

## 說明

### 一、引言

臺灣地區氣候圖集(以下簡稱本圖集)係根據中華民國臺灣地區氣象測站累年觀測資料加以整理與統計而繪成。以下將說明各該氣候圖之製作依據、底圖規格、資料來源、繪製方法、第一冊及附冊各種氣候圖之內容,以利應用。

### 二、依據

本圖集之內容係依據世界氣象組織所出版「氣候實務指引」<sup>(1)</sup>內之規定,另參考該組織出版之「亞洲氣候圖集」<sup>(2)</sup>、日本氣象廳出版之「日本氣候圖集」<sup>(3)</sup>、美國氣象局出版之「美國氣候圖集」<sup>(4)</sup>配合現有資料及客觀需要而編製,先出版三冊,以溫度、降水及風等三種基本氣候要素為主題,以後將以其他氣候要素之圖陸續出版。

### 三、底圖

繪製等值線所用之底圖有兩種:一為以臺灣本島為主體之臺灣區域地圖,使用於地形圖、測站分布圖、溫度、降水量等值線圖及地面風花圖等,此圖係以聯勤製圖署繪製之蘭勃脫(Lambert)正形投影八十萬分之一比例地形圖為基準;另一為東亞太平洋區域地圖,使用於颱風發生頻率分布圖,此圖係根據中華航空測量學會繪製之彭訥(Bonne's)投影一千一百萬分之一比例地形圖描繪而得。

### 四、資料

本圖集使用之資料,除颱風路徑外,以臺灣本島為主體,另亦採用澎湖、東吉島、彭佳嶼及蘭嶼四處離島資料。資料之來源共有二種:一為中央氣象局所屬二、三、四等測站(二十五站)氣象觀測資料<sup>(5)(6)(7)</sup>;另一為臺灣省水利局、臺灣糖業公司、臺灣電力公司、臺灣省糧食局、臺灣省菸酒公賣局、臺灣省林務局及各地農田水利會等三十餘單位其所設置之雨量站、農業氣象站、氣候站等專用氣象觀測站之氣象月報資料。前者觀測紀錄較完整,每日觀測次數較多,其中臺北、臺中、臺南、花蓮及臺東五站一日觀測二十四次,其餘為一日觀測(或記錄)八次,觀測(或記錄)之時間為中原標準時(東經120°)02、05、08、11、14、17、20及23時;後者觀測記錄因各作業單位需求不一而參差不齊。由於溫度平均值之統計方法不盡相同,因此部分測站之月平均溫度資料需作適度之調整<sup>(8)</sup>;降水資料除中央氣象局所屬測站係採用零時為日界點外,其餘測站則採用上午九時為日界點以計算日降水量,本圖集使用之資料並未作統一時段之處理。根據世界氣象組織之建議,1901~1930、1931~1960及1961~1990為計算氣候標準平均之統計期間,其他任何連續三十年之統計值則為準平均值。因此在繪製歷年變化曲線圖時,凡期間涵蓋上述標準平均之統計期間的年份部分,則加繪標準平均線,以利比較與分析;溫度、降水量等值線及日變化等圖之繪製,需要使用較多測站或較多觀測時間的資料,因此選擇資料最完整的1956~1985年作為統計期間。又部份測站因設站較晚或資料不甚完整,因此在繪製各測站溫度日變化等圖時,採用了較短期間之統計值做為繪圖依據,各圖所使用之資料期間均標示於該圖中。

### 五、描繪等值線之守則

描繪各種氣象要素之等值線,與繪製地形圖上之等高線有異,主要是因為後者可憑藉周密之實測;前者因測站既少,分布又不均勻,尤以平地與山區相差為甚,故描繪極為困難。以雨量站而言,臺灣若干平原地區測站過於密集,觀測值難免因人為因素或測站位置缺乏代表性而造成不均勻之分布,必須用統計方法加以處理;山區則因設站觀測困難,蒐集資料有限,任何測站觀測資料不能輕言放棄。

臺灣因有中央山脈而造成極為複雜之地形,故而描繪各種基本氣象要素之等值線格外困難。氣溫不僅隨著海拔增加而降低,且高度相等之山區面西坡及面南坡又較面東坡及面北坡為暖。降水量則先視海拔而遞增,到達一定高度後,再向上又減少;迎風坡之雨量遠較背風坡為多更為眾所周知之事實。凡此均不能不從大氣物理學、氣候學及中尺度氣象學之考量以補救觀測資料之不足。

本圖集為儘可能達到準確合理而又符合實際觀測資料之目的,特訂立以下守則:

1. 根據各測站位置之代表性、資料之可靠性、以及觀測年代之長短,作為考量其可信度之優先次序。
2. 統計記錄年代不同而缺乏比較性者,利用統計原理予以補救並修正之<sup>(8)</sup>。
3. 描繪等值線前,先對臺灣主要地形有一概念性之了解,再參考以往專家學者之研究成果<sup>(9)(10)(11)</sup>,以認識各該氣象要素之可能分布。
4. 然後根據各測站實際之統計數值描繪等值線初稿,再利用透視桌,配合臺灣地形,儘量求其合乎大氣之物理原則。

## EXPLANATION

### 1. Introduction

This is a Climatic Atlas of Taiwan area in Republic of China drawn according to the weather information from individual weather stations around Taiwan after arrangement and statistics of the data were made. Below is an explanation of the basis of drawing, specifications of draft maps, sources of data, methods of drawing, and contents of the Climatic Atlas of the first volume and two subvolumes so as to facilitate its application.

### 2. Basis

This Climatic Atlas was compiled in accordance with the provisions of "Guide to Climatological Practices"<sup>(1)</sup> and from the data in "Climatic Atlas of Asia"<sup>(2)</sup> published both by the World Meteorological Organization (W.M.O.), "Climatic Atlas of Japan"<sup>(3)</sup> published by Japan Meteorological Agency, and "Climatic Atlas of the United States"<sup>(4)</sup> published by National Oceanic and Atmospheric Administration while other existing data available in Taiwan and objective demands were taken into account. The first volume which has been published focuses on the three basic climate elements: temperature, rainfall and wind. Volumes to be published later will focus on other supplemental elements.

### 3. Background Maps

There are two kinds of background maps used for drawing contour lines. One is the Taiwan regional map, focusing on the island of Taiwan. It is used in topography, distribution of weather stations, temperature and rainfall contour maps, and also for wind roses. This map is based on the topography the scale of 1/800,000 of Lambert Conformal Conic Projection as drawn by the Administration of Mapping. The Headquarters of Combined Service Force. The other is the distribution of frequency of typhoon occurrence. This map is drawn according to the enlarged Bonne's projection topography on the scale of 1/11,000,000 as drawn by the Chinese Aviation Measurement Institute.

### 4. Data

Exclusive of the track of typhoon, the data used in this Climatic Atlas is mainly from the island of Taiwan and secondarily from such offshore islands as Penghu, Penchiayu and Lanyu. There are two sources for the data. One is the meteorological observation from the (25) 2nd, 3rd & 4th-class weather stations of the Central Weather Bureau<sup>(5)(6)(7)</sup>. The other is the monthly weather reports of the weather stations exclusively owned by the rainfall stations, agrometeorological stations and climatological stations of more than thirty organization such as Taiwan Provincial Water Conservancy Bureau, Taiwan Sugar Corporation, Taiwan Power Company, Taiwan Provincial Food Bureau, Taiwan Tobacco & Wine Monopoly Bureau, Taiwan Provincial Forestry Bureau and Farmland Water Conservancy Association. As to the former the records are comparatively complete and the observations conducted are more intensive. The stations in Taipei, Taichung, Tainan, Hualien and Taitung conduct observations (or make records) 24 times and the other stations 8 times a day. The hours of observation (or recording) are 02, 05, 08, 11, 14, 17, 20 & 23 standard Central Plains (120° east longitude) time. The records of observation for the latter are irregular due to different requirements. Since the methods of statistics used in the mean temperature are not same, it is necessary to make proper adjustment to the data of monthly mean temperature<sup>(8)</sup>. For the rainfall, the weather stations of the Central Weather Bureau adopt zero hour as borderline, while other weather stations take 09:00 a.m. as borderline for calculation of daily rainfall. But in this Climatic Atlas, no arrangement has been made to unify hours in adoption of data. The W.M.O. suggested that the periods 1901~1930, 1931~1960 and 1961~1990 be used as periods of statistics of climatic standard normal, and the statistical value for any other thirty-year be normal. In drawing isoline maps and diurnal variations of temperature and precipitation, we needed a great number of data collected from more stations and more observations. Therefore, we chose the period 1956~1985 as the statistical period. Some observation stations were established rather late and part of the data, collected from observation stations, were incomplete, so, the statistical value of a shorter period was adopted in drawing some maps. The employed period was indicated on the map.

### 5. Principle of Drawing Isolines

To draw an isoline for various weather elements is different compare to draw an isoline on the topography. It is mainly because the latter may rely on actual and careful measurements, while the former is quite difficult owing to few stations and uneven distribution resulting in more difference between plain land and mountain area. In speaking of rainfall stations, many stations in plain land are too close. As such, it may be unavoidable that man made factors and weather stations which are lack of representative may result in uneven distribution, and it will be necessary to treat it with statistical method. For the mountain area, there is few data available, thus any observation station may be not given up if without sound reason.

In Taiwan, the complicated topography may be attributed to the Central Mountain Range. Therefore, it is much difficult to draw the isoline for various basic weather elements. The temperature not only drops with the elevation above sea level but also shows warmer in slopes facing west and south than in slopes facing east and north even in same elevation. The rainfall first increases with the elevation above sea level, then it will become less when it is over some fixed elevation. It is known to all that the rainfall in windward slopes is more than in leeward slopes. That is why we have to take into account the atmospheric physics, climatology and mesoscale meteorology in order to compensate the sparse observational data.

For accuracy and reason and to achieve the purpose of actual observation, the following principles are followed in this collection of weather maps:

- 1) Based on the data from weather stations that can be representative, the reliability of data, and the length of period for observation, priority in order will be decided in consideration of their creditability.
- 2) For those statistical records that cannot be taken as comparison because of different years, it will be remedied and modified with the principle of statistics<sup>(8)</sup>.
- 3) Before drawing the isoline, it is necessary to realize the main topography of Taiwan and to understand reasonable distribution of various weather elements by taking the results of scholars' research as reference<sup>(9)(10)(11)</sup>.
- 4) A draft isoline will be made according to actual statistical figures from the weather stations. Then modification will be made to show physical behavior of the atmosphere by using the perspective drawing table and matching the topography of Taiwan.

5. 凡發現某測站之統計值有疑問，而從氣候學觀點難以解釋者，則檢視原始資料作進一步之查證與修正。
6. 基於海陸之氣候迥異，加以海上缺少可靠之觀測資料，故臺灣本島之溫度及降水量等值線均不延伸至海岸線以外。
7. 臺灣地區各離島之面積甚小，大都只有一處測站，故不繪製等值線。
8. 凡規定之間隔相鄰等值線距離過寬者，為能表達其較精密之分布形態，得加繪一條用點線表示之中間等值線，以利參考。
9. 凡因測站太少，或無測站而僅憑理論推斷或臆測者，等值線用虛線表示之。

## 六、色調分級

根據世界氣象組織對氣候圖集色調選擇之建議，在高溫度、少降水及低相對濕度之位置，以採用近紅色之熱色調表示為佳。本圖集採用之顏色有紅、橙、黃、綠及藍等五種，每種顏色按深淺再分為若干等級，因此由紅、橙、黃、淺黃逐漸轉變為淺綠、綠、深綠及藍之順序排列，共分廿四個等級的色調。在這些色調中，除兩極端之色調代表超過某數值之極限部分外，溫度由 36°C ~ -8°C 按每 2°C 之間隔排列（其中 0、10、20、30°C 採用粗線）；月降水量由 10mm ~ 2400mm（間距採用 10、25、50、75、100、200、250、300、400、600、800、1000、1200、1400、1600、1800、2000、2200、2400mm；其中 10、50、100、300、600、1200、1800、2400mm 採用粗線）；年降水量則由 100mm ~ 6400mm（間距採用 100、200、300、400、600、800、1000、1200、1400、1600、2000、2400、2800、3200、4000、4800、5600、6400mm；其中 400、800、1600、3200、6400mm 採用粗線）。

## 七、第一冊各圖內容說明

### 甲、地形及測站分布

#### (一) 臺灣地區地形圖

臺灣地區地形圖涵蓋範圍包括臺灣本島、澎湖群島、彭佳嶼、蘭嶼及綠島等地。圖內除標明海岸線、等高線（間距採用 100、400、700、1000、1500、2000、2500、3000m 等八個高度）外，並標示主要山峰、河川、都市之位置、名稱及山峰之標高。

#### (二) 氣候站分布圖

本圖係根據臺灣地區地形圖，將繪製等溫線圖所使用之測站標示於圖中，等高線間距採用 100、400、1000、2000、3000m 等五種高度。

#### (三) 雨量站分布圖

本圖係根據臺灣地區地形圖，按繪製等降水量線圖所使用之測站將各站位置標示於圖上，等高線間距採用 100、400、1000、2000、3000m 等五種高度。

### 乙、主要氣象要素分布

#### (一) 月(年)等溫線圖

採用 1956 ~ 1985 年共 281 站之溫度資料，經統計成準平均值後填圖繪製而成，共含月等溫線圖十二幅，年等溫線圖一幅。

#### (二) 月平均溫度年較差圖

根據月平均溫度準平均值資料，計算最冷月與最暖月之溫度差。即為年較差，用以繪製月平均溫度年較差圖一幅。

#### (三) 月(年)等降水量線圖

採用 1956 ~ 1985 年間共 1,293 站之降水量準平均值資料，計算經緯度各 4' 區域內所含測站之降水量的平均值，再向東或向北平移 2'，得其相鄰區域之平均值，使資料重疊以勻消資料之不均勻，惟 400 公尺以上之山地測站不作區域平均。經填圖後繪製成月等降水量線圖十二幅，年等降水量線圖一幅。

#### (四) 地面風花圖

根據中央氣象局所屬測站自 1951 ~ 1980 年間之逐時或每三小時風觀測資料，按風速分三個等級（I 為 0.3 ~ 5.4 公尺/秒，II 為 5.5 ~ 13.8 公尺/秒，III 為 13.9 公尺/秒以上），統計各方位風之出現頻率，繪成風花圖，標示於地形圖上之各站位置或以引線標示於其相近範圍內，地面風花圖分各月分及全年共十三幅。

### 丙、各測站氣象要素變化

#### (一) 溫度日變化

根據各測站逐時或每三小時溫度觀測值，統計成各月各時間之平均溫度，繪成溫度日變化圖，圖內等溫線間隔為 1°C，橫坐標為時間，縱坐標為月份。並將日最高溫度及日最低溫度出現之概略時間，分別以粗虛線及細虛線標示於圖中。

#### (二) 降水日變化

降水日變化圖包含降水量強度（降水量/時數）日變化及降水出現頻率（降水時數/全部時數 × 100%）日變化兩個項目。

- 5) When any statistical value of some stations is doubtful and it is difficult to explain from the viewpoint of meteorology, examination of original data will be taken for further verification and correction.
- 6) Because of different temperature at sea and on land, and lack of reliable data for sea, the various isolines for the temperature and rainfall in Taiwan shall be not expanded beyond the coastline.
- 7) The offshore islands in Taiwan territory have smaller land areas, and only one weather station may be available on each of them, no isoline will be drawn.
- 8) When the distance as set between adjoining isolines is too separated, a dotted isoline will be drawn in between to show its more accurate distribution for reference.
- 9) When there is few weather stations or no observation station is available and only reasoning or guess can be done, indications will be made with dashed lines.

## 6. Grading of Shades of Color

As suggested by the W.M.O. for the shades of weather maps, it may be appropriate to show the positions in high temperature, less rainfall and lower relative humidity with warm colors close to red. This Climatic Atlas employs 5 colors: red, orange, yellow, green and blue. With each color being graded according to its lightness, they, in their order, become red, orange, yellow, light yellow, light green, light blue and blue, totalling divided into 24 grades of shades. Except for the shades of two extremes which represent those beyond the limit of a certain index, the temperature between 36°C to -8°C will be lined by every 2°C separation. The monthly rainfall will be arranged from 10mm to 2400mm (10, 25, 50, 75, 100, 150, 200, 250, 300, 400, 600, 800, 1000, 1200, 1400, 1600, 1800, 2000, 2200, 2400mm in which 10, 50, 100, 300, 600, 1200, 1800 and 2400 are in bold lines). The annual rainfall will be arranged from 100mm to 6400mm (100, 200, 300, 400, 600, 800, 1000, 1200, 1400, 1600, 2000, 2400, 2800, 3200, 4000, 4800, 5600 and 6400mm, in which 400, 800, 1600, 3200 and 6400mm are in bold lines).

## 7. Descriptions of Maps of Volume one

### A. Topography and Distribution of Stations

#### (1) Topography of Taiwan Area

The topography of Taiwan area includes the island of Taiwan, Penghu, Pengchiayiu, Lanyu and Green Isle. On the map, the coast line, and the isoline (the interval is according to eight elevations of 100, 400, 700, 1000, 1500, 2000, 2500 and 3000m) are marked out with major peaks, rivers, urban locations, names and the elevation of peaks.

#### (2) Distribution of Weather Stations

Based on the topography of Taiwan area, all weather stations used in the normal daily average temperature map are marked out in the map. The isoline's interval is based on five elevations like 100, 400, 1000, 2000 and 3000m.

#### (3) Distribution of Rainfall Stations

Based on the topography of Taiwan area, all rainfall stations used in normal total precipitation for their locations are marked out in the map. The interval of the isolines is based on five elevations like 100, 400, 1000, 2000 and 3000m.

### B. Distribution of Main Weather Elements

#### (1) Normal Daily Average Temperature, Monthly and Annual

This map is drawn according to the normal statistic data for the temperature recorded by 281 stations between 1956 and 1985 totalling 12 maps of monthly average temperature and one map of annual average temperature.

#### (2) Annual Range of Monthly Normal Temperature

The annual range means the difference between the lowest temperature in monthly normal and the highest temperature in monthly normal and on which an annual range of monthly normal temperature is drawn.

#### (3) Normal Total Precipitation, Monthly and Annual

From the data for normal of rainfall of 1,293 stations between 1956 and 1985, the average of the region within 4' of longitude and latitude, is calculated and by moving both to the east and north for 2' to superimpose the average and smooth out the uneven data. But no regional average will be calculated for rainfall stations in mountain area over 400m in altitude. A total of 12 maps are drawn for normal total monthly precipitation, and one map of normal total annual precipitation.

#### (4) Surface Wind Roses

According to the observation data for each hour and every three hours between ~~1956 and 1985~~ by weather stations of the Central Weather Bureau, the wind velocity has three classes (I is 0.3 ~ 5.4m/s, II is 5.5 ~ 13.8m/s, III is 13.9m/s and more). Based on the frequency of wind of various directions, a map of wind roses is drawn in which the locations of all stations in the topography or in adjacent area are marked out. A total of 13 maps are available including one for a year and others for 12 months.

### C. Variation of Weather Elements of Selected Stations

#### (1) Diurnal Variation of Temperature of Selected Stations

Based on the observation value for the temperature each hour or every three hours of all stations, statistics is conducted for mean temperature for each month and each hour, thus a map of diurnal variation is drawn in which the mean temperature is paced at 1 intervals, abscissa are times, ordinate are months. The approximate daily maximum and minimum temperature are respectively marked out with real line, heavy dashed line and dashed line.

#### (2) Diurnal Variation of Precipitation of Selected Stations

The map of diurnal variation precipitation includes intensity (mm/hr) diurnal variation and frequent diurnal variation (hr/hr × 100%). The former is indicated with broken line, while the latter is indicated with histogram. The data of all months are drawn separately.

前者以折線方式表示，後者以直方條表示，分月併繪於一幅圖內。

#### (三)合成風日變化

根據各測站逐時或每三小時風觀測資料，統計合成風速與風向，繪成合成風向量之日變化圖。“/”代表合成風向(箭頭來向)及風速(箭桿長度)。為補救某些測站盛行風太強使風矢超出圖外，故箭桿長度之比例尺分為兩類：一為2公尺/秒，一為10公尺/秒以作必要之選擇。

#### (四)溫度五日加權滑動平均

根據各測站日平均溫度、日最高溫度及日最低溫度之1956~1985年準平均值，按0.06、0.25、0.38、0.25、0.06五個權重比例<sup>(1)(2)</sup>，統計五日移動平均值，繪成溫度五日加權滑動平均曲線圖。

#### (五)月降水量與蒸發量

根據中央氣象局所屬測站自1956~1985年間之月降水量及蒸發量資料，分別以不同網底之直方柱表示於同一幅圖中，以比較地面上水分之得失。

### 丁、颱風

#### (一)颱風登陸臺灣各旬、各時段及各區段之頻率

根據中央氣象局之作業規定，颱風近中心最大風速在17.2~32.6公尺/秒(34~63哩/時)者稱為「輕度颱風」，32.7~50.9公尺/秒(64~99哩/時)者稱為「中度颱風」，51.0~66.9公尺/秒(100~129哩/時)者稱為「強烈颱風」，67.0公尺/秒(130哩/時)及以上者稱「超級颱風」。經統計1956~1985年間各級颱風中心登陸臺灣本島各旬之次數、各時段(按每兩小時作為一時段，一日內分為12個時段)之次數及各區段(將臺灣沿海地區分為七個區段)之次數，分別求其與總登陸次數的百分比，是為各類之頻率。

#### (二)北太平洋西部各月颱風發生頻率

根據1956~1985年間東經180°以西，北緯0°以北之西太平洋地區及南海地區，就各月所發生之颱風(分包含「輕度颱風」及不包含「輕度颱風」兩類)，分別統計各月發生次數，並計算其佔全期總次數之百分比。

#### (三)北太平洋西部颱風通過次數及路徑

根據1956~1985年間東經105°~155°、北緯10°~40°範圍內出現的颱風(指近中心最大風速大於或等於17.2公尺/秒者)資料，按2°×2°之經緯度範圍，統計颱風中心通過其間之次數，根據經過次數繪等值線(細線)，另以粗線表示主要路徑，中等粗線表示次要路徑。由於北太平洋西部冬季颱風出現之次數甚少，故將十二月至翌年四月之五個月資料合併於一幅圖內，其餘各月則分月繪製，另繪全年一幅，合計共有九幅圖。

### 八、附冊一各圖內容說明

#### (一)臺灣地區地形圖

臺灣地區地形圖涵蓋範圍包括臺灣本島、澎湖群島、彭佳嶼、蘭嶼及綠島等地。圖內除標明海岸線、等高線(間距採用100、400、700、1000、1500、2000、2500、3000m等八個高度)外，並標示主要山峰、河川、都市之位置、名稱及山峰之標高。

#### (二)月(年)平均溫度歷年變化

根據中央氣象局所屬各測站自設站以來之月平均溫度紀錄，按年序排列繪成各月及年平均溫度歷年變化曲線圖，並將標準準平均值以直線標繪於圖中(本圖集附冊內選繪之測站及各圖使用之尺度範圍與間距參見表一)。

#### (三)月(年)平均最高溫度歷年變化

根據中央氣象局所屬各測站自設站以來之月平均最高溫度紀錄，按年序排列繪成各月及年平均最高溫度歷年變化曲線圖，並將標準準平均值以直線標繪於圖中。

#### (四)月(年)平均最低溫度歷年變化

根據中央氣象局所屬各測站自設站以來之月平均最低溫度紀錄，按年序排列繪成各月及年平均最低溫度歷年變化曲線圖，並將標準準平均值以直線標繪於圖中。

### 九、附冊二各圖內容說明

#### (一)臺灣地區地形圖

臺灣地區地形圖涵蓋範圍包括臺灣本島、澎湖群島、彭佳嶼、蘭嶼及綠島等地。圖內除標明海岸線、等高線(間距採用100、400、700、1000、1500、2000、2500、3000m等八個高度)外，並標示主要山峰、河川、都市之位置、名稱及山峰之標高。

#### (二)月(年)絕對最高溫度歷年變化

#### (3) Diurnal Variation of Resultant Wind of Selected Stations

Based on the observation data for the wind for each hour or every three hours from selected stations, statistics is conducted for resultant wind velocity and resultant wind direction. A map of diurnal variation of resultant wind is therefore drawn. The mark "v" represents direction of resultant wind (direction of arrow) and wind velocity (length of arrow pole). To clearly indicate the change of wind velocity and to keep the map intact, the scale of the length for the arrow pole is alternatively divided into two kinds: one is 2m/s and other is 10m/s.

#### (4) Daily Temperature Five-day Low-pass Filtered of Selected Stations

Based on the normal value between 1956 and 1985 for daily mean temperature, daily maximum temperature and daily minimum temperature, statistics is conducted for the average value for five days and a curve map is drawn according to five weighting factors 0.06, 0.25, 0.38, 0.25 and 0.06<sup>(1)(2)</sup>.

#### (5) Monthly Precipitation and Evaporation of Selected Stations

Based on the data of monthly precipitation and evaporation between 1956 and 1985 from the weather stations of the Central Weather Bureau, a map is drawn with different shades density (□ indicates precipitations data and ■ evaporation data) for comparison of gains and loss of ground water.

### D. Typhoon

#### (1) Frequency of Typhoon Landfall on Taiwan in Ten-day Periods, Various Times and Various Districts

According to the rule of the Central Weather Bureau, R. O. C., when the maximum wind velocity near the typhoon center is 17.2 ~ 32.6m/s (34 ~ 63 knots), it is called "weak typhoon", and 32.7 ~ 50.9m/s (64 ~ 99 knots), "moderate typhoon", 51.0 ~ 66.9m/s (100 ~ 129 knots) "intense typhoon", and over 67m/s (130 knots), "super typhoon". We conduct statistics about the number of landfalls of typhoon centers in various ten-day periods and various times (a day is divided into 12 time periods of two hours interval) and also their number of landfalls in various regions (the coastal area of Taiwan is divided into seven regions). Against the number of landfalls as above, we obtain the percentage of them in total number of landfalls which are frequency of various classes.

#### (2) Frequency of Typhoon Occurrence within each Month in the Western North Pacific Ocean

Based on the typhoon (two kinds: one is that including weak typhoon, and the other is that not including weak typhoon) occurred in the western Pacific region (including South China Sea), west of 180° east longitude and north of equator in each month between 1956 and 1985, the statistics is conducted for the number of occurrence each month, and for the percentage of it in total number of occurrence at all times.

#### (3) Typhoon Occurrence and Path in the Western North Pacific Ocean

Based on the data of occurrence of typhoon (with maximum center velocity higher than 17.2m/s) within 105° ~ 155° east longitude and 10° ~ 40° north latitude, the statistics is conducted according to the longitudinal and latitudinal width scope of 2° x 2° for calculation of number of landfalls of typhoon center, and then based on the number of crossing the isoline (thin line), with the main path marked out with thick line, and the secondary path with medium thick line. Since few typhoon in winter occurs in the west of North Pacific Ocean, the data from Dec. to following Apr. five months are consolidated in one map and maps for other months are drawn separately, and totally as nine maps in all.

### 8. Descriptions of Maps of Subvolume one

#### (1) Topography of Taiwan Area

The topography of Taiwan area includes the island of Taiwan, Penghu, Pengchiayiu, Lanyu and Green Isle. On the map, the coast line, and the isoline (the distance is according to eight elevations of 100, 400, 700, 1000, 1500, 2000, 2500 and 3000m) are marked out with major peaks, rivers, urban locations, names and the elevation of peaks.

#### (2) Long Period Variation of Average Temperature, Monthly and Annual

Based on the monthly average temperature records since the establishment of weather stations of the Central Weather Bureau and according to sequence of year, maps of curve for various months and annual average temperature long period variation is made available. In same maps, the standard normal value is marked out with straight real line. (The selected stations with drawing scale ranges and interval are listed on table 1.)

#### (3) Long Period Variation of Average Maximum Temperature, Monthly and Annual

Based on the monthly average maximum temperature records since the establishment of weather stations of the Central Weather Bureau and according to sequence of year, maps of curve for various months and annual average temperature long period variation is made available. In same maps, the standard normal value is marked out with straight real line.

#### (4) Long Period Variation of Average Minimum Temperature, Monthly and Annual

Based on the monthly average minimum temperature records since the establishment of weather stations of the Central Weather Bureau and according to sequence of year, maps of curve for various months and annual average temperature long period variation is made available. In same maps, the standard normal value is marked out with straight real line.

### 9. Descriptions of Maps of Subvolume two

#### (1) Topography of Taiwan Area

The topography of Taiwan area includes the island of Taiwan, Penghu, Pengchiayiu, Lanyu and Green Isle. On the map, the coast line, and the isoline (the interval is according to eight elevations of 100, 400, 700, 1000, 1500, 2000, 2500 and 3000m) are marked out with major peaks, rivers, urban locations, names and the elevation of peaks.

#### (2) Long Period Variation of Absolute Maximum Temperature, Monthly and Annual

Based on the monthly absolute maximum temperature records since the establishment of weather stations of the Central Weather Bureau and ac-

根據中央氣象局所屬各測站自設站以來之月絕對最高溫度紀錄，按年序排列繪成各月及年絕對最高溫度歷年變化曲線圖，並將標準平均直線標繪於圖中。

(三)月(年)絕對最低溫度歷年變化

根據中央氣象局所屬各測站自設站以來之月絕對最低溫度紀錄，按年序排列繪成各月及年絕對最低溫度歷年變化曲線圖，並將標準平均直線標繪於圖中。

(四)月(年)降水量歷年變化

根據中央氣象局所屬各測站自設站以來之降水量紀錄，按年序排列繪成各月及年降水量歷年變化直方圖，並將標準平均直線標繪於圖中。

ording to sequence of year, maps of curve for various months and annual average temperature long period variation is made available. In same maps, the standard normal value is marked out with straight real line.

(3) Long Period Variation of Absolute Minimum Temperature, Monthly and Annual

Based on the monthly absolute minimum temperature records since the establishment of weather stations of the Central Weather Bureau and according to sequence of year, maps of curve for various months and annual average temperature long period variation is made available. In same maps, the standard normal value is marked out with straight real line.

(4) Long Period Variation of Precipitation, Monthly and Annual

Histogram for monthly and annual long period variation are made available on basis of precipitation records according to year sequence since the establishment of weather stations of the Central Weather Bureau. In same maps, the standard normal value is marked out with real line.

表一 氣溫與降水歷年變化圖繪製尺度範圍及間距一覽表

資料種類	站別	項目	尺度範圍	間距	圖式				
氣溫	平地	平均	11~3月全年	8~26°C	折線圖				
			4~10月全年	14~32°C					
		平均最高	11~3月全年	12~30°C					
			4~10月全年	18~36°C					
		平均最低	11~3月全年	4~22°C					
			4~10月全年	12~30°C					
		絕對最高	11~3月全年	16~34°C					
			4~10月全年	22~40°C					
		絕對最低	11~4月全年	-2~16°C					
			5~10月全年	8~26°C					
		溫	山地	平均		11~3月全年	-12~24°C	折線圖	
						4~10月全年	0~36°C		
				平均最高		11~3月全年	-4~32°C		
						4~10月全年	0~36°C		
平均最低	11~3月全年			-14~22°C					
	4~10月全年			-4~32°C					
絕對最高	11~3月全年			0~36°C					
	4~10月全年			4~40°C					
絕對最低	11~4月全年			-22~14°C					
	5~10月全年			-12~24°C					
降水	以上所有測站			降水量	月總量	0~1600mm	200mm		直方圖
					年總量	0~5000mm	1000mm		

Table I Table of scale ranges and intervals of long period variation in temperature and precipitation.

Observation	Stations	Item	Scale Range	Interval	Drawings Form			
AIR TEMPERATURE	PLAINT	Average	Nov.~Mar. Annual	8~26°C	CURVE			
			Apr.~Oct. Annual	14~32°C				
		Average maximum	Nov.~Mar. Annual	12~30°C				
			Apr.~Oct. Annual	18~36°C				
		Average minimum	Nov.~Mar. Annual	4~22°C				
			Apr.~Oct. Annual	12~30°C				
		Absolute maximum	Nov.~Mar. Annual	16~34°C				
			Apr.~Oct. Annual	22~40°C				
		Absolute minimum	Nov.~Apr. Annual	-2~16°C				
			May.~Oct. Annual	8~26°C				
		MOUNTAINOUS REGION	Anpu	Average		Nov.~Mar. Annual	-12~24°C	CURVE
						Apr.~Oct. Annual	0~36°C	
			Chutzehu	Average maximum		Nov.~Mar. Annual	-4~32°C	
						Apr.~Oct. Annual	0~36°C	
Jihyuehtan	Average minimum		Nov.~Mar. Annual	-14~22°C				
			Apr.~Oct. Annual	-4~32°C				
Alishan	Absolute maximum		Nov.~Mar. Annual	0~36°C				
			Apr.~Oct. Annual	4~40°C				
Yushan	Absolute minimum		Nov.~Apr. Annual	-22~14°C				
			May~Oct. Annual	-12~24°C				
PRECIPITATION	All stations listed as above	Amount	Monthly	0~1600mm	200mm			
			Annual	0~5000mm	1000mm			