Seen from Space?"]

[Summary] Specialists at the young scientific-production center "Kaspiy" are analyzing the information obtained from artificial earth satellites of the "Meteor" type. In September of last year they carried out joint work with the "Soyuz-22," which photographed the earth by means of special equipment. Despite its newness, the center is an impressive scientific and practical organization. It includes a scientific unit, a special design bureau, experimental production division, marine station, floating base, control-measuring polygons and specialized transport facilities. The director of the center, Candidate of Technical Sciences T. Ismaylov, stated that the center is located in Azerbaydzhan due to the economic and geographical peculiarities of the republic. It works hand-in-hand with the Azerbaydzhan Academy of Sciences, which has accumulated work experience associated with study of the earth from space. The center has a broad work program. It includes study of natural resources by ground and aerospace methods, developing methods for interpreting the collected information applicable to this region, creation of means for processing it, including new types of semiconductor memory devices, detectors of IR radiation, and instrumentation for flightcraft, buoys and the land surface. This research equipment will make possible a more complete and better interpretation of the information received in a synchronous survey, that is, as a result of simultaneous observation of definite sectors of a region on the land (or water) from an aircraft or space vehicle. From space it is easier to study large natural features (these are difficult, and in some cases, impossible to detect from the earth or from an aircraft). Using a satellite it was possible to detect a series of tectonic faults of a meridional-latitudinal strike, process the collected data on an electronic computer and create a regional map of faults. This map in combination with other methods made it possible to ascertain the prospects for finding ores in the northwestern part of Azerbaydzhan. Methods are being developed for using space data in soil-biological investigations, in the future making it possible to prescribe measures for the care of cotton, grain and

vegetable crops and ascertain their yield. In the territory of Azerbaydzhan and Stavropol'skiy Kray plans call for an original aerospace experiment for use of the collected information in agriculture. On the initiative of the center the institutes of the Azerbaydzhan Academy of Sciences (soil science and agrochemistry, geology, geography) are establishing laboratories specializing in the use of aerospace information.
[321]

NOTES ON LANDING OF "SOYUZ-24" COSMONAUTS

Moscow PRAVDA in Russian 26 Feb 77 p 3

[Article by A. Pokrovskiy, "Excellent Work; Soft Landing"]

[Summary] During the last days of flight of the "Salyut-5" the crew prepared it for flight in an automatic regime and made the "Soyuz-24" ready for return to earth. And this means that V. Gorbatko and Yu. Glazkov had to put hundreds of instruments in the appropriate regime, pack and move into the "Soyuz-24" descent module hundreds of meters of still and motion picture film, magnetic tapes, all shipboard documents and the results of numerous experiments. In short, these days were filled with work... On earth the ballistics specialists and representatives of the search service carefully studied the landing area with respect to the landscape, populated places and weather. As always, several variants of the landing program were worked out -- a territory of several thousand square kilometers was involved. Over the landing region there was to be multilayered low clouds, precipitation and a rather strong wind. Aircraft, helicopters and cross-country vehicles were on the ready. The day 25 February began earlier than usual for V. Gorbatko and Yu. Glazkov. They carried out operations for the mothballing of the station, disconnected the air line connecting the "Salyut-5" and the "Soyuz-24" and went into the ship wearing anti-g suits and spacesuits. At the center several large electronic computers were processing the flow of ballistic and telemetric information, the results being fed out in the form of tables and graphs... Thus, all was ready for the final operations. The earth transmits to the ship a program for control of descent and the crew seals the hatch of the descent module. The time has come for undocking. The crew gives the undocking command and the two spacecraft float apart... A command is given for firing of the braking engine. After 168 seconds of its operation the descent module is separated and the controlled descent system begins to function. When at an altitude of 10 km in the earth's atmosphere the braking parachute extinguishes the excess velocity. The main parachute opens at an altitude of seven kilometers... Soon the helicopters of the search service have landed alongside the descent module, the hatch of the latter opens and the cosmonauts safely emerge...

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Abstracts of Scientific Articles

PULSATIONS OF ELECTRIC FIELD IN IONOSPHERE OBSERVED FROM SATELLITE

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977
1A338

[Abstract of article by S. Klimov and A. V. Gul'yel'mi; Moscow, ISSLED. PO GEOMAGNETIZMU, AERON. I FIZ. SOLNTSA, No 39, "Nauka," 1976, pp 39-43, "Pulsations of the Electric Field in the Ionosphere in the Range 0.1-0.2 Hz According to data from the 'Interkosmos-10' Artificial Earth Satellite"]

[Text] The paper gives the results of a comparative analysis of fluctuations of the electric field E (0.1-2.0 Hz) in the ionosphere (on the basis of measurements aboard the "Interkosmos-10" artificial earth satellite) and geomagnetic pulsations $Pc1$ and $Pc2$ (on the basis of observations at ground observatories). For the analysis the authors selected signals of a quasi-sinusoidal form. Use was made of records of the registry of E on the northern segments of the AES trajectory when it passed at a short distance from observatories. The article gives examples of simultaneous registry of E pulsations aboard the satellite and pulsations of the magnetic field at the earth. The pulsations have close periods but the form of E fluctuations is less regular; usually they last a shorter time than pulsations at the earth. The correspondence of the periods of oscillations makes it possible to conclude that the variations of E are not spatial, but are of temporal origin. The noncoincidence of the times of appearance of electric signals at the artificial earth satellite with the times of satellite intersection of the ionospheric source of $Pc1$ requires additional consideration. Bibliography of two items.

[276]

NONLINEAR PHENOMENA IN IONOSPHERIC RADIO WAVE PROPAGATION

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977
1A249

[Abstract of article by I. M. Vilenskiy, N. I. Izrayleva, A. A. Kapel'zon and V. V. Plotkin; Novosibirsk, ISSLED. OKOLOZEMN. PROSTRANSTVA, 1976, pp 17-35, "Nonlinear Phenomena in Ionospheric Radio Wave Propagation"]

[Text] This is a review of the results of theoretical investigations of the authors carried out in 1971-1975. The following are considered: 1) formation of artificial inhomogeneities in the ionosphere and their influence on the propagation of radio waves at different frequencies; 2) reflection of powerful radio waves with a frequency $f < 200$ KHz from the lower ionosphere; 3) ionospheric propagation of powerful radio signals, amplitude and phase distortions of these signals; 4) nonlinear effects in the propagation of powerful low-frequency radio waves; 5) interaction between powerful radio pulses, experimental conditions for attaining the maximum values of the coefficient of amplitude and phase cross-modulation. The authors have computed the profiles of electron concentration in the lower ionosphere (50-75 km) on the basis of experimental data on amplitude cross-modulation. Bibliography of 26 items.
[276]

COORDINATED MEASUREMENTS OF IONOSPHERIC DRIFTS

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977 1A235

[Abstract of article by G. A. Zherebtsov, E. S. Kazimirovskiy and B. A. Ferberg; Moscow, FIZ. IONOSFERY. KRATK. SOOBSHCHENIYA, "Nauka," 1976, pp 163-164, "Coordinated Measurements of Ionospheric Drifts"]

[Text] This is a report on the preliminary results of measurements of ionospheric horizontal drifts at the Polar Space Physics Polygon (Noril'sk) which were carried out by the D1 method beginning in 1973 under a coordinated program. The authors point out the great frequency of fadings and rapid changes in the nature of fading over times of about five minutes. The high-latitude ionosphere is characterized by a great number of cases of drift velocities of > 300 m/sec, especially in winter and summer. Analysis of the data (in the case of synchronous measurements) on the total velocity vector, azimuth φ and components of drift velocity for Noril'sk and Irkutsk made it possible to establish that in contrast to the usual predominance of movement to the east in the middle-latitude lower ionosphere the maximum of the φ distribution for Noril'sk falls at $210-270^\circ$. The conclusion is drawn that in the high latitudes there is an independent general circulation cell (in the lower ionosphere).
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ANALYSIS OF SPECIAL PHOTOELECTRIC TRACKING SYSTEM

Moscow REFERATIVNYY ZHURNAL 62. ISSLEDOVANIYE KOSMICHESKOGO PROSTRANSTVA, OTDEL'NYY VYPUSK in Russian No 10, 1976 10.62.270

[Abstract of article by A. F. Burov, A. A. Parshin and O. V. Popov; Leningrad, SISTEMY AVTOMAT. UPR., 1975, pp 19-24, "Analysis of Photoelectric Tracking System with Dissector and Structure Switching"]
[290]

EFFECT OF ION DENSITY ON STRUCTURE OF ELECTROSTATIC FIELD

Moscow REFERATIVNYY ZHURNAL 62. ISSLEDOVANIYE KOSMICHESKOGO PROSTRANSTVA, OTDEL'NYY VYPUSK in Russian No 10, 1976 10.62.332

[Abstract of article by V. A. Shuvalov and E. A. Zel'dina; Kiev, KOSMICH. ISSLED. NA UKRAINE. RESP. MEZHVED. SB., No 8, 1976, pp 25-30, "Effect of Ion Density on the Structure of the Electrostatic Field in the Trail Behind a Body Moving in the Ionosphere"]

[Text] In a "neutral approximation" with use of the quasilinearization method the authors have solved the problem of the structure of an electrostatic field in the trail behind a body moving in rarefied ionospheric plasma. The authors consider the influence of body configuration, distribution of ion density and the Mach number on the structure of the near trail. The results of the computations, carried out for a broad range of parameters S_1 and ε (S_1 is the Mach number, $\varepsilon = R/\lambda_d$ is the ratio of the characteristic dimension of the body to the Debye radius), indicate a relatively weak influence of ion density on the distribution of the electrostatic potential field. The limiting values obtained for potential in the trail with respect to position and intensity agree satisfactorily with the results of other authors. Bibliography of six items.

[290]

SATELLITE STUDY OF PLASMA RESONANCES

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977 1A68

[Abstract of article by T. V. Yefimova, N. A. Mityakov, E. Ye. Mityakova, V. V. Pisareva, V. O. Rapoport and Yu. V. Chugunov; Moscow, FIZ. IONOSFERY. KRATK. SOOBSHCHENIYA, "Nauka," 1976, p 147, "Investigation of Passive Plasma Resonances on the 'Kosmos-259' Satellite"]

[Text] This paper gives the results of an investigation of passive plasma resonances at frequencies of 1395, 1730, 3270 and 5850 KHz aboard the "Kosmos-259" AES in December 1968 and in January 1969. Resonances were clearly observed at frequencies of 1395 and 1730 KHz with an intensity exceeding cosmic radio emission. There was a considerably less intense resonance with a duration of about 15 sec which was frequently registered at a frequency of 3270 KHz; at a frequency of 5850 KHz no plasma resonances were observed. An analysis of the data carried out on the basis of fine antennas in magnetically active plasma indicates that in the ionosphere there are plasma waves whose intensity is determined by fast photoelectrons with an energy $E = 1-25$ eV. The investigation of plasma resonances makes it

possible to determine the profiles of electron concentration in the ionosphere at great altitudes. Bibliography of one item.
[276]

ROCKET MEASUREMENTS OF UPPER ATMOSPHERE PARAMETERS

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977
1A104

[Abstract of article by N. M. Shyutte; Moscow, FIZ. IONOSFERY. KRATK. SOOB-SHCHE NIYA, "Nauka," 1976, pp 90-91, "Some Data on the Interrelationship of the Principal Parameters of the Upper Atmosphere Using the Results of Rocket Experiments"]

[Text] On the basis of data from measurements of UV radiation of the sun in the atmosphere, carried out using vertical geophysical rockets in 1965-1971, the author examines variations of the composition and temperature of the thermosphere at altitudes 130-400 km. For clarifying the interrelationship of the neutral and ionized components of the upper atmosphere the author carried out a comparison of the data collected on the composition and temperature T_n with the results of measurements of N_e and T_e , carried out in these same experiments. There was found to be semiannual variations of the concentration and composition of the neutral components; there was no unambiguous correlation between these parameters, solar and geomagnetic activity. Changes in neutral composition exert an influence on the distribution of N_e below the maximum of the F2 layer; at great altitudes the distribution of N_e is dependent on ionization drifts caused by neutral winds. In the autumn and winter the drift of charged particles considerably changes the nature of the vertical distribution of the effective recombination coefficient and its absolute value. Bibliography of two items.
[276]

ENERGY SPECTRUM OF ATMOSPHERIC GAMMA QUANTA

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977
1A162

[Abstract of article by A. M. Gal'par, A. V. Kurochkin, N. G. Luchkov and Yu. T. Yurkin; Moscow, ELEMENTAR. CHASTITSY I KOSMICH. LUCHI, No 4, Atomizdat, 1976, pp 20-22, "Vertical Variation of the Energy Spectrum Index for Atmospheric Gamma Quanta with Energies $E \geq 40$ MeV"]

[Text] For the purpose of carrying out a correct extrapolation to the boundary of the atmosphere when determining the intensity of primary gamma quanta and checking theoretical models of the nuclear-electromagnetic cascade in the atmosphere, the authors carried out an investigation of the vertical variation in the pressure range 6-1000 g·cm² of the exponent for the energy spectrum of atmospheric gamma quanta with an energy $E \geq 40$ MeV. The measurements were made during two flights with high-altitude balloons using a high-transmission gamma telescope consisting of a system made up of a Cerenkov counter and scintillation detectors and also three spark chambers with photographic registry of information (the gamma quanta are converted into electron-positron pairs in one of the spark chambers -- in a six-gap chamber-converter). Conclusions: the energy spectrum of gamma quanta in the range 40-200 MeV was harder at the level with a pressure of 6-8 g·cm² than near sea level; there was found to be a nonmonotonic nature of the dependence of the exponent in the energy spectrum on depth in the pressure range 8-100 g·cm². Bibliography of 22 items. [276]

DISTRIBUTION OF IONIZATION IN LOWER IONOSPHERE

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977 1A214

[Abstract of article by E. I. Ginzburg and I. I. Nesterova; Novosibirsk, ISSLED. OKOLOZEMN. PROSTRANSTVA, 1976, pp 70-77, "Peculiarities of the Distribution of Ionization in the Lower Ionosphere and Radio Wave Absorption"]

[Text] The authors summarize conclusions pertaining to the annual variability of absorption of radio waves in the ionosphere, in particular, the winter absorption anomaly (WAA). The following are considered: 1) the annual variation of absorption L for a constant solar zenith angle (χ); 2) the annual variation of midday L_N values; 3) the change in WAA in the solar activity cycle at different frequencies; the asymmetry of premidday and postmidday L values ($\chi = \text{const}$). The following conclusions are drawn: 1) in the range 1-3 MHz the maximum appearance of WAA was associated with the maximum variation of electron concentration at altitudes ≥ 85 km in winter; 2) the latitude limits of WAA are evidently determined by geomagnetic coordinates; 3) variations of winter absorption are associated with variations of the N(h) profile caused by an increased variability of atmospheric parameters and an intensification of the role of vertical transfer in winter. The authors propose a model for explaining the principal peculiarities of the winter absorption anomaly. Bibliography of six items. [276]

WAVE PROCESSES IN IONOSPHERE AFTER SUBSTORM

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977
1A219

[Abstract of article by V. M. Shashun'kina; Moscow, FIZ. IONOSFERY. KRATK. SOOBSHCHENIYA, "Nauka," 1976, pp 150-151, "Wave Processes in the Ionosphere After a Substorm"]

[Text] A study was made of the propagation of moving ionospheric disturbances (MID) after substorms in the northern hemisphere and this is compared with the propagation of MID after a sudden commencement of a magnetic storm. An oscillatory disturbance is observed at a planetary scale, propagating from the polar regions to the low latitudes. At the equinox the velocities of propagation (daytime ~ 600 m·sec⁻¹, nighttime ~ 800 -1100 m·sec⁻¹) are close to the velocities for the ionospheric effect of SC in winter. After a substorm, as after SC, planetary atmospheric waves with a quasiperiod of 20 minutes - 3 hours and with a propagation velocity 300-1000 m·sec⁻¹ arise. The source of generation of MID has the form of an oval and the regions of generation, determined by several methods, were situated in the zone $\Phi \approx 60$ -65°N for 13 September 1967 and $\Phi \approx 65$ -68° for 16 March 1968. Comparison of oscillations in T_i after substorms with geometric parameters of the layers indicated that at the equinox during the passage of a wave with an increase in T_i and T_e there is an increase in $h_{\max}$, the layer expands somewhat, and $N_{\max}$ and the concentration at the levels N_h decreases; in summer, on the other hand, a decrease in T_i corresponds to an increase in $h_{\max}$ and $y_{\max}$ and a decrease in $N_{\max}$ and N_h . An attempt has been made to interpret the results. Bibliography of five items.
[276]

ANALYSIS OF PROTONS FROM SOLAR FLARE

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977
1A333

[Abstract of article by P. V. Vakulov, Yu. I. Logachev, Yu. V. Mineyev, I. V. Savenko, Ye. S. Spir'kova and N. F. Pisarenko; Moscow, SIMPOZ. KAPG PO SOLNECHNO-ZEMN. FIZ., TBILISI, 1976, Ch. I, TEZISY DOKL., 1976, pp 53-55, "Fluxes and Anisotropy of Protons from the Solar Flare of 3 November 1973 According to Data from the Automatic Interplanetary Station 'Mars-7'"]

[Text] This is a report on the discovery of a relatively prolonged (about 10 hours) negative anisotropy of the flux of solar protons with $E = 3$ -35 MeV with an amplitude up to 50% after a chromospheric flare of the importance 2B on 7 September 1973. The active region in which the proton flare

of 7 September occurred was recurrent; powerful flares were observed in it on 4 October and 3 November 1973. The authors compare the proton fluxes and their anisotropy in different flares. The article gives the temporal variation of the intensity and anisotropy of protons with $E = 1-150$ MeV and with $E = 3-35$ MeV for the period 2-7 November. In the phase of an increase in the fluxes of solar protons there is a segment with negative anisotropy for protons with $E = 1-150$ MeV of about 25% for a period of four hours and for protons with $E = 3-35$ MeV about 30% in the course of two hours. Before the sector with a negative anisotropy there is a sector with a positive anisotropy identified with the direct diffusional arrival of particles from the sun. The negative phase of anisotropy is interpreted as the arrival of particles along the lines of force of the interplanetary field to the south of the helioequator (heliocoordinates of the flare 18°S , 47°W) and as their subsequent transfer to the north from the plane of the ecliptic. It is noted that the intensity of the flare exerts a strong influence on the duration of the phase of negative anisotropy.

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AUTOMATIC INFORMATION MEASURING SYSTEM FOR SOLAR MAGNETOGRAPH

Moscow REFERATIVNYY ZHURNAL 51. ASTRONOMIYA, OTDEL'NYY VYPUSK in Russian No 10, 1976 10.51.119.

[Abstract of article by M. S. Keredzhyan, F. O. Avetisyan and G. A. Korkotyan; --, MEZHVUZ. SB. NAUCH. TR. YEREVAN. POLITEKHN. IN-TA. ELEKTRO-TEKHNICA, No 2, 1976, pp 118-122, "Automatic Data Measuring System for the IZMIRAN SSSR Solar Magnetograph"]

[Text] For processing data obtained using the new IZMIRAN magnetograph the authors have created an automatic data measuring system (DMS). The magnetograph is intended for the simultaneous registry of the magnetic field, radial velocity and brightness in two spectral lines and also the registry of four Stokes parameters for the third line. The total number of channels is 14. The DMS makes it possible to transform analog signals into a digital code and write the information on a punch card which can then be introduced into a digital computer for further processing. The article is accompanied by a functional block diagram and a brief description of the operation of the system. The DMS can be used not only in magnetographic observations, but also in measurements where analog-digital transformation is necessary.

[300]

NUMERICAL MODELING OF GEOMAGNETIC FIELD

Moscow REFERATIVNYY ZHURNAL 62. ISSLEDOVANIYE KOSMICHESKOGO PROSTRANSTVA, OTDEL'NYY VYPUSK in Russian No 12, 1976, 12.62.239

[Abstract of article by N. A. Tsyganenko; Moscow, ISSLED. PO GEOMAGNETIZMU, AERON. I FIZ. SOLNTSA, No 39, "Nauka," 1976, pp 74-89, "Numerical Modeling of the Geomagnetic Field at Different Phases of Magnetospheric Disturbance with Allowance for Inclination of the Axis of the Geodipole"]

[Text] The author has formulated a quantitative model describing the geomagnetic field in the region of the outer magnetosphere and tail up to a distance of about $60R_E$. The current system of the ring current and the plasma layer of the tail is modeled by a smooth surface whose configuration is dependent on the inclination of the geodipole; the profile of the distribution of the density of these currents was selected using as a point of departure data from magnetic measurements. The currents at the magnetopause, including the currents closing the plasma layer of the tail, are computed from the condition of screening of the total field outside the cavity. The authors constructed maps of the configuration of the magnetospheric field for four values of inclination of the dipole under quiet conditions and for two characteristic stages in a geomagnetic storm. A study was made of the influence of inclination of the dipole on the position of the conjugate points under quiet and disturbed conditions. Bibliography of 34 items.
[303]

CYCLIC VARIATION OF STRUCTURE OF INTERPLANETARY MAGNETIC FIELD

Moscow REFERATIVNYY ZHURNAL 62. ISSLEDOVANIYE KOSMICHESKOGO PROSTRANSTVA, OTDEL'NYY VYPUSK in Russian No 12, 1976, 12.62.219

[Abstract of article by S. M. Mansurov, G. S. Mansurov and L. G. Mansurova; Moscow, ANTARKTIKA. DOKL. KOMIS., No 15, "Nauka," 1976, pp 11-15, "Cyclic Variation of the Geomagnetic Effect of the Sectoral Structure of the Interplanetary Magnetic Field"]

[Text] During the solar cycle (1958-1969), for stations Vostok and Resolute, the authors have obtained the variation of the two-month mean values of the vertical component Z of the geomagnetic field, corrected for secular variation, computed separately for days when the earth was situated in positive and negative sectors of the interplanetary magnetic field (IMF). In all years of the cycle, with few exceptions, it is easy to see two peculiarities in the geomagnetic effect of the sector structure of the IMF -- north-south and spring-autumn asymmetry. Not one of the existing hypotheses on the nature of the effect explains these peculiarities. The degree of this effect correlates well with solar activity. The authors have estimated the values of the azimuthal B_y component of the IMF on the basis of surface

geomagnetic data for the period of maximum activity of the 19th cycle, when there were no direct measurements of the magnetic field in space. For this purpose the authors use a method excluding the influence exerted on the result by possible errors in determining the main geomagnetic field. Thus, geomagnetic data for circumpolar stations can be used simultaneously for determining (in real time) the polarity of sectors of the IMF and the geoeffectiveness of the solar wind. Bibliography of 17 items.

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BEHAVIOR OF FAST PROTONS IN MAGNETOSPHERIC PLASMA

Moscow REFERATIVNYY ZHURNAL 62. ISSLEDOVANIYE KOSMICHESKOGO PROSTRANSTVA, OTDEL'NYY VYPUSK in Russian No 12, 1976, 12.62.230

[Abstract of article by A. S. Potapov and O. A. Pokhotelov; Moscow, ISSLED. PO GEOMAGNETIZMU, AERON. I FIZ. SOLNTSA, No 39, "Nauka," 1976, pp 12-30, "Interaction of a Mode with Trapped Ions and Fast Protons in the Magnetosphere"]

[Text] A study was made of the resonance interaction of fast protons in magnetospheric plasma with a trapped ions mode. The analysis was made taking into account the nonpotentiality of increasing oscillations. The authors discuss the possibility of using the results for explaining satellite observations of geomagnetic pulsations of the Pc5 type at the onset of the main phase of a substorm. Bibliography of six items.

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NEPHELOMETRIC MEASUREMENTS IN VENUSIAN ATMOSPHERE

Moscow REFERATIVNYY ZHURNAL 62. ISSLEDOVANIYE KOSMICHESKOGO PROSTRANSTVA, OTDEL'NYY VYPUSK in Russian No 12, 1976 12.62.186

[Abstract of preprint by M. Ya. Marov, V. N. Lebedev, V. Ye. Lystsev, I. S. Kuznetsov and G. K. Popandopulo; Moscow, NEPELOMETRICHESKIYE IZMERENIYA V ATMOSFERE VENERY (PREDVARITEL'NYYE REZUL'TATY EKSPERIMENTA MNV-75) (Nephelometric Measurements in the Venusian Atmosphere (Preliminary Results of MNV-75 Experiment)), Institute of Applied Mathematics USSR Academy of Sciences, Preprint No 44, 1976, 37 pages]

[Text] In October 1975 specialists for the first time carried out direct nephelometric sounding of the Venusian atmosphere. This paper describes the design of the MNV-75 nephelometric complex and also a method for obtaining calibration curves. The primary results of the measurements were obtained in the form of output voltages, on the basis of which it was possible to compute the effective values of the angular indices of scattering

by aerosols for altitudes of 62-33 km. The measurement data show that with altitude there is a change not only in atmospheric transparency, but also the microstructure of the aerosol. The optical thicknesses of the cloud layer (62-50 km) were found to be 20-25 for measurements made by the Venera-9 and 50-55 for the Venera-10. The measurements by both the Venera-9 and the Venera-10 indicate the existence of two zones in the cloud layer at altitudes 62-57 km and 57-49 km, characterized by different sizes of aerosol particles on the assumption that the refractive index of particles is 1.45. The concentration of particles in the upper zone is of the order of several hundred particles per cubic centimeter, and in the lower zone is about one hundred. Below 49 km the optical thickness of the aerosol is 3-5 with a refractive index of 1.9-2.1 and a particle concentration of 2 cm^{-3} . The results do not contradict the hypothesis that the principal component of the clouds is a 70-85% solution of sulfuric acid. At an altitude of 49 km the content of H_2O vapor should be 10^{-5} . It is pointed out that the cloud layer on Venus more likely resembles a fog haze, not terrestrial clouds. With respect to the chemical nature of the aerosol below 49 km it can be said that the most suitable substances are some salts of sulfuric acid (for example, PbSO_4) and also some mercury-halogen compounds (for example, Hg_2Cl_2 , HgCl_2). Bibliography of seven items.

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REMOTE SENSING FROM ARTIFICIAL EARTH SATELLITES

Moscow REFERATIVNYY ZHURNAL 62. ISSLEDOVANIYE KOSMICHESKOGO PROSTRANSTVA, OTDEL'NYY VYPUSK in Russian No 12, 1976, 12.62.263

[Abstract of article by S. Ye. Khanin; Moscow, XXIII MEZHDUNAR. GEOGR. KONGR., MOSKVA, 1976. SEKTS. II. OBSHCH. PROBL. GEOGR. I MODELIR. GEOSISTEM, 1976, pp 160-164, "Remote Sensing on the Basis of a Survey from Artificial Earth Satellites"]

[Text] The author has made an analysis of the advantages and present-day technical possibilities of a space survey, making it possible to obtain information on the parameters of the surrounding medium directly and in quantitative form. It is pointed out that the use of space sensing in a geographic information system raises the following series of problems of a technical and organizational nature: 1) choice of technical sensing apparatus and discrimination of noise superposed on the space survey of the surrounding medium, 2) determination of the confidence limits of use of data from remote sensing, 3) determination of the times of space surveys for different types of natural features, 4) choice of the survey scale, 5) creation of a bank of algorithms automating the process of collecting and processing space sensing data, 6) modeling, prediction and monitoring of the environment by regional systems on the basis of data from a geographic information system. The article touches upon the problems in remote sensing

of economic-geographic features which are distinguished on space photographs by a complex range of spectral characteristics and a considerable amplitude of the dispersion of brightness levels. Taking these peculiarities into account, the author mentions the small effectiveness of use of quantitative procedures for interpretation with use of the index of mean brightness of an object and its variation and recommends the use of spectrozonal photographs making it possible to obtain the vector spectral characteristics of economic-geographic features. As the most important problems in economic-geographic investigations the article mentions the problems in determining the effective limits of the latter, different types of earth, functional zones of large cities, the quality of residential areas, number and density of population in the real boundaries of the latter, intensity and direction of transport flow, etc. The article emphasizes the importance of computer methods for processing space sensing data.

[303]

RADIOBROADCASTING ARTIFICIAL EARTH SATELLITES

Moscow REFERATIVNYY ZHURNAL 62. ISSLEDOVANIYE KOSMICHESKOGO PROSTRANSTVA, OTDEL'NYY VYPUSK No 1, 1977 1.62.344

[Abstract of article by H.-D. Naumann; Berlin, RADIO-FERNSEHEN-ELEKTRON., 25, No 14, 1976, pp 470-472, "Radiobroadcasting Satellites"]

[Text] This is a discussion of the use of artificial earth satellites (AES) in radio broadcasting. Radiobroadcasting via AES can be an effective means for countries with a weak network of transmitting stations and also in developing new broadcasting systems, for example, quadrophony. A study was made of the technical and economic possibilities of radiobroadcasting via AES at ultrashort waves (100-108 MHz) and in the centimeter (~ 12 GHz) ranges. At the present time and in the near future the use of the ultrashort range is irrational for national broadcasting due to the requirements on the size of the transmitting antenna of AES (~ 100 m in diameter). However, for regional broadcasting, where these requirements are not so high (diameter $\sim 20-50$ m) there is no solution of the problems associated with space law. The use of the range 12 GHz requires the development of special receivers. It is noted that for development of work on radiobroadcasting via AES it will be useful to combine satellite systems for radiobroadcasting and television. Bibliography of eight items.

[294]

SOLUTION OF SOME PROBLEMS IN SPACECRAFT FLIGHT CONTROL

Moscow REFERATIVNYY ZHURNAL 62. ISSLEDOVANIYE KOSMICHESKOGO PROSTRANSTVA, OTDEL'NYY VYPUSK in Russian No 1, 1977, 1.62.294

[Abstract of preprint by M. L. Lidov and N. M. Teslenko; Moscow, OPTIMIZATSIYA RESHENIYA NEKOTORYKH ZADACH UPRAVLENIYA POLETOM KOSMICHESKIKH APPARATOV METODOM SPUSKA PO PARAMETRU (Optimization of Solution of Some Problems in Flightcraft Flight Control by the Parameter Descent Method), Institute of Applied Mathematics, Preprint No 13, 1976, 51 pages]

[Text] The authors indicate the analogy of the variant of the problem of the choice of an optimum measurement program when there is a restriction on the frequency of measurements and the problem of linear correction with restriction on the thrust level. The article gives a generalization of the problem of choice of the measurement program for the case of several evaluated parameters and the presence of a priori information. It is shown that the solution of these problems with the controlling function following from the dynamic programming principle is absolutely optimum. The authors describe an algorithm for solving these problems by the parameter descent method, beginning with the value of the parameter of the problem for which the solution can be obtained by the simplex method analog. The article also gives the results of computations by selection of the optimum measurement program (with a priori information) for a Martian satellite.
[294]

ARTIFICIAL SATELLITE DRAG AND ESTIMATION OF ATMOSPHERIC DENSITY

Moscow REFERATIVNYY ZHURNAL 62. ISSLEDOVANIYE KOSMICHESKOGO PROSTRANSTVA, OTDEL'NYY VYPUSK in Russian No 10, 1976 10.62.337

[Abstract of article by V. N. Chepurnoy and G. A. Charina; Kiev, KOSMICH. ISSLED. NA UKRAINE. RESP. MEZHVED. SB., No 8, 1976, pp 30-36, "Drag of Artificial Satellites and Estimates of Density of the Earth's Upper Atmosphere Obtained from Data on Orbital Changes"]

[Text] The authors examine estimates of the density of the earth's upper atmosphere obtained on the basis of the braking of AES. It is noted that the existing discrepancy in density values obtained on the basis of braking and using instruments can be associated with resistance forces which are not proportional to density. It was possible to determine the interaction between the AES and positive ions and excited ionospheric particles. It is shown that the presence of high concentrations of excited atoms and molecules in the atmosphere can be a cause of an increase in drag and a systematic discrepancy in the densities obtained on the basis of braking and on the basis of instruments. It is noted that during the time of magnetic storms in determining the drag of AES it is necessary to take into

account interaction with positive ions, the concentrations of which can increase considerably. Bibliography of 15 items.

[290]

HYDROPRESSING OF SPACECRAFT SKIN

Moscow REFERATIVNYY ZHURNAL 62. ISSLEDOVANIYE KOSMICHESKOGO PROSTRANSTVA, OTDEL'NYY VYPUSK in Russian No 10, 1976, 10.62.290

[Abstract of article by Ye. S. Pereverzev; Kiev, KOSMICH. ISSLED. NA UKRAINE. REP. MEZHVED. SB., No 8, 1976, pp 73-76, "Selection of a Regime for Hydropressing of Spacecraft Skins"]

[Text] This is a discussion of the choice of a regime for preliminary tests of spacecraft skins loaded by internal excess pressure for the purpose of detecting skins with a short lifetime. It is shown to be desirable to carry out pressing of skins in a case when the law of distribution of time prior to destruction of the skins is not described by a single-peak distribution. In order to designate specific regimes of preliminary technological tests it is necessary to know the laws of distribution of longevities or destructive pressures.

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SPACECRAFT DEVICES BASED ON CHALCOGENIDE MATERIALS

Moscow REFERATIVNYY ZHURNAL 62. ISSLEDOVANIYE KOSMICHESKOGO PROSTRANSTVA, OTDEL'NYY VYPUSK in Russian No 10, 1976, 10.62.287

[Abstract of article by S. A. Kostylev and L. N. Makhinya; Kiev, KOSMICH. ISSLED. NA UKRAINE. RESP. MEZHVED. SB., No 8, 1976, pp 99-102, "Functional Devices in On-Board Systems Based on Chalcogenide Glass"]

[Text] The article describes the operating principles and working characteristics of a frequency divider, synchronized relaxation oscillator, converter with the use of diode switching S-structures based on chalcogenide glass. The active element used is sprayed films of chalcogenide glass of the systems As-Te-Si-Ge, As-Te-Si and Si-Te with metal electrodes, for which Pt, Mo, W, Ti, Al, Ni are used. It is shown that it is possible to obtain pulses with a duration of 20-50 nsec with a front of 1.5 nsec.

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REACTION OF ELASTIC FLIGHTCRAFT TO WIND

Moscow REFERATIVNYY ZHURNAL 62. ISSLEDOVANIYE KOSMICHESKOGO PROSTRANSTVA, OTDEL'NYY VYPUSK in Russian No 10, 1976, 10.62.283

[Abstract of article by V. A. Velichkin, Yu. I. Savvin and S. P. Fediy; Kiev, KOSMICH. ISSLED. NA UKRAINE. RESP. MEZHVED. SB., No 8, 1976, pp 69-73, "Dynamic Reaction of an Elastic Flightcraft to the Wind"]

[Text] It is shown that wind velocity as a nonstationary random function of altitude during the motion of flightcraft can be represented by the sum of the mathematical expectation, variable with altitude, and the product of the standard deviation, also variable with altitude, and some stationary random function of space frequency in the form of a noncanonical Chernetskiy expansion. The correlation function and the spectral density were found for this expansion. On the basis of the cited wind effect model it was possible to determine the stochastic characteristics of the dynamic reaction of a flightcraft with allowance for oscillations of the structure. Bibliography of eight items.

[290]

INTERORBITAL FLIGHT WITH WEAR ON SOLAR SAIL

Moscow REFERATIVNYY ZHURNAL 62. ISSLEDOVANIYE KOSMICHESKOGO PROSTRANSTVA, OTDEL'NYY VYPUSK in Russian No 10, 1976, 10.62.254

[Abstract of article by N. D. Dzhumanaliyev and M. I. Kiselev; Frunze, TRUDY FRUNZ. POLITEKHN. IN-TA, No 90, 1975, pp 142-145, "Approximate Analytical Computation of Interorbital Flight with Wear on Solar Sail"]

[Text] This paper gives equations for the radial and azimuthal components of the velocity of motion of a spacecraft, taking into account the dependence of the coefficients of transparency and reflection of a solar sail on time. The equations were derived with neglecting of the change in the radial components of velocity of the spacecraft as a result of the smallness of the thrust developed by the sail. Using these equations, by the substitution method it is possible to obtain a first-degree linear differential equation whose integration gives an approximate solution for an interorbital flight. The flight trajectory is a spiral with a constant decrease in the pitch. The possibility of taking erosion of the sail into account is noted. Bibliography of eight items.

[290]

METHOD FOR STABILIZING MATERIAL SYSTEM

Moscow REFERATIVNYY ZHURNAL 62. ISSLEDOVANIYE KOSMICHESKOGO PROSTRANSTVA, OTDEL'NYY VYPUSK in Russian No 10, 1976, 10.62.247

[Abstract of article by V. V. Kravets; Kiev, KOSMICH. ISSLED. NA UKRAINE. RESP. MEZHVED. SB., No 8, 1976, pp 95-99, "Stabilization of a Material System by a Change in the Direction of an External Force"]

[Text] A study was made of the plane motion of a carrying solid body with supported pendulums. Equations are derived for the perturbed angular motion of the material system. It is shown analytically that with a change in the direction of operation of an external force, in accordance with the adopted linear control algorithm, the angular motion of the body and the pendulums is stabilized. Linear systems of algebraic equations are derived which make it possible to determine the parameters of the control algorithm through the stipulated parameters of the material system and the roots of the characteristic equation of perturbed motion.

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METHOD FOR MEASURING CARTESIAN COORDINATES IN SPACE

Moscow REFERATIVNYY ZHURNAL 62. ISSLEDOVANIYE KOSMICHESKOGO PROSTRANSTVA, OTDEL'NYY VYPUSK in Russian No 10, 1976, 10.62.235

[Abstract of patent by G. P. Bron; Moscow, Author's Certificate USSR, No 489942, published 28 January 1976, "Method for Measuring Cartesian Coordinates in Space"]

[Text] A method is proposed for measuring Cartesian coordinates. In this method, at the point whose coordinates must be measured, there is a source of some oscillations (for example, electromagnetic or ultrasonic). For determining the coordinates of a point along one of the axes, an object-detector is directed along this axis, on which is situated a detector of the waves emitted from the intersected point. The second detector is situated at the origin of coordinates. There is constant measurement of the phase difference of the received signal for the two receivers. The detector moves until the phases are equalized. Then by precisely measuring (by any known method) the distance between the origin of coordinates and the detector it is possible to determine the sought-for coordinate as half this distance.

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GEOMORPHOLOGICAL INTERPRETATION OF SPACE PHOTOGRAPHS

Moscow REFERATIVNYY ZHURNAL 62. ISSLEDOVANIYE KOSMICHESKOGO PROSTRANSTVA, OTDEL'NYY VYPUSK in Russian No 10, 1976, 10.62.203DEP

[Abstract of article by Yu. N. Pankrat'yev and Yu. S. Apostolov; Kalinin, MATERIALY 8-y NAUCH. KONF. SEKTS. GEOD., GEOL. I RAZVEDKI TORF. MESTOROZH-DENIY KALININ. POLITEKHN. IN-T, 1975, pp 91-95, "Characteristics of the Geological and Geomorphological Interpretation of Space Photographs" [Manuscript deposited at the All-Union Institute of Scientific and Technical Information, 31 May 1976, No 1950-76DEP]

[Text] The authors note the singularity of the information contained in space photographs: coverage and natural generalization of the images of terrestrial landscapes. The article gives an analysis of stereoscopic perception of the earth's surface shown on space photographs and discusses a number of difficulties arising in the interpretation of some geomorphological and geological features. It is concluded that it is necessary to study the psychophysiological factors of perception and construction of a spatial model in the interpretation of space photographs.
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METHOD FOR ADJUSTING SYSTEM FOR UNLOADING KINETIC MOMENT OF SPACECRAFT

Moscow REFERATIVNYY ZHURNAL 62. ISSLEDOVANIYE KOSMICHESKOGO PROSTRANSTVA, OTDEL'NYY VYPUSK in Russian No 10, 1976, 10.62.262

[Abstract of article by A. P. Alpatov, V. I. Dranovskiy, V. M. Mishin and V. S. Khoroshilov; Kiev, KOSMICH. ISSLED. NA UKRAINE. RESP. MEZHVED. SB., No 8, 1976, pp 76-81, "Adaptive Adjustment of the Parameters of a Magnetic System for Unloading of the Kinetic Moment of a Spacecraft"]

[Text] A study was made of the dependence of the number of triggerings of a magnetic unloading system (MUS) and the duration of the process of unloading of the kinetic moment of a spacecraft on the characteristics of the external medium and the parameters of the MUS. It is shown that the effectiveness of the system can be considerably increased when there is a suitable choice of its parameters. The article describes an algorithm for the adaptive adjustment of these parameters using a digital computer.
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VI. MISCELLANEOUS

News

PAPERS ON RESEARCH UNDER POLEX-SOUTH-75 PROGRAM

Moscow REFERATIVNYY ZHURNAL, GEOFIZIKA, SVODNYY TOM in Russian No 1, 1977
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[Abstract of collection of articles; Leningrad, ISSLEDOVANIYA PO PROGRAMME POLEX-South-75, edited by A. F. Treshnikov, TRUDY ARKT. I ANTARKT. NII, 344, Gidrometeoizdat, 1976, 184 pages]

[Text] Foreword: A. F. Treshnikov, E. I. Sarukhanyan. Yu. A. Men'shov -- "Principal Results of the First Field Experiment Under the POLEX-South Program in Drake Passage (December 1974-February 1975)"; E. I. Lutsenko and E. P. Lysakov -- "Summer Atmospheric Processes Over Drake Passage and Adjacent Regions of the Antarctic Ocean (Based on Satellite Data"; V. F. Vasil'yev, N. N. Kazakova, V. I. Nikonov -- "Characteristics of Free Atmospheric Processes Over Drake Passage in Summer and the Principal Time Scales of Their Fluctuation"; V. F. Vasil'yev, V. N. Malinin, N. P. Smirnov -- "Horizontal Fluxes of Enthalpy and Water Vapor Over Drake Passage and Their Temporal Variability"; A. V. Leont'yev and V. N. Malinin -- "On Heat and Moisture Content in the Atmosphere Over Drake Passage"; V. K. Trofimov -- "Total Flux of Solar Radiation and its Dependence on the Cloud Cover in the Region of Drake Passage"; E. P. Lysakov and K. I. Romashkina -- "Spectral Transparency of the Atmosphere and the Characteristics of Aerosol Over the Atlantic Ocean"; S. G. Bobrov, N. N. Kazakova, V. I. Nikonov -- "Blocking Layers in the Troposphere in Summer Over Drake Passage"; V. E. Godvod and Yu. A. Men'shov -- "Small-Scale Interaction Between the Atmosphere and the Ocean in Drake Passage in the Summer of 1974/1975"; V. E. Godvod, Yu. A. Kravchuk, Yu. A. Men'shov -- "Some Characteristics of the Fields of Meteorological Elements in the Near-Water Layer in Drake Passage in the Summer of 1974/1975"; A. F. Treshnikov, B. D. Karellin, E. I. Sarukhanyan -- "Spatial Structure of Currents in the Central and Southern Parts of Drake Passage"; N. V. Bagryantsev, V. G. Borisov, E. I. Sarukhanyan, N. P. Smirnov -- "Intramonthly Variability of Currents in Drake Passage";

L. S. Stepanov and S. Z. Mandel', "Characteristics of Tidal Currents in Drake Passage"; V. N. Kharitonov -- "Hydrochemical Characteristics of the Waters in Drake Passage"; A. T. Bozhkov, V. A. Romanov, A. F. Bub, A. V. Klepikov -- "Analysis of Water Masses in Drake Passage Using the Main Components"; I. M. Katunin -- "Exchange of CO₂ Between the Ocean and the Atmosphere in the Region of Drake Passage"; L. V. Monakhov -- "Influence of Waves on the Readings of the BPV-2 Automatic Current Meter"; B. V. Afanas'yev, V. V. Medvedenko, V. A. Romanov, E. I. Sarukhanyan -- "Meso-scale Variability of Water Temperature in Drake Passage."

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