

Best Available Copy

Approved for public release;  
Distribution unlimited.

ENVPREDRSCHFAC  
Technical Note No. 5-74

~~201~~  
~~203vK~~  
~~205~~ T.  
~~206~~ Jea  
20x4

SUMMARIES AND ABSTRACTS  
OF  
TROPICAL PUBLICATIONS  
OF THE  
NAVY WEATHER RESEARCH FACILITY  
AND  
ENVIRONMENTAL PREDICTION RESEARCH FACILITY  
1968 TO FEB 1974

FEBRUARY 1974

Best Available Copy

ENVIRONMENTAL PREDICTION RESEARCH FACILITY  
NAVAL POSTGRADUATE SCHOOL  
MONTEREY, CALIFORNIA 93940

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Doc Available Copy

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ENVPREDRSCHFAC Technical Note No. 5-74	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Summaries and Abstracts of Tropical Publications of the Navy Weather Research Facility and Environmental Prediction Research Facility, 1968 to Feb 1974		5. TYPE OF REPORT & PERIOD COVERED
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s)		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Environmental Prediction Research Facility Naval Postgraduate School Monterey, California 93940		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS Naval Air Systems Command Department of the Navy Washington, D.C. 20361		12. REPORT DATE March 1974
		13. NUMBER OF PAGES 20
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		15. SECURITY CLASS. (of this report)  UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report)  Approved for public release; Distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Catalog of Tropical Publications Tropical cyclones Tropical meteorology Typhoons Hurricanes		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)  This technical note describes the publications in the area of tropical meteorology that have been produced and published by this Facility during the period 1968 to February 1974.		

Doc Available Copy

FOREWORD

Tropical weather phenomena are of vital concern to naval operating forces in many regions of the world. For this reason, tropical meteorology is an important area of study at the Environmental Prediction Research Facility. The broad purpose of this research is to develop forecasting techniques for particular phenomena and/or specific regions as aids for the operational Navy environmentalist concerned with forecasting in tropical zones.

The objective of this Technical Note is to make Navy forecasters or other interested environmentalists aware of the publications produced by this facility in the area of tropical meteorology. Abstracts or summaries of all related documents produced by Navy Weather Research Facility (now disestablished) and ENVPREDRSCHFAC during the period 1968 through February 1974 are given in chronological order of publication.

Naval Weather Service units with an interest or need for the publications listed may submit a letter request to:

Commanding Officer  
Environmental Prediction Research Facility  
Naval Postgraduate School  
Monterey, California 93940

Qualified requestors other than NWS units may obtain copies from the Defense Documentation Center, Cameron Station, Alexandria, Virginia 22314; all others should apply to the National Technical Information Service, Springfield, Virginia 22151. The accession "AD" number should be cited if available when requesting a publication from DDC or NTIS.

1. REVIEW OF "GLOBAL VIEW OF THE ORIGIN OF TROPICAL DISTURBANCES AND STORMS"

By: L. R. Brody

NAVWEARSCHFAC Technical Paper No. 2-68 (1968)  
AD 768-749

Summary: This review is a condensation of a publication by Dr. William Gray of Colorado State University. The publication offers a clear insight into the dominant physical processes of the tropical atmosphere, and represents a sizable step toward a much needed updating of tropical storm climatology.

2. REVIEW OF "STRUCTURE OF A STEADY-STATE COLD LOW" and "THE TROPICAL UPPER-TROPOSPHERIC TROUGH AS A SECONDARY SOURCE OF TYPHOONS AND A PRIMARY SOURCE OF TRADEWIND DISTURBANCES"

By: G. Hunolt

NAVWEARSCHFAC Technical Paper No. 15-68 (1968)  
AD 768-750

Summary: This report contains review-condensations of two papers on the subject of "cold-core" lows in the tropics.

The first paper, "Structure of a Steady-State Cold Low," by Toby N. Carlson, describes the characteristic distribution of atmospheric parameters and weather conditions relative to a moving tropical "cold low" system. This detailed diagnosis covers the six-day period 12-18 October 1965, during which an unusually dense data base was provided through Project ECCRO (Eastern Caribbean Cooperative Reconnaissance Operation) plus TIROS V-X satellite pictures and specially arranged supplementary radiosonde observations. Such data coverage is totally unrealistic in the operational environment; but it is felt that the descriptive completeness provided by Carlson's work contributes to a better concept of these systems, and will thereby assist operational forecasters by furnishing a model to which such reports as are routinely available may be fitted in the process of analysis.

The second paper, "The Tropical Upper-Tropospheric Trough as a Secondary Source of Typhoons and a Primary Source of Tradewind Disturbances," by James C. Sadler, discusses the relationship between cold lows and the upper-tropospheric trough as a causal factor. Sadler

substantiates this premise by presenting several detailed case histories wherein the characteristic features are deduced from satellite data supported by conventional weather reports.

3. "SURFACE WINDS OVER THE SOUTH CHINA SEA DURING THE NORTHEAST MONSOON SEASON"

By: H. Riehl

NAVWEARSCHFAC Technical Paper No. 22-68  
AD 758-757

(1968)

Summary: Meteorological services in support of naval operations in the South China Sea during the Northeast Monsoon season may conveniently be divided into three parts, insofar as the surface wind field is concerned:

1. Specification of the current wind field, especially of wind speed;
2. Prediction of monsoon "surges"; and
3. Special computations regarding the "Gulf of Tonkin Eddy."

These three topics are examined in this publication.

4. "INTERACTION OF BINARY TROPICAL CYCLONES OF THE WESTERN NORTH PACIFIC"

By: S. Brand

NAVWEARSCHFAC Technical Paper No. 26-68  
AD 861-024

(1968)

Abstract: Fifteen years of typhoon data (1953-1967) were evaluated to determine the general character of the "Fujiwhara effect" with respect to the separation distance between two interacting tropical cyclones. The results show that the rotation of the binary system is sharply dependent upon separation distance for distances less than 750 nautical miles. There appears also to be a slight attraction between the two vortex systems, which becomes well defined at separation distances less than 400 nautical miles. The results are compared with theoretical rotation rates for vortex systems with varying velocity profiles.

5. "A COMPARISON OF JANUARY-FEBRUARY 1968 CLOUD COVER AND WEATHER CONDITIONS IN THE TONKIN GULF-NORTHERN VIETNAM REGION"

By: S. Brand and J. R. Bocchieri

NAVWEARSCHFAC Technical Paper No. 32-68 (1968)  
AD 768-758

Summary: The purpose of this study is to compare the cloud cover and weather over Tonkin Gulf and Vietnam north of 15° N during two months of the Northeast Monsoon, January and February 1968, which exhibited markedly different synoptic regimes. An attempt is made to relate the observed cloud and weather patterns to the synoptic circulation patterns during each of these two months.

6. "A TECHNIQUE FOR PREDICTING SOUTH CHINA SEA TROPICAL CYCLONES"

By: L. R. Brody and J. D. Jarrell

NAVWEARSCHFAC Technical Paper No. 8-69 (1969)

Abstract: The low-level cyclonic shear zone in the South China Sea is investigated as a possible precursor of tropical storm activity within the South China Sea. For tropical storm genesis in this area, it is shown that the strength of the cyclonic shear zone reaches a critical intensity approximately 24 to 48 hours before cyclogenesis takes place. Also, if the cyclonic shear zone is not present and there is either a large-scale ridge or easterly flow across the South China Sea, then tropical storm genesis does not take place for at least a week. With respect to tropical storms approaching the South China Sea from the Philippine Sea, the presence of a cyclonic shear zone is a good indication that the tropical storm will move into the area. On the other hand, when a large-scale low-level ridge is present over the area, these storms recurve northward and will not enter the South China Sea.

7. "DIAGNOSIS OF THE SUMMER MONSOON OF SEASIA"

By: C. S. Ramage, L. R. Brody, R. F. Adler, and S. Brand

NAVWEARSCHFAC Technical Paper No. 10-69 (1969)

Summary: The research reported in this publication describes the weather phenomena associated with the SEASIA Southwest Monsoon. The latest diagnostic and prediction techniques are discussed incorporating detailed case studies.

8. "SHORT RANGE PREDICTION OF THE AVERAGE WIND SPEED OVER THE SOUTH CHINA SEA DURING THE NORTHEAST MONSOON SEASON"

By: J. R. Bocchieri

NAVWEARSCHFAC Technical Paper No. 12-69 (1969)  
AD 768-759

Abstract: Using five years of winter-season data, empirical equations are developed to provide 24-, 30-, and 48-hour forecasts of the average surface wind speed in the northern part of the South China Sea during the Northeast Monsoon season. The sea-level pressure over subtropical China and persistence are found to be suitable predictors. The equations are simple and convenient to use, exhibit some skill over persistence, and should be operationally useful. They should be especially helpful during the period subsequent to a surge in the Northeast Monsoon.

9. "WIND CONDITIONS IN THE CUA VIET RIVER AREA DURING THE SOUTHWEST MONSOON"

By: S. Brand and A. Lester

NAVWEARSCHFAC Technical Paper No. 15-69 (1969)  
AD 758-760

Abstract: Surface wind conditions in the Cua Viet River area are examined to determine the nature of the strong, southwesterly, Winds-of-Laos situations which occur during the Southwest Monsoon. A preliminary indicator of not only the intensity and areal coverage of these strong winds, but also their diurnal variability, is found in the 850-mb and 2,000-ft flow over eastern Thailand.

10. "THE DIAGNOSIS AND PREDICTION OF SEASIA NORTHEAST MONSOON WEATHER"

By: E.C. Kindle, L. R. Brody, J. R. Bocchieri, S. Brand  
and R. F. Adler

NWRF 12-0669-144 (No. 302) (1969)  
AD 861-798

Summary: The research reported in this publication describes the weather phenomena associated with the SEASIA Northeast Monsoon. The latest diagnostic and prediction techniques are discussed incorporating detailed case studies.

11. "TROPICAL CYCLONE EVASION PLANNING"

By: W. L. Somervell and J. D. Jarrell

NAVWEARSCHFAC Technical Paper No. 16-69 (Rev) (1969)  
AD 768-761

Summary: The paper reviews heavy weather doctrine and relates the most important factors pertinent to evasion procedures and planning.

12. "A PRELIMINARY SURVEY OF SEASIA SPRING TRANSFORMATION SEASON WEATHER"

By: W. L. Somervell and R. F. Adler

NAVWEARSCHFAC Technical Paper No. 4-70 (1970)  
AD 770-487

Summary: This paper discusses the spring weather in SEASIA, and describes the "transformation" that occurs during this season from a winter to a summer monsoon.

13. "A COMPUTER TECHNIQUE FOR USING TYPHOON ANALOGS AS A FORECAST AID"

By: J. D. Jarrell and W. L. Somervell

NAVWEARSCHFAC Technical Paper No. 6-70 (1970)

Summary: An analog program for the prediction of tropical cyclones in the western North Pacific Ocean is described. The computer program is based on finding past storms which exhibit characteristics similar to those of the storm under consideration.

14. "A PRELIMINARY SURVEY OF SEASIA FALL TRANSFORMATION SEASON WEATHER"

By: R. F. Adler, L. R. Brody and W. L. Somervell

NAVWEARSCHFAC Technical Paper No. 10-70 (1970)  
AD 770-740

Summary: This paper discusses the fall weather in SEASIA, and describes the "transformation" that occurs during this season from a summer to a winter monsoon. Climatological variations from August to November and the characteristic synoptic events of this season are described, and a case study is presented of a typical fall-season surge.

15. "SURFACE WIND CHARACTERISTICS OVER RVN COASTAL WATERS DURING OCTOBER AND NOVEMBER"

By: L. R. Brody and R. A. Godfrey

NAVWEARSCHFAC Technical Paper No. 12-70 (1970)  
AD 771-010

Summary: The purposes of this investigation were to prepare an improved wind climatology for the months of October and November, and to develop an objective technique for making short-range forecasts of the day-to-day variations in surface wind speeds for designated areas along the Vietnam coast.

16. "GEOGRAPHIC AND MONTHLY VARIATIONS OF VERY LARGE AND VERY SMALL TYPHOONS OF THE WESTERN NORTH PACIFIC OCEAN"

By: S. Brand

NAVWEARSCHFAC Technical Paper No. 13-70 (1970)  
AD 763-357

Abstract: Twenty-four years of typhoon data (1945-1968) were evaluated to determine if there are geographic and seasonal variations in very large and very small tropical cyclones of typhoon intensity. The results show that there are indeed distinct geographic and seasonal preferences for both large and small storms.

17. "THE EFFECTS ON A TROPICAL CYCLONE OF COOLER SURFACE WATERS DUE TO UPWELLING AND MIXING PRODUCED BY A PRIOR TROPICAL CYCLONE"

By: S. Brand

NAVWEARSCHFAC Technical Paper No. 16-70 (1970)  
AD 769-092

Abstract: Typhoons of the western North Pacific Ocean are examined to determine the effects on tropical cyclones of cooler surface waters due to upwelling and mixing produced by a prior tropical cyclone. The results show that both the movement and the intensity of a tropical cyclone may be affected by the cooler water left in the wake of a prior storm.

18. "CLIMATOLOGY OF TROPICAL CYCLONES AND DISTURBANCES OF THE WESTERN PACIFIC WITH A SUGGESTED THEORY FOR THEIR GENESIS/MAINTENANCE"

By: W. M. Gray

NAVWEARSCHFAC Technical Paper No. 19-70 (1970)  
AD 769-545

Abstract: This paper presents up-to-date climatological statistics on the frequency, intensity, movement and environmental conditions associated with tropical disturbances and tropical cyclones of the western North Pacific. Data summaries are stratified into annual and monthly averages for two periods 1900-1945 and 1946-1968, with more emphasis placed on the latter period. United States, British, Chinese and Japanese information sources were consulted; and of these sources, the Annual Typhoon Reports of the U. S. Navy and Air Force from Guam (JTWC) for the years 1949-1969 were most heavily relied upon. The study also presents both a physical description and dynamical interpretation of the tropical cyclone statistics. In addition, data summaries are presented of conditions associated with the maintenance and intensification of trade wind disturbances into tropical cyclones as observed by weather satellites. A section is included on analysis and forecasting techniques for tropical disturbances and tropical cyclone genesis and maintenance.

19. "PROCEEDINGS OF THE CONFERENCE ON THE SUMMER MONSOON OF SEASIA"

By: C. S. Ramage

NWRF 09-0969-146 (No. 304)  
AD 876-677

(1970)

Summary: The problems of forecasting summer weather over southeast Asia, where continental and maritime influences interact on the edge of the south Asian monsoon, defy easy solution. To bring together representatives of the scattered groups working on these problems, a conference on the summer monsoon of southeast Asia was held at the University of Hawaii from 7 through 9 April 1969. The U. S. Navy Weather Research Facility and the U. S. Air Force Cambridge Research Laboratories sponsored the conference, which was organized and directed by the Department of Geosciences of the University of Hawaii. The proceedings of this conference are presented herein.

20. "SPACE-TIME INVENTORY OF WESTERN NORTH PACIFIC TROPICAL STORM AND TYPHOON FREQUENCIES"

By: S. Brand

NAVWEARSCHFAC Technical Paper No. 23-70  
AD 769-225

(1970)

Summary: The inventory frequencies presented in this publication represent an aid to the forecaster in specifying the space/time dimensions of the "envelope" to be searched for past tropical cyclones in using the typhoon analog computer program.

21. "SURFACE WIND CHARACTERISTICS OVER RVN COASTAL WATERS DURING DECEMBER THROUGH MARCH" (PROVISIONAL)

By: L. R. Brody and R. A. Godfrey

NAVWEARSCHFAC Technical Paper No. 1-71  
AD 770-446

(1971)

Summary: The purposes of this investigation were to prepare an improved wind climatology for the winter season, December through March, and to develop objective techniques for making short-range forecasts of the surface wind speeds for designated areas along the Vietnam coast.

22. "TROPICAL CYCLONES OF THE SOUTHWEST INDIAN OCEANS; TRACKS AND SYNOPTIC CONSIDERATIONS"

By: S. Brand and R. V. Cormier

NAVWEARSCHFAC Technical Paper No. 2-71

(1971)

Summary: The report is presented in two distinct sections. The first presents summaries of frequencies and tracks of tropical cyclones in the southwest Indian Ocean. The second section is an edited translation of "Les Cyclones du Sud-Quest de l'Ocean Indien" by A. Chaussard and L. Laplace, Ministère des Travaux Publics et des Transports, Paris, Mémorial de la Météorologie Nationale, No. 49, 1964. This section is a subjective appraisal (by the French authors) of the synoptic characteristics which influence the formation and movement of these tropical cyclones.

23. "INTENSITY OF RECURVING TYPHOONS"

By: H. Riehl

NAVWEARSCHFAC Technical Paper No. 3-71  
AD 770-139

(1971)

Abstract: The maximum wind speed observed by reconnaissance aircraft in typhoons which have recurved is examined for 66 cases from 1957 to 1968 for 2-3 days after recurvature. The maximum wind decreases at a variable rate as the storms move out of the tropics, but a fairly uniform behavior is found if the maximum speed at any given time after recurvature is normalized to a percentage of the highest speed attained during the life of a typhoon.

For latitude increments in position of up to about 8 deg in 48-72 hr a linear relation gives results within fairly narrow limits. For longer displacements a logarithmic relation is indicated. The latter is compared with the variation of maximum wind speed in steady-state storms with latitude. It appears that a large fraction of the decrease in intensity after recurvature can be ascribed to the latitude effect itself but that an additional smaller term possibly related to decreasing ocean and air temperatures is present.

24. "INTENSITY CHANGES OF TROPICAL STORMS AND TYPHOONS OF THE WESTERN NORTH PACIFIC OCEAN"

By: S. Brand and R. Gaya

NAVWEARSCHFAC Technical Paper No. 5-71 (1971)  
AD 769-223

Summary: One of the problems of concern to the tropical cyclone forecaster is forecasting the future intensity (maximum wind) of tropical cyclones. There are many complex processes governing tropical cyclone intensification and dissipation, and the present state of knowledge limits the understanding of these processes. As an important step toward understanding the effect of the ocean-atmosphere system on tropical cyclone intensification and dissipation, the intensity changes of storms should be examined. This examination is presently underway at this Facility, and some of the results are presented in this report.

The purpose of this report is to familiarize the forecaster with the geographic and seasonal variations of tropical cyclone intensity changes based on 25 years of tropical storm and typhoon data (1945-1969). Intensity changes for 12, 24, and 48 hours have been examined and the results are presented. This information, in conjunction with conventional prediction techniques, should be a useful forecast aid to the tropical cyclone forecaster.

25. "STORM-SURGE FORECASTING"

By: J. W. Nickerson

NAVWEARSCHFAC Technical Paper No. 10-71 (1971)  
AD 751-578

Summary: This publication represents an adaptation of a unique storm-surge forecasting technique developed by Dr. C. P. Jelesnianski. This technique results in a computed storm surge profile at the inner boundary of an artificial standard basin seaward of the coast. The profile is derived from nomograms based upon a standard storm passing over a standard basin. Thumb rules and guidelines are presented in this publication for subjectively modifying the computed storm surge height as it moves shoreward of the artificial basin boundary, to fit the natural conditions of a particular coastline.

An extensive bibliography is furnished, in addition to references cited in the text, for those who require a greater understanding of this phenomena.

26. "GEOGRAPHIC AND MONTHLY VARIATION OF RAPID INTENSIFICATION AND LOW-LATITUDE WEAKENING OF TROPICAL CYCLONES IN THE WESTERN NORTH PACIFIC OCEAN"

By: S. Brand

ENVPREDRSCHFAC Technical Paper No. 5-72  
AD 746-130

(1972)

Abstract: Twenty-five years of tropical storm and typhoon data for the western North Pacific (1945-1969) were evaluated to determine the geographic and seasonal variation of those tropical cyclones which rapidly intensified over the open ocean ( $> 50$  knots increase in 24 hours) and those tropical cyclones that weakened at low latitudes over the open ocean ( $> 20$  knots decrease in 24 hours, south of 25N). The results show distinct geographic and seasonal preferences for both rapid intensification and low-latitude weakening of tropical cyclones.

27. "CHANGES IN THE CHARACTERISTICS OF TYPHOONS CROSSING THE PHILIPPINES"

By: S. Brand and J. W. Blelloch

ENVPREDRSCHFAC Technical Paper No. 6-72  
AD 746-131

(1972)

Abstract: Thirty typhoons (1960-1970) are examined to determine the effect of the Philippines on the intensity, speed of movement and size characteristics of tropical cyclones crossing the Philippines. The results show an average intensity (maximum surface wind) decrease of 33%, a northward perturbation as the storms pass through the Islands, and a decrease of circulation size for weak typhoons. The study also showed an increase in speed of movement as storms approach the Philippines.

28. "SPEED OF TROPICAL STORMS AND TYPHOONS AFTER RECURVATURE IN THE WESTERN NORTH PACIFIC OCEAN"

By: L. D. Burroughs and S. Brand

ENVPREDRSCHFAC Technical Paper No. 7-72  
AD 746-880

(1972)

Abstract: Twenty-five years of tropical cyclone data (1945-1969) for the western North Pacific were evaluated to determine the speed of movement characteristics of

tropical storms and typhoons following recurvature. The results show that the acceleration of storms following recurvature is a function of the time of year, the meteorological characteristics of the storm, and the surrounding synoptic environment. Forecast equations derived by linear regression techniques are presented for the speed of movement of tropical cyclones 36 hours after recurvature.

29. "THE MEAN WINDS OF THE UPPER TROPOSPHERE OVER THE CENTRAL AND EASTERN PACIFIC"

By: J. C. Sadler

ENVPREDRSCHFAC Technical Paper No. 8-72  
AD 751-579

(1972)

Abstract: Analyses of mean monthly upper-tropospheric winds for the 200-, 250- and 300-mb levels are presented for the eastern and central Pacific region. Analyses are based on 9 years of PIREP winds measured on commercial jet aircraft as well as rawins from fixed stations. The upper troposphere is discussed in terms of its major features and their changes from month to month.

30. "A DIAGNOSTIC STUDY OF THE PLANETARY BOUNDARY LAYER OVER THE OCEANS"

By: W. M. Gray

EPRF B2-0272-001 (No. 319)  
AD 741-717

Abstract: A statistical survey of the wind veering in the lowest two kilometers is made for the oceans of the Northern Hemisphere. The data sample consists of over 100,000 pibal and rawin soundings. This includes observations made from ships in the 0°-70° latitude belt and observations at atolls and small islands in the 5°-35° latitude belt. The wind veering is stratified by latitude, season, wind direction and wind speed. The results show average veering values of 8-12 degrees in the lowest km layer and 0-3 degrees in the second km layer. The average veering shows little latitude or seasonal variation. The veering increases with wind speed in the middle latitudes but not in the tropics. As expected from thermal wind considerations, south winds show a characteristic veering of 20° more than north winds. This thermal wind influence is largely eliminated by assuming constancy of thermal wind with height and subtracting the second km layer veering from the first.

It is observed that the height of the planetary boundary layer does not increase towards the equator and can be specified by vertical stability and turbulent intensity considerations without resort to rotation arguments. The frictional induced kinetic energy (KE) dissipation is substantially greater than the cross isobaric KE generation. In the tropics the dissipation to generation ratio is more than five to one. The oceanic boundary layer can be maintained only by a downward transport of KE from higher levels.

31. "MONSOON METEOROLOGY BY COLIN S. RAMAGE; A DIGEST FOR AFRICA AND ADJOINING INDIAN OCEAN WATERS"

By: L. R. Brody

ENVPREDRSCHFAC Technical Paper No. 12-72 (1972)  
AD 907-418L

Abstract: A digest is presented of those chapters of the recent book "Monsoon Meteorology" (Academic Press, New York) by Dr. C. S. Ramage which deal with the meteorological problems encountered in Africa and the adjoining Indian Ocean waters. The variability of the observed weather as a function of development, decay, and movement of the principal monsoon features is discussed. Descriptions of significant meteorological phenomena found in these regions are presented, along with possible explanations, as an aid to the Naval Weather Service forecaster.

32. "THE 1972 TYPHOON ANALOG PROGRAM (TYFOON-72)"

By: J. D. Jarrell and R. A. Wagoner

ENVPREDRSCHFAC Technical Paper No. 1-73 (1973)  
AD 758-007

Abstract: TYFOON, an analog program for the prediction of tropical cyclones in the western North Pacific Ocean, has been in operational use at FWC/JTWC Guam since August 1970. A brief review of TYFOON is presented focussing on its concept, operational results and limitations. Modifications to remedy shortcomings and limitations in the original version are discussed.

The modified program TYFOON-72 resulted in the reduction of both computer run time and data storage requirements. Testing and development of the modified program using a sample of 131 forecast situations are reported. TYFOON-72 compared favorably with the official JTWC and TYFOON forecasts at 24 and 48 hr and was superior to both at 72 hr.

33. "TROPICAL CYCLONES OF THE NORTH INDIAN OCEAN"

By: J. C. Sadler and R. E. Gidley

ENVPREDRSCHFAC Technical Paper No. 2-73 (1973)  
AD 764-859

Abstract: Photographs from polar-orbiting meteorological satellites were used in this study to obtain the frequency and tracks of depressions, storms, and hurricanes in the North Indian Ocean from November 1966 through December 1970 plus October 1971.

The distribution of the mean sea-surface temperature, cloudiness, and atmospheric circulation for selected months are discussed in relation to the observed cyclone climatology. Appropriate and pertinent climatic charts of these parameters are presented.

The results from the satellite period are compared with the 70-year (1891-1960) climatology of cyclonic storms from the India Meteorological Department (1964). Plotted cyclone tracks derived from satellite data are presented, as are plotted monthly tracks developed by the India Meteorological Department.

34. "THE LOW-LEVEL STRUCTURE OF WEAK TROPICAL WAVES"

By: R. W. Fett, R. E. Nagle and W. F. Mitchell

ENVPREDRSCHFAC Technical Paper No. 3-73 (1973)

Abstract: High resolution satellite data, ESSA-5 data and wind data derived from the Applications Technology Satellites (ATS), indicate that weak tropical waves characteristically have associated centers of maximum relative vorticity west of the bisector of the "inverted V" cloud pattern. Two examples of the high resolution satellite views are shown and discussed. Upper-air analyses and a time-section analysis for an ESSA-5 series used to define the original inverted V cloud pattern are

examined. These analyses confirm that a trough axis placed on the west side of the inverted V cloud pattern fits the data more consistently than a trough or streamline axis which bisects this pattern. Finally, objective analyses of an Atlantic inverted V cloud pattern based on winds extracted from geosynchronous satellite views are shown. These analyses indicate that an area of maximum relative vorticity exists on the west side of the inverted V cloud pattern. An anticyclone is found south of the inverted V apex contrary to the inverted V model which requires a trough rather than a ridge or anticyclone in this area. The results of this study suggest that the original inverted V model relating to easterly waves requires modification.

35. "THE TYPHOONS OF OCTOBER 1970 IN THE SOUTH CHINA SEA"

By: C. S. Ramage

ENVPREDRSCHFAC Technical Paper No. 4-73 (1973)

Abstract: In October 1970, the South China Sea experienced three typhoons. Meteorological and oceanographic data were examined in an attempt to explain why the typhoons underwent intensity changes while over the South China Sea. The clearest relationship was found with troughs in the upper tropospheric westerlies -- intensification accompanied development of a middle and high cloud plume streaming northeastward from the storm area.

36. "STATE OF THE SEA AROUND TROPICAL CYCLONES IN THE WESTERN NORTH PACIFIC OCEAN"

By: S. Brand, J. W. Blelloch and D.C. Schertz

ENVPREDRSCHFAC Technical Paper No. 5-73 (1973)  
AD 767-030

Abstract: The combined sea-height data for the year 1971 for the western North Pacific Ocean are examined to determine the sea-state characteristics around tropical storms and typhoons. The results from subjectively analyzed sea-state charts show that the areal extent about the storms of the combined sea height in the 9-15 ft range is primarily a function of storm duration, intensity (maximum sustained wind) and size. Equations derived by linear regression techniques are presented for describing the state of the sea about tropical cyclones.

37. "A HANDBOOK FOR FORECASTERS IN THE BAY OF BENGAL"

By: M. J. Cuming

ENVPREDRSCHFAC Technical Paper No. 7-73 (1973)

Abstract: A literature search was conducted with the objective of assimilating information from widely diverse sources to provide the operational Navy forecaster with a single reference text for the Bay of Bengal. To avoid presenting conflicting points of view about the various phenomena discussed, the author has given the viewpoint which, at this time, seems most reasonable.

The approach adopted has been to describe and discuss the various large-scale and synoptic scale features and then to link all the components together in a description of the "March of the Seasons." Mean climatic charts are presented and, wherever possible, typical satellite photographs are presented to illustrate various features.

38. "EXTENDING THE COMPUTERIZED TYPHOON/TROPICAL STORM PREDICTION PROGRAM (TYFOON 72) TOWARD SEVEN DAYS"

By: J. F. Steukert and W. S. Yogi

ENVPREDRSCHFAC Technical Report No. 1-73 (ODSI) (1973)  
AD 770-207

Abstract: The objective of this research was to develop methods for improved prediction of the movement of tropical cyclones in the 3-7 day time scale; the improved system was to be based on the existing TYFOON and/or TYFOON 72 automated programs for producing prediction out to 3 days. The work was divided into 3 tasks:

Task I: A survey of the 2 existing prediction models and updating and extending of the analog historical file used by these programs in producing their predictions.

Task II: To determine the value of large-scale patterns in the prediction of typhoon formation and in subsequent track prediction. This work was to result in the development of a set of predictor rules directly useable by the Environmental Prediction Research Facility.

Task III: To refine the typhoon analog predictive techniques developed under Task II, which were to include the impact of large-scale patterns. The yield of this task is to be a predictive technique in a form suitable for immediate operational application.

The work to accomplish the above tasks is detailed in this Final Report.

39. "CHANGES IN THE CHARACTERISTICS OF TYPHOONS CROSSING THE ISLAND OF TAIWAN"

By: S. Brand and J. W. Blelloch

ENVPREDRSCHFAC Technical Paper No. 8-73 (1973)  
AD 769-538

Abstract: Twenty-two typhoons (1960-72) are examined to determine the effect of Taiwan on the intensity and movement of tropical cyclones crossing the island. The results show an average intensity (maximum surface wind) decrease of over 40% and a distinct northward perturbation as the storms pass over the island. The effects of crossing Taiwan on tropical cyclones of different intensities are discussed. Forecast rules for typhoons approaching or crossing Taiwan are also presented.

40. "AN EVALUATION OF HONG KONG HARBOR AS A TYPHOON HAVEN"

By: D. A. Mautner and S. Brand

ENVPREDRSCHFAC Technical Paper No. 9-73 (1973)

Abstract: This study evaluates the harbor of Hong Kong as a typhoon haven. Characteristics of the harbor under tropical cyclone conditions, including topographical effects on the wind, storm surge, and reliability of moorings and anchorages are discussed and highlighted by two case studies (Typhoon ROSE, August 1971 and Typhoon WANDA, September 1962). Problem areas to be considered if remaining in port and possible evasion procedures for ships sailing from the port are examined for tropical cyclones approaching from various directions. Tropical cyclone tracks for 87 years of data (1884-1970) for the western North Pacific Ocean are examined in order to determine the probability of threat to the port of Hong Kong. Results suggest early sortie action under threatening conditions by all Fleet units capable of evasion at sea. An operationally oriented flow diagram summarizing the locations of the various sections of the text that could be used in decision making is also presented.

41. "TROPICAL CYCLONE MOVEMENT FORECASTS BASED ON OBSERVATIONS FROM SATELLITES"

By: R. W. Fett and S. Brand .

ENVPREDRSCHFAC Technical Paper No. 1-74

(1974)

AD 774-683

Abstract: A method to predict 24-hr movement of tropical cyclones using consecutive daily satellite views is described. The method is based on the observation that changes in the location of major structural features of the storm are correlated with changes in the direction of movement of storm centers. Major structural features appear to retain the same relative location with respect to the direction of movement of the storm center. The rotation of features noted in comparing satellite views over a 24-hr period is frequently found to approximate in sense and value the further deflection the storm will take in its track during the following 24 hours. A test evaluation of the method by seven individuals using 31 separate data sets of satellite data produced results significantly better than official 24-hr forecasts.