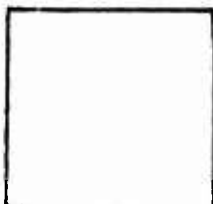


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NATIONAL INTELLIGENCE SURVEY

NETHERLANDS

SECTION 23

WEATHER AND CLIMATE

AD A950798

Section 23 on NIS 4 is issued under the NIS maintenance program. It supersedes the material on the Netherlands in the original Section 23 on NIS 4-6, dated January 1950. Belgium and Luxembourg are designated as NIS Areas 5 and 6, respectively, and subsequent revisions of NIS units on these areas will be so identified.

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CHAPTER II

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This Section was prepared for the NIS under the general supervision of the Assistant Chief of Staff, Intelligence, USAF, by the Air Weather Service, with contributions on clothing, storage, and shelter from the Office of the Quartermaster General, Department of the Army, and on amphibious operations from the Naval Weather Service Division.

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23. Weather and Climate

The user can supplement the information in this Section by referring to Section 20 for an evaluative summary of the Area's external geographic relationships and its significant internal geographic characteristics, including internal routes, barriers, and strategic areas. Topical treatment of Coasts and Landing Beaches, including some aspects of weather in amphibious operations, is given in Section 22; Topography, including State of the Ground, in Section 24; and Urban Areas in Section 25. Integrated analysis of key aspects of these topical sections by regions is presented in Section 21.

A. General weather and climatic conditions

1. Introduction

The Netherlands is subject to strong oceanic influences. All of the country lies within 120 miles of the North Sea, and westward beyond the British Isles lies the great expanse of the North Atlantic Ocean. Because of the prevalence of strong westerly, or onshore, winds in all seasons, the climate of the Netherlands is dominated throughout by the influence of these ocean bodies. Winters are comparatively mild and summers cool. Precipitation amounts, because of the barrier effect of the British Isles, are surprisingly small, averaging for this NIS Area less than 30 inches annually. The air is generally quite humid with an abundance of cloud in all seasons. Cloud bases below 1,000 feet, however, are uncommon. Visibilities are generally good although limited at times by fog and smoke. The average surface wind speed is relatively high. Because of the small size and general flatness of the Netherlands (FIGURE 23-49), there is little climatic variation across the country.

The primary controls governing the airflow in the Area are the Icelandic *low* to the northwest and the North Atlantic subtropical *high* to the southwest, an extension of which projects into southern Europe. The circulation around these systems is responsible for the prevalence of west and southwest winds across the Area. Individual low-pressure centers embedded in the prevailing westerly airflow regularly approach Europe from the North Atlantic. These *lows* take a variety of paths. Many move northeast skirting the Norwegian coast, while a limited number pass directly onto the continent in both summer and winter. The approach of each *low* brings a renewal in strength of the moisture-bearing westerly winds.

NOTE Requests for solutions to specific problems involving the interpretation of the weather factor in the user's unique operational terms should be directed to the Director, Climatic Center, USAF, Annex 2, 225 D Street, S.E., Washington 25, D. C.

During the winter season the adjacent North Atlantic is unusually warm for this latitude. The warmth is transported to the Netherlands by the prevailing westerly wind, and winters although cloudy are comparatively mild. Precipitation is frequent but relatively light and mostly in the form of rain with occasional snow. Generally the snowfall is light and melts within a day or two. There is much low cloudiness with visibilities occasionally restricted by fog. The westerly flow is periodically blocked by the presence of a high-pressure cell over Europe. Cold air associated with these anticyclones will then spread over the Netherlands and bring periods of clear skies and below normal temperatures. Ordinarily this condition is short lived. In some years, however, the anticyclone, once well established, may persist for a week or more.

During the summer season the oceanic winds are responsible for the generally cool, cloudy weather. Rainfall is less frequent than in winter but amounts are slightly greater. Cloudiness, although less than that of winter, is substantial. Cloud bases are somewhat higher, seldom below 1,000 feet. Visibilities too are better, with relatively little fog. As in winter the prevailing westerly wind is occasionally interrupted by easterly winds flowing out of a *high* over the continent. Under the clear sky conditions associated with these *highs* the days are pleasantly warm and sunny over the interior, although the coastal sections frequently remain cloudy.

Spring and autumn are periods of gradual change, particularly with respect to temperature. Rainfall changes are small during these seasons; precipitation is at a minimum in spring and at a maximum in either autumn or summer. There is also a small increase in northerly and westerly winds during spring and an increase in southerly and southwesterly winds in autumn. As a rule late autumn and winter experience the highest frequency of strong winds and stormy weather conditions, and spring and summer the lowest frequency. Periods of warm sunny weather, reminiscent of summer, occasionally occur in early autumn.

The climate of the Netherlands is probably less affected by topography than almost any other European country. Almost all sections are flat and low-lying. Much of the northwestern part of the Area lies 10 to 20 feet below sea level, and most of the remainder not more than 200 feet above sea level. The northwestern portion is mostly reclaimed sea bottom, crisscrossed by innumerable canals and ditches which collect the rain water and facilitate its removal by a system of pumps. Relief from the general flatness is afforded by low-lying dunes along the coast and by moraines over the central interior. The southern portion is gently rolling except for the relatively steep Maas river valley in the extreme southeast.

Because of its small size and generally flat terrain the Netherlands is climatically homogeneous and is discussed as a single region. The climatic seasons referred to in this text are those commonly used in the Northern Hemisphere: winter (December through February), spring (March through May), summer (June through August), and autumn (September through November).

2. Climatic controls

The climate of the Netherlands is determined by a number of factors—the ocean waters to the west, the vast continental interior to the east, the general circulation, the succession of migratory pressure cells, the topographic influences both in and around the country, and the solar radiation as determined by latitude. Of these the most effective is the oceanic influence, particularly in winter when the Netherlands experiences stormy but relatively mild weather conditions in spite of its northerly position. This mildness can be attributed to the relative warmth of the adjacent North Atlantic and the prevailing westerly winds which transport this warmth to the continent. During the summer the oceanic winds are responsible for the cloudy and cool weather. Because of the expanse of flat low-lying land the oceanic influences can be felt across the entire country.

Another strong, although less frequent, climatic control is the vast continental interior. During winter the cold air present over the continent to the east and northeast occasionally invades the Netherlands, causing below-normal temperatures and generally clear skies. During summer the winds from the interior generally bring clear skies and higher temperatures, although cooler air may occasionally reach the Area from northern Europe.

a. GENERAL CIRCULATION — The low-pressure system known as the Icelandic *low* is a major control over the climate of the Netherlands. The normal path of low-pressure centers moving out of Labrador or the eastern United States lies through

this statistical *low*. Over or southwest of Iceland, air from the Arctic frequently rejuvenates these storms, so that this vicinity is the point of most frequent occurrence of deep low-pressure centers in the North Atlantic. Another, but somewhat less significant, pressure system is the North Atlantic subtropical *high*, centered over the Atlantic at about 30° N. latitude with a ridge extending into southern Europe.

In winter, pressures are lowest in the Icelandic *low* and highest in the ridge over the continent. The resultant intense pressure gradient causes frequent strong southwest winds over the Netherlands. The mean sea-level pressure pattern and prevailing low-level flow in January, a representative winter month, are shown in FIGURE 23-1. In summer the Icelandic *low* fills and decreases greatly in intensity, while the subtropical high moves northward and extends farther into southern Europe. Relatively weak winds, predominantly from the west, replace the southwesterly winds of winter. FIGURE 23-2 gives the mean sea-level pressure pattern and prevailing windflow in July, a representative summer month.

b. MIGRATORY PRESSURE SYSTEMS AND FRONTS —

The Netherlands experiences frequent weather changes in all seasons. These changes are associated with the migratory low-pressure centers which approach from the North Atlantic. Many of the *lows* can be traced back across the Atlantic to North America; however, a substantial number form in the North Atlantic. The *lows* take a variety of paths and approach with a wide range of speeds. Many pass quickly northeastward along the coast of Norway, and some pass directly onto the continent, while others stagnate out over the ocean. The activity of these *lows* is indicated on the mean sea-level pressure maps, particularly those for winter. FIGURE 23-1 suggests that in January the path of greatest frequency taken by the *lows* lies to the northwest of the British Isles where the mean pressure is lowest. FIGURE 23-2 indicates that in summer the *lows* take a more easterly course and enter the continent with greater frequency. With the approach of each *low* the winds across the Netherlands range from south to southeast, temperatures rise, cloudiness increases, and occasional showers fall. After the *low* passes, either northeastward along the coast of Norway or directly eastward into the continent, the winds gradually shift to the southwest and west with showers and colder weather. Fast moving *lows* of this type frequently contain cold fronts or occluded cold fronts. These fronts also approach from many directions, but mostly from the west. Occasionally the cold front, propelled by strong northerly winds, may speed southward across the North Sea, sweeping onto the coast with

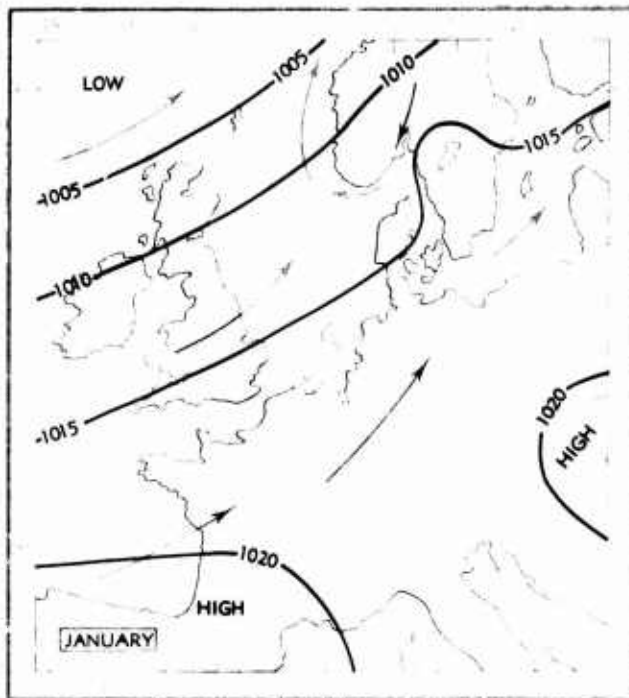


FIGURE 23-1. MEAN SEA LEVEL PRESSURE (MILLIBARS) AND PREVAILING SURFACE WIND, JANUARY

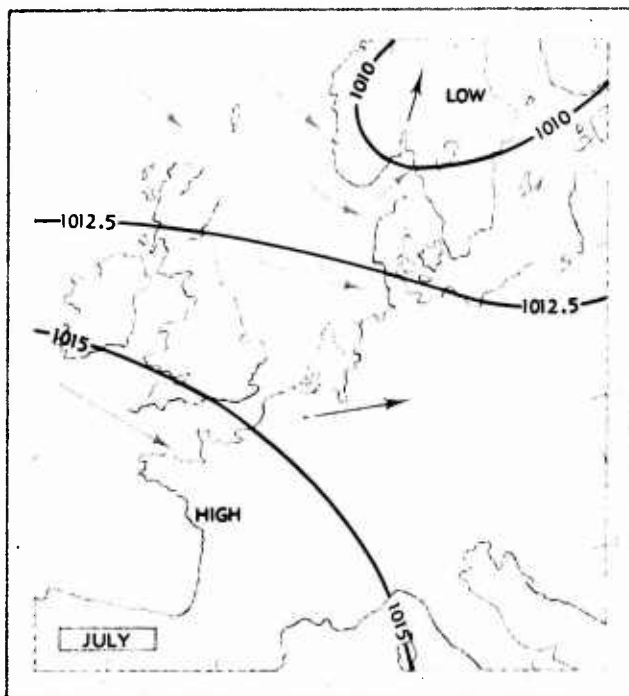


FIGURE 23-2. MEAN SEA LEVEL PRESSURE (MILLIBARS) AND PREVAILING SURFACE WIND, JULY

unusual vigor. The resulting high seas have in the past caused considerable damage to the sea walls and widespread flooding in the Netherlands. In a majority of cases in winter the low-pressure systems are occluded, having no open warm sector. These occluded *lows* are normally slow moving and cause extended periods of cloudy rainy weather. Their frontal systems are rather obscure.

It is difficult to estimate the number of individual *lows* which affect the Netherlands. A glance at any daily weather map in winter will show numerous low-pressure centers and their frontal systems out over the adjacent North Atlantic, with the continent dominated by higher pressure. Most of these *lows* affect the weather in the Netherlands to some degree. As a rule, the closer the low-pressure center comes to the Netherlands the greater the effect on the weather. The low-pressure centers, upon reaching the latitude of the British Isles, generally move northeast, skirting the Norwegian coast. This general pattern is the one most frequently observed on the daily weather map in winter and is accompanied by winds with a southwesterly component over the Netherlands.

A less frequently observed pattern is one in which the center, after crossing the British Isles, moves eastward across the North Sea into the Baltic Sea and then continues eastward across the continent. The centers of these *lows* pass close to the Area and are the cause of the strongest winds and heaviest precipitation.

A third pattern occasionally observed is one in which a pronounced high-pressure cell is centered over or close to the Netherlands. *Highs* of this nature block the movement of *lows* toward the continent and produce clear skies, below normal temperatures, and light winds over the Area.

c. AIR MASSES — Two air masses, one maritime and the other continental, dominate the weather over the Netherlands. The maritime air mass, the one most frequently observed, originates over the northern portions of the North Atlantic. This polar maritime (*mP*) air mass periodically surges onto the continent in all seasons. It is extremely moist and causes extensive cloudiness.

In winter the *mP* air is quite unstable when it reaches the coast. Flowing across the colder land surface, the lower levels tend to become stable; however, because of the instability at upper levels this air mass is frequently accompanied by showers. The *mP* air is responsible for the mild winter weather experienced in the Netherlands. In summer the polar maritime air is more stable upon reaching the coast of the Netherlands. Moving across the warmer land surface it becomes unstable, with resulting local afternoon showers and thunderstorms. This air mass is responsible for the relatively cool summer weather.

On rare occasions tropical maritime (*mT*) air or modified *mT* air reaches the Netherlands from the southwest. During the winter this air mass acquires stability as it moves northward across the colder ground surface. Fog and drizzle with extremely low cloudiness frequently accompany its

arrival in winter. Tropical maritime air reaches the Netherlands somewhat more frequently in summer, causing uncomfortably hot and humid weather. As a rule, this air mass does not persist for more than one day before it is replaced by polar maritime.

Continental air masses originate over interior Europe or Asia and periodically flow westward across the Netherlands. During the winter this air mass is appreciably colder than the maritime air it displaces. It is known as polar continental (cP) although at times its origin may be traced to the Arctic region, when it is more properly called arctic continental (cA). Clear skies, below normal temperatures, and light winds characterize the polar continental air masses in winter. As a rule, this cold air is quickly displaced by warmer air from the ocean. On rare occasions, however, it may persist for several days or weeks at a time.

During summer the air which arrives over the Netherlands from the continent may vary appreciably in temperature. If the invading air reaches the Netherlands from northern Europe, it is relatively cold and is termed polar continental. Clear skies generally accompany its arrival. During the day this air mass is generally warmer than the maritime air it displaces; at night, however, under clear skies it will bring lower temperatures. Continental air reaching the Netherlands from the southwest or south in summer is comparatively warm. Skies are generally clear and both day and night temperatures are above normal. These continental air masses are not frequently observed over the Netherlands.

d. TOPOGRAPHY — The Netherlands, because of the nature of its terrain, is probably less affected climatically by topography than any nation in Europe. Most of the Area is low and relatively flat. The northern and western portions, which constitute about two-fifths of the entire NIS Area, lie below sea level. The Netherlands is, therefore, open to the full effect of oceanic influences, with westerly winds periodically sweeping across the entire country. The oceanic effect is most pronounced in the north and west, where the many canals, rivers, inland seas and lakes are merely extensions of the ocean itself. The most striking of these topographic features are the IJsselmeer and the vast delta regions at the mouth of the Nederrijn and Maas rivers. In all seasons the oceanic effect decreases gradually inland, particularly with regard to temperature. The winter warming effect and the summer cooling effect of the oceanic winds gradually decrease inland. Relative humidities also decrease slightly toward the interior in summer.

The Netherlands contains a number of hilly sections which exert a limited influence on the precipitation pattern. The windward facing slopes of these hills generally experience slightly higher precipitation amounts. The largest of these hilly sections is located to the southeast of the IJsselmeer, where several hilltops are close to 300 feet in elevation. There is a second hilly section in the extreme southeast, with several hills above 300 feet and one peak about 1,000 feet near the common boundary of Belgium, Germany, and the Netherlands. A third hilly section of some consequence is near the central portion of the eastern border; here the highest hills are between 200 and 300 feet in elevation.

Outside of the NIS 4 Area, the British Isles constitute the chief topographic feature influencing the climate of the Netherlands. These islands protect the Netherlands from the full effect of the prevailing west to southwest winds. Thus the Netherlands lie in the rainshadow of the British Isles and precipitation is comparatively light. The rising land surface to the southeast, culminating in the Alps, is a second topographic feature of some importance. Well developed airflow from this direction embodies foehn effects which bring generally clear and warm weather to the Netherlands.

e. LATITUDE AND OCEANIC EFFECTS — The Netherlands is situated mostly between 51° and 53° north latitude. During the winter, although the day is close to 8 or 9 hours long, there are on the average only 1 or 2 hours of sunshine daily (FIGURE 23-3). Then too, the sun remains low on the southern horizon even at midday. In spite of the short duration and low intensity of the sunshine, temperatures are relatively high in winter. This warmth in winter is due to the moderating influence of the North Atlantic and the relatively high frequency of onshore winds, ranging from

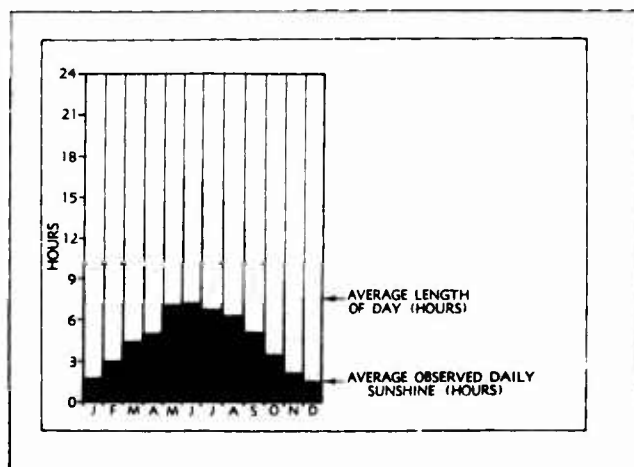


FIGURE 23-3. AVERAGE LENGTH OF DAY AND OBSERVED SUNSHINE HOURS AT DE BILT

southwest to north. The ocean area itself, over which these winds approach the Netherlands, is unusually warm for the latitude. The northward drift of water from more southerly latitudes is responsible for this phenomenon. The fact that the winds are frequently from the south and southwest is also significant in that they accomplish the transfer of heat from more southerly latitudes. This combination of frequent winds from warmer land and ocean areas and infrequent winds from the cold interior of the continent is primarily responsible for the mild winters experienced in the Netherlands.

During summer the amount of sunshine is appreciably greater. The length of the day is close to 15 or 16 hours in May through August, and the average amount of sunshine is close to 6 hours daily. In spite of the comparatively large amount of insolation, the summer is cool, as a result of the influence of the North Atlantic. This cooling influence is not as severe as it might be, because even in summer the adjacent ocean is comparatively warm for the latitude.

3. Special phenomena

Intense low-pressure systems with gale-force winds, although rare, sometimes pass directly over the Netherlands. At such times the center of lowest pressure approaches from the North Sea, passes close to or over the Netherlands, and then moves northeastward toward the Baltic Sea. The accompanying high seas and pounding surf are a menace to the sea walls which protect the low-lying farmlands and villages. The strongest winds are normally experienced along the coast during the winter. High winds are mostly from the southwest, the prevailing winter wind direction. However, the highest-recorded short-period speeds are from the north or northeast; winds from these directions have a relatively long fetch across the sea. Tornadoes have also occurred on rare occasions in the Netherlands. Like those that occur in the United States, they are frequently associated with thunderstorm conditions, although they may also accompany the circulation about an intense low-pressure system.

B. Weather and military operations

This Subsection is concerned with the effects of the meteorological elements upon military operations, which are here divided into four basic groups: air, air-ground, ground surface, and amphibious. Under each group are discussed the weather elements primarily relevant to the operations in that group. However, weather elements which are considered most applicable to one basic group may also affect operations in others. In such cases, reference should be made to the appro-

priate Subsection. The meteorological information contained herein is organized to highlight conditions that may be pertinent factors in planning. Discussion of the effects of weather on specific operations is not attempted since the weather factor in an operation is subject to change with the changing requirements of the operation itself.

1. Air operations

a. **CLOUDINESS** — The Netherlands, exposed to the moisture-laden airstreams from the North Atlantic, is an Area of extensive cloudiness. The average annual cloud cover for the Area as a whole varies from about 59% at 0000 LST to about 72% at 1200 LST. The period of maximum cloudiness extends from November through February and the minimum from April through June (FIGURE 23-31). The average cloud cover does not vary appreciably across the country except in summer, when averages are slightly higher over the interior. Least cloudiness probably occurs during the night hours of the summer season.

The Netherlands has a wide variety of cloud types ranging from low stratus to cirrostratus. The most common type, strato-cumulus, is characteristic of the moisture-laden airstreams from the North Atlantic. Towering cumulus and cumulonimbus, associated with thunderstorm conditions, are relatively rare except in summer. Low stratus clouds are present at times, particularly during the early morning as a result of radiative processes. Low stratus clouds also form in warm air masses moving up from the southwest. Altostratus clouds with bases above about 8,000 feet are also quite common. The cloud pattern over the Area undergoes a fairly systematic change as the low-pressure centers come and go. High thin cirrus merging into altostratus normally herald the approach of each *low*. At lower levels stratus clouds attended by drizzle frequently form in the southerly airflow in advance of these *lows*. As the *lows* approach the coast, the winds tend to shift to the southwest and then to west as the *low* moves northeastward along the coast. During this phase a solid stratus overcast is normally present and is frequently accompanied by light rain. After the wind shifts to the west or northwest, stratocumulus clouds, accompanied by occasional showers, dominate the sky.

NOTE Air operations are defined as those operations taking place primarily above the frictional influence of the surface terrain on atmospheric circulation. The meteorological elements discussed in this Subsection are those which are of primary importance to such operations as high-level visual bombing, radar bombing, aerial photography, most types of aerial reconnaissance, and fighter support and interception.

The seasonal variations in cloud amount in the Netherlands, although influenced by location and station exposure, are fairly regular in most sections. Late autumn and winter is the period of maximum cloudiness in the Netherlands. The overall average cloudiness is mostly between 70% and 80% during this period. Individual monthly averages also lie for the most part between these values, with lowest values in late winter during night hours. There is little variation across the country as a whole. In spring the average cloud cover decreases, with lowest averages of the year experienced in April, May, and June. Average cloudiness during this period falls in the 60% to 75% range except near midnight, when observations show somewhat lower cloud amounts. The average cloud amount remains comparatively small in summer and early autumn, with averages in July through October only slightly higher than those of spring, most of them falling in the 65% to 75% range during the day and about 50% to 70% at night.

The frequencies of clear days (FIGURES 23-4 and 23-32) and of cloudy days (FIGURES 23-5 and 23-33) reveal additional information on cloudiness in the Netherlands. Although the average cloud cover is relatively great, there are a significant number of clear days when high-level visual air operations can be conducted. The more important features of the seasonal, areal, and diurnal variations of clear and cloudy conditions at specified hours are discussed in the following paragraphs. Clear, in this discussion, is defined as that sky condition with equal to or less than 1-eighth cloud cover, and cloudy as the condition with equal to or greater than 7-eighths cloud cover. The high frequency of clear days at midnight in many months, and the corresponding low frequency of cloudy days, may be somewhat in error because of the difficulty of detecting clouds, particularly high thin cirrus clouds, during the darkest part of the night.

In late autumn and winter the average number of clear days reaches a minimum, with an average of about 4 days per month for the Area as a whole. The areal variations are minor, with frequencies slightly lower along the coast as suggested by the data for the lightships. A small diurnal variation is also apparent, with lowest frequencies at midday and greatest frequencies of clear skies at night, although the nighttime observations appear to be too high. Clear sky conditions normally attend the arrival of cold dry air from the continental interior. In contrast there are a large number of cloudy days in late autumn and winter, the average approaching 20 days per month. Both areal and diurnal variations are small.

The average number of clear days increases to about 5 per month in spring and early summer. The diurnal variation is small with minimum frequencies occurring during midday and an apparent maximum at night. As in winter the clear sky conditions accompany the invasion of drier air masses from the continental interior. As might be expected, the number of cloudy days decreases, with an overall average of about 17 days in March and 14 days in April through June. Frequencies of cloudy days show no marked areal or diurnal variations.

The frequency of clear days in July through September is nearly equal to that of winter, the overall average being about 4 days per month. Only slight areal variations occur, with minimum frequencies on the coast. In regard to the diurnal variation the minimum appears at midday and the maximum apparently at night. Clear sky conditions, as in the other seasons, are associated with the dry air from the continental interior. The average number of cloudy days for the country as a whole averages about 14 per month in this period, with the frequency slightly higher in the morning. The areal variation is small.

The overall average number of clear days in October is close to 5 per month, and cloudy days average about 16 per month with only minor diurnal variations.

b. THUNDERSTORMS AND TURBULENCE — The Netherlands experiences a substantial amount of thunderstorm activity as shown graphically in FIGURE 23-6 and by the tabular data in FIGURE 23-34. The average annual frequency ranges from 24 days at points on the coast to as high as 34 days per year at a number of points in the interior.

Summer is the season of maximum frequency with the overall average close to 5 days per month. Individual station averages range from 3 or 4 days per month along the coast to 6 or 7 days in the interior. These summer storms generally form in moist oceanic air as it moves eastward across the warmer land, and their frequency is therefore highest during midafternoon, the warmest part of the day. The storms are primarily expressions of local convective activity, although a few are directly associated with cold fronts approaching from the west or northwest. On rare occasions the thunderstorms are accompanied by hail.

Winter is the season of minimum thunderstorm activity; the average number of days on which storms are reported is 1 or less per month. The storms of winter are all associated with low-pressure systems in which there is a pronounced warm sector and an active cold front. Spring and autumn are transitional seasons of increase and decrease in thunderstorm activity.

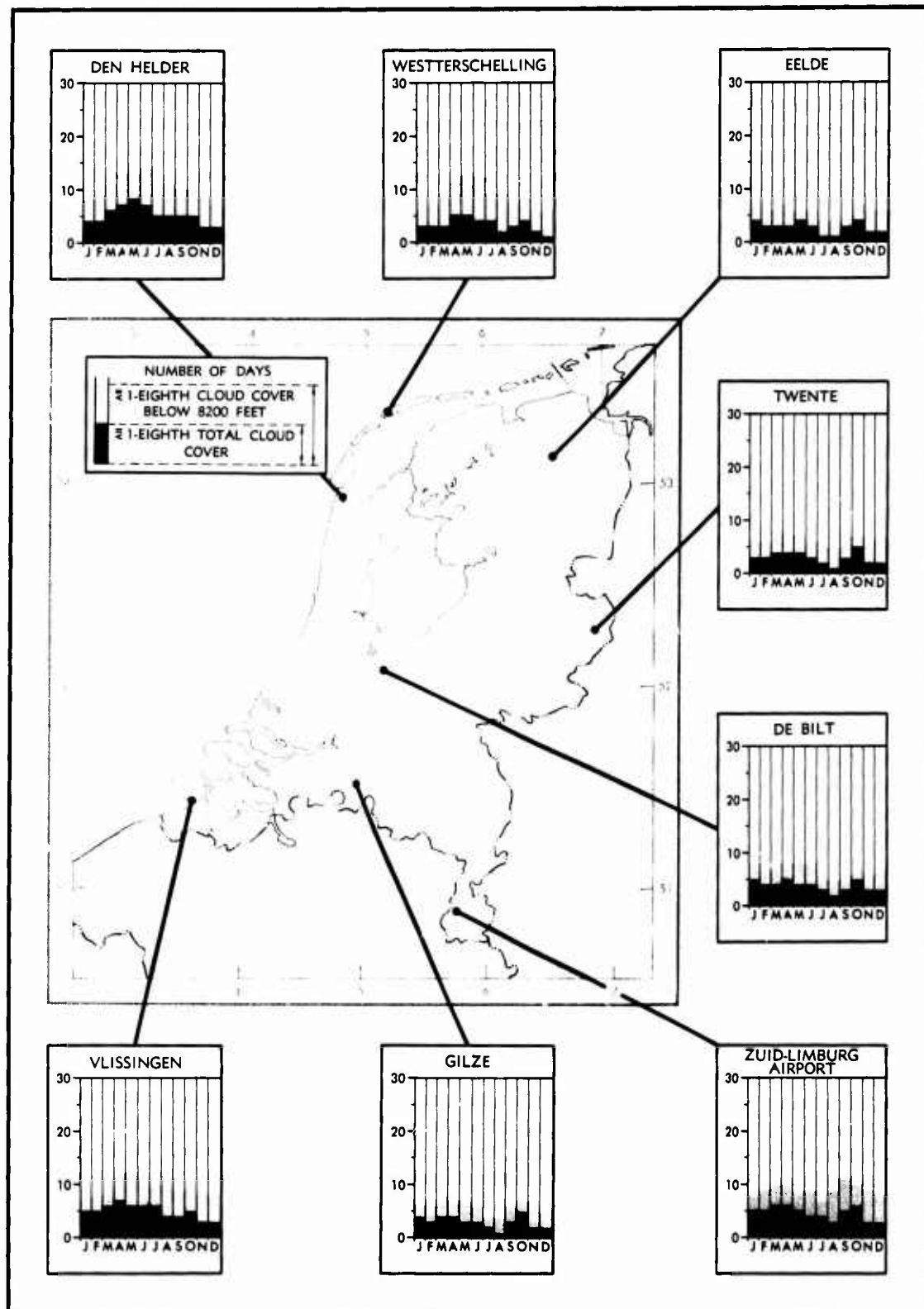


FIGURE 23-4. MEAN NUMBER OF CLEAR DAYS AT MIDDAY. (For tabular data see FIGURES 23-32 and 23-35.)

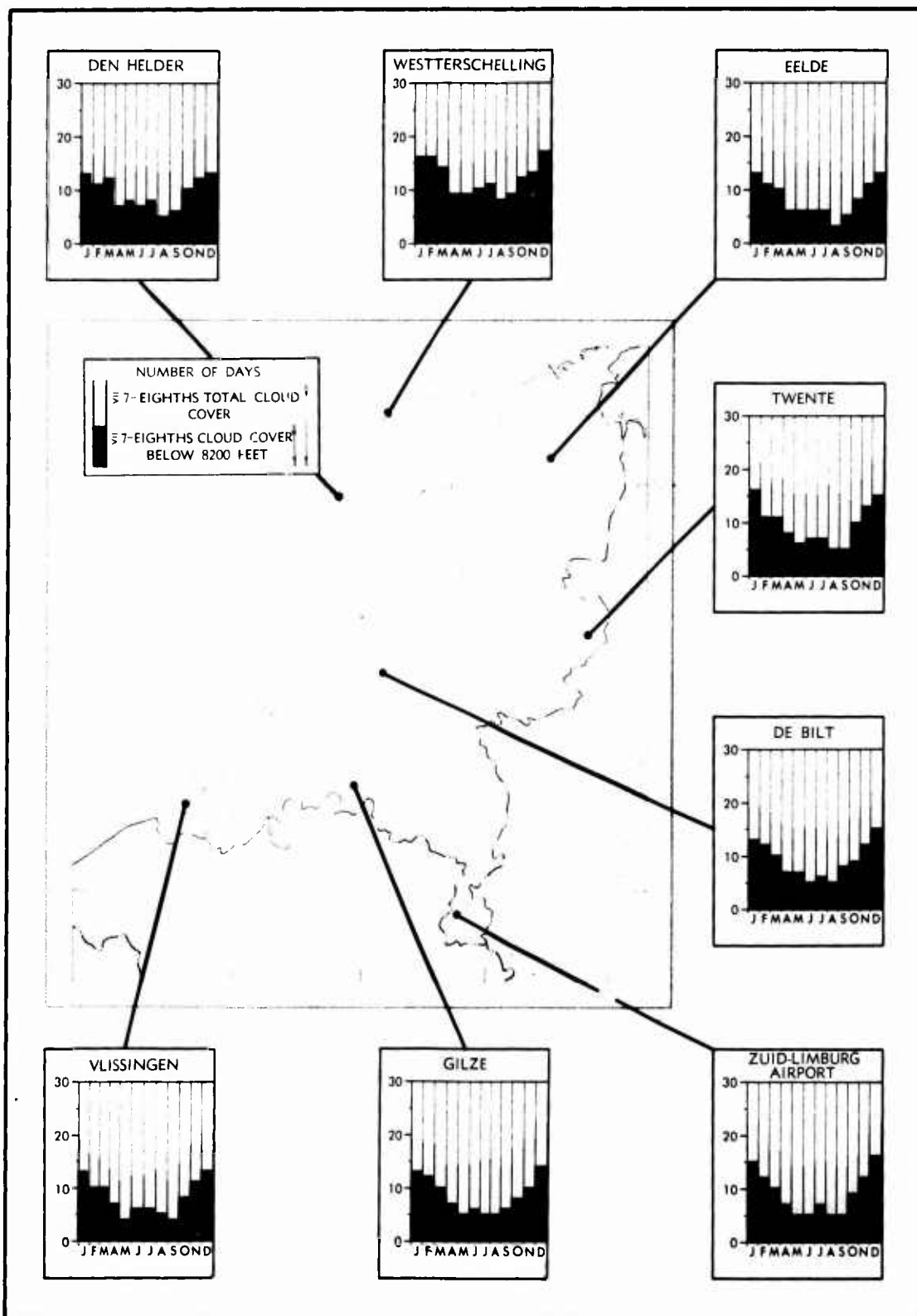


FIGURE 23-5. MEAN NUMBER OF CLOUDY DAYS AT MIDDAY. (For tabular data see FIGURES 23-33 and 23-36.)

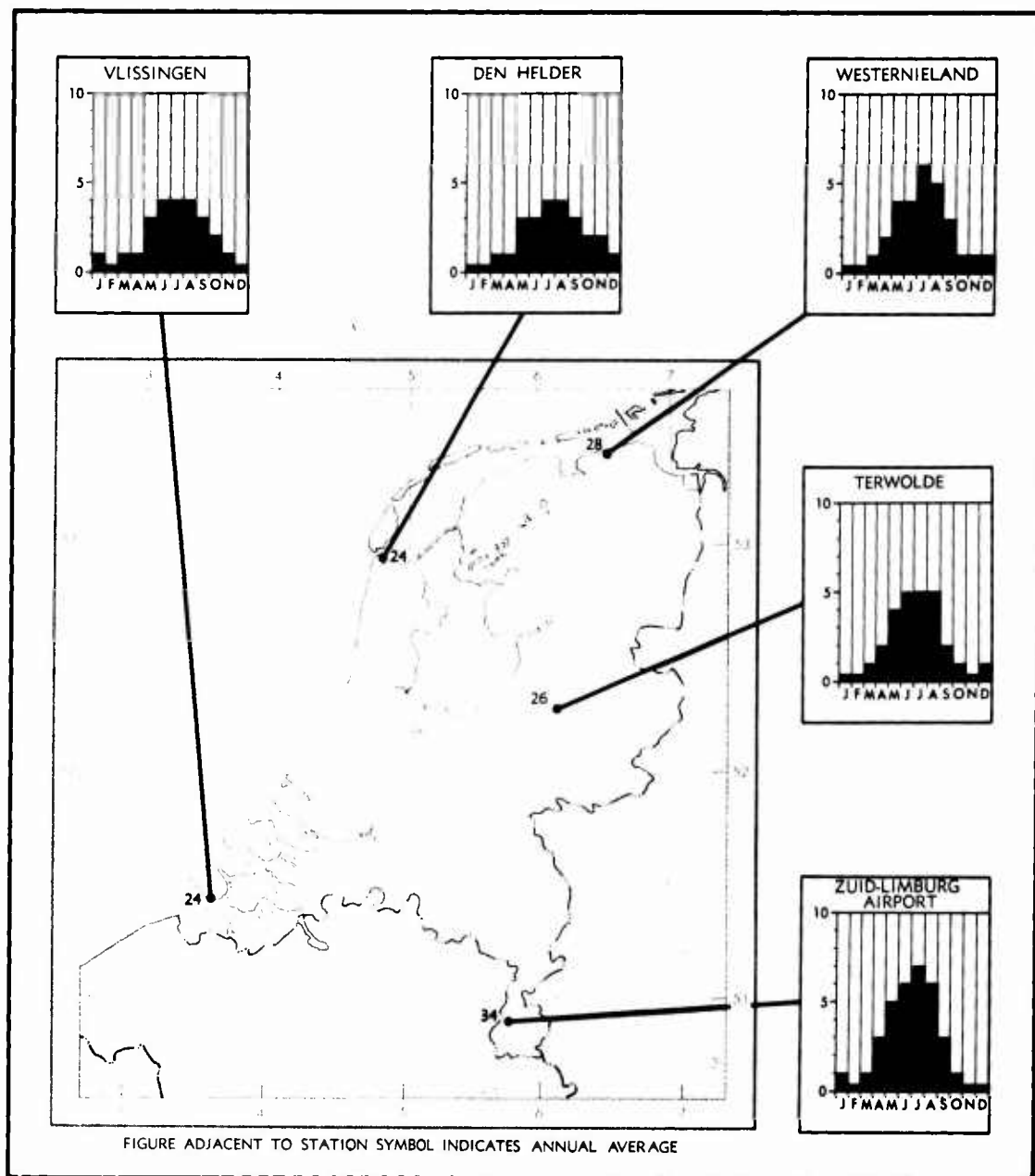


FIGURE 23-6. MEAN NUMBER OF DAYS WITH THUNDERSTORMS. (For tabular data see FIGURE 23-34.)

Turbulent air conditions are frequently present over the Netherlands. During the summer, turbulence is generally associated with maritime air masses as they move across the warmer land surface. Cumulus clouds are the first visual evidence. They make their appearance during the course of the morning. By afternoon they occasionally grow into towering cumulus and culminate in thunderstorms. Violent updrafts may then extend to 20,000 feet or more. Downdrafts are also present near the surface. Turbulent air conditions are also present whenever deep *lows* depart from their normal path and pass close to or over the Netherlands. This turbulence may then extend over the entire NIS Area at all levels. The wind direction

may change rapidly at a given point; also, the change in direction between levels may be abrupt. *Lows* in this category are most likely to affect the Netherlands in winter.

c. UPPER-AIR WINDS — Except at the very lowest levels westerly winds are prevalent up to at least 50,000 feet in all seasons. Below 5,000 feet southerly and easterly winds are frequent from late summer through winter and spring. The mean wind speed increases up to the level of the tropopause at 33,000 to 35,000 feet where the average speed ranges from about 30 knots in June to about 55 knots in January. The level of maximum wind speed, also referred to as the jet stream, is normally found immediately below the tropopause. The

overall wind pattern is shown by the wind roses for De Bilt in FIGURE 23-7. During winter, southerly and westerly winds, with the average speed 10 to 15 knots, predominate near the surface. At 5,000 feet west to southwest winds prevail, shifting at higher levels to west to northwest winds. Wind speeds are 22 to 25 knots at 5,000 feet, 25 to 30 knots at 10,000 feet, and to 40 to 53 knots at 30,000 feet, the level of the tropopause. Above the tropopause speeds decrease, averaging 20 to 30 knots near 50,000 feet.

During summer the low-level as well as the high-level winds are mostly from the west, with some southwest winds. The average speed is about 10 knots at the surface, 18 knots at 10,000 feet, and 32 to 38 knots at 30,000 feet. Above the tropopause the mean speed decreases, reaching 10 to 12 knots at 50,000 feet.

d. UPPER-AIR TEMPERATURE AND AIRCRAFT ICING — Mean upper-air temperatures for De Bilt as given in FIGURE 23-8 are considered representative of conditions over the Netherlands. January or February is normally the coldest month and July the warmest. The average decrease in temperature with height to 30,000 feet is about 1.8° C. per 1,000 feet. The average height of the freezing level in summer is close to 10,000 feet, while in winter it is found at or just above the ground surface. Icing is most likely to occur in clouds lying from this level up to the level of the -10° C. isotherm. At colder temperatures the clouds are generally composed of ice crystals and the hazard is less severe. The average height of the -10° C. isotherm is approximately 9,000 feet in winter and 16,000 feet in summer. At -20° C. the water content of the air is too small for all but light rime icing; the -20° C. isotherm is near 14,000 feet in winter and 22,000 feet in summer.

The likelihood and severity of icing is closely associated with the cloud type. During winter, icing is most likely to be experienced in nimbus, stratus, and stratocumulus clouds which occur at levels below 9,000 feet, the height of the -10° C. isotherm. The icing hazard decreases above this level, where altostratus, altocumulus, and cirrus clouds are found. During summer, icing is found in the same cloud masses as in winter but at higher levels, generally those above 9,000 feet. In addition icing is present in the towering cumuliform clouds associated with thunderstorms.

The likelihood of icing also varies with the overall pressure pattern. It is greatest in the migratory low-pressure systems, particularly in those whose centers pass close to or over the Netherlands. The hazard is especially severe along frontal zones, where its severity increases toward the center of the low. Although icing is normally limited to the

interior of clouds, it may also be encountered where rain is falling through air at temperatures below freezing.

The danger of aircraft icing reaches a maximum in winter for a number of reasons. First the migratory low-pressure centers are most frequent and intense; second, this is the season of maximum cloud; third, the freezing level is found at low levels where the moisture content of the air is greatest. The danger of aircraft icing reaches a minimum in summer when the migratory low-pressure centers reach their lowest frequency and intensity, cloudiness is less extensive, and the freezing level is found some distance above the ground where the moisture content of the air is reduced.

The regional variation in the likelihood of aircraft icing is believed to be slight. During the winter the hazard may be slightly greater near the coast in that this section is closer to the low-pressure centers which move northeastward along the coast of Europe. During the summer the likelihood may be slightly greater over the interior, where thunderstorm clouds are most frequently observed.

The tropopause marks the height at which the decrease in temperature with height ends. The average height of this level varies from 33,000 feet in winter to 35,000 feet in summer. Its average temperature is about -52° C. (FIGURE 23-8).

2. Air-ground operations

a. LOW CLOUDINESS AND CEILINGS — Air-ground operations normally require good visibility at the ground and in the air space immediately above. The amount of cloudiness within this air space is therefore of primary concern. FIGURE 23-35 presents data on the mean number of days with 1-eighth or less cloud cover below 8,200 feet. FIGURE 23-36 shows the frequency of days with 7-eighths or more cloud cover below 8,200 feet. Days with such extensive cloudiness below 8,200 feet are generally unfavorable for air-ground operations except for those that can be carried out at levels below the cloud bases. FIGURES 23-4 and 23-5 show

NOTE Air-ground operations are defined as those operations taking place in, or primarily influenced by, the meteorological conditions existing within the friction layer above the earth's surface. The meteorological elements discussed in this Subsection are those which are of primary importance to such operations as parachute drops, chemical and biological warfare, tactical support, low-level reconnaissance, and air rescue. The success or failure of many of these operations may also depend to a large degree upon the behavior of elements above the friction layer or near the surface. A detailed discussion of such elements may be found in Subsections B, 1 and B, 3.

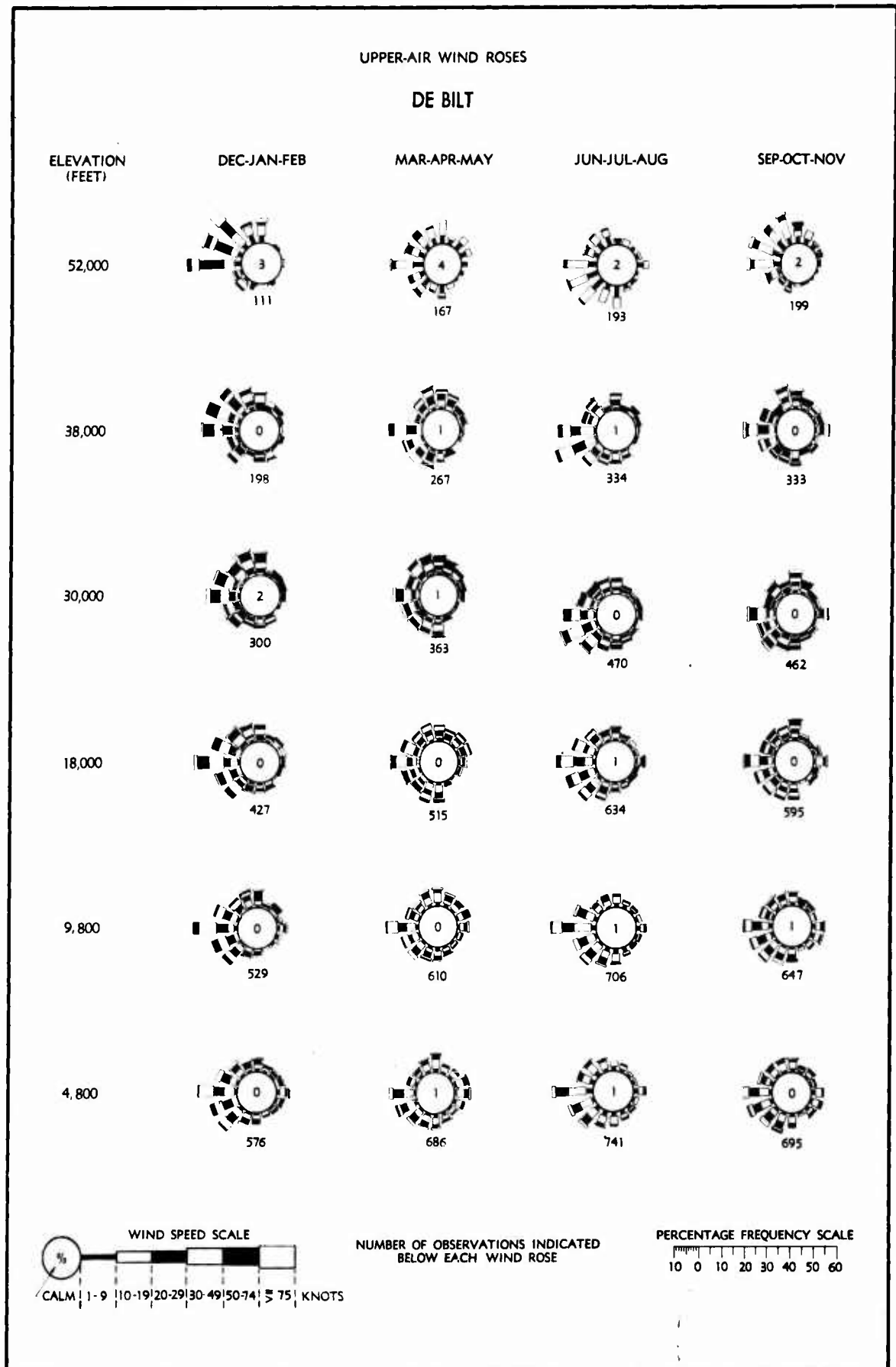


FIGURE 23-7. UPPER-AIR WIND ROSES, DE BILT

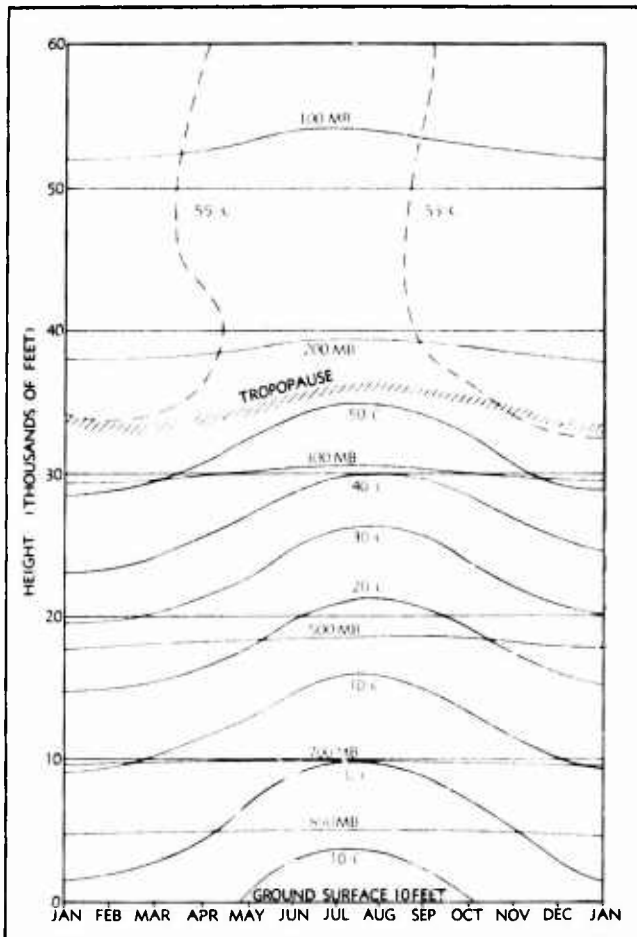


FIGURE 23-8. MEAN MONTHLY UPPER-AIR TEMPERATURES AND PRESSURES, DE BILT

graphically the frequency of days with 1-eighth or less cloud cover and 7-eighths or more cloud cover below 8,200 feet at midday. The frequency of days with ceilings below 1,000 feet are shown in FIGURE 23-37. Days with such low ceilings generally unsuited for most types of operations.

The frequency of days when clouds below 8,000 feet cover 1-eighth or less of the sky shows many areal, seasonal, and diurnal variations. For the Area as a whole, April through June experiences the highest frequencies with an overall average of about 12 days per month, and November through February the lowest with a mean of 8 days per month. In regard to diurnal variations the annual average for the Area as a whole ranges from about 95 days at 1200 LST to 160 at 0000 LST. The 0000 LST frequency may be somewhat overestimated in that high thin clouds at night are difficult to detect. The areal variation is relatively small at any given hour in winter. The data for 1200 LST, which are probably the most representative, show that in January the average number of days with 1-eighth or less low cloud cover varies little, being close to seven at all stations. During spring, substantial variations between stations are

apparent at 1200 LST. Along the coast the monthly average in April is about 12 days as compared to 7 days at most stations in the interior. During summer the areal variation is even more pronounced at noon. In July there are about 10 favorable days on the average along the coast and 4 days over the interior. The areal variation in autumn is about equal to that of spring, with highest frequencies along the coast.

As might be expected, the distribution of days with 7-eighths or more cloud cover below 8,200 feet (FIGURE 23-36) is approximately the reverse of that of days with 1-eighth or less cloud cover. In general, however, the areal variations are not as large. The winter months have the greatest frequency of days with 7-eighths or more low clouds, the mean being about 15 days per month; such days are probably least frequent in August and September, with an overall average of about 6 days per month. Some stations average as low as 3 days per month on late summer afternoons, especially in August.

The frequency of days with ceilings less than 1,000 feet also shows distinct seasonal, but only slight areal and diurnal, variation (FIGURE 23-37). Ceilings below 1,000 feet are most likely to occur in winter, when the overall monthly average is about 8 days. From April through September the average falls to about 3 days per month. The diurnal variation is small, with the maximum likelihood of low ceilings at 0600 LST when the overall annual average is about 77 days and least at 1800 LST when the average is about 50 days. The available data indicate that the areal variation is negligible, although the data for Westterschelling suggest that frequencies are somewhat higher over the Frisian Islands and along the north coast.

b. VISIBILITY — Air-ground operations are hindered at times by poor visibility at the ground surface as shown by the data in FIGURE 23-38. The data show that visibilities less than $2\frac{1}{2}$ miles are most likely to occur during the winter half year, October through March. FIGURE 23-9 shows this seasonal trend graphically for a selected number of stations at 1200 LST. Fog is one of the chief restricting agents in winter when it occasionally reduces the visibility to $\frac{5}{8}$ mile or less (FIGURES 23-10 and 23-39). Smoke and haze are also present in winter, but their effect on the visibility is less than that of fog. During the summer half year, April through September, haze and smoke are the chief restrictions. Diurnal variations in the frequency of restricted visibility are small in winter and large in summer, with poorest visibilities occurring near the time of sunrise.

Restricted visibilities reach their maximum frequency in winter. The data suggest that at any given hour in this season there are on the average

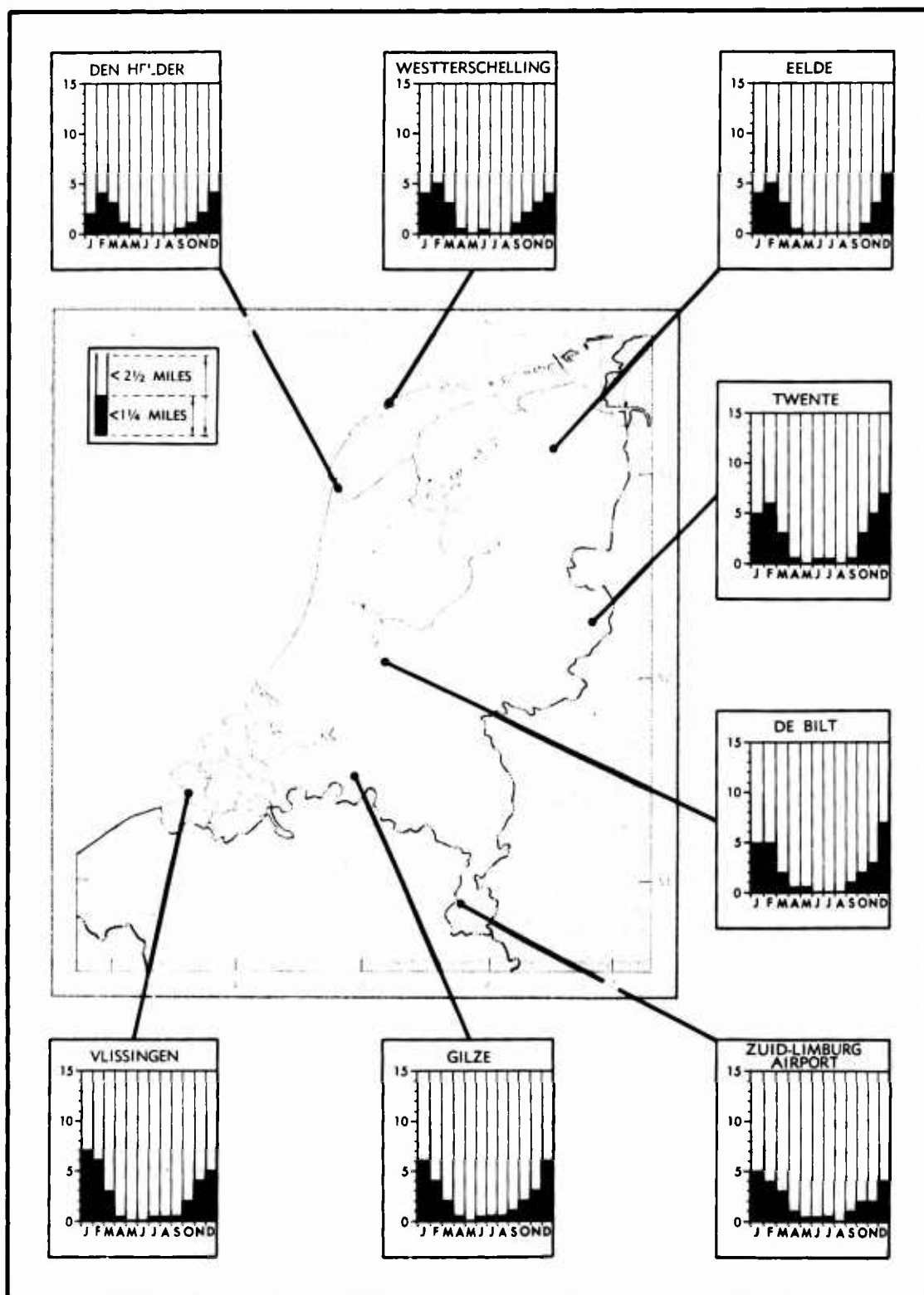


FIGURE 23-9. MEAN NUMBER OF DAYS WITH SPECIFIED VISIBILITIES AT MIDDAY

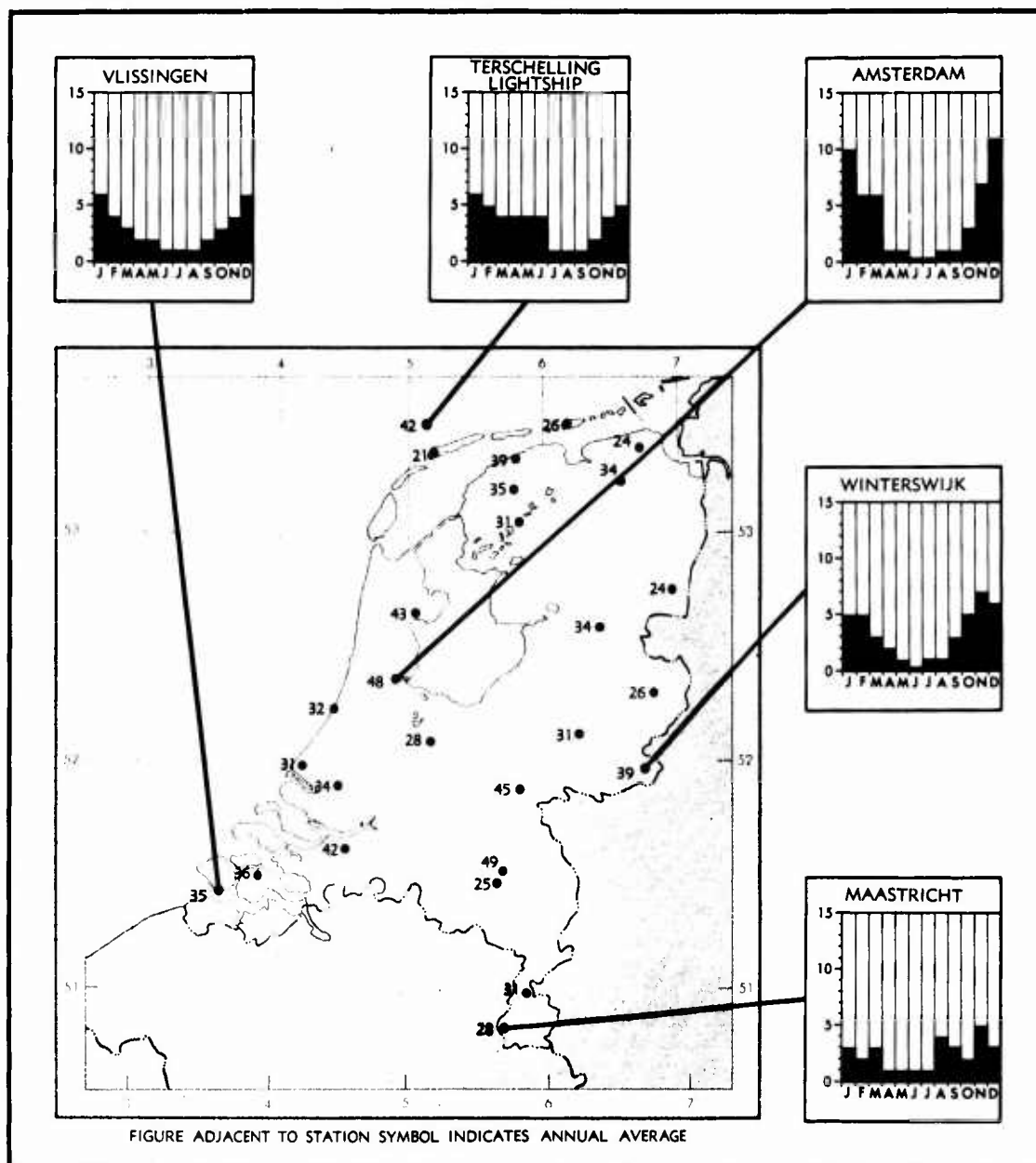


FIGURE 23-10. MEAN NUMBER OF DAYS WITH FOG. (For tabular data see FIGURE 23-39.)

about 10 days per month when the visibility is less than $2\frac{1}{2}$ miles. Fog is the chief restriction. The data in FIGURE 23-39 show that for the country as a whole in winter there are on the average 5 days per month when fog restricts the visibility to $\frac{5}{8}$ mile or less. Radiation fog is the predominant type. It is most likely to occur on clear nights and reaches its greatest density about the time of sunrise. The dissipating effect of sunshine is at a minimum in winter and fog frequently persists throughout the day. The diurnal variation in fog is therefore small. Next in importance is the fog which occurs with light southerly winds. This fog forms in the relatively warm air as it moves northward across colder ground and tends to persist throughout the day.

The areal variation in the frequency of fog in winter appears to depend on exposure. The overall average number of days with fog, visibility $\frac{5}{8}$ mile or less, is close to 5 in January. Most of the individual station averages are within 1 day of this figure. The smallest averages, 3 days per month, are recorded in the hills of the extreme southeast, while the greatest, 8 to 10 days per month, occur in the portions near sea level in the northwest. Haze and smoke are the second most important causes of restricted visibility. By themselves they do not as a rule reduce the visibility to less than 1 mile. Visibilities less than 1 or 2 miles are generally caused by a combination of haze, smoke, and fog. The average number of days with haze or

smoke for the Netherlands as a whole is close to 5 per month in winter. A small diurnal variation is evident, with restricted visibilities most frequent during the day when the smoke from home and industrial fires reaches a peak.

Restricted visibilities are least frequent in summer. The overall average number of days per month in this season with visibility less than $2\frac{1}{2}$ miles is close to 3 at 0000 LST, 5 at 0600 LST, and 1 at 1200 LST and 1800 LST. Fog is secondary to haze and smoke as a visibility restriction in summer. The average number of days with visibility less than $\frac{1}{2}$ mile due to fog is not quite one per month. Significant amounts of haze or smoke are discernible on an overall average of 5 days per month. During the day they rarely restrict the visibility to less than $2\frac{1}{2}$ miles. At night, however, when the haze and smoke are occasionally augmented by fog, visibilities below $2\frac{1}{2}$ miles are not uncommon. Diurnal trends are quite evident in summer. The poor nighttime visibilities are due to the light wind movement and pronounced stability of the air. The smoke therefore tends to concentrate in the lowest levels. After sunrise the air becomes more turbulent, the smoke is dissipated to upper levels, and the visibility improves. Some areal variations are also evident. The data for 0600 LST show that visibilities less than $2\frac{1}{2}$ miles occur on an average of 7 days in July over the interior and on 3 days over the lowlands. A similar areal variation is evident at 0000 LST. The frequency of restricted visibility becomes negligible at 1200 LST and 1800 LST in all sections in summer. The spring and autumn seasons are essentially transitional between summer and winter.

C. COMBINED CEILING AND VISIBILITY — The most favorable conditions for air-ground operations occur when both ceiling and visibility are above selected limits. Many types of air-ground operations including close ground support and takeoffs and landings can generally be accomplished with a ceiling of 1,000 feet or more and visibility of $2\frac{1}{2}$ miles or more. FIGURE 23-40 shows that this condition is frequently observed at all stations in all seasons. The graphical presentation in FIGURE 23-11 indicates that the seasonal trends are substantial. Highest frequencies occur in late afternoon in summer.

In winter the overall average number of days with ceiling 1,000 feet or more with visibility $2\frac{1}{2}$ miles or more is close to 17 per month at all 4 hours of observation. Thus there is little diurnal variation. There is, however, a small areal variation with highest frequencies in the lowlands of the northeast, where the average number of days is close to 20.

In summer the overall average number of days with a ceiling of at least 1,000 feet and visibility at least $2\frac{1}{2}$ miles is about 26. A small diurnal variation is present, with frequencies varying from about 23 days at 0600 LST to 28 days at 1200 LST and 1800 LST for the Area as a whole. Highest frequencies are 30 days at some locations at 1800 LST, and lowest frequencies are 18 to 20 days at other locations at 0600 LST.

d. SURFACE WINDS — Both wind speed and direction are important factors in most types of air-ground operations. Although the average wind speed is high, a wide variety of wind conditions are experienced over the Netherlands, ranging from periods of calm to gale-force winds off the oceans. FIGURE 23-41 shows that wind speeds in excess of 28 knots are most likely to occur in winter, particularly along the coast. The most frequently observed wind directions (FIGURES 23-12 and 23-13) are those from the southwest quadrant. Calm wind conditions are by no means uncommon. FIGURE 23-14 shows that calms are most likely to occur in late summer or early autumn near the time of sunrise. Mean wind speeds are relatively high; along the coast they range from 13 to 15 knots in winter (FIGURE 23-15) to 10 to 12 knots in summer (FIGURE 23-16). Over the interior average speeds are lower. The maximum wind speeds (FIGURES 23-17 and 23-18) are observed along the coast, where speeds slightly over 60 knots have occurred in winter and over 50 knots in summer. The direction of these strongest winds is from the north quadrant.

In winter, low-pressure centers from the North Atlantic normally recurve northeastward before reaching the Netherlands. With the passage of each *low* the winds veer from south through southwest to west; these directions are prevalent as shown in FIGURE 23-12. Northerly winds are uncommon although the highest speeds observed have been from this direction. Easterly winds in contrast are relatively frequent; they are normally associated with the establishment of a high-pressure cell over the continental interior.

The average winter wind speed is quite high, ranging from 15 knots along the coast to 7 knots over the extreme southeastern interior. Calm wind conditions are quite rare, with an overall frequency of 1 or 2 days per month at any given hour. The relatively high frequency of speeds in excess of 17 knots and 28 knots also attest to the strength of the wind, particularly along the coasts (FIGURE 23-41). Winds in excess of 17 knots occur about 40% of the time along the coast and 15% to 20% of the time over the interior in winter. The highest observed wind speeds occur along the coast and in the northern lowlands. FIGURE 23-17 shows that speeds over 60 knots have been observed at a num-

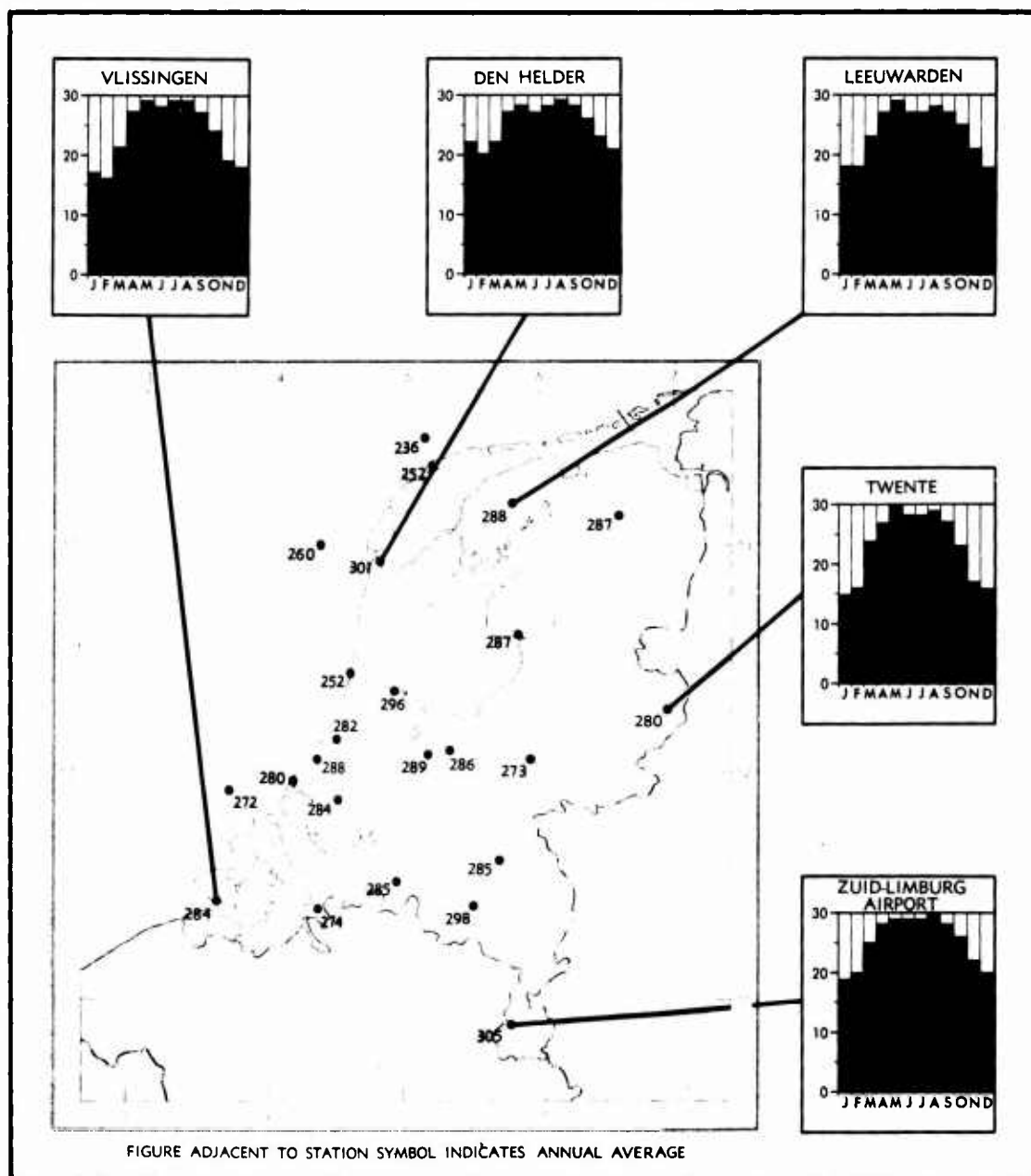


FIGURE 23-11. MEAN NUMBER OF DAYS WITH CEILING $\leq 1,000$ FEET AND VISIBILITY $\leq 2\frac{1}{2}$ MILES AT MIDDAY. (For tabular data see FIGURE 23-40.)

ber of places. These speeds are based on 4 observations a day over a period of not more than 11 years, 1949 to 1959, and it is quite likely that higher speeds were experienced between observation times. However, these maximum observed speeds agree quite well with some of the older records. In 1914 and again in 1921 a sustained speed of 62 knots was experienced at Hoek van Holland and Vlissingen while a gust of 86 knots was recorded at Hoek van Holland. Over the interior the strength of the wind depends to a large extent on exposure, and the maximum observed varies from about 35 knots to 60 knots.

In summer low-pressure centers take a more easterly course and enter the continent with much greater frequency. Winds from the southwest generally attend the approach of each *low*. As the *low* passes into the continent, westerly and even northerly winds follow. Winds from the southwest and west are therefore predominant in summer (FIGURE 23-13).

The average summer wind speed ranges from about 12 knots along the coast to 6 knots in the extreme southeast. Calm wind conditions are infrequent in summer. They occur on 2 or 3 days per month in the morning and less than one day

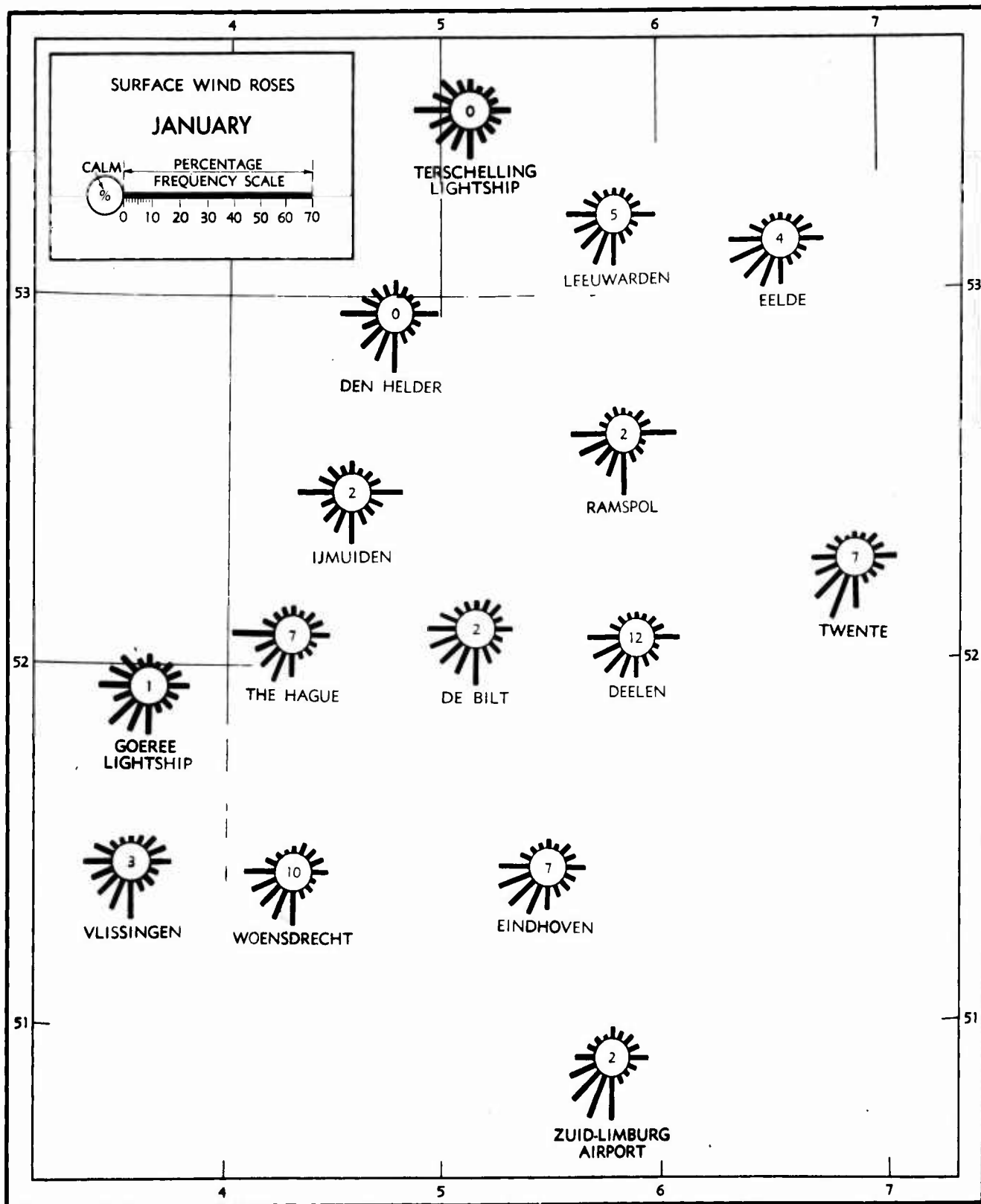


FIGURE 23-12. SURFACE WIND ROSES, JANUARY

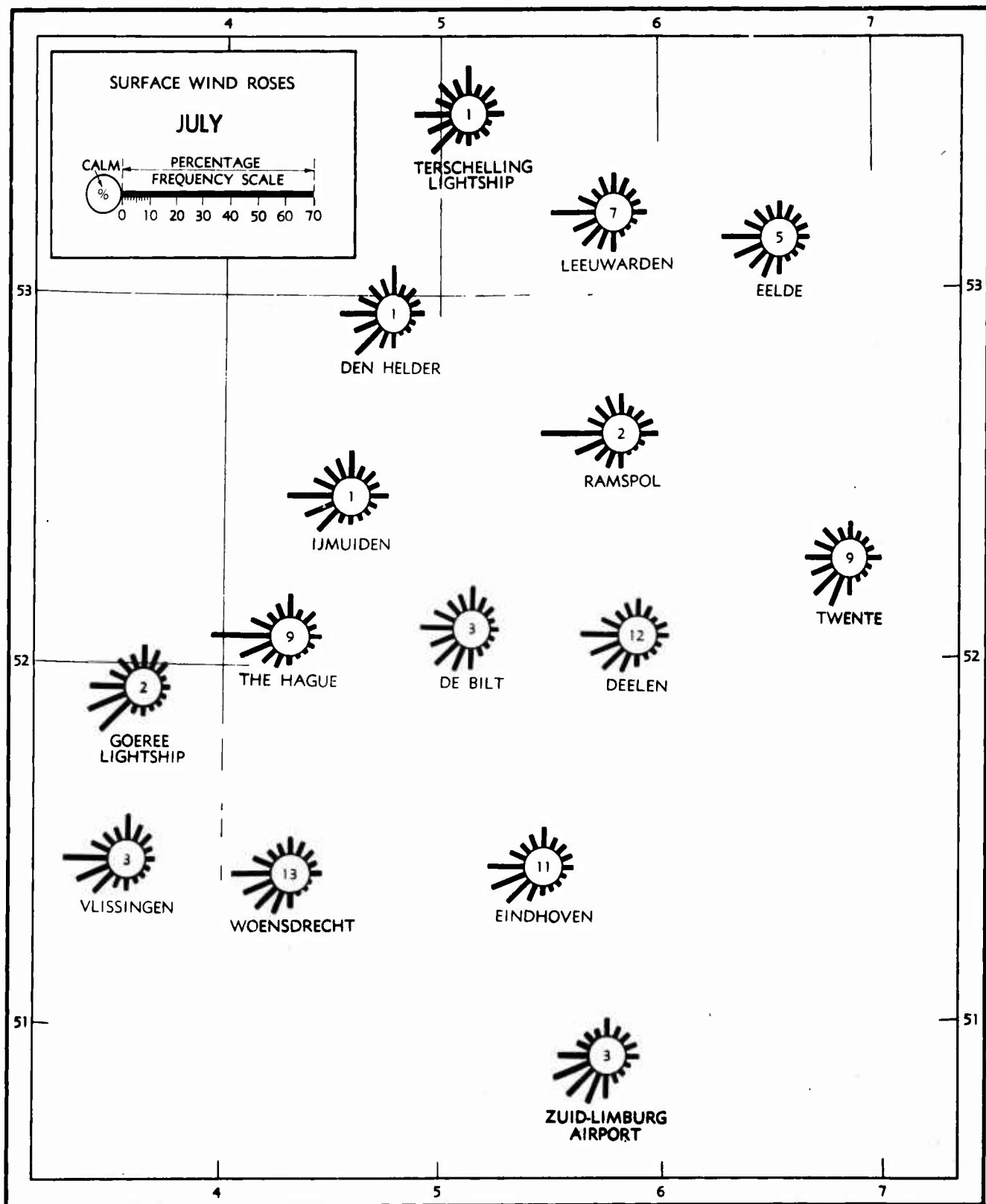


FIGURE 23-13. SURFACE WIND ROSES, JULY

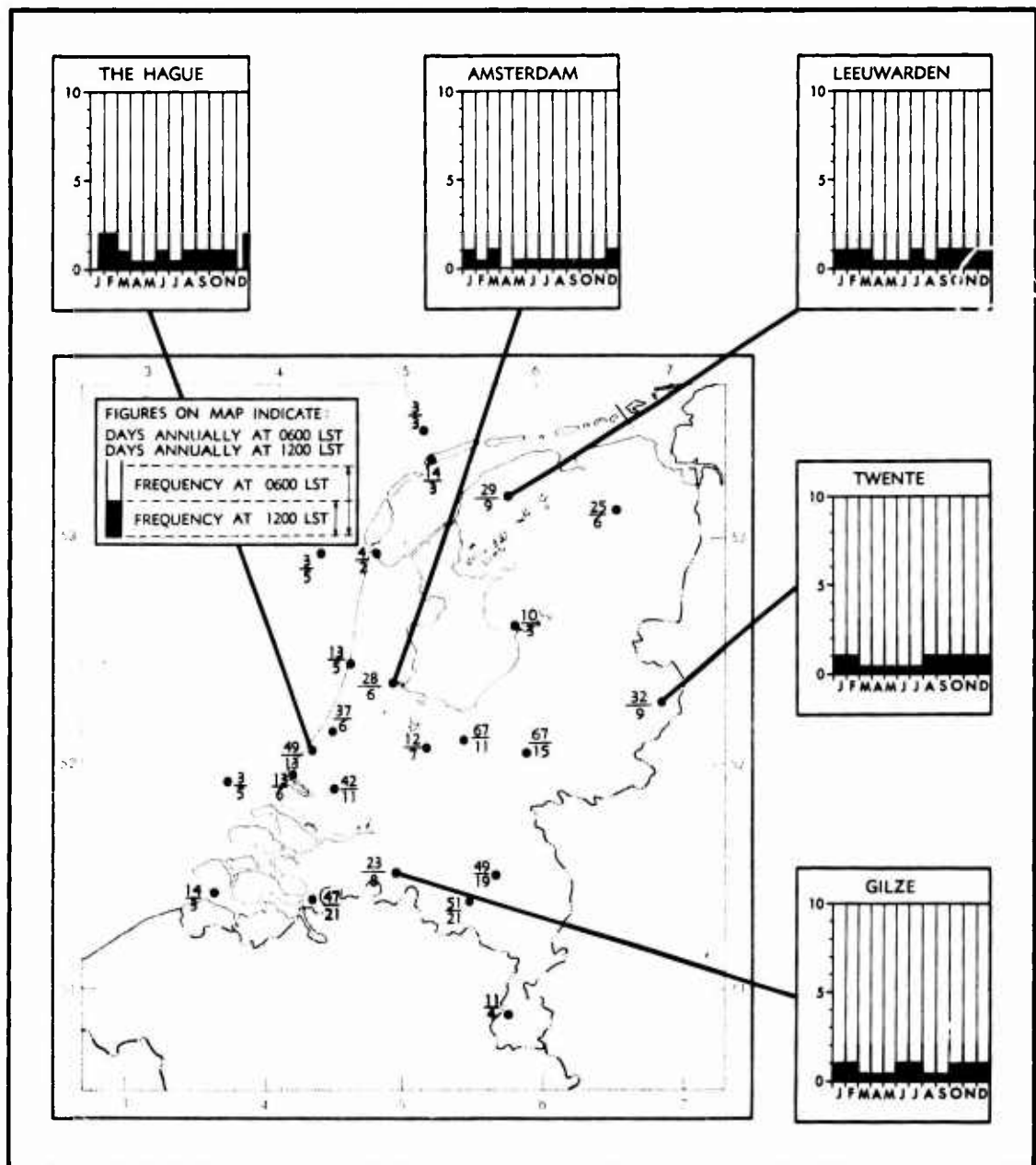


FIGURE 23-14. MEAN NUMBER OF DAYS WITH CALM WIND AT SPECIFIED HOURS

at noon. Wind speeds in excess of 28 knots are relatively rare in summer. Along the coast they occur about 2% or 3% of the time and less than 1% over the interior. The maximum speeds observed, during an 11-year period, were near 50 knots along the coasts and 25 to 40 knots over the interior.

e. **STABILITY** — Stable air conditions within 50 to 100 feet of the ground are necessary for the success of certain types of air-ground operations. This condition is most likely to occur during the night when the area is dominated by a high-pressure cell. The surface winds are then usually light, the sky is clear, and a temperature inversion tends to form during the night. The inversion

consists of a shallow layer of colder air resting on the ground surmounted by a warmer layer which acts as a lid, preventing smoke, fog, or any other contaminant from escaping into the upper atmosphere. Inversions of this type are relatively infrequent, since the Netherlands is usually dominated by low-pressure conditions. As a rule the high-pressure cell lies to the east while migratory low-pressure centers are active out over the North Atlantic. There are, therefore, few occasions with light winds and clear skies at night, conditions which are favorable for the formation of an inversion. The data indicating the frequency of calms suggest that inversions are most likely to form during the summer. Another form of sta-

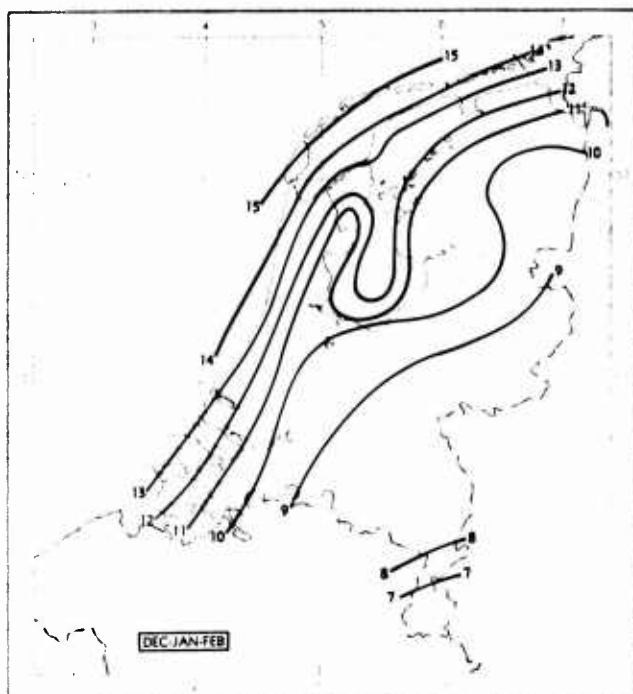


FIGURE 23-15. MEAN WIND SPEEDS (KNOTS), DECEMBER-FEBRUARY

bility occurs in winter wherever warm air from southern Europe flows northward across the colder land surface of the Netherlands. The flow of air from the south is generally initiated by the approach of a low-pressure center from the North Atlantic. Fog and smoke tend to accumulate in this cooled layer of air next to the ground. The warmer air above then acts as a lid, preventing any diffusion into the upper atmosphere. This form of stability occurs somewhat more frequently than that associated with high-pressure conditions.

3. Ground surface operations

Surface weather conditions in the Netherlands are frequently determined by the migratory low-pressure systems which regularly approach the continent from the west in all seasons. These *lows* bring extensive cloud systems, rain or snow, strong winds, and high humidities. Abrupt changes in temperature may also attend their passing. These low-pressure systems reach their maximum intensity in winter and early spring, when they often curtail all outdoor activity. In all seasons the fre-

NOTE Ground surface operations are defined as those operations taking place primarily at or very near the earth's surface. The meteorological elements discussed in this Subsection are those which are of primary importance to such operations as movement of troops and vehicles, selection of clothing and equipment, storage of supplies, and maintenance of armament and equipment. Some meteorological elements which may also have an effect upon this type of operation are discussed in Subsection B, 1 and B, 2.

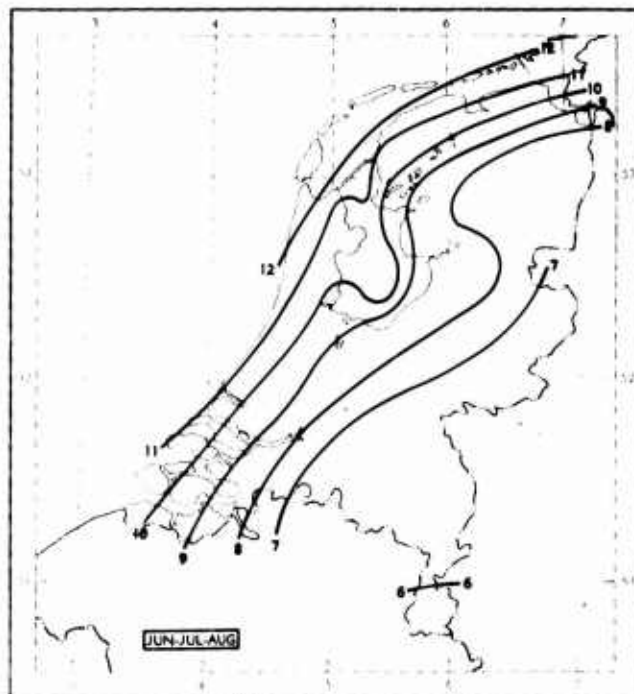


FIGURE 23-16. MEAN WIND SPEEDS (KNOTS), JUNE-AUGUST

quent rains, high humidity, and paucity of sunshine tend to keep the soil soft or muddy, while alternate freezing and thawing in winter tends to aggravate this problem.

Short periods of dry weather occur occasionally when high-pressure cells become established over the Area. The skies are clear, winds are light, and humidities are lower during these periods, but in winter the temperature drops far below normal. The low temperatures tend to preserve a snow cover and cause the freezing over of the many drainage canals and rivers. At such times the movement of troops and vehicles across the frozen land and water surfaces may be facilitated. The cold wave may end abruptly with the arrival of warmer air from the North Atlantic. Under these conditions, a glaze of frost or ice may form on the cold land surface as the moist air moves inland. Motor vehicles are then often difficult to start because of the coating of moisture on the ignition system. During summer and autumn the ground surface tends to dry out under the sunny weather conditions associated with the *highs*. These two seasons are therefore the most favorable for outdoor activity, although thunderstorms and showers are occasionally present.

a. TEMPERATURE—The Netherlands has a comparatively equitable temperature regime. The winters are generally warm and the summers cool. The principal stabilizing influence can be traced to the North Atlantic ocean. During winter the prevailing westerly winds transport the ocean's warmth to the otherwise cold continent; in sum-

mer they transport the oceans coolness to the otherwise hot continent. The oceanic effect is lost whenever a high-pressure cell dominates eastern Europe and the winds become easterly. In winter this condition frequently brings abnormally cold weather and in summer abnormally warm weather to the Netherlands. Because of its small size and the fact that it lies for the most part below 200 feet mean sea-level, the Netherlands has no pronounced regional differences, only a gradual decrease in temperature toward the interior in winter, and an increase in summer. The temperature range between afternoon maximum and early morning minimum is quite small, particularly in winter, as indicated graphically in FIGURE 23-19 and by tabular data in FIGURE 23-42. The average distribution of cold days is illustrated in FIGURES 23-20 and 23-21, while the distribution of warm days is shown in FIGURE 23-22. These figures also confirm the normally gradual change in temperatures from the coast toward the interior.

Mean maximum temperatures in the Netherlands are mostly near 40° F. in winter and 65° to 75° F. in summer, while the mean daily minimum is 30° to 35° F. in winter compared to mostly 50° to 55° F. in summer. The variation across the country is quite small; however, data for coast stations indicate that along the coasts the mean daily maximum in summer is below that of the interior, while in winter the mean minimum is above that of the interior.

The mean daily range in temperature is not excessive in the Netherlands. It reaches its lowest value in winter when there is a minimum of sunshine and a maximum of wind and cloud. The average range in winter is close to 7 Fahrenheit degrees along the coasts and 10 degrees over the interior. Although much of this variation can be attributed to warming during the day and cooling at night, a substantial part is caused by air-mass changes. During summer the contrast between the warmth of afternoon and the coolness of the early morning reaches a maximum. The range over most of the interior is close to 19 degrees. The moderating influence of sea is evident along the coast where the range is about 8 to 12 degrees.

Extremely high temperatures are rare in the Netherlands. Temperatures above 100° F. have not been recorded (FIGURE 23-43). FIGURE 23-22 shows that even temperatures above 77° F. are not frequent and are most likely to occur on the interior plain. The highest recorded temperature is 99° F. at Maastricht in August. Temperatures above 85° F. are most likely to occur on those relatively rare occasions when a flow of dry air originating beyond the Alps reaches the Netherlands. Extremely low temperatures are also uncommon. Temperatures below 0° F. seldom occur. The lowest observed as shown by the data in FIGURE 23-43 is -8° F. These very cold readings are most likely in winter whenever the oceanic flow is replaced by cold winds from the interior of northern Europe.

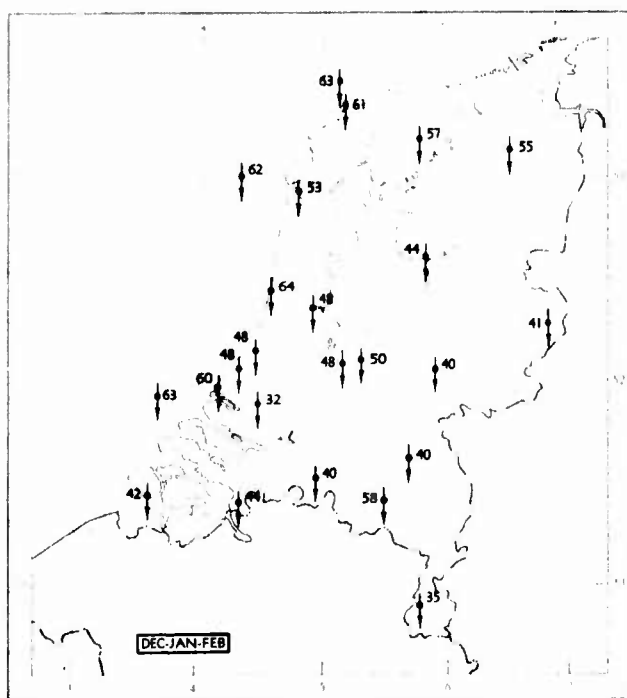


FIGURE 23-17. MAXIMUM WIND SPEED (KNOTS) AND DIRECTION, DECEMBER-FEBRUARY

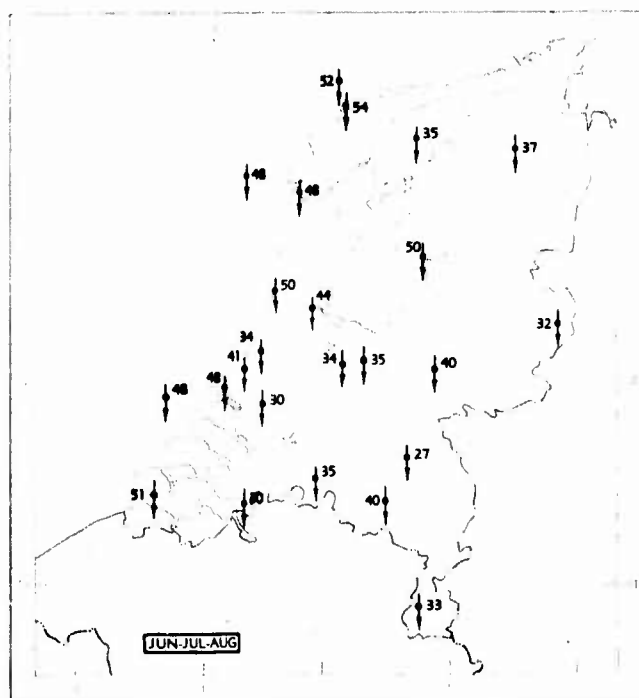


FIGURE 23-18. MAXIMUM WIND SPEED (KNOTS) AND DIRECTION, JUNE-AUGUST

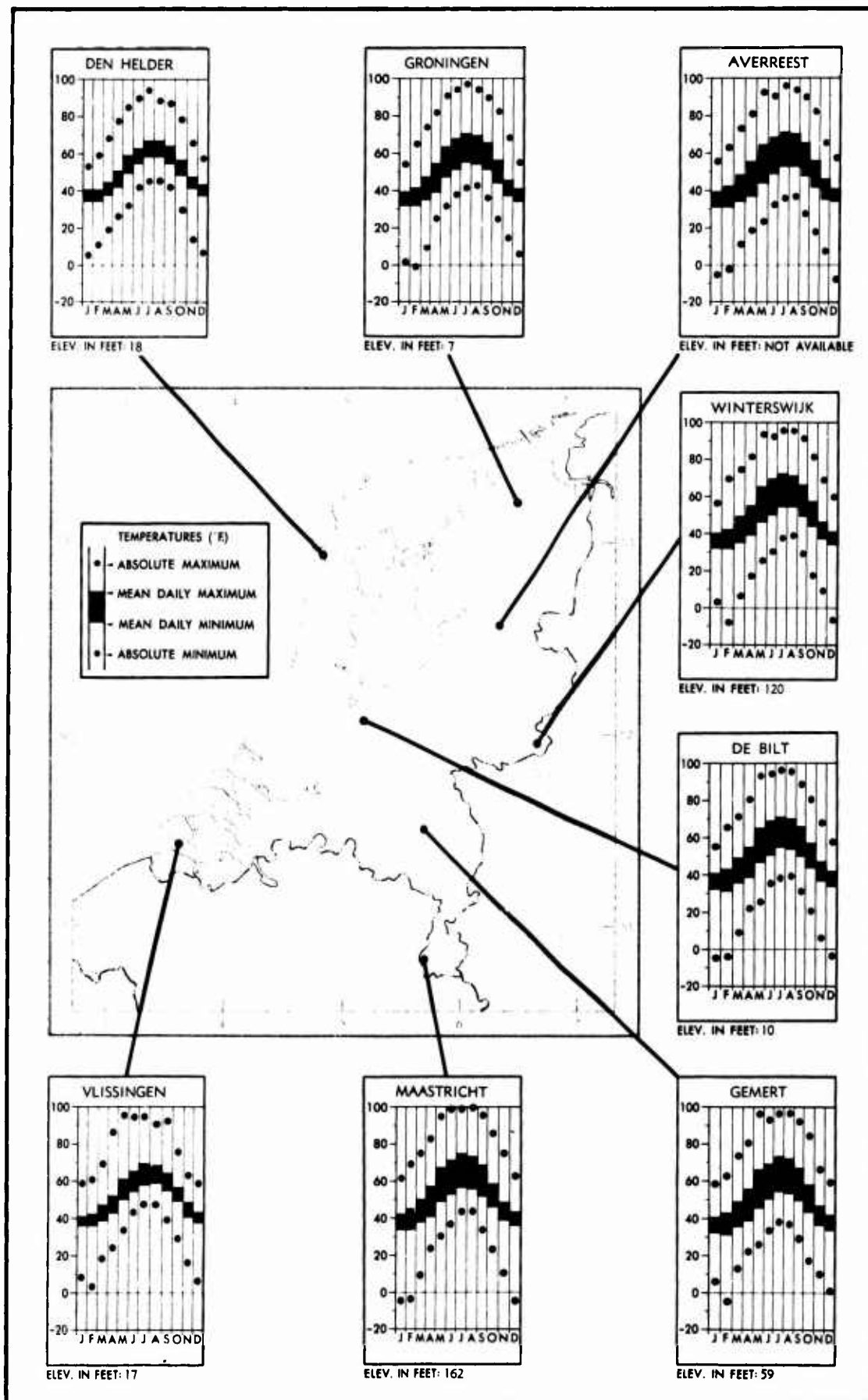


FIGURE 23-19. TEMPERATURES (° F.). (For tabular data see FIGURES 23-42 and 23-43.)

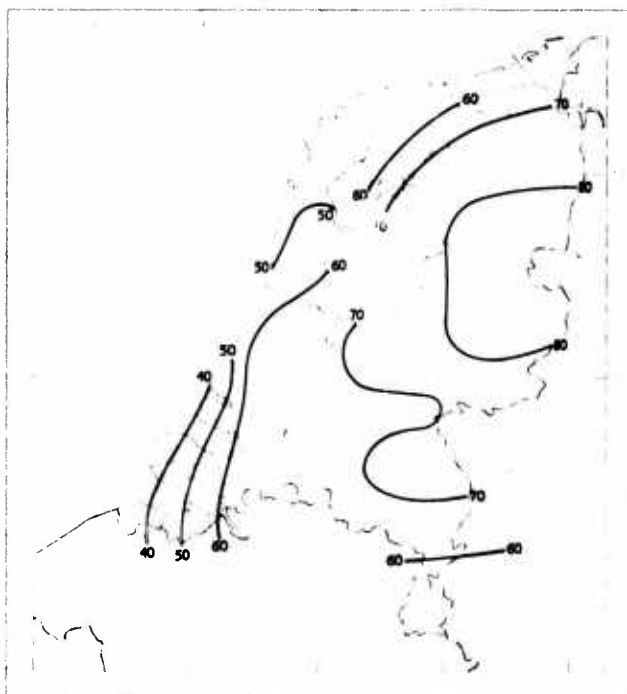


FIGURE 23-20. MEAN NUMBER OF DAYS PER YEAR WITH MINIMUM TEMPERATURES $<32^{\circ}$ F.

The frequency of freezing temperature is brought out in FIGURES 23-20 and 23-21. The data show that temperatures fall below 32° F. on as many as 80 days in the northeastern interior. In most cases the temperature does not remain below freezing for the entire day. The average number of days with maximums below freezing ranges from 8 along the coast to 13 over the northeastern interior.

b. RELATIVE HUMIDITY — The Netherlands is dominated by oceanic winds and thus experiences high relative humidity values throughout the year (FIGURES 23-23 and 23-44). The overall early morning average is close to 90% in January and 80% in July. Some areal variation can be discerned in the early afternoon averages of summer. Along the coasts and lowlands averages are close to 70% as compared to about 60% at stations deep within the interior plain. Diurnal variations are negligible in winter along the coast and lowlands. In the interior the average range amounts to 7% or 8% in winter, with the least range in December. Diurnal variations in summer are also small at a number of coastal stations where the range lies between 5% and 10% compared to 15% to 20% at many stations in the interior.

c. PRECIPITATION — Although dominated by winds from the oceans, the Netherlands experiences relatively light precipitation (FIGURES 23-24 and 23-45). A number of factors are responsible. Before reaching the Netherlands these winds must first cross the British Isles, where they deposit

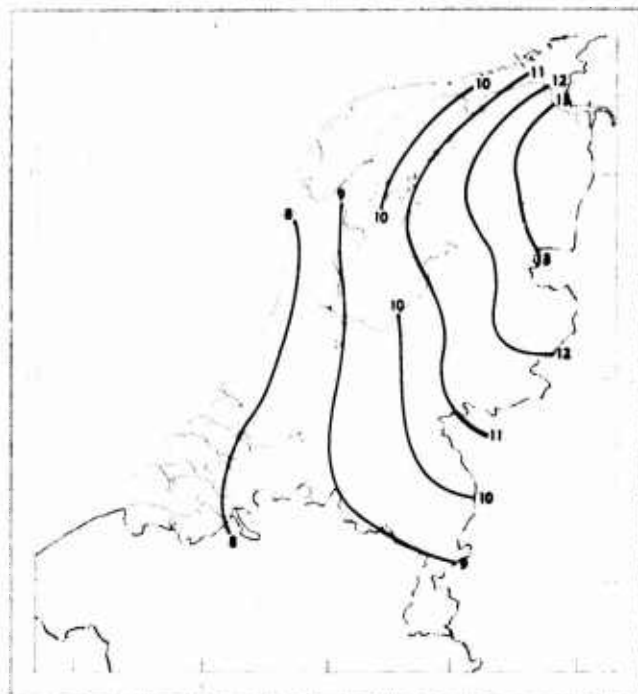


FIGURE 23-21. MEAN NUMBER OF DAYS PER YEAR WITH MAXIMUM TEMPERATURES $<32^{\circ}$ F.

much of their moisture on the hills and ridges. Their subsequent path across the Netherlands is uninterrupted by any highlands which might stimulate precipitation. The fact that the low-pressure centers and attendant precipitation areas do not, as a rule, pass directly over the Netherlands is also significant. Then too, warm dry winds from the south and southeast are not uncommon. Definite but slight seasonal variations are apparent in all sections (FIGURES 23-24 and 23-25). Maximum amounts generally occur in July through October, when the oceanic winds frequently penetrate the continent. Heated over the warmer land, these oceanic air masses become unstable, producing widespread afternoon showers and occasional thunderstorms. During winter these moisture laden winds do not reach the interior quite as frequently. Also, the air is cooled from below as it flows inland, increasing its stability and lessening the likelihood of precipitation. A small portion of the winter precipitation falls as snow. References to hail in winter are quite common in literature concerning the climate of the Area; this type of hail, however, refers to soft hail or graupel, often called snow pellets. Moisture and temperature conditions frequently favor this type of precipitation in the Netherlands.

Winter and spring experience the lowest amounts of precipitation. The overall average decreases slightly during winter, from 2.6 inches in December to 2.2 inches in January and to 1.7 inches in February, the driest month. Individual station

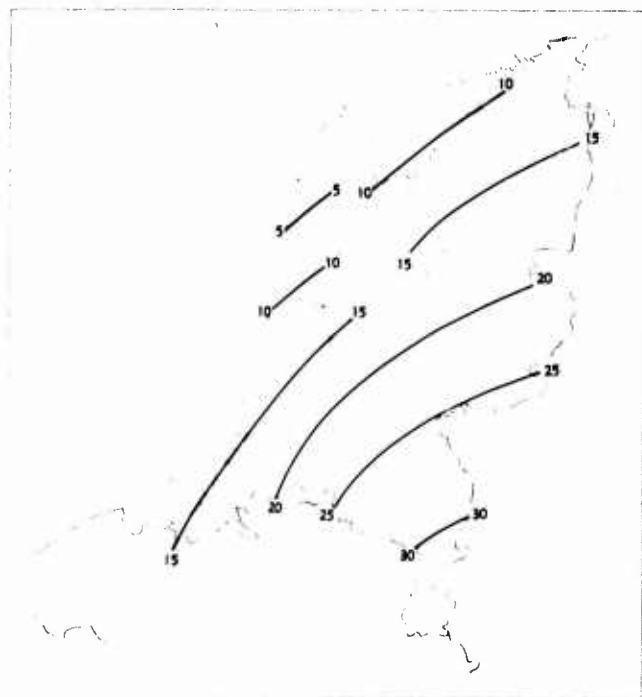


FIGURE 23-22. MEAN NUMBER OF DAYS PER YEAR WITH MAXIMUM TEMPERATURES $>77^{\circ}$ F.

averages range from 3.1 inches at Slijk Ewijk in December to 1.4 inches at Amsterdam in February. Precipitation is light and fairly even throughout spring. The overall average is about 1.8 inches per month with only slight areal variations.

During the summer season, afternoon showers and thunderstorms are the most frequently observed forms of precipitation. For the Area as a whole monthly averages increase from about 2.3 inches in June to 2.7 in July and 3.0 in August, the wettest month of the year. The overall average is therefore almost 1 inch greater than that of spring. The areal variation is also more pronounced in summer with somewhat higher averages over most interior sections. Individual station averages range from as high as 3.5 inches in July or August at several interior locations to slightly less than 2 inches in June at selected points along the coast.

Autumn has distinctive precipitation features of its own. The seasonal average, 2.7 inches per month, is about equal to that of summer, but areal variations are quite different. Highest averages are recorded in the central coastal part of the Area where the overall average in October is slightly above 3 inches. Lowest amounts are observed in the north. November precipitation shows a decrease toward the winter minimum.

Precipitation amounts in any one month vary appreciably from year to year. As a rule the greatest monthly amount that can be expected over a period of years appears to be about twice the average amount. In summer, therefore, when the

monthly average is 3 inches as much as 6 inches is not unusual. A few stations have recorded 7 inches while the maximum recorded in any one month was 8.7 inches in August at De Bilt, the station for which 88 years of data are available.

The least amount recorded in most months is about a fourth of the average. In summer, therefore, monthly amounts of 1 inch or less are not unusual, while in winter amounts less than $\frac{1}{2}$ inch are quite common, particularly in February. There are a few places where no precipitation at all has been recorded during an entire month.

Maximum 24-hour precipitation amounts indicate that short period rainfall is occasionally heavy in the Netherlands, although when compared to other regions of the world, these amounts are neither unusually large nor small. The data given in FIGURE 23-46 and the graphic presentation in FIGURE 23-26 suggest that the maximum 24-hour amount varies from approximately one-half the monthly average to about equal the monthly average, considering long-period data. In summer, therefore, when the monthly average is close to 3 inches, about 1.5 to 3.0 inches may occur in a 24-hour period, whereas in February and March when averages are close to 1.7 inch, about 0.8 inch to 1.7 inches may occur. The heavy rains in summer are normally associated with afternoon showers or thunderstorms. In winter they are more likely to be associated with the cold front attending a well-developed low-pressure system.

The frequency of days with precipitation is moderately high in the Netherlands as shown by the tabular data in FIGURE 23-47. The overall annual average number of days with precipitation equal to or greater than 0.004 inch is about 190. Individual station averages range from 164 days at Naaldwijk on the coast to 214 days at Warnsveld in the central interior. A rather striking fact brought out by this table is that over most of the Netherlands rainfall is most frequent in December and January and least frequent in most localities in May and June. This contrasts sharply with the distribution of rainfall amounts, which reach a maximum in July through October and a minimum in February and March. These distributions point up the increased occurrence of migratory storms in winter. These winter storms are characterized by light rain and drizzle and do not attain the intensity of the heavy showers and thunderstorms of summer and early autumn.

The graphical presentation in FIGURE 23-27 shows that on many of the days with precipitation the daily amount is less than 0.04 inch. Thus at De Bilt there are 207 days with greater than 0.004 inch but only 125 with greater than 0.04 inch. The seasonal distribution is also indicated in FIGURES 23-27 and 23-47. For the Netherlands as a whole,

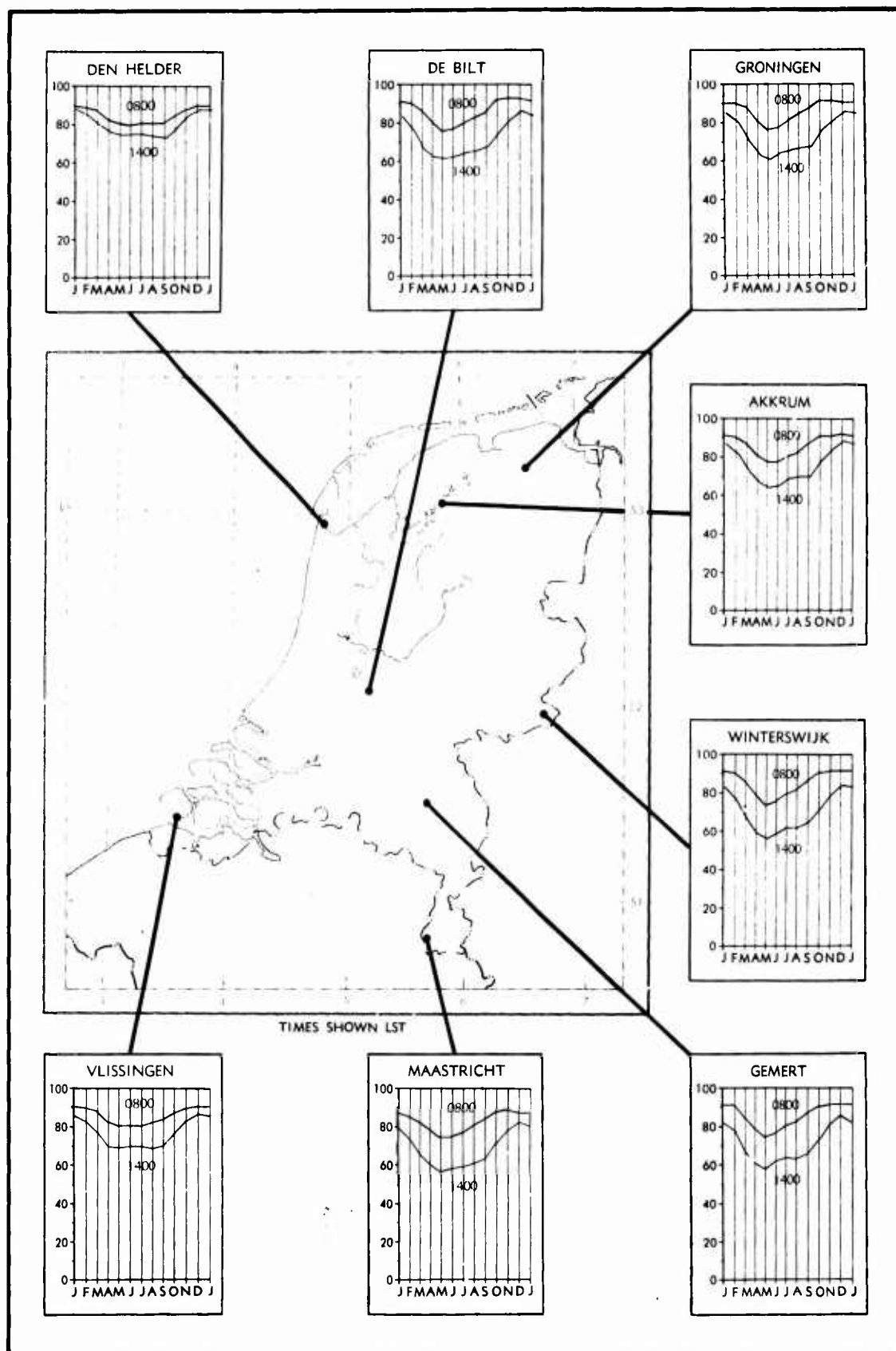


FIGURE 23-23. MEAN RELATIVE HUMIDITY (%). (For tabular data see FIGURE 23-44.)

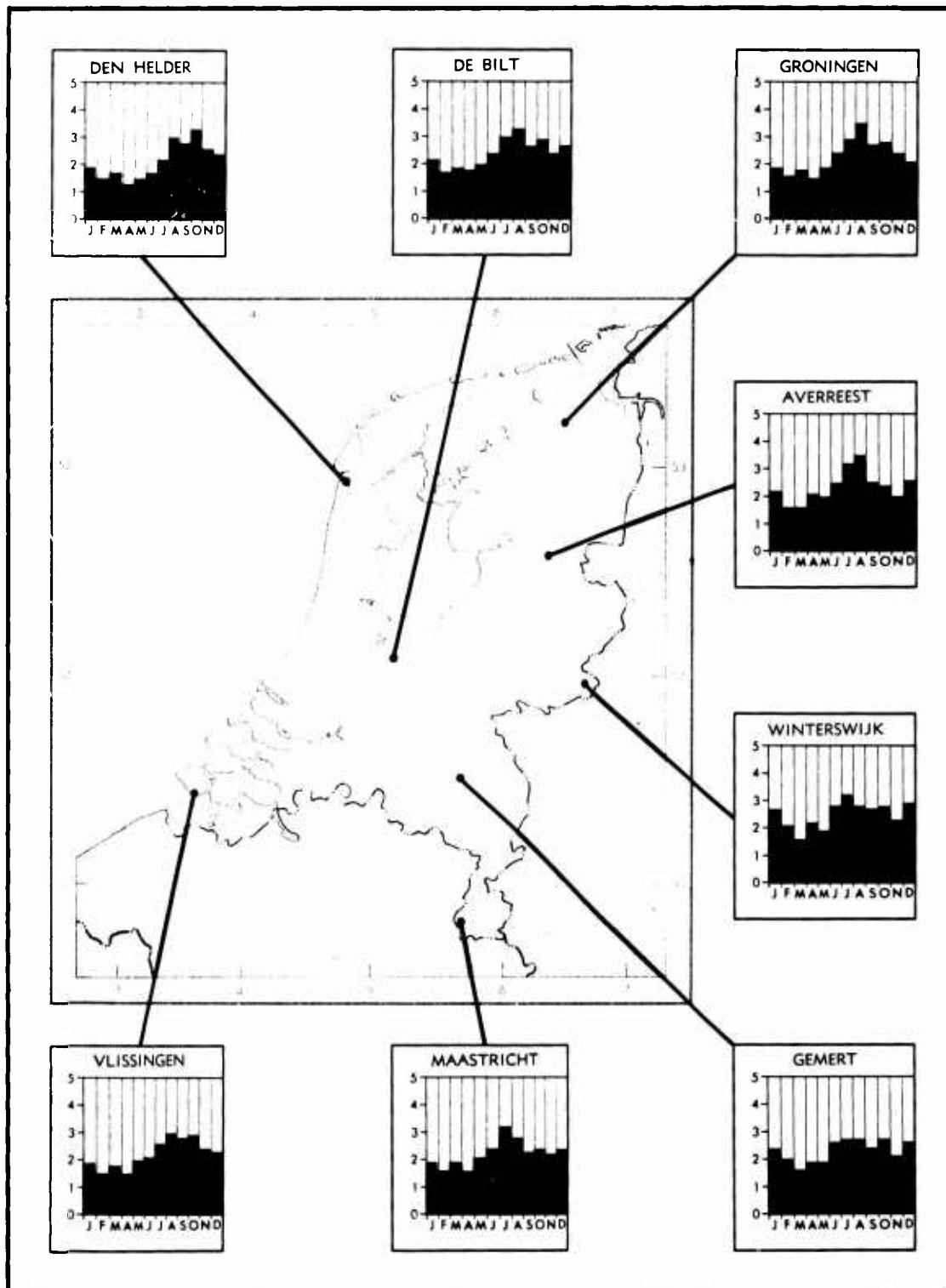


FIGURE 23-24. MEAN PRECIPITATION (INCHES). (For tabular data see FIGURE 23-45.)

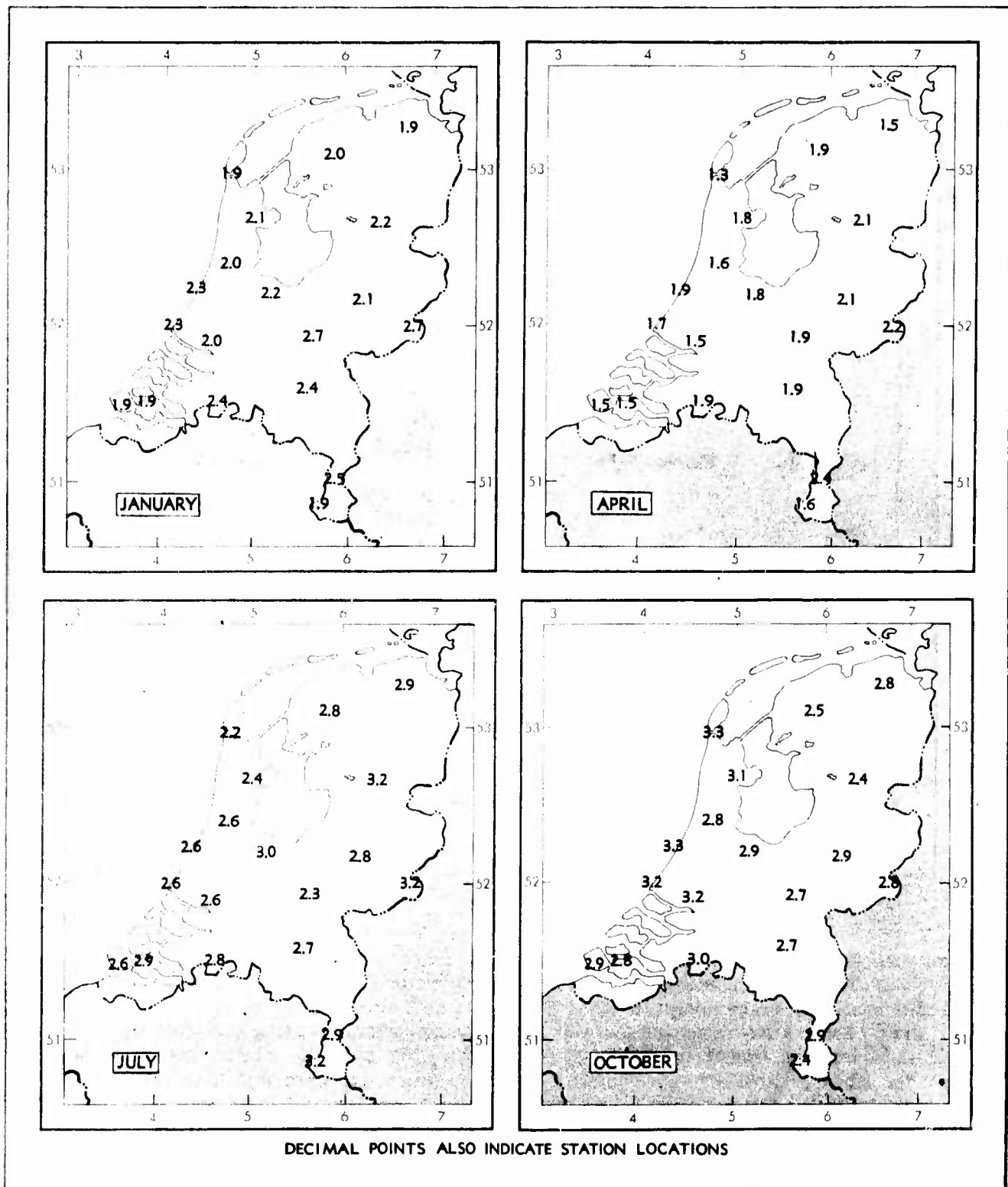


FIGURE 23-25. MEAN MONTHLY PRECIPITATION (INCHES), JANUARY, APRIL, JULY, AND OCTOBER

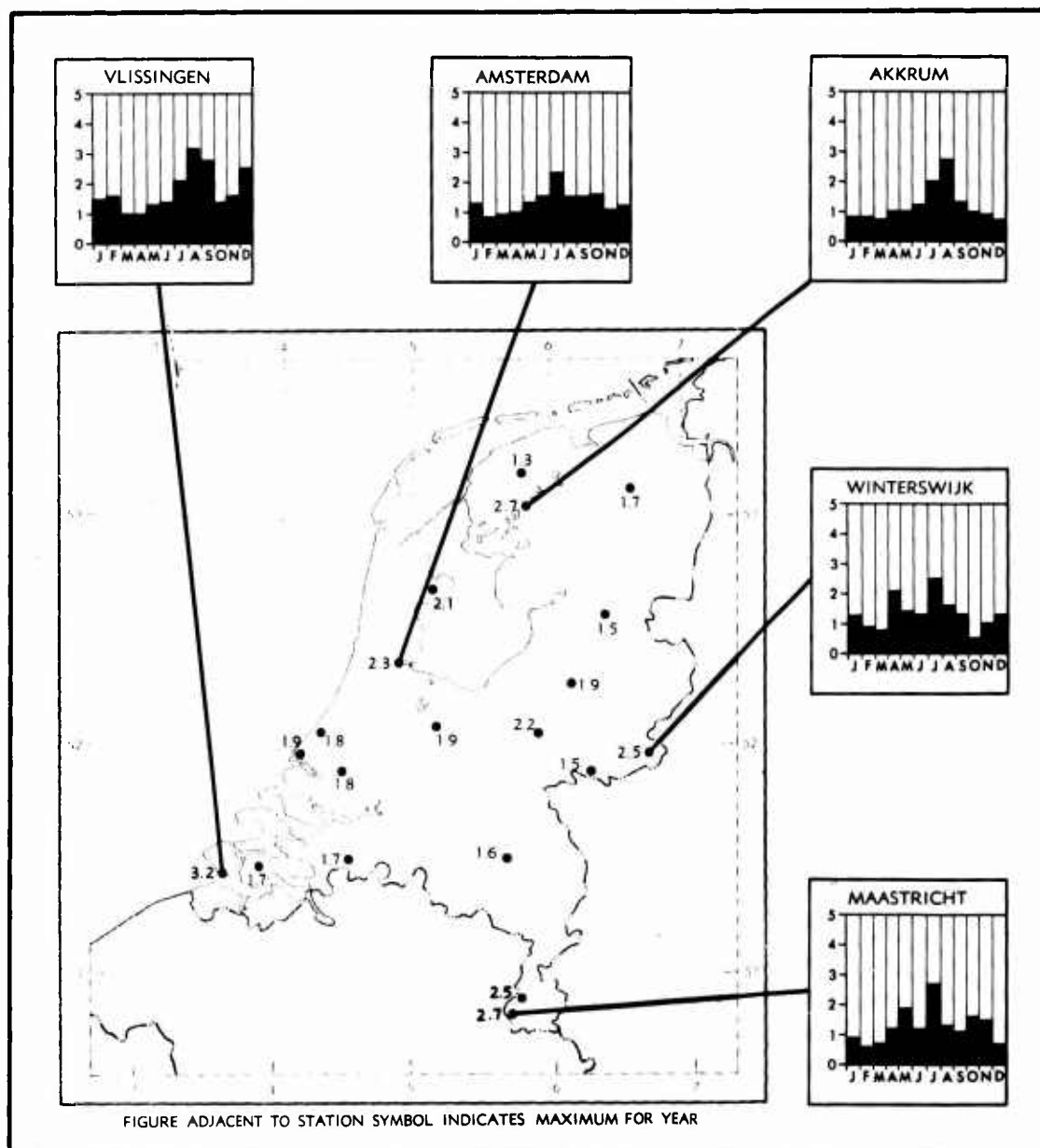


FIGURE 23-26. MAXIMUM 24-HOUR PRECIPITATION (INCHES). (For tabular data see FIGURE 23-46.)

May and June, the months with fewest rainy days, average about 13 days and December and January, the rainiest months, average about 19 days with rain or snow. Some areal variations as well as seasonal variations are evident in FIGURE 23-28. The map for January, generally representative of winter, indicates little areal variation in the number of days with precipitation. The overall average in this month is 19 days. Few stations differ more than 1 or 2 days from this average. The map for April, when the overall average is 15 days, is representative of spring. Individual stations average about 13 rainy days along the coast and about 16 days over the interior. Variations in summer, as indicated by the graphical data for July, resemble those outlined for spring. In autumn the overall

frequency increases to about 18 days with precipitation. The areal variation, as revealed by the map for October, is not as clear cut as in the other seasons. Averages along the coast are close to 17 days, while over the interior they evidently vary according to exposure, with individual station averages ranging from 15 to 22 days.

Snowfall frequencies are relatively low in the Netherlands (FIGURES 23-29 and 23-48). The overall average number of days with snowfall is about 18 annually. Some areal variations are in evidence. The coastal sections normally experience the lowest snowfall frequencies with about 14 days annually. In the interior most stations average between 19 and 23 days annually. The first snowfall is usually experienced in November and on

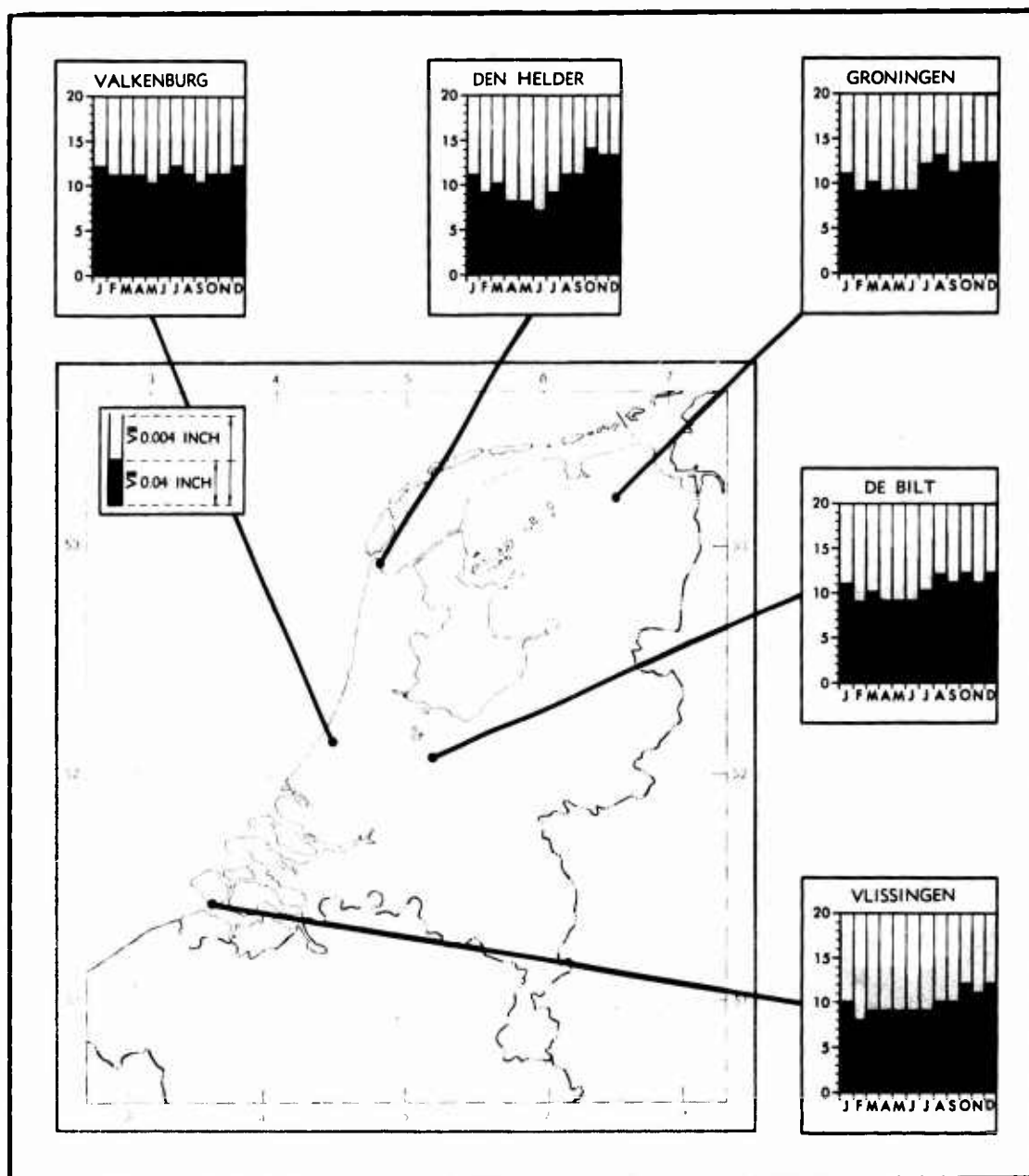


FIGURE 23-27. MEAN NUMBER OF DAYS WITH SPECIFIED PRECIPITATION AMOUNTS

rare occasions in October. The average number of days increases from 2 in October to 3 or 4 per month through March. In April there are about 2 days, while snow in May is extremely rare.

Specific information on the frequency of a snow cover on the ground is very limited. The average annual number of days with a snow cover increases from less than 10 along the coast to about 20 or 22 on the eastern border. These frequencies are about equal to snowfall frequencies. The temperature data suggest that in most winters the snow melts soon after it falls, or at least within a day or two. During winters with below normal temperatures the ground is frozen, and the snow cover may persist for several days or even weeks.

d. OVERALL EFFECT OF SURFACE WEATHER ON CLOTHING, STORAGE, AND SHELTER.

(1) Clothing

(a) MAJOR INFLUENCES — Precipitation in the forms of rain, sleet, and snow, strong westerly winds, and cold air masses from eastern Europe are the most important climatic factors affecting clothing requirements for the Netherlands. The moderating North Atlantic Drift (northward moving warm water) is indirectly responsible for the high humidity, abundant cloudiness, frequent fogs, and unusual warmth, particularly along the North Sea coast. Summers are cool and the winters are generally mild, although continental air masses

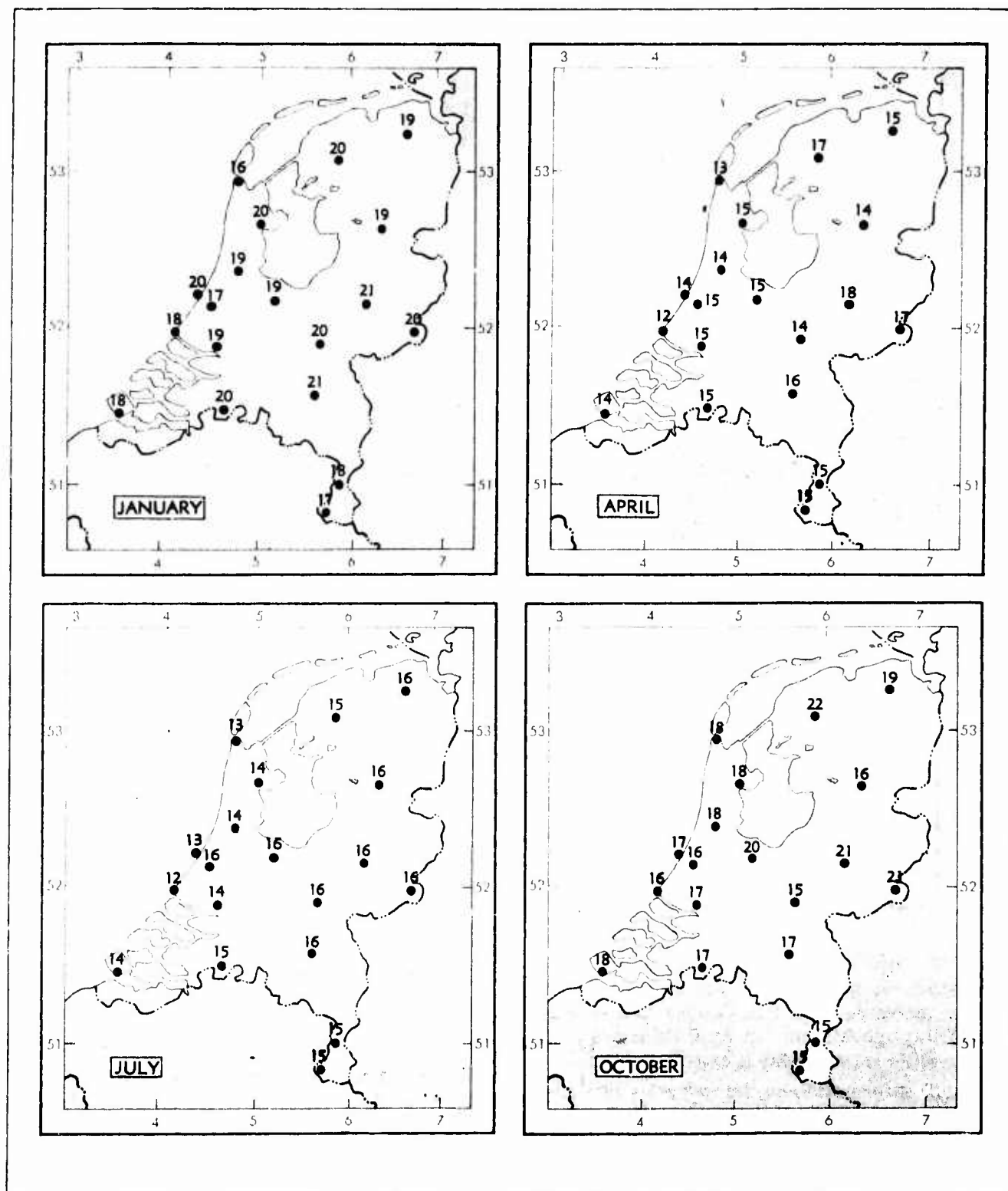


FIGURE 23-28. MEAN NUMBER OF DAYS WITH PRECIPITATION ≤ 0.004 INCH, JANUARY, APRIL, JULY, AND OCTOBER

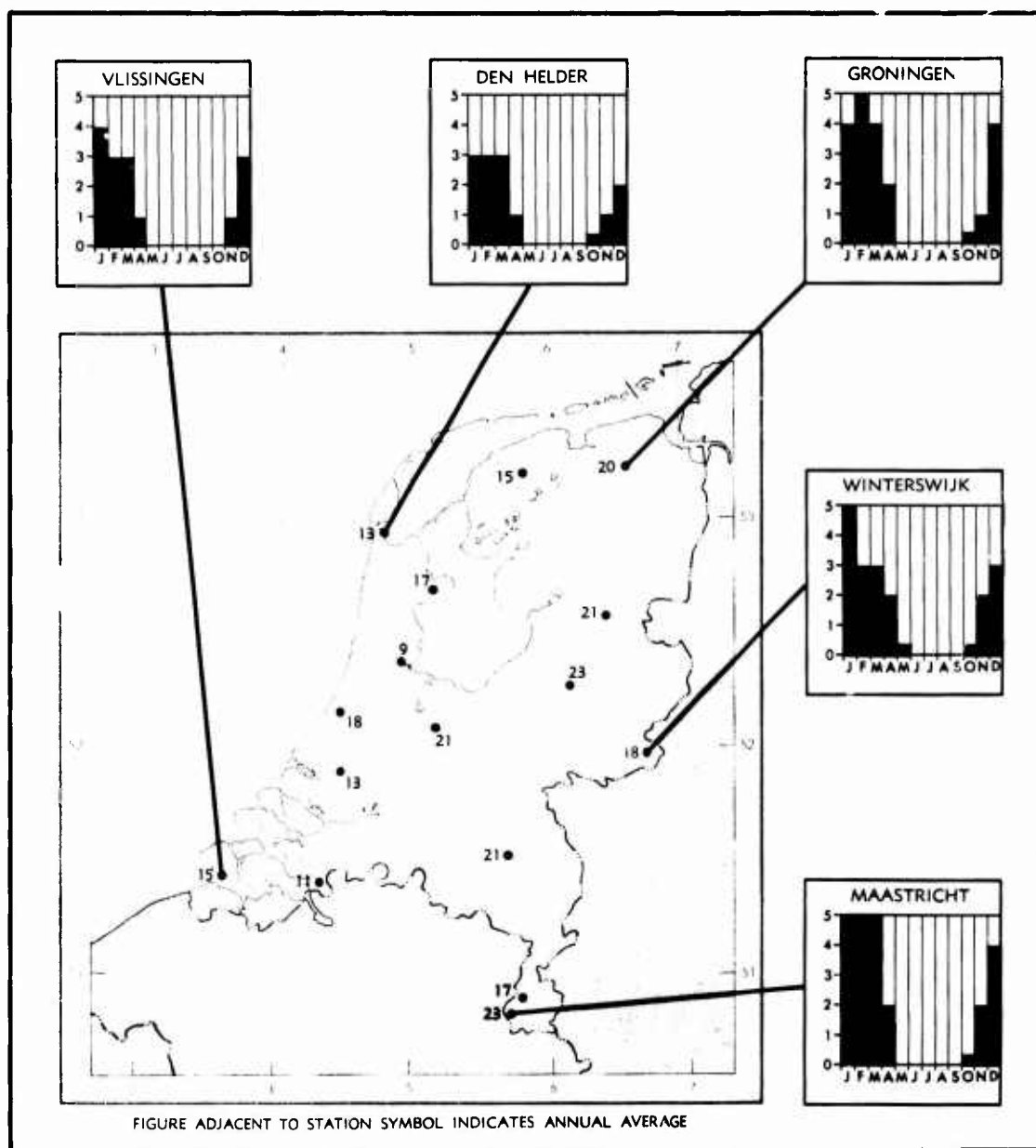


FIGURE 23-29. MEAN NUMBER OF DAYS WITH SNOWFALL. (For tabular data see FIGURE 23-48.)

from eastern Europe may bring occasional periods of rigorous cold to the Netherlands in winter.

(b) **REGIONAL REQUIREMENTS** — Clothing requirements for the Netherlands are given in FIGURE 23-30. These requirements are expressed in terms of clothing ensembles that have been prescribed for worldwide military use depending upon the occurrence of mean monthly temperatures, as follows:

CLOTHING ENSEMBLE	MEAN MONTHLY TEMPERATURES
Cool-weather	50° to 68° F.
Cold-weather	14° to 50° F.

Appropriate service regulations list the exact nomenclature and the basis for issue of various components of these clothing ensembles. For plan-

ning purposes, however, the clothing ensemble components are described in general terms. Also listed are special items which are necessary because of varying climatic factors.

The cool-weather ensemble consists of a cotton visored cap, shirt, trousers, and underwear, supplemented with a hooded water-repellent wind-resistant coat. It also includes leather combat boots and a poncho. Two woolen blankets or a lightweight sleeping bag are adequate sleeping equipment for use with this ensemble.

The cold-weather clothing ensemble consists of a wool shirt, wool trousers, wool-and-cotton underwear, and insulated rubber boots. A coat liner is added to the coat used with the cool-weather ensemble. A cotton field cap or a field cap with wool-

FIGURE 23-30. CLOTHING REQUIREMENTS

REGION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Netherlands.....	D	D	D	D	C	C	C	C	C	D	D	D

C - cool-weather clothing ensemble; D - cold-weather clothing ensemble.

pile lining is worn, depending on the degree of coldness. Woolen glove inserts or woolen mitten inserts, worn with the appropriate leather shells, are also components of the cold-weather ensemble. A mountain-type sleeping bag (down- and feather-filled) with a water-repellent case is adequate sleeping equipment for use with this ensemble.

(c) **EXCEPTIONS AND ADDITIONS FOR INDIVIDUALS IN A PROTECTED ENVIRONMENT** — The clothing ensembles described above are based on the assumption that the individuals wearing them will be living in the open 24 hours a day. Clothing requirements at permanent installations might be modified; for example, a raincoat may be more practical than a poncho, and blankets may take the place of sleeping bags.

(d) **SPECIAL REQUIREMENTS** — Although there is a definite minimum in the spring, the precipitation in this season and in the rest of the year is sufficient to influence the clothing requirements for the Netherlands. Extra socks are necessary, particularly in autumn, winter, and spring, as a precautionary measure against trench foot. Chap sticks are recommended for protection against the cold damp winds.

(2) **Storage** — Although the mean monthly temperatures for the Netherlands Area are above freezing during the winter months, daily minimum temperatures average well below freezing and readings below zero have occurred at most stations. Accordingly, items that may be damaged by low temperatures or by alternate freezing and thawing conditions require storage in warehouses, heated tents, or shelters. During the summer months mean temperatures in this Area seldom exceed 68° F. However, stored items would have to be well spaced to allow maximum ventilation.

Dunnage and tarpaulins are required to protect open stored items from dampness caused by the abundant rainfall and high relative humidity. The polder land, most of which is below sea level, is dominantly wet throughout the year. This region has a high ground water level and is subjected to occasional inundation by the Nederrijn and Maas rivers and the IJsselmeer. Storage sites in this region are therefore subject to flooding.

(3) **Shelter** — Shelter is necessary throughout the year. Protection is required against near-freezing temperatures in winter and against precipitation during the entire year. Tentage sim-

ilar to that developed by the U.S. Army for Temperate Zone operations provides adequate protection during the entire year. Tent flooring is desirable for protection against the dampness of the ground surface. Limited supplies of timber, for the construction of tent flooring or improvised shelters, are found in the small patches of forest in the southeast uplands near the Belgian border and in the central plain southeast of the IJsselmeer.

4. Amphibious operations

The climate of the southern part of the North Sea is temperate, with mild winters, cool summers, extensive cloud cover, and fresh winds. The prevailing flow of air is from the west. This flow is frequently interrupted by the passage of storms which approach the Area from the North Atlantic. Strong winds and great variability in weather are associated with these storms.

Conditions for amphibious operations are most favorable during the summer and early autumn. At this time temperatures are mild, winds are lighter, and visibility is good. Spring is less favorable, and winter the least desirable because of reduced visibilities, strong winds, cold temperatures, especially adjacent to the land, and the risk of sea ice in the bays and river months.

The prevailing wind direction is westerly, for the year as a whole. From October to March, southwesterly winds predominate. In April and May there is a more uniform distribution of wind directions. The greatest monthly percentage frequency of north and northeast winds occurs during these months. In summer the prevailing winds are west to northwest. The mean wind speed in October through February is about 18 knots; May to July it is 10 knots; and for the intervening months, March, April, August, and September, it is about 13 knots.

NOTE Amphibious operations are defined as those operations involving the movement of troops and equipment onto a beach and the associated protective measures. The meteorological elements discussed in this Subsection are those which are of primary importance to such operations as helicopter troop transport, waterborne troop and cargo landing, underwater demolition, air support, and naval gunfire support. Further discussion of some of the elements may be found in the Subsections on Air, Air-ground, and Ground Surface Operations.

Land and sea breezes are infrequent. About two cyclones per month directly affect the Area. Gale-force winds are most frequent in winter. From October through February gales occur about 10% of the time, and from April through August they occur about 2% of the time. Gales are usually associated with the passage of low-pressure centers through the Area, so that wind direction and change of direction are functions of the relative position of the center of low pressure. Westerly gales are most frequent.

Sea and swell conditions are favorable for conducting amphibious operations throughout most of the year. The most favorable period is from April to August and the least favorable is December and January. The monthly cloud cover averages about 7-tenths throughout the year. Late spring and early summer months have slightly less cloudiness. There is little diurnal variation in cloud amount.

The cyclonic storms transiting the Area are the main source of precipitation. The average frequency of occurrence of all types of precipitation is least from May through August, occurring about 10% of the time, and greatest from November through January, occurring about 20% of the time. Rain constitutes the bulk of the annual precipitation. Snow occurs about 3% of the time from December through March. Northerly or easterly winds of polar origin are most likely to bring snow during this period. Soft hail (graupel) falls on an average of 3 to 10 days during entire winter season. Hail associated with thunderstorms occurs on rare occasions from June to September. Thunderstorms are most frequent in summer. These storms are usually of frontal origin; however, summer air-mass thunderstorms frequently drift from the land out over the coastal waters.

The major restrictions to visibility are drizzle and fog. Visibility less than $\frac{1}{2}$ mile is observed about 3% of the time from December to June and less than 1% during the remainder of the year. Visibility less than 1 mile is observed about 6% of the time from November to June and 2% from July to October. Because offshore winds may spread land fog over the immediate coastal waters, reduced visibility is more frequent near the land than over the open sea. The southern portion of the North Sea rarely has extended periods of unrestricted visibilities. Visibility less than 5 miles occurs about 31% of the time from December to June and 22% from July to November. The average visibility over the Area throughout the year is between 4 and 9 miles.

Warm air from the North Atlantic causes relatively high mean temperatures over the North Sea. The mean monthly temperature in August, the

warmest month, is about 62° F. and in February, the coldest month, about 40° F. In summer the temperature rarely exceeds 68° F., and in winter it seldom falls below 32° F., except in the vicinity of the coast when an off-shore breeze is blowing. The diurnal variation in temperature over the open sea is approximately 2 Fahrenheit degrees. The mean monthly sea-water temperature ranges from a high of 63° F. in August to a low of 39° F. in February.

Sea ice, except in the bays and rivers, is rare; occasionally small amounts of ice will form close to the shore during severe winters. This ice is sufficiently thick to impede navigation of small craft. In mild winters thin ice forms in the bays and rivers but lasts only a few days and is navigable by small craft.

C. Meteorological facilities and organization (as of January 1961)

1. History

The meteorological service of the Netherlands was founded in 1854 by Professor C. H. D. Buys-Ballot and is administered by the Koninklijk Nederlands Meteorologisch Instituut (Royal Netherlands Meteorological Institute). Regulations for the Institute were established by a royal decree in October 1933 (Staatblad 528), and amended by a decree in September 1937 (Staatblad 578). The Institute controls all meteorological services in the Netherlands, both civilian and military.

2. Organization

The Royal Netherlands Meteorological Institute is under the Minister of Transport and Waterways. Its headquarters is located at Utrechtseweg 297, De Bilt, Netherlands, and Mr. C. J. Warners is the Director. All civilian and military weather services are under this Institute.

The meteorological services in the Netherlands are modern, adequately manned, and accurate in their forecasting. They have close liaison and exchange of information with England and western Europe and are quite competent and current in providing all weather media. The Netherlands is a member nation of the "International Meteorological Teleprinter, Europe" circuit utilizing the International Code.

3. Weather observing and forecasting facilities

There are at present 25 first-order stations in the Netherlands, all sending 3-hourly synoptic observations around the clock except for curtailed operation at a few stations on 1 or 2 days per week. Of these stations, 21 also take hourly observations 24 hours per day. There are 14 airport stations, of which 8 are military, 4 civilian, and 2 both military

and civilian. The 25 first-order stations include 4 on lightships in the North Sea. Only 1 station, De Bilt, takes regular winds aloft observations by electronic means 4 times daily; 5 other stations take pibals irregularly as necessary for their operations. The only meteorological observatory in the Netherlands is located at the Institute at De Bilt.

All weather stations use the same reporting procedures and codes. These reports are sent every hour on the hour to the Institute headquarters at De Bilt. The Institute then consolidates them and sends out a master report 4 minutes after every hour.

Most observing stations are manned by 4 to 7 persons. The military forecasting stations have approximately 4 forecasters and 11 observers. The largest unit, at Schiphol Airport, Amsterdam, has 30 forecaster and 70 observers. There are approximately 300 people working at De Bilt, with an additional 100 assigned there but working at the branch offices and various other places. Weather stations are standard for Europe and contain complete weather equipment for the continuous reporting required under international rules.

Short-range forecasting is accomplished at both the military and civilian airfields. All long-range forecasting (for periods greater than 24 hours) is accomplished at the Institute at De Bilt. The Institute also prepares the upper-air forecasts for use by the subordinate stations. The competency and accuracy of weather forecasts in the Netherlands compare favorably with those of other countries in western Europe.

4. Training and education

The elementary observing course is 12 to 13 weeks long. Courses are scheduled 2 to 3 times per year, with a class enrollment of 20 to 30 students. The advanced observing course, 2 months in duration, is scheduled as required, with 5 to 6 students per class. Emphasis is placed on the use of instruments.

Forecasters all receive 6 months of training at the Institute at De Bilt. The educational level is comparable to that of the United States. The

complete training is accomplished at the Institute, thus providing the students with the best opportunity of acquiring first-hand knowledge while still in training. This training is reflected in the accuracy of the forecasts. The advanced forecasting school is conducted approximately every 4 to 6 years. Students are drawn from their units 2 days per week to attend classes. The course for both civilian and military personnel is based on an 800 to 900 hour syllabus.

5. Research and development

The main development project at the present is a new radiosonde being tested in conjunction with Phillips Industries. The radiosonde is designed for accurate use to 100,000 feet. Much research has also been done on methods of forecasting the influence of storms in the North Sea upon the height of tides in the Netherlands. Late reports indicate that a rather reliable technique may have been developed. Research has also been done recently on effects of weather on navigation, on forecasting high-level winds and temperatures, and on techniques of seasonal forecasting.

D. Climatic data tables

This Subsection contains the various climatic data tables referred to in Subsections A and B. Because of the small size of the Netherlands and the absence of any distinctive climatic regions, the stations in each table have been listed alphabetically for the country as a whole. The data contained in the tables were selected from a relatively large amount of observational material, and, except for some of the cloudiness data, appear to be reliable. The tables generally contain enough data to give a representative cross section of climatic conditions in the Area. The annual values in some tables may be slightly different from the sums or means of the monthly values because of the rounding-off of fractions.

A map of station locations (FIGURE 23-49), with an accompanying list giving latitude, longitude, and elevation of stations mentioned in Subsections A, B, and D, appears in the end of the Section.

FIGURE 23-31. MEAN CLOUDINESS (%) AT SPECIFIED HOURS

STATION	HOURL (LST)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN	YRS REC
Amsterdam.....	0000	68	63	57	52	53	53	56	52	55	55	67	71	58	11
De Bilt.....	0000	70	64	57	47	49	48	51	47	49	52	66	71	56	11
Deelen.....	0000	71	66	58	47	47	52	48	46	47	56	67	73	57	7-8
Den Helder.....	0000	69	64	62	55	52	54	56	51	53	54	70	73	59	11
Eelde.....	0000	69	66	57	53	50	54	57	47	48	58	68	75	59	11
Gilze.....	0000	65	61	52	43	47	44	49	45	46	54	62	69	53	9-11
Goeree Lightship.....	0000	67	65	61	58	55	54	58	56	51	59	71	73	61	11
Leeuwarden.....	0000	72	68	59	52	52	55	58	48	51	58	71	72	60	11
Terschelling Lightship.....	0000	72	74	67	57	60	58	64	58	62	64	76	79	66	11
Texel Lightship.....	0000	75	69	65	59	58	59	63	63	62	63	77	77	66	9-11
The Hague.....	0000	70	65	56	50	47	48	58	56	54	64	66	73	59	4
Twente.....	0000	73	65	56	45	45	53	53	49	49	54	70	74	57	11
Vlissingen.....	0000	66	59	55	47	50	47	52	48	52	52	66	69	55	11
Westerschelling.....	0000	71	68	61	55	55	61	62	57	59	63	75	73	63	11
Zuid-Limburg Airport.....	0000	73	68	58	51	50	51	54	52	51	56	72	76	59	11
Amsterdam.....	0600	71	72	69	66	65	67	69	68	65	66	72	74	69	11
De Bilt.....	0600	68	72	71	64	63	66	69	67	64	65	72	74	68	11
Deelen.....	0600	73	76	74	68	66	68	75	72	71	69	77	77	72	9
Den Helder.....	0600	71	69	71	64	62	65	68	68	65	65	72	73	68	11
Eelde.....	0600	73	73	71	64	63	66	68	64	63	65	75	77	69	11
Gilze.....	0600	68	70	71	62	62	66	69	67	64	66	71	71	67	11
Goeree Lightship.....	0600	72	75	75	70	68	69	73	72	71	73	75	77	73	11
Leeuwarden.....	0600	72	72	69	68	67	68	70	70	66	67	75	74	70	11
Terschelling Lightship.....	0600	77	76	79	71	68	67	72	73	72	73	81	77	74	11
Texel Lightship.....	0600	75	76	77	72	66	70	73	74	73	75	79	78	74	9-11
The Hague.....	0600	68	71	70	66	66	67	72	72	68	69	72	74	70	11
Twente.....	0600	74	69	70	67	64	66	72	67	66	67	77	77	70	11
Vlissingen.....	0600	68	70	69	61	62	61	66	63	62	67	70	72	66	11
Westerschelling.....	0600	73	74	73	71	67	70	73	75	72	73	80	77	73	11
Zuid-Limburg Airport.....	0600	75	76	70	67	64	64	67	67	66	67	77	77	70	11
Amsterdam.....	1200	75	73	70	65	65	67	68	70	69	70	76	80	71	11
De Bilt.....	1200	73	74	70	65	68	69	71	70	70	70	77	78	71	11
Deelen.....	1200	78	77	75	72	75	76	79	77	74	75	82	85	77	9
Den Helder.....	1200	74	69	67	58	59	59	64	63	62	67	75	76	66	11
Eelde.....	1200	75	75	74	69	68	70	74	72	69	68	78	79	73	11
Gilze.....	1200	75	75	72	68	69	71	73	75	70	70	79	81	73	11
Goeree Lightship.....	1200	78	76	70	64	65	64	65	67	68	69	79	81	71	11
Leeuwarden.....	1200	77	76	74	69	71	72	76	75	72	71	79	78	74	11
Terschelling Lightship.....	1200	79	77	77	65	65	65	69	70	70	72	80	82	73	11
Texel Lightship.....	1200	81	75	74	67	67	68	70	72	67	71	84	82	73	9-11
The Hague.....	1200	77	75	73	66	66	68	71	73	73	72	79	82	73	11
Twente.....	1200	78	76	73	70	69	71	77	73	70	71	80	81	74	11
Vlissingen.....	1200	72	71	65	59	60	59	59	64	64	63	74	76	66	11
Westerschelling.....	1200	79	75	75	64	65	66	72	73	71	72	81	82	73	11
Zuid-Limburg Airport.....	1200	76	72	78	63	65	66	67	67	63	66	77	80	70	11
Amsterdam.....	1800	71	69	66	55	61	57	60	63	63	63	74	76	65	11
De Bilt.....	1800	69	69	63	56	60	59	62	63	61	61	72	74	64	11
Deelen.....	1800	73	73	67	62	65	68	70	70	66	64	70	73	68	9
Den Helder.....	1800	71	67	66	57	58	56	60	63	63	64	73	74	64	11
Eelde.....	1800	72	72	67	58	61	63	65	63	62	63	74	77	66	11
Gilze.....	1800	67	68	62	58	63	63	63	64	63	57	66	72	64	11
Goeree Lightship.....	1800	74	76	71	62	66	62	64	68	70	68	76	77	70	11
Leeuwarden.....	1800	72	73	71	61	66	63	66	66	64	64	72	75	68	11
Terschelling Lightship.....	1800	77	79	76	63	66	63	65	71	72	71	78	80	72	11
Texel Lightship.....	1800	76	77	74	65	67	64	68	69	72	73	80	78	72	9-11
The Hague.....	1800	69	68	65	57	64	60	62	66	65	63	74	74	66	11
Twente.....	1800	73	71	65	63	64	65	67	69	64	62	72	77	68	11
Vlissingen.....	1800	69	66	60	52	59	53	56	59	62	61	71	72	62	11
Westerschelling.....	1800	74	75	72	63	66	64	68	72	71	71	78	79	71	11
Zuid-Limburg Airport.....	1800	70	68	61	61	62	62	63	62	60	58	74	76	65	11

FIGURE 23-32. MEAN NUMBER OF CLEAR DAYS (≥ 1 -EIGHTH CLOUD COVER) AT SPECIFIED HOURS

STATION	HOOR (LST)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN	YRS REC
Amsterdam.....	0000	7	6	11	12	10	10	10	10	9	11	7	6	109	11
De Bilt.....	0000	7	8	11	12	13	12	12	12	11	12	7	6	123	11
Deelen.....	0000	7	7	11	13	12	10	12	12	12	11	7	5	119	7-8
Den Helder.....	0000	7	8	9	10	11	11	10	10	10	10	5	5	106	11
Eelde.....	0000	7	7	10	10	12	9	9	10	11	9	6	4	104	11
Gilze.....	0000	8	9	13	14	13	12	12	12	13	12	8	7	133	9-11
Goeree Lightship.....	0000	5	5	7	7	9	7	6	8	6	7	4	3	74	11
Leeuwarden.....	0000	6	6	10	10	10	8	8	10	9	9	6	5	97	11
Terschelling Lightship.....	0000	4	3	5	8	6	5	4	5	4	4	2	1	51	11
Texel Lightship.....	0000	4	5	7	6	7	6	6	4	5	6	2	2	60	9-11
The Hague.....	0000	8	8	12	12	14	12	10	10	11	9	8	6	120	4
Twente.....	0000	6	7	11	14	13	10	11	11	12	11	6	5	117	11
Vlissingen.....	0000	8	9	12	13	12	12	11	12	11	11	7	7	125	11
Westerschelling.....	0000	6	6	9	10	10	8	7	9	8	7	4	5	89	11
Zuid-Limburg Airport.....	0000	7	8	11	11	12	12	11	11	11	11	6	5	116	11
Amsterdam.....	0600	6	5	7	6	6	5	5	4	4	6	5	6	65	11
De Bilt.....	0600	7	6	5	5	6	6	6	6	6	6	5	5	69	11
Deelen.....	0600	6	4	5	5	6	5	3	4	4	5	3	5	55	9
Den Helder.....	0600	6	6	5	6	7	6	5	3	4	6	4	6	64	11
Eelde.....	0600	5	4	5	5	6	5	4	4	5	6	3	4	56	11
Gilze.....	0600	8	5	5	7	6	5	4	4	5	6	5	6	66	11
Goeree Lightship.....	0600	4	3	3	3	4	3	2	2	2	3	2	2	33	11
Leeuwarden.....	0600	5	4	6	4	5	4	4	3	4	5	3	4	51	11
Terschelling Lightship.....	0600	3	2	2	3	4	3	2	2	2	3	1	2	29	11
Texel Lightship.....	0600	4	3	2	3	4	4	2	1	2	3	1	2	31	9-11
The Hague.....	0600	8	6	7	7	7	7	5	4	5	7	5	6	74	11
Twente.....	0600	5	6	6	5	6	6	4	5	4	6	4	4	61	11
Vlissingen.....	0600	8	6	7	7	7	7	5	6	6	6	5	6	76	11
Westerschelling.....	0600	6	4	4	4	5	4	4	2	3	4	2	4	46	11
Zuid-Limburg Airport.....	0600	6	5	6	7	7	7	6	6	6	6	4	5	71	11
Amsterdam.....	1200	4	4	5	5	5	4	4	2	3	4	2	2	44	11
De Bilt.....	1200	5	4	4	5	4	4	3	2	3	5	3	3	45	11
Deelen.....	1200	3	3	4	3	2	2	1	1	3	4	2	2	30	9
Den Helder.....	1200	4	4	6	7	8	7	5	5	5	5	3	3	62	11
Eelde.....	1200	4	3	3	3	4	3	1	1	3	4	2	2	33	11
Gilze.....	1200	4	3	4	4	3	3	2	1	3	5	2	2	36	11
Goeree Lightship.....	1200	2	3	4	3	3	3	3	2	2	4	1	1	31	11
Leeuwarden.....	1200	3	3	3	3	4	3	2	1	2	4	2	2	32	11
Terschelling Lightship.....	1200	1	2	3	3	4	3	3	2	3	3	1	1	29	11
Texel Lightship.....	1200	2	2	4	4	5	3	3	2	3	4	1	2	35	9-11
The Hague.....	1200	4	4	5	5	7	5	4	3	3	5	3	2	50	11
Twente.....	1200	3	3	4	4	4	3	2	1	3	5	2	2	36	11
Vlissingen.....	1200	5	5	6	7	6	6	6	4	4	5	3	3	60	11
Westerschelling.....	1200	3	3	3	5	5	4	4	2	3	4	2	1	39	11
Zuid-Limburg Airport.....	1200	5	5	6	6	5	4	4	3	5	6	3	3	55	11
Amsterdam.....	1800	6	5	6	8	7	7	6	5	5	6	4	5	70	11
De Bilt.....	1800	7	5	7	7	7	6	6	4	5	8	5	5	72	11
Deelen.....	1800	6	4	5	4	4	3	3	2	4	6	5	5	51	9
Den Helder.....	1800	6	6	6	7	7	7	7	5	5	6	5	5	72	11
Eelde.....	1800	6	4	5	7	6	5	4	3	4	6	3	3	56	11
Gilze.....	1800	7	5	6	6	4	4	4	4	4	8	6	6	64	11
Goeree Lightship.....	1800	3	2	3	4	3	3	3	2	2	3	2	2	32	11
Leeuwarden.....	1800	5	4	4	5	4	5	4	2	3	5	3	4	48	11
Terschelling Lightship.....	1800	3	1	2	4	4	4	4	1	2	3	1	2	31	11
Texel Lightship.....	1800	3	2	3	4	4	4	3	2	2	3	2	2	34	9-11
The Hague.....	1800	7	7	7	9	7	8	7	6	6	7	5	6	82	11
Twente.....	1800	5	5	5	6	5	4	4	2	4	6	5	4	55	11
Vlissingen.....	1800	7	7	8	10	7	8	8	6	5	8	5	5	84	11
Westerschelling.....	1800	5	3	4	6	6	5	4	3	3	5	3	3	50	11
Zuid-Limburg Airport.....	1800	7	6	8	6	6	6	6	5	6	9	5	5	75	11

FIGURE 23-33. MEAN NUMBER OF CLOUDY DAYS (≥ 7 -EIGHTHS CLOUD COVER) AT SPECIFIED HOURS

STATION	HOOR (LST)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN	YRS REC
Amsterdam.....	0000	19	16	15	13	13	11	13	12	13	14	17	19	175	11
De Bilt.....	0000	19	16	15	11	12	10	12	10	11	14	17	20	167	11
Deelen.....	0000	20	16	16	12	12	12	11	9	10	14	17	21	170	7-8
Den Helder.....	0000	19	16	17	13	12	13	14	11	12	13	19	19	178	11
Eelde.....	0000	19	16	15	12	12	11	13	9	10	15	17	20	169	11
Gilze.....	0000	18	15	14	10	11	8	11	10	10	14	16	18	155	9-11
Goeree Lightship.....	0000	17	15	15	13	13	11	13	12	12	13	16	18	168	11
Leeuwarden.....	0000	19	16	16	11	13	11	12	9	10	14	18	19	168	11
Terschelling Lightship.....	0000	18	17	17	12	14	12	15	11	12	14	18	20	180	11
Texel Lightship.....	0000	19	16	17	13	12	12	15	12	13	14	19	19	181	9-11
The Hague.....	0000	18	15	15	10	10	9	13	12	12	16	17	19	166	4
Twente.....	0000	21	17	15	11	10	12	12	10	10	14	18	21	171	11
Vlissingen.....	0000	18	14	15	11	12	11	12	11	12	13	17	18	164	11
Westerschelling.....	0000	19	17	17	14	14	14	15	13	13	16	19	20	191	11
Zuid-Limburg Airport.....	0000	20	18	16	12	12	12	13	13	13	14	20	22	185	11
Amsterdam.....	0600	19	18	19	15	16	16	17	16	14	17	18	18	205	11
De Bilt.....	0600	19	18	19	14	15	16	17	15	14	16	18	20	201	11
Deelen.....	0600	21	18	20	16	16	17	20	18	17	18	19	21	221	9
Den Helder.....	0600	20	16	19	15	15	16	17	16	13	16	18	20	201	11
Eelde.....	0600	20	17	18	15	15	16	16	14	13	16	19	21	200	11
Gilze.....	0600	19	18	19	14	13	15	17	15	13	16	17	19	195	11
Goeree Lightship.....	0600	19	18	18	16	14	14	16	14	15	17	16	20	197	11
Leeuwarden.....	0600	19	17	18	16	16	16	17	16	14	16	19	19	203	11
Terschelling Lightship.....	0600	20	18	19	16	16	14	16	16	14	17	19	20	205	11
Texel Lightship.....	0600	19	18	20	16	15	16	18	16	17	19	19	20	213	9-11
The Hague.....	0600	18	17	18	16	16	16	18	17	15	17	17	19	204	11
Twente.....	0600	21	17	19	16	15	16	18	16	15	18	20	22	213	11
Vlissingen.....	0600	19	17	19	14	14	13	16	14	13	17	17	20	193	11
Westerschelling.....	0600	20	18	20	17	17	16	19	19	17	19	20	21	223	11
Zuid-Limburg Airport.....	0600	22	20	19	18	16	16	17	16	17	17	21	22	221	11
Amsterdam.....	1200	20	18	17	13	14	13	15	14	14	18	19	22	197	11
De Bilt.....	1200	19	18	16	13	15	15	15	13	14	17	19	22	196	11
Deelen.....	1200	22	19	19	16	17	18	19	16	16	20	22	24	228	9
Den Helder.....	1200	20	16	18	12	14	13	14	13	13	17	19	20	189	11
Eelde.....	1200	20	17	17	14	15	14	15	13	13	15	20	20	193	11
Gilze.....	1200	19	18	18	14	14	14	15	15	14	17	19	22	199	11
Goeree Lightship.....	1200	18	17	16	12	12	11	11	11	11	14	18	20	171	11
Leeuwarden.....	1200	20	17	18	15	17	16	17	16	15	17	20	21	209	11
Terschelling Lightship.....	1200	20	18	19	13	14	14	15	14	15	18	20	21	201	11
Texel Lightship.....	1200	21	17	18	14	15	15	15	15	14	17	21	22	204	9-11
The Hague.....	1200	20	18	18	13	14	13	15	15	16	17	19	23	201	11
Twente.....	1200	21	17	18	15	15	15	17	15	14	18	21	22	208	11
Vlissingen.....	1200	19	16	15	13	11	12	12	13	11	14	18	20	174	11
Westerschelling.....	1200	21	18	19	14	15	14	17	17	16	18	21	23	213	11
Zuid-Limburg Airport.....	1200	22	18	17	14	14	14	15	14	14	16	20	22	200	11
Amsterdam.....	1800	19	16	17	11	14	11	14	13	13	15	19	21	183	11
De Bilt.....	1800	19	16	16	11	14	12	14	13	12	15	19	21	182	11
Deelen.....	1800	21	17	16	13	13	15	15	15	14	15	18	20	192	9
Den Helder.....	1800	19	16	17	12	13	11	13	13	13	15	19	20	181	11
Eelde.....	1800	19	17	16	11	13	12	14	12	12	14	19	21	180	11
Gilze.....	1800	18	16	14	10	12	12	14	13	12	12	16	20	169	11
Goeree Lightship.....	1800	19	16	16	11	12	11	12	13	14	15	18	20	177	11
Leeuwarden.....	1800	19	17	18	12	14	12	15	13	13	15	18	20	186	11
Terschelling Lightship.....	1800	19	18	18	13	15	12	14	15	15	17	18	21	195	11
Texel Lightship.....	1800	20	18	18	14	15	13	15	14	16	18	19	19	199	9-11
The Hague.....	1800	18	15	16	10	14	11	13	14	14	14	18	19	176	11
Twente.....	1800	20	16	16	13	14	14	15	15	13	14	18	21	189	11
Vlissingen.....	1800	18	15	15	11	13	10	11	12	12	15	18	19	169	11
Westerschelling.....	1800	20	18	19	14	16	13	16	18	16	18	20	22	210	11
Zuid-Limburg Airport.....	1800	20	17	15	13	14	14	15	13	13	14	20	21	189	11

FIGURE 23-34. MEAN NUMBER OF DAYS WITH THUNDERSTORMS

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN	YRS REC
Amsterdam.....	*	*	1	2	3	4	5	5	4	2	1	1	28	30
De Bilt.....	*	*	1	2	5	5	5	5	3	1	1	*	28	30
Den Helder.....	*	*	1	1	3	3	4	4	3	2	2	1	24	30
Goes.....	*	*	1	2	4	5	4	5	3	2	1	1	28	30
Hallum.....	1	*	1	2	4	5	6	5	4	2	1	1	32	30
Hauwert.....	*	1	1	1	3	5	4	4	3	2	1	1	26	30
Helmond.....	*	*	1	2	4	6	6	5	3	1	1	*	29	30
Hummelo.....	*	*	1	2	6	6	6	7	3	2	1	*	34	30
Katwijk Aan Zee.....	*	*	1	1	3	4	4	4	3	3	1	1	25	30
Rotterdam.....	*	*	1	2	4	5	5	5	3	2	1	1	29	30
Terwolde.....	*	*	1	2	4	5	5	5	2	1	*	1	26	30
The Hague.....	*	*	1	2	3	4	4	5	3	2	1	*	25	30
Vlissingen.....	1	*	1	1	3	4	4	4	3	2	1	*	24	30
Westernieland.....	*	*	1	2	4	4	6	5	3	1	1	1	28	30
Zuid-Limburg Airport.....	1	*	1	3	5	6	7	6	3	1	*	*	34	30

* <0.5 day.

FIGURE 23-35. MEAN NUMBER OF DAYS WITH $\geq$ 1-EIGHTH CLOUD COVER BELOW 8,200 FEET AT SPECIFIED HOURS

STATION	HOOR (LST)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN	YRS REC
Amsterdam.....	0000	9	10	13	15	15	15	15	15	15	13	10	9	154	11
De Bilt.....	0000	8	10	13	15	16	15	15	16	14	14	10	9	155	11
Deelen.....	0000	8	9	13	16	16	14	14	15	15	12	9	7	148	7-8
Den Helder.....	0000	9	10	12	13	15	15	14	16	14	13	9	7	147	11
Eelde.....	0000	9	9	13	14	16	14	13	16	15	12	9	7	147	11
Gilze.....	0000	10	10	15	17	17	15	15	16	16	14	11	8	164	9-11
Leeuwarden.....	0000	8	8	13	13	15	13	12	15	14	11	9	7	138	11
The Hague.....	0000	9	10	13	15	17	16	12	14	13	11	10	8	148	4
Twente.....	0000	8	9	14	17	18	14	15	16	16	13	9	7	156	11
Vlissingen.....	0000	9	12	14	16	15	16	14	16	14	14	11	9	160	11
Westterschelling.....	0000	17	15	21	20	26	20	23	23	20	20	14	14	233	3-5
Zuid-Limburg Airport.....	0000	9	10	13	16	17	16	15	16	16	14	11	8	161	11
Amsterdam.....	0600	8	7	11	12	14	12	11	12	11	10	9	7	124	11
De Bilt.....	0600	9	7	9	11	13	11	9	10	10	10	8	7	114	11
Deelen.....	0600	7	5	8	10	11	10	7	8	9	8	6	6	95	9
Den Helder.....	0600	8	8	8	12	13	12	10	10	9	9	8	7	114	11
Eelde.....	0600	7	6	10	11	11	11	10	11	11	9	8	5	110	11
Gilze.....	0600	9	7	9	11	13	10	9	9	9	9	8	7	110	11
Leeuwarden.....	0600	7	6	9	10	11	10	9	9	9	8	6	6	100	11
The Hague.....	0600	9	8	10	13	13	13	11	11	10	10	8	7	123	11
Twente.....	0600	7	7	9	10	11	10	9	10	11	10	7	6	107	11
Vlissingen.....	0600	9	8	11	11	12	11	10	12	10	10	9	8	121	11
Westterschelling.....	0600	15	10	8	9	11	10	9	9	8	8	6	11	114	4-11
Zuid-Limburg Airport.....	0600	8	8	10	13	14	12	12	12	13	12	9	7	130	11
Amsterdam.....	1200	8	8	9	10	10	10	8	7	7	8	8	8	101	11
De Bilt.....	1200	8	7	8	8	8	8	5	5	6	7	6	7	83	11
Deelen.....	1200	7	5	8	6	6	5	3	4	5	6	5	5	65	9
Den Helder.....	1200	8	9	11	13	15	14	11	11	10	10	8	7	127	11
Eelde.....	1200	7	6	7	6	6	6	4	4	5	7	6	6	70	11
Gilze.....	1200	6	6	8	7	7	6	4	4	6	7	6	5	72	11
Leeuwarden.....	1200	7	6	7	7	8	7	5	4	5	7	6	7	76	11
The Hague.....	1200	8	8	9	10	11	11	8	8	7	8	8	7	103	11
Twente.....	1200	6	6	8	7	7	6	5	5	7	7	6	7	77	11
Vlissingen.....	1200	9	8	10	12	12	12	10	10	9	10	8	8	118	11
Westterschelling.....	1200	6	7	9	11	13	12	9	9	7	8	6	6	103	11
Zuid-Limburg Airport.....	1200	8	9	10	10	9	9	7	9	11	10	9	8	109	11
Amsterdam.....	1800	9	9	12	15	17	16	16	16	14	13	8	7	152	11
De Bilt.....	1800	9	8	12	14	15	12	12	13	12	12	8	7	134	11
Deelen.....	1800	7	7	10	10	10	9	8	8	10	10	8	7	104	9
Den Helder.....	1800	9	9	12	14	15	16	16	13	11	11	8	8	142	11
Eelde.....	1800	8	8	11	12	13	11	10	13	13	12	8	7	126	11
Gilze.....	1800	9	7	12	11	12	10	11	11	11	13	9	7	123	11
Leeuwarden.....	1800	7	7	9	12	12	12	9	11	11	10	7	7	114	11
The Hague.....	1800	9	10	14	16	15	16	16	16	14	13	8	8	155	11
Twente.....	1800	8	8	11	11	11	11	9	10	12	11	8	7	117	11
Vlissingen.....	1800	9	10	14	15	15	16	15	14	13	13	9	8	151	11
Westterschelling.....	1800	13	8	10	13	13	13	11	10	8	10	12	12	133	3-11
Zuid-Limburg Airport.....	1800	10	10	15	13	14	14	13	14	15	14	10	9	151	11

FIGURE 23-36. MEAN NUMBER OF DAYS WITH ≥ 7 -EIGHTHS CLOUD COVER BELOW 8,200 FEET AT SPECIFIED HOURS

STATION	HOURL (LST)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN	YRS REC
Amsterdam.....	0000	16	13	12	9	9	8	9	7	9	10	13	16	131	11
De Bilt.....	0000	17	14	12	9	9	7	8	7	8	12	14	17	134	11
Deelen.....	0000	19	14	14	9	10	9	8	7	7	12	14	18	141	7-8
Den Helder.....	0000	17	14	15	11	10	10	10	8	8	11	15	18	147	11
Eelde.....	0000	17	13	13	10	9	8	10	6	6	12	13	17	134	11
Gilze.....	0000	16	13	12	7	8	6	8	7	8	11	14	16	126	9-11
Leeuwarden.....	0000	16	14	13	9	9	8	8	5	5	11	13	16	127	11
The Hague.....	0000	16	14	14	9	8	6	9	8	9	14	15	17	139	4
Twente.....	0000	17	14	12	8	7	8	8	6	7	11	13	18	129	11
Vlissingen.....	0000	16	12	12	8	10	8	9	7	8	10	13	15	128	11
Westterschelling.....	0000	10	10	9	6	3	5	5	3	4	7	10	13	85	3-5
Zuid-Limburg Airport.....	0000	17	15	13	9	8	9	9	8	8	11	15	17	139	11
Amsterdam.....	0600	16	14	13	9	8	9	8	6	6	11	14	17	131	11
De Bilt.....	0600	17	16	14	9	9	9	10	8	7	12	14	18	143	11
Deelen.....	0600	19	16	17	10	10	11	12	11	10	14	15	19	164	9
Den Helder.....	0600	18	15	15	10	9	9	10	7	7	12	14	18	144	11
Eelde.....	0600	17	14	13	9	9	8	8	7	6	10	14	17	132	11
Gilze.....	0600	17	15	13	9	7	8	9	7	7	11	13	17	133	11
Leeuwarden.....	0600	16	15	13	9	9	8	9	6	6	10	14	17	132	11
The Hague.....	0600	16	14	13	9	8	8	8	7	7	11	13	17	131	11
Twente.....	0600	18	15	14	10	9	8	11	8	8	13	15	18	147	11
Vlissingen.....	0600	17	16	14	9	8	9	9	7	7	12	13	17	138	11
Westterschelling.....	0600	12	13	16	11	11	11	12	10	10	14	15	14	149	4-11
Zuid-Limburg Airport.....	0600	19	16	14	10	10	10	10	9	8	12	16	19	153	11
Amsterdam.....	1200	11	10	8	6	5	4	5	3	4	8	9	12	85	11
De Bilt.....	1200	13	12	10	7	7	5	6	5	8	9	12	15	109	11
Deelen.....	1200	16	13	11	10	8	8	8	7	9	12	13	17	132	9
Den Helder.....	1200	13	11	12	7	8	7	8	5	6	10	12	13	112	11
Eelde.....	1200	13	11	10	6	6	6	6	3	5	8	11	13	98	11
Gilze.....	1200	13	12	10	7	5	6	5	5	6	8	10	14	101	11
Leeuwarden.....	1200	13	10	12	7	7	7	7	6	6	8	10	13	106	11
The Hague.....	1200	12	10	10	6	4	4	6	4	6	8	10	13	93	11
Twente.....	1200	16	11	11	8	6	7	7	5	5	10	13	15	114	11
Vlissingen.....	1200	13	10	10	7	4	6	6	5	4	8	11	13	97	11
Westterschelling.....	1200	16	16	14	9	9	10	11	8	9	12	13	17	144	11
Zuid-Limburg Airport.....	1200	15	12	10	7	5	5	7	5	5	9	12	16	108	11
Amsterdam.....	1800	14	10	7	5	4	3	3	3	4	9	13	16	91	11
De Bilt.....	1800	16	11	9	5	6	4	6	5	5	10	14	18	109	11
Deelen.....	1800	18	13	10	6	6	5	7	5	6	10	14	17	117	9
Den Helder.....	1800	16	12	12	7	7	5	6	3	6	11	14	17	116	11
Eelde.....	1800	15	13	9	5	5	5	5	3	4	9	12	17	102	11
Gilze.....	1800	16	11	8	5	4	4	4	3	4	8	12	17	96	11
Leeuwarden.....	1800	14	12	10	6	6	4	5	3	4	8	11	15	98	11
The Hague.....	1800	13	11	8	3	4	3	4	3	4	8	12	16	89	11
Twente.....	1800	17	12	9	5	5	5	5	4	4	9	12	17	104	11
Vlissingen.....	1800	16	11	8	5	5	4	5	5	4	8	13	16	100	11
Westterschelling.....	1800	13	12	13	9	9	8	8	6	8	10	11	12	119	3-11
Zuid-Limburg Airport.....	1800	16	13	8	6	5	6	7	4	5	10	13	17	110	11

FIGURE 23-37. MEAN NUMBER OF DAYS WITH CEILING* <1,000 FEET AT SPECIFIED HOURS

STATION	HOURL (LST)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN	YRS REC
Amsterdam.....	0000	7	6	6	4	3	2	2	2	1	4	6	8	51	11
De Bilt.....	0000	8	6	5	3	2	2	2	2	2	5	6	9	52	11
Deelen.....	0000	9	9	6	2	2	2	2	2	1	6	7	10	58	7-8
Den Helder.....	0000	8	6	6	3	2	3	3	2	2	3	6	8	52	11
Eelde.....	0000	8	6	7	3	2	2	3	2	2	5	7	11	58	11
Gilze.....	0000	8	7	6	3	2	2	2	2	2	4	6	9	53	11
Leeuwarden.....	0000	9	7	6	2	3	2	3	2	2	5	8	11	60	11
The Hague.....	0000	8	8	6	3	2	2	4	2	2	4	6	7	54	4
Twente.....	0000	10	7	6	2	3	3	3	2	2	5	7	10	60	11
Vlissingen.....	0000	7	5	5	2	2	2	3	2	2	2	4	6	42	11
Westterschelling.....	0000	8	9	7	5	2	4	4	3	2	6	9	9	68	3-5
Zuid-Limburg Airport.....	0000	9	7	5	3	2	3	2	3	3	4	5	7	53	11
Amsterdam.....	0600	8	8	8	4	4	5	5	3	3	5	6	10	69	11
De Bilt.....	0600	9	7	8	5	4	5	5	3	5	6	4	10	71	11
Deelen.....	0600	11	9	9	6	5	5	8	8	7	8	7	10	93	9
Den Helder.....	0600	8	9	7	4	2	3	4	3	2	4	7	9	62	11
Eelde.....	0600	9	9	9	5	4	5	3	3	3	6	8	10	74	11
Gilze.....	0600	10	7	8	4	4	5	7	4	4	5	6	9	73	11
Leeuwarden.....	0600	9	8	7	5	4	4	5	4	3	6	8	10	73	11
The Hague.....	0600	8	7	8	4	4	5	5	3	4	6	6	8	68	11
Twente.....	0600	11	8	8	6	5	6	7	6	6	7	8	11	89	11
Vlissingen.....	0600	6	7	6	3	3	3	3	3	3	5	5	7	54	11
Westterschelling.....	0600	10	12	13	9	8	8	9	10	8	11	13	12	123	4-11
Zuid-Limburg Airport.....	0600	10	7	8	6	6	5	7	5	5	7	8	8	82	11
Amsterdam.....	1200	9	7	5	2	2	1	2	2	3	5	6	9	53	11
De Bilt.....	1200	10	7	5	3	2	1	2	2	3	5	6	8	54	11
Deelen.....	1200	11	8	6	3	2	1	3	2	3	7	7	12	65	9
Den Helder.....	1200	7	7	6	2	3	3	3	1	2	4	6	7	51	11
Eelde.....	1200	10	8	6	3	2	2	2	2	2	5	8	10	60	11
Gilze.....	1200	10	7	5	2	1	2	2	2	2	4	8	9	54	11
Leeuwarden.....	1200	11	8	7	3	2	3	4	3	3	6	8	11	69	11
The Hague.....	1200	9	7	5	4	2	3	2	2	3	6	6	10	59	11
Twente.....	1200	12	9	5	2	1	2	3	1	3	6	8	11	63	11
Vlissingen.....	1200	7	6	4	2	1	2	1	1	2	4	5	6	41	11
Westterschelling.....	1200	14	12	12	6	5	6	7	7	6	10	12	14	111	11
Zuid-Limburg Airport.....	1200	9	5	4	2	2	1	2	1	1	4	6	7	44	11
Amsterdam.....	1800	7	6	3	2	1	2	2	3	1	4	6	9	46	11
De Bilt.....	1800	9	6	4	2	1	1	1	1	2	3	6	9	45	11
Deelen.....	1800	11	8	5	3	2	2	2	2	1	5	6	10	57	9
Den Helder.....	1800	7	7	5	3	2	2	2	1	1	3	5	7	45	11
Eelde.....	1800	9	6	5	2	2	2	2	1	1	4	7	9	50	11
Gilze.....	1800	7	6	3	1	1	2	2	1	2	3	5	9	42	11
Leeuwarden.....	1800	8	8	6	2	3	2	2	1	2	4	6	9	53	11
The Hague.....	1800	8	6	5	2	1	2	1	2	2	4	5	8	46	11
Twente.....	1800	10	6	4	2	1	2	1	1	2	3	6	9	47	11
Vlissingen.....	1800	6	5	2	1	1	1	1	1	1	2	4	6	31	11
Westterschelling.....	1800	10	11	11	6	6	5	6	6	6	8	9	11	95	3-11
Zuid-Limburg Airport.....	1800	7	5	2	2	**	1	1	1	1	2	4	6	32	11

* Ceiling herein is defined as $\geq$ 5-eighths cloud cover.

** <0.5 day.

FIGURE 23-38. MEAN NUMBER OF DAYS WITH VISIBILITY <2½ MILES AT SPECIFIED HOURS

STATION	HOOR (LST)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN	YRS REC
Amsterdam.....	0000	8	8	7	3	2	1	2	3	3	5	7	9	58	11
De Bilt.....	0000	9	9	7	2	2	2	3	4	4	8	9	11	70	11
Deelen.....	0000	12	11	9	3	2	2	3	4	4	10	12	15	87	7-8
Den Helder.....	0000	7	7	7	3	1	1	1	1	1	3	5	8	45	11
Eelde.....	0000	11	11	10	4	3	4	4	6	5	9	12	13	92	11
Gilze.....	0000	12	10	11	4	3	4	4	4	6	10	13	13	94	11
Leeuwarden.....	0000	10	11	10	5	3	2	3	4	4	8	11	12	83	11
The Hague.....	0000	9	10	7	2	2	2	3	4	4	7	10	11	71	4
Twente.....	0000	13	12	10	3	3	2	3	3	4	11	14	15	93	11
Vlissingen.....	0000	12	9	10	3	2	2	2	2	3	6	9	11	71	11
Westerschelling.....	0000	8	11	8	3	1	1	1	*	2	3	9	9	56	3-5
Zuid-Limburg Airport.....	0000	10	12	7	3	2	3	2	2	5	8	10	9	73	11
Amsterdam.....	0600	8	10	12	4	3	3	3	6	8	11	8	9	85	11
De Bilt.....	0600	9	9	10	8	5	5	6	7	9	11	9	11	99	11
Deelen.....	0600	11	13	16	10	5	4	8	9	11	14	13	14	128	9
Den Helder.....	0600	7	10	9	3	1	1	2	2	2	5	6	8	56	11
Eelde.....	0600	11	14	14	6	4	3	4	6	8	14	14	12	110	11
Gilze.....	0600	12	13	16	10	5	6	7	9	12	16	14	13	133	11
Leeuwarden.....	0600	10	13	13	5	3	2	2	5	7	11	10	11	92	11
The Hague.....	0600	10	12	15	7	5	3	4	8	10	13	9	8	104	11
Twente.....	0600	12	14	14	7	4	4	6	8	10	15	15	14	123	11
Vlissingen.....	0600	12	11	15	7	4	4	5	6	7	10	10	10	101	11
Westerschelling.....	0600	11	11	8	3	2	1	1	2	2	4	6	11	62	4-11
Zuid-Limburg Airport.....	0600	10	12	10	9	6	5	6	7	7	10	10	10	102	11
Amsterdam.....	1200	10	8	5	1	*	*	*	*	2	4	6	10	46	11
De Bilt.....	1200	10	9	6	1	1	*	1	1	2	4	8	12	55	11
Deelen.....	1200	12	10	7	1	*	1	2	1	2	6	10	13	65	9
Den Helder.....	1200	6	7	7	2	1	1	1	1	1	3	5	7	42	11
Eelde.....	1200	9	11	8	1	*	*	1	1	1	3	10	11	56	11
Gilze.....	1200	13	10	6	1	1	*	1	1	2	5	10	13	63	11
Leeuwarden.....	1200	10	8	5	1	*	*	1	1	1	3	5	9	44	11
The Hague.....	1200	11	9	7	1	*	1	1	1	2	4	8	12	57	11
Twente.....	1200	11	10	5	1	*	1	1	1	2	6	11	12	61	11
Vlissingen.....	1200	13	12	10	2	1	1	1	1	1	6	10	11	69	11
Westerschelling.....	1200	7	8	8	2	1	*	*	1	2	4	6	8	47	11
Zuid-Limburg Airport.....	1200	9	8	5	2	*	*	1	1	2	4	5	8	45	11
Amsterdam.....	1800	7	8	7	1	*	*	1	1	2	4	7	9	47	11
De Bilt.....	1800	9	9	7	1	1	1	*	1	1	5	8	11	54	11
Deelen.....	1800	13	11	6	2	1	1	1	1	2	8	12	14	72	9
Den Helder.....	1800	7	7	6	2	1	1	1	1	1	3	5	8	43	11
Eelde.....	1800	11	11	9	1	1	1	1	1	2	8	12	12	70	11
Gilze.....	1800	13	10	7	1	1	1	*	1	2	8	12	14	70	11
Leeuwarden.....	1800	11	11	8	1	1	*	*	1	2	5	9	11	60	11
The Hague.....	1800	10	10	8	1	*	*	*	1	2	6	9	12	59	11
Twente.....	1800	13	11	5	1	1	1	1	1	2	7	13	13	69	11
Vlissingen.....	1800	12	10	8	2	1	1	1	1	2	6	8	12	64	11
Westerschelling.....	1800	8	6	8	1	1	1	1	*	1	3	8	9	47	3-11
Zuid-Limburg Airport.....	1800	9	8	5	1	*	1	*	1	2	5	8	10	50	11

* <0.5 day.

FIGURE 23-39. MEAN NUMBER OF DAYS WITH FOG (VISIBILITY $\leq \frac{5}{8}$ MILE)

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN	YRS REC
Akkrum.....	4	5	2	1	*	0	0	*	2	4	6	7	31	7
Amsterdam.....	10	6	6	1	1	*	*	1	1	3	7	11	48	16
Averreest.....	4	5	3	2	*	*	*	1	2	5	6	6	34	21
Borne.....	4	3	2	1	*	0	*	*	1	4	5	6	26	18
De Bilt.....	5	3	3	1	*	*	1	1	2	3	4	5	28	41
Den Helder.....	6	5	4	2	2	1	1	*	1	3	5	5	35	6
Gemert.....	5	5	3	2	1	1	2	3	6	7	7	7	49	20
Goes.....	6	5	3	1	1	*	1	*	3	4	6	6	36	6
Groningen.....	5	5	4	1	1	*	*	1	2	4	5	6	34	30
Hallum.....	8	4	4	2	1	*	0	1	3	3	7	6	39	9
Helmond.....	4	3	2	1	*	*	*	1	2	3	5	4	25	43
Hoorn.....	8	6	5	1	1	*	*	*	1	4	8	9	43	34
Katwijk Aan Zee.....	5	3	3	1	1	*	*	1	3	4	4	7	32	9
Leeuwarden.....	5	4	3	1	*	*	1	*	3	6	6	6	35	18
Maastricht.....	3	2	3	1	1	1	1	4	3	2	5	3	28	7
Naaldwijk.....	5	3	5	1	*	*	*	1	2	3	5	6	31	11
Noord Hinder Lightship.....	4	4	3	4	4	5	2	1	1	1	2	3	34	48
Oudenbosch.....	6	5	4	1	1	*	1	1	4	5	7	7	42	25
Rotterdam.....	6	4	3	1	1	*	1	1	2	3	6	6	34	18
Schiermonnikoog.....	4	4	4	1	1	*	0	*	1	2	3	6	26	15
Sittard.....	3	3	3	2	1	1	1	2	3	3	5	4	31	2
Slijk Ewijk.....	4	4	3	2	1	1	2	3	6	7	7	5	45	28
Terschelling Lightship.....	6	5	4	4	4	4	1	1	1	2	4	5	42	25
Uithuizen.....	5	4	2	1	1	0	0	*	1	2	4	4	24	7
Vlissingen.....	6	4	3	2	2	1	1	1	2	3	4	6	35	37
Warnsveld.....	4	3	3	1	1	1	1	2	3	4	4	4	31	23
Westerschelling.....	4	4	2	1	1	1	*	*	1	1	2	4	21	33
Winterswijk.....	5	5	3	2	1	*	1	1	3	5	7	6	39	30
Zuidbarge.....	4	4	2	*	*	*	*	*	2	3	4	5	24	16

* <0.5 day.

FIGURE 23-40. MEAN NUMBER OF DAYS WITH CEILING $\leq 1,000$ FEET AND VISIBILITY $\leq 2\frac{1}{2}$ MILES AT SPECIFIED HOURS

STATION	HOURL (LST)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN	YRS REC
Amsterdam.....	0000	20	19	22	26	27	27	27	27	27	24	22	19	287	11
De Bilt.....	0000	19	18	22	26	28	27	27	26	25	21	19	17	275	11
Deelen.....	0000	16	16	20	26	27	26	26	26	26	20	17	13	259	7-8
Den Helder.....	0000	21	20	23	26	29	27	28	28	27	26	23	20	298	11
Eelde.....	0000	17	17	19	25	27	25	24	24	24	21	17	15	255	11
Gilze.....	0000	16	17	18	24	26	26	26	26	23	20	16	15	253	9-11
Leeuwarden.....	0000	18	17	20	25	27	26	26	26	25	21	18	16	265	11
The Hague.....	0000	19	16	19	26	27	27	25	25	24	22	19	18	267	4
Twente.....	0000	16	16	19	26	26	26	26	26	24	19	14	14	252	11
Vlissingen.....	0000	18	18	20	27	28	26	27	28	27	24	20	18	281	11
Westerschelling.....	0000	21	16	22	24	29	26	27	28	27	24	20	20	284	3-5
Zuid-Limburg Airport.....	0000	19	16	23	26	28	26	28	26	24	22	18	19	275	11
Amsterdam.....	0600	20	16	17	23	26	25	24	23	22	19	20	19	254	11
De Bilt.....	0600	18	17	19	20	24	24	22	23	20	18	19	17	241	11
Deelen.....	0600	16	14	14	19	24	23	20	18	17	15	15	14	209	9
Den Helder.....	0600	21	17	20	25	28	27	27	27	26	24	22	20	284	11
Eelde.....	0600	18	14	16	22	25	25	25	23	21	16	15	17	237	11
Gilze.....	0600	16	15	14	19	24	22	21	21	17	15	15	16	215	11
Leeuwarden.....	0600	19	15	17	23	26	26	26	24	23	19	18	17	253	11
The Hague.....	0600	19	16	14	21	25	24	24	22	19	16	20	20	240	11
Twente.....	0600	15	14	16	21	24	23	21	20	18	14	13	14	213	11
Vlissingen.....	0600	18	17	15	22	26	24	25	24	22	20	20	20	253	11
Westerschelling.....	0600	17	15	15	21	23	22	22	21	22	19	17	18	232	4-11
Zuid-Limburg Airport.....	0600	18	16	18	19	22	23	21	22	21	20	18	20	238	11
Amsterdam.....	1200	18	19	24	27	29	28	29	29	27	25	22	18	296	11
De Bilt.....	1200	18	17	23	27	29	29	29	29	26	25	20	17	289	11
Deelen.....	1200	15	15	22	27	29	28	27	29	26	23	18	14	273	9
Den Helder.....	1200	22	20	22	27	28	27	28	29	28	26	23	21	301	11
Eelde.....	1200	18	16	22	27	29	28	28	29	28	25	18	18	287	11
Gilze.....	1200	16	17	23	27	29	28	29	29	27	25	18	16	285	11
Leeuwarden.....	1200	18	18	23	27	29	27	27	28	27	25	21	18	288	11
The Hague.....	1200	18	17	22	26	29	27	29	29	27	24	21	16	285	11
Twente.....	1200	15	16	24	27	30	28	28	29	27	23	17	16	280	11
Vlissingen.....	1200	17	16	21	27	29	28	29	29	27	24	19	18	284	11
Westerschelling.....	1200	16	16	18	23	26	24	24	24	24	21	18	16	250	11
Zuid-Limburg Airport.....	1200	19	20	25	28	29	29	29	30	28	26	22	20	305	11
Amsterdam.....	1800	21	19	24	28	30	28	29	28	28	26	22	19	302	11
De Bilt.....	1800	19	18	24	28	30	29	29	29	28	25	20	17	296	11
Deelen.....	1800	14	17	22	27	29	28	29	29	27	22	17	15	276	9
Den Helder.....	1800	21	19	23	27	29	28	29	30	28	27	23	22	306	11
Eelde.....	1800	18	17	21	28	29	28	29	30	28	23	18	17	286	11
Gilze.....	1800	16	17	22	28	30	28	29	30	27	23	18	15	283	11
Leeuwarden.....	1800	18	17	21	28	28	28	29	29	27	24	19	18	286	11
The Hague.....	1800	18	17	21	28	30	28	29	29	27	23	20	18	288	11
Twente.....	1800	16	16	24	27	30	28	30	30	27	23	16	16	283	11
Vlissingen.....	1800	18	18	22	28	29	28	30	30	28	24	21	18	291	11
Westerschelling.....	1800	18	16	19	24	25	25	25	25	24	22	20	19	262	3-11
Zuid-Limburg Airport.....	1800	20	19	25	28	31	28	30	30	28	26	22	20	307	11

FIGURE 23-41. PERCENTAGE FREQUENCY OF WINDS EXCEEDING SPECIFIED SPEEDS

STATION	SPEEDS ≥ 17 KNOTS				SPEEDS ≥ 28 KNOTS			
	Dec-Jan- Feb	Mar-Apr- May	Jun-Jul- Aug	Sep-Oct- Nov	Dec-Jan- Feb	Mar-Apr- May	Jun-Jul- Aug	Sep-Oct- Nov
Amsterdam.....	24	18	12	16	5	2	1	1
De Bilt.....	15	9	3	8	1	1	*	*
Deelen.....	16	11	7	11	1	1	*	1
Den Helder.....	39	31	27	31	9	4	2	5
Eelde.....	20	11	6	11	2	1	*	1
Eindhoven.....	23	14	11	13	3	2	1	1
Gilze.....	18	11	6	10	2	1	*	*
Goeree Lightship.....	43	24	25	38	11	3	3	8
Hoek Van Holland.....	33	23	24	30	6	3	3	5
Ijmuiden.....	41	29	34	39	12	4	7	11
Leeuwarden.....	20	12	6	10	3	2	*	1
Noord Hinder Lightship.....	46	22	24	36	13	2	2	8
Ramspol.....	24	13	13	15	3	2	2	2
Rotterdam.....	17	12	6	10	1	0	*	1
Soesterberg.....	14	8	7	9	2	1	*	1
Terschelling Lightship.....	37	19	16	34	10	2	2	6
Texel Lightship.....	40	18	17	36	12	3	2	9
The Hague.....	25	16	10	13	3	2	1	1
Twente.....	11	7	3	5	1	1	*	*
Valkenburg.....	23	16	11	16	2	1	*	1
Vlissingen.....	23	13	11	15	2	1	1	1
Volkel.....	15	6	3	8	2	*	0	*
Westerschelling.....	11	3	5	7	1	*	*	*
Woensdrecht.....	15	9	5	8	1	1	*	*
Zuid-Limburg Airport.....	15	7	2	7	1	*	*	*

* <0.5%.

FIGURE 23-42. MEAN DAILY MAXIMUM AND MINIMUM TEMPERATURES (°F.)

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN	YRS REC
Akkrum.....	Max	39	41	47	53	63	67	70	69	65	56	45	40	55	18
	Min	30	30	33	37	44	49	53	53	48	42	35	32	41	18
Averreest.....	Max	39	42	48	55	64	68	71	70	65	56	46	41	55	21
	Min	30	30	33	36	43	48	52	52	47	41	34	33	40	21
De Bilt.....	Max	41	43	49	55	65	69	71	70	66	57	47	42	56	45
	Min	32	31	35	38	46	50	54	53	49	43	36	33	42	45
Den Helder.....	Max	40	40	44	50	58	62	66	66	63	56	47	43	53	45
	Min	33	33	36	41	48	53	57	57	53	47	40	36	44	45
Gemert.....	Max	41	43	49	56	66	69	73	72	67	58	47	42	57	45
	Min	32	31	35	38	45	50	54	53	49	43	36	33	42	45
Gilze.....	Max	40	41	49	56	63	68	72	71	66	58	47	42	56	11
	Min	32	31	35	38	45	50	55	54	51	44	38	35	42	11
Groningen.....	Max	39	41	47	54	63	67	70	69	65	56	45	41	55	45
	Min	31	31	34	38	46	50	54	53	50	43	36	33	42	45
Maastricht.....	Max	42	45	50	57	67	71	74	73	68	58	48	43	58	45
	Min	33	33	37	40	48	52	56	55	51	45	38	35	44	45
Naaldwijk.....	Max	42	41	48	53	62	67	70	70	66	57	48	42	55	8
	Min	33	32	35	41	47	53	57	56	52	46	39	35	44	8
Ramspol.....	Max	37	37	46	53	60	66	68	68	64	56	46	42	54	8
	Min	32	30	35	40	46	53	57	57	52	47	38	36	44	6-7
Vlissingen.....	Max	41	42	47	52	61	65	69	68	64	56	48	43	55	45
	Min	35	35	38	42	49	53	57	58	54	48	40	37	46	45
Winterswijk.....	Max	40	42	49	55	65	69	72	71	66	57	46	41	56	45
	Min	31	31	34	38	45	49	53	53	48	43	36	33	41	45

FIGURE 23-43. ABSOLUTE MAXIMUM AND MINIMUM TEMPERATURES (°F.)

STATION		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN	YRS REC
Akkrum.....	Max	52	58	70	77	90	91	94	90	84	78	63	54	94	18
	Min	0	-4	10	21	25	33	40	38	30	19	8	-6	-6	18
Averreest.....	Max	55	62	72	80	92	90	95	93	89	81	64	56	95	21
	Min	-6	-3	11	18	23	32	35	36	27	17	7	-8	-8	21
De Bilt.....	Max	55	65	71	80	92	93	96	95	88	80	67	57	96	81
	Min	-5	-4	9	22	25	35	38	39	31	20	6	-4	-5	81
Den Helder.....	Max	52	58	67	76	84	89	92	87	86	77	64	56	92	66
	Min	4	10	18	25	31	41	44	44	41	29	13	6	4	66
Gemert.....	Max	58	62	73	80	96	93	96	96	92	84	66	59	96	45
	Min	6	-5	13	22	26	33	38	37	29	17	10	1	-5	45
Gilze.....	Max	55	64	72	81	86	95	97	90	95	79	64	61	97	11
	Min	9	-2	18	27	28	37	41	41	37	23	18	3	-2	11
Groningen.....	Max	53	64	73	81	90	93	96	93	89	81	67	54	96	66
	Min	1	-2	9	24	31	37	41	42	35	24	14	5	-2	66
Maastricht.....	Max	61	68	74	82	94	98	98	99	95	85	74	62	99	78
	Min	-5	-4	9	23	30	36	43	43	33	23	10	-5	-5	78
Naaldwijk.....	Max	55	54	67	74	86	93	94	92	86	73	62	54	94	8
	Min	12	3	16	24	29	41	46	46	37	23	26	12	3	8
Ramspol.....	Max	50	61	66	73	82	90	91	84	81	73	61	54	91	8
	Min	14	-8	14	27	32	37	50	46	43	34	19	16	-8	7
Vlissingen.....	Max	58	60	69	86	95	94	94	90	92	75	62	58	95	75
	Min	8	3	18	24	33	43	47	47	39	29	16	6	.3	75
Winterswijk.....	Max	56	69	74	81	93	92	95	95	91	81	68	59	95	45
	Min	3	-8	6	17	25	30	37	38	29	17	9	-7	-8	45

FIGURE 23-44. MEAN RELATIVE HUMIDITY (%) AT SPECIFIED HOURS

STATION	HOOR (LST)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN	YRS REC
Akkrum.....	0800	91	90	87	81	77	77	80	82	87	91	91	92	86	43
Averreest.....	0800	90	95	92	84	76	79	84	85	87	94	94	94	88	8
De Bilt.....	0800	91	90	86	80	75	76	79	82	85	91	92	92	85	43
Den Helder.....	0800	89	88	87	82	80	79	80	80	80	84	87	89	84	43
Gemert.....	0800	91	91	85	79	74	76	80	82	87	90	91	91	85	43
Groningen.....	0800	90	90	88	81	76	77	80	84	87	91	91	90	85	43
Hoorn.....	0800	92	89	89	84	79	79	81	87	86	90	92	92	87	43
Maastricht.....	0800	87	85	82	78	74	74	76	80	83	87	88	87	82	43
Naaldwijk.....	0800	89	88	83	81	78	78	79	80	84	88	89	89	84	43
Oudenbosch.....	0800	91	90	87	82	78	79	81	85	89	91	92	92	86	43
Vlissingen.....	0800	90	89	88	82	80	80	80	81	83	86	89	90	85	43
Winterswijk.....	0800	91	90	86	79	73	75	79	81	86	90	91	91	84	43
Akkrum.....	1400	87	82	73	67	64	65	69	70	70	78	84	88	75	43
Averreest.....	1400	89	83	78	70	64	70	72	75	75	82	87	91	78	8
De Bilt.....	1400	83	76	66	62	61	62	64	65	67	74	81	86	71	43
Den Helder.....	1400	87	84	79	75	74	74	74	73	72	77	83	87	78	43
Gemert.....	1400	82	78	67	61	58	62	64	63	66	73	81	86	70	43
Groningen.....	1400	85	80	71	63	61	64	66	67	68	76	82	86	72	43
Hoorn.....	1400	89	84	79	74	70	71	73	71	75	81	87	90	79	43
Maastricht.....	1400	80	73	65	60	56	58	59	61	63	71	78	82	67	43
Naaldwijk.....	1400	85	81	74	68	66	69	70	71	70	76	82	86	75	43
Oudenbosch.....	1400	83	87	68	63	61	64	65	66	68	77	81	86	72	43
Vlissingen.....	1400	85	82	76	69	68	69	69	68	69	75	82	86	75	43
Winterswijk.....	1400	83	76	67	59	56	59	62	62	65	72	79	84	69	43
Akkrum.....	1900	90	89	85	81	79	77	80	84	88	90	90	91	85	43
Averreest.....	1900	92	92	88	80	74	79	82	87	91	93	93	94	87	8
De Bilt.....	1900	89	87	81	77	75	73	76	81	87	90	90	91	83	43
Den Helder.....	1900	88	87	85	81	80	79	79	79	79	83	85	88	83	43
Gemert.....	1900	89	88	81	76	72	73	76	79	85	89	89	90	82	43
Groningen.....	1900	89	88	83	77	74	74	77	80	84	88	89	89	83	43
Hoorn.....	1900	92	89	88	85	81	80	82	85	86	89	91	91	87	43
Maastricht.....	1900	85	81	75	70	65	66	68	71	77	83	85	86	76	43
Naaldwijk.....	1900	90	87	85	81	76	76	77	80	85	87	90	90	84	8
Oudenbosch.....	1900	90	87	83	79	76	76	78	82	87	91	90	90	84	43
Vlissingen.....	1900	89	87	84	79	77	76	76	77	80	84	87	88	82	43
Winterswijk.....	1900	89	86	79	72	69	69	72	77	84	88	89	90	80	43

FIGURE 23-45. MEAN PRECIPITATION (INCHES)

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN	YRS REC
Akkrum.....	2.0	1.7	1.5	1.9	1.9	2.1	2.8	2.7	2.8	2.5	2.2	2.1	26.2	44
Amsterdam.....	2.0	1.4	1.3	1.6	1.8	1.8	2.6	2.7	2.8	2.8	2.6	2.2	25.6	29
Averreest.....	2.2	1.6	1.6	2.1	2.0	2.5	3.2	3.5	2.5	2.4	2.0	2.6	28.2	14
De Bilt.....	2.2	1.7	1.9	1.8	2.0	2.4	3.0	3.3	2.7	2.9	2.4	2.7	29.0	88
Den Helder.....	1.9	1.5	1.7	1.3	1.5	1.7	2.2	3.0	2.8	3.3	2.6	2.4	25.9	40
Gemert.....	2.4	2.0	1.6	1.9	1.9	2.6	2.7	2.7	2.4	2.7	2.1	2.6	27.6	19
Groningen.....	1.9	1.6	1.8	1.5	1.9	2.4	2.9	3.5	2.7	2.8	2.4	2.1	27.5	57
Hoorn.....	2.1	1.6	1.5	1.8	1.6	2.3	2.4	3.0	3.1	3.1	2.5	2.5	27.5	19
Katwijk Aan Zee.....	2.3	1.7	1.5	1.9	1.8	2.2	2.6	2.8	3.5	3.3	2.9	2.7	29.2	19
Maastricht.....	1.9	1.6	1.9	1.6	2.1	2.4	3.2	2.8	2.3	2.4	2.2	2.4	26.8	58
Naaldwijk.....	2.3	1.7	1.6	1.7	1.7	2.2	2.6	2.9	3.6	3.2	3.0	2.8	29.3	19
Oudenbosch.....	2.4	1.9	1.6	1.9	1.7	2.5	2.8	3.1	3.0	3.0	2.6	2.7	29.2	19
Rotterdam.....	2.0	1.7	2.0	1.5	1.6	2.4	2.6	3.0	2.4	3.2	2.4	2.8	27.6	25
Sittard.....	2.5	1.9	1.6	2.4	1.9	2.6	2.9	2.7	2.3	2.9	2.2	2.7	28.6	19
Slijk Ewijk.....	2.7	2.0	1.8	1.9	1.9	2.1	2.3	3.1	2.4	2.7	2.2	3.1	28.2	10
Vlissingen.....	1.9	1.5	1.8	1.5	2.0	2.1	2.6	3.0	2.8	2.9	2.4	2.3	26.8	50
Warnsveld.....	2.1	1.4	1.5	2.1	2.1	2.7	2.8	3.0	2.2	2.9	2.1	2.4	27.3	16
Winterswijk.....	2.7	2.1	1.6	2.2	1.9	2.8	3.2	2.8	2.7	2.8	2.3	2.9	30.0	19

FIGURE 23-46. MAXIMUM 24-HOUR PRECIPITATION (INCHES)

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN	YRS REC
Akkrum.....	0.8	0.8	0.7	1.0	1.0	1.2	2.0	2.7	1.3	1.0	0.9	0.7	2.7	14
Amsterdam.....	1.3	0.8	0.9	1.0	1.3	1.5	2.3	1.5	1.5	1.6	1.1	1.2	2.3	37
Averreest.....	1.3	0.7	1.0	1.0	0.8	1.2	1.5	1.4	1.1	1.0	0.7	0.7	1.5	14
De Bilt.....	1.8	0.9	0.7	1.1	1.8	1.9	1.5	1.7	1.7	1.3	1.0	0.8	1.9	19
Gemert.....	1.4	1.0	0.7	1.1	1.0	1.4	1.4	1.6	1.1	1.4	0.9	0.9	1.6	19
Goes.....	1.1	0.7	0.7	0.8	1.0	1.4	1.0	1.7	0.9	1.5	1.2	0.9	1.7	6
Hoorn.....	0.7	0.7	0.6	1.1	1.2	1.1	1.3	2.1	1.4	1.8	1.1	0.7	2.1	19
Katwijk Aan Zee.....	0.9	0.8	0.9	0.9	1.6	1.5	1.3	1.0	1.8	1.5	1.0	0.9	1.8	14
Leeuwarden.....	0.8	0.4	0.7	0.5	1.1	1.2	1.0	2.3	1.0	2.0	0.7	0.9	2.3	5
Maastricht.....	0.9	0.6	0.7	1.2	1.9	1.2	2.7	1.3	1.1	1.6	1.5	0.7	2.7	19
Naaldwijk.....	1.7	0.8	0.9	1.2	1.5	1.7	1.5	1.9	1.4	1.3	1.1	1.3	1.9	19
Oudenbosch.....	1.0	0.7	1.3	0.7	1.6	1.2	1.2	1.7	1.3	1.5	1.2	0.9	1.7	19
Rotterdam.....	1.8	1.0	1.1	0.9	0.8	1.0	1.2	1.3	1.6	1.7	1.0	1.0	1.8	25
's Heerenberg.....	0.6	0.6	0.5	1.1	1.0	1.2	0.6	1.0	1.5	1.0	1.7	0.7	1.5	5
Sittard.....	1.4	0.7	0.9	1.2	2.5	1.9	1.5	1.7	1.1	1.5	1.4	1.0	2.5	19
Slijk Ewijk.....	0.8	0.9	0.9	0.6	1.6	1.0	1.1	2.2	0.8	1.3	0.7	1.0	2.2	10
Vlissingen.....	1.5	1.6	1.0	1.0	1.3	1.4	2.1	3.2	2.8	1.4	1.6	2.5	3.2	65
Warnsveld.....	1.5	0.7	0.8	0.8	1.9	1.6	1.3	1.5	0.9	1.3	0.9	0.8	1.9	16
Wijster.....	0.6	0.6	0.8	1.1	0.9	1.1	0.9	1.7	1.7	1.2	0.7	0.8	1.7	8
Winterswijk.....	1.3	0.9	0.8	2.1	1.4	1.3	2.5	1.6	1.3	0.5	1.0	1.3	2.5	19

FIGURE 23-47. MEAN NUMBER OF DAYS WITH PRECIPITATION ≥ 0.004 INCH

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN	YRS REC
Akkrum.....	20	17	16	17	14	14	15	17	20	22	20	20	212	14
Amsterdam.....	19	15	13	14	12	12	14	14	15	18	19	19	184	29
Averreest.....	19	14	15	14	13	13	16	17	15	16	18	19	189	14
De Bilt.....	19	16	18	15	15	14	16	18	17	20	19	20	207	na
Den Helder.....	16	14	16	13	12	11	13	15	15	18	18	18	179	na
Gemert.....	21	15	15	16	12	15	16	15	15	17	18	20	195	19
Groningen.....	19	17	16	15	14	14	16	16	17	19	20	20	203	30
Hoorn.....	20	15	15	15	12	14	14	14	16	18	18	21	192	19
Katwijk Aan Zee.....	20	14	15	14	11	13	13	16	16	17	18	21	188	14
Maastricht.....	17	13	14	15	13	13	15	15	15	15	15	18	178	19
Naaldwijk.....	18	13	12	12	10	11	12	12	14	16	16	18	164	19
Oudenbosch.....	20	16	14	15	12	13	15	14	15	17	18	20	189	19
Rotterdam.....	19	15	13	15	13	12	14	15	16	17	19	18	186	27
Sittard.....	18	14	13	15	13	14	15	14	14	15	16	18	179	19
Slijk Ewijk.....	20	15	17	14	13	14	16	17	14	15	14	19	188	10
Valkenburg.....	17	15	16	15	14	15	16	15	14	16	17	18	188	na
Vlissingen.....	18	14	17	14	14	13	14	15	15	18	18	19	189	na
Warnsveld.....	21	16	16	18	14	16	16	17	18	21	20	21	214	16
Winterswijk.....	20	18	16	17	14	14	16	16	17	21	21	21	211	30

na Data not available.

FIGURE 23-48. MEAN NUMBER OF DAYS WITH SNOWFALL

STATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN	YRS REC
Akkrum.....	3	3	2	2	0	0	0	0	0	*	1	3	15	13
Amsterdam.....	4	4	4	1	0	0	0	0	0	0	2	4	19	19
Averreest.....	5	4	5	2	0	0	0	0	0	1	2	3	21	8
De Bilt.....	4	4	4	1	0	0	0	0	0	*	2	4	19	40
Den Helder.....	3	3	3	1	0	0	0	0	0	*	1	2	13	40
Gemert.....	5	4	4	2	*	0	0	0	0	*	2	4	21	19
Groningen.....	4	5	4	2	0	0	0	0	0	*	1	4	20	40
Hoorn.....	4	4	3	1	0	0	0	0	0	0	1	4	17	19
Katwijk Aan Zee.....	4	2	5	2	0	0	0	0	0	*	2	3	18	11
Maastricht.....	5	5	5	2	0	0	0	0	0	*	2	4	23	40
Oudenbosch.....	3	2	2	1	0	0	0	0	0	0	1	2	11	18
Rotterdam.....	3	2	3	1	*	0	0	0	0	*	1	2	13	19
Sittard.....	4	3	3	2	0	0	0	0	0	0	2	3	17	19
Vlissingen.....	4	3	3	1	0	0	0	0	0	0	1	3	15	40
Warnsveld.....	6	4	4	2	0	0	0	0	0	*	2	4	23	16
Winterswijk.....	5	3	3	2	*	0	0	0	0	*	2	3	18	19

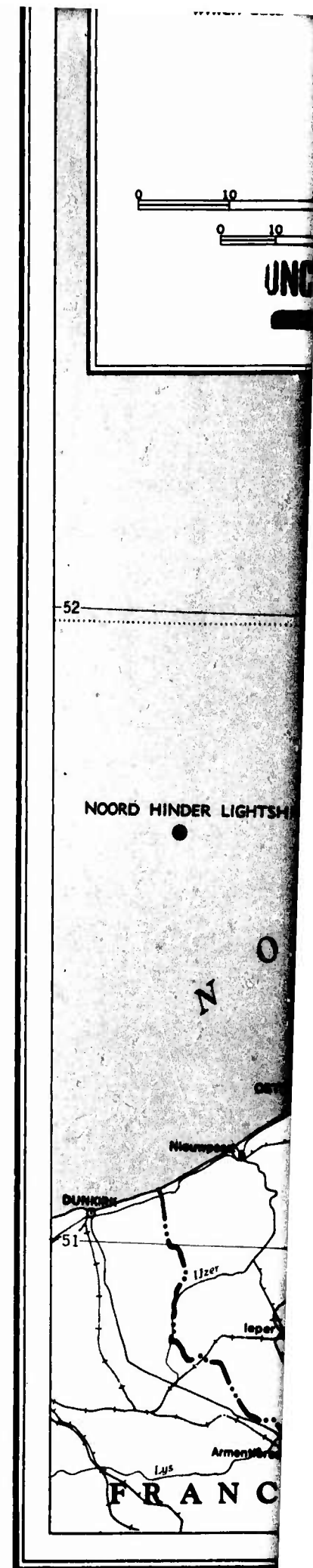
* <0.5 day.

LIST OF STATIONS

STATION	LATI- TUDE*	LONGI- TUDE*	ELEVA- TION
	° 'N.	° 'E.	feet
Akkrum.....	53 03	5 50	3
Amsterdam.....	52 19	4 47	5
Averreest.....	52 35	6 24	n a
Borne.....	52 18	6 47	n a
De Bilt.....	52 06	5 11	10
Deelen.....	52 04	5 55	172
Den Helder.....	52 58	4 48	18
Eelde.....	53 08	6 35	16
Eindhoven.....	51 26	5 30	75
Gemert.....	51 32	5 43	59
Gilze.....	51 33	4 57	39
Goeree Lightship.....	51 56	3 40	10
Goes.....	51 31	3 53	1
Groningen.....	53 13	6 33	7
Hallum.....	53 19	5 47	n a
Hauwert.....	52 42	5 08	n a
Helmond.....	51 29	5 40	n a
Hoek Van Holland.....	51 59	4 07	72
Hoorn.....	52 39	5 03	n a
Hummelo.....	52 00	6 15	n a
Ijmuiden.....	52 28	4 35	72
Katwijk Aan Zee.....	52 13	4 25	n a
Leeuwarden.....	53 12	5 47	5
Maastricht.....	50 51	5 41	162
Naaldwijk.....	51 59	4 12	n a
Noord Hinder Lightship.....	51 39	2 34	10
Oudenbosch.....	51 36	4 31	n a
Ramspol.....	52 37	5 51	16
Rotterdam.....	51 54	4 29	12
Schiermonnikoog.....	53 29	6 10	n a
's Heerenberg.....	51 54	6 13	256
Sittard.....	51 00	5 54	143
Slijk Ewijk.....	51 53	5 48	34
Soesterberg.....	52 07	5 19	59
Terschelling Lightship.....	53 29	5 08	10
Terwolde.....	52 17	6 08	n a
Texel Lightship.....	53 01	4 22	10
The Hague.....	52 05	4 18	13
Twente.....	52 16	6 53	135
Uithuizen.....	53 22	6 42	n a
Valkenburg.....	52 10	4 28	3
Vlissingen.....	51 26	3 35	17
Volkel.....	51 38	5 41	82
Warnsveld.....	52 08	6 14	25
Westernieland.....	53 24	6 31	n a
Westerschelling.....	53 22	5 13	105
Wijster.....	52 49	6 29	33
Winterswijk.....	51 58	6 43	120
Woensdrecht.....	51 25	4 18	64
Zuidbarge.....	52 45	6 56	n a
Zuid-Limburg Airport.....	50 55	5 46	381

n a Data not available.

* Coordinates give location of weather stations and do not necessarily correspond to those for populated places.



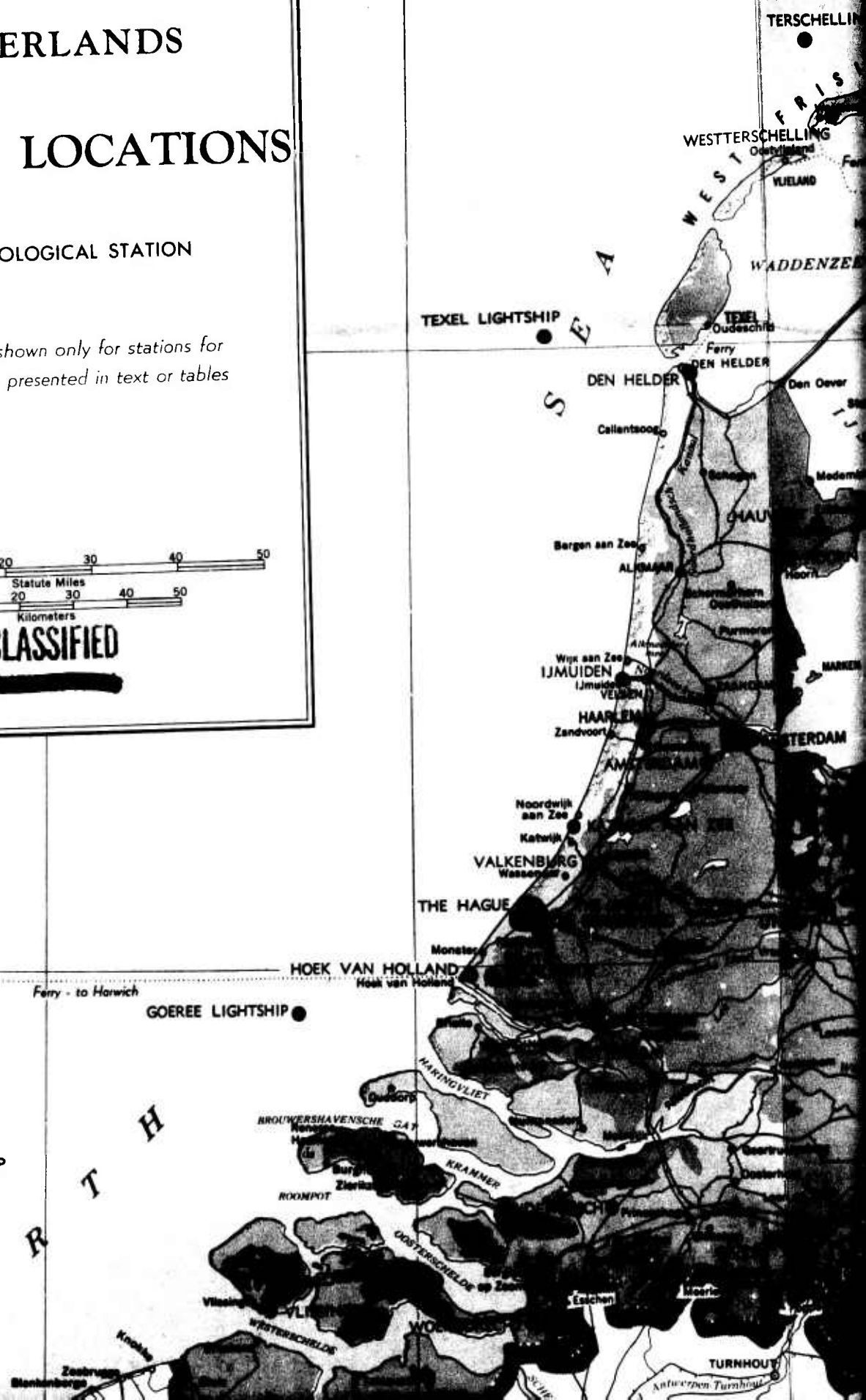
NETHERLANDS STATION LOCATIONS

● METEOROLOGICAL STATION

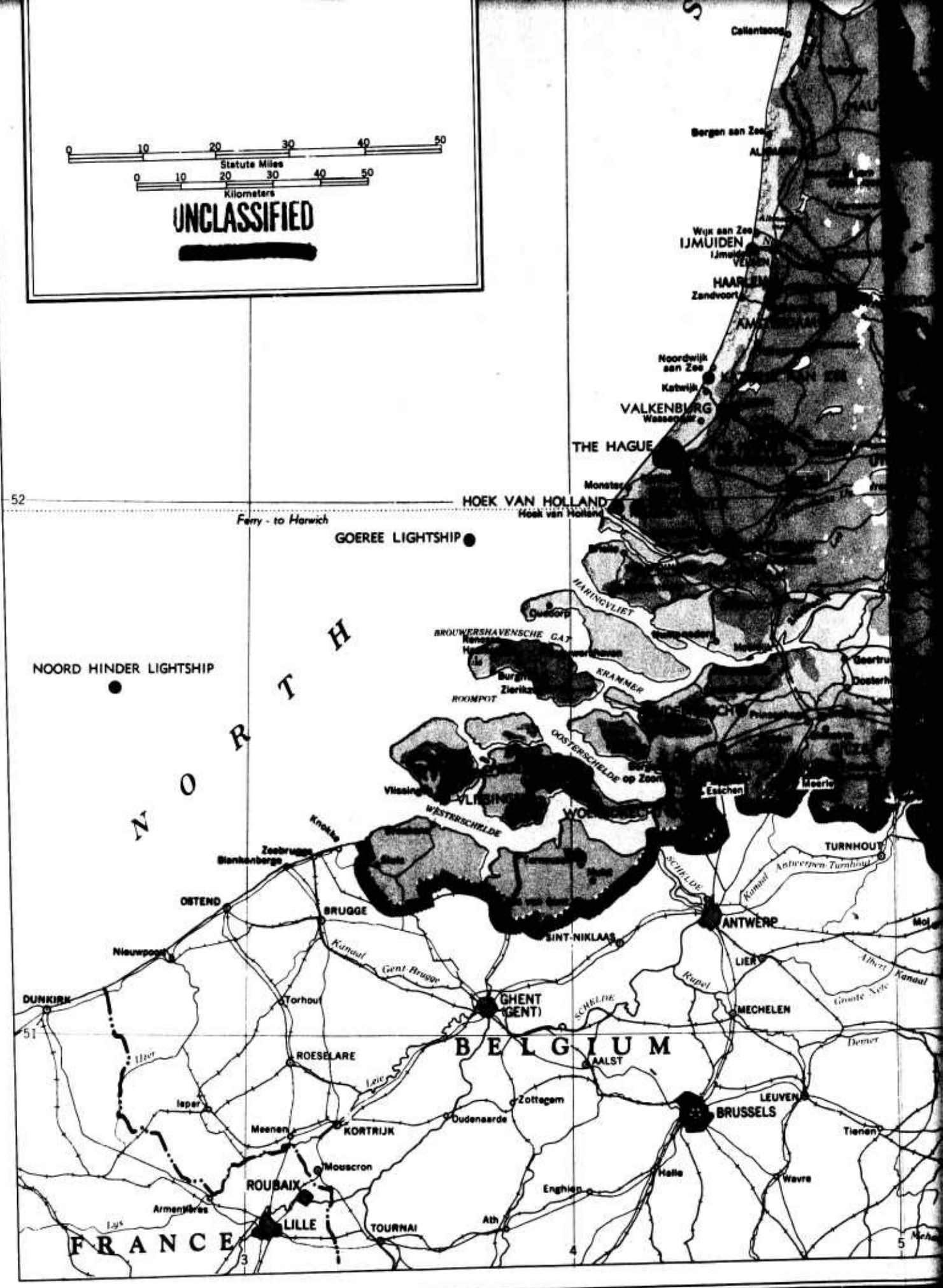
Locations are shown only for stations for which data are presented in text or tables



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