



Taiwan's Climate in 2022

Central Weather Bureau, Taiwan

In 2022, the global mean temperature was 0.91°C above average (1901-2000), the 6th warmest on record since 1880. Taiwan had a similar situation, where the annual mean temperature was 24.1°C (1.10°C above average), making 2022 the 12th warmest year on record (FIG. 1). For the last 30 years, Taiwan's temperature has been increasing at a rate of 0.25°C per decade, higher than the global rate of 0.21°C per decade, and the mean temperature of 2022 was above the climatological normal (1991-2020) for Taiwan as a whole (FIG. 2).

The annual total precipitation was 2244.6mm, 83.5mm more than the 1991-2020 median, about 103.9% of the climate median. Precipitation was below normal in southern Taiwan (FIG. 2), while the northern Taiwan saw above normal precipitation that mainly comes from the Meiyu in May and tropical cyclones in October (FIG. 3). Although Taiwan is affected by tropical cyclones and the northeast monsoon in autumn and winter, southern Taiwan still lack rainfall because of the leeward effect. In addition, the subtropical high is significantly stronger in summer, so the combination of the above resulted in fewer rainy days in these areas (FIG. 2).

Global and Taiwan's Annual Mean Temperatures 1880-2022

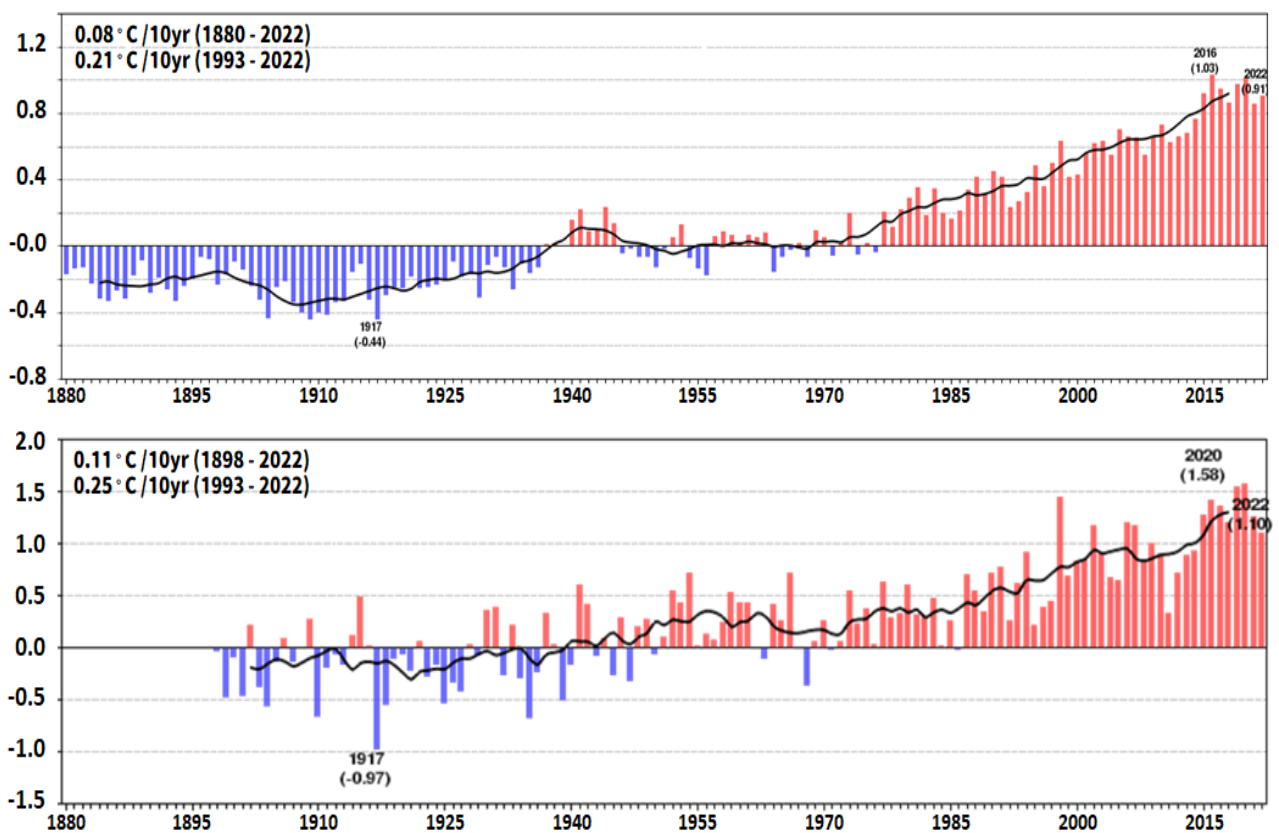


FIG. 1. Global (upper) and Taiwan (lower) long-term annual mean temperature anomalies time series (compared to 1901-2000 average). The solid line shows the 9-year running mean.

Annual Mean Temperature and Total Precipitation of Taiwan in 2022

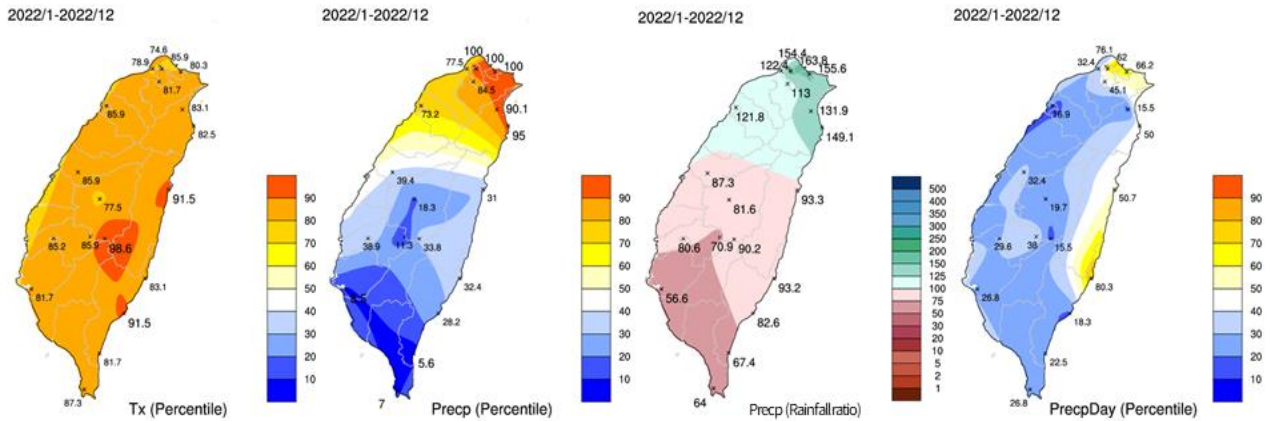


FIG. 2. Left to right: annual mean temperature percentile, precipitation percentile, rainfall ratio and rainy days percentile in Taiwan since 1951.

Monthly Mean Temperature and Precipitation of Taiwan

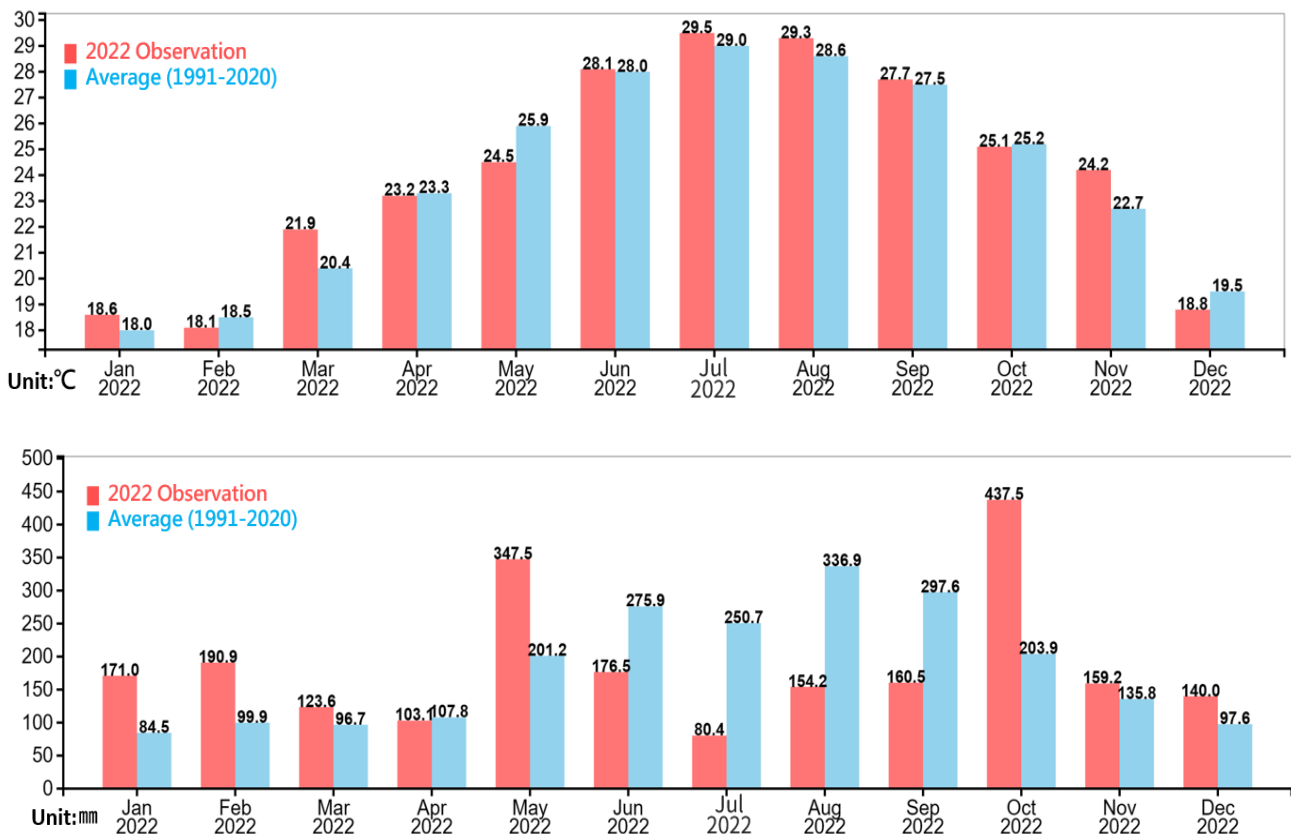


FIG. 3. Monthly mean temperature (upper) and total precipitation (lower) of 2022 and the average (1991-2020).

Selected Significant Climate Anomalies and Events in 2022



12th Warmest Year for Taiwan



Unequal Rainfall Distribution

Rainfall was greatly above normal in northern Taiwan, while below normal in southern Taiwan.



Record Low Sunshine Hours and Temperature for Meiyu Season (May-Jun.)



Lowest sunshine hours in May

Lowest mean temperature for Meiyu season since 2000.



High Temperature and Little Rain in Summer (Jul.-Aug.)



Banqiao Station had record breaking 39.4°C on July 24, a total of 29 hot days* in July (matching historical high).

Taiwan had 2nd lowest rainfall ever observed. For all of the 23 stations of Taiwan, 13 stations saw their respective top 5 lowest rainfall and 15 stations saw their respective top 5 highest temperature.

*Hot day: day with maximum temperature of $\geq 35^{\circ}\text{C}$



More Tropical Cyclones and Northeast



Monsoons in Autumn (Sep.-Nov.)



Extremely High Temperature in November

Heavy rain in northern and eastern Taiwan, came from the outer circulations of 5 tropical cyclones (HINNAMNOR, MUIFA, NORU, NESAT and NALGAE) and northeast monsoon. NESAT had the most significant impact in Taiwan.

16 of 23 stations all over Taiwan broke their respective highest temperature on record for Nov.



Latest Typhoon Warning

CWB had the latest typhoon warning in a year on Sep. 2 for typhoon HINNAMNOR, which was the only one typhoon approaching Taiwan for 2022.



Early Arrival of Cold Surge

Earliest cold surge (with minimum temperature of $\leq 10^{\circ}\text{C}$) since 2010 on Dec. 18.

Tropical Cyclones

In 2022, a total of 25 named tropical cyclones (TCs) generated over the western North Pacific, close to the long-term annual average (1991-2020) of 25.43. While warnings were issued for 3 typhoons, only Typhoon HINNAMNOR (purple track in FIG. 4) caused some damage to Taiwan. Up to 2022, the number of tropical cyclones that approached Taiwan has been below normal (3.23) for 9 years straight (FIG. 5). In addition, 2022 also holds the record of the latest typhoon warning issuance in a year (September 2, for HINNAMNOR).

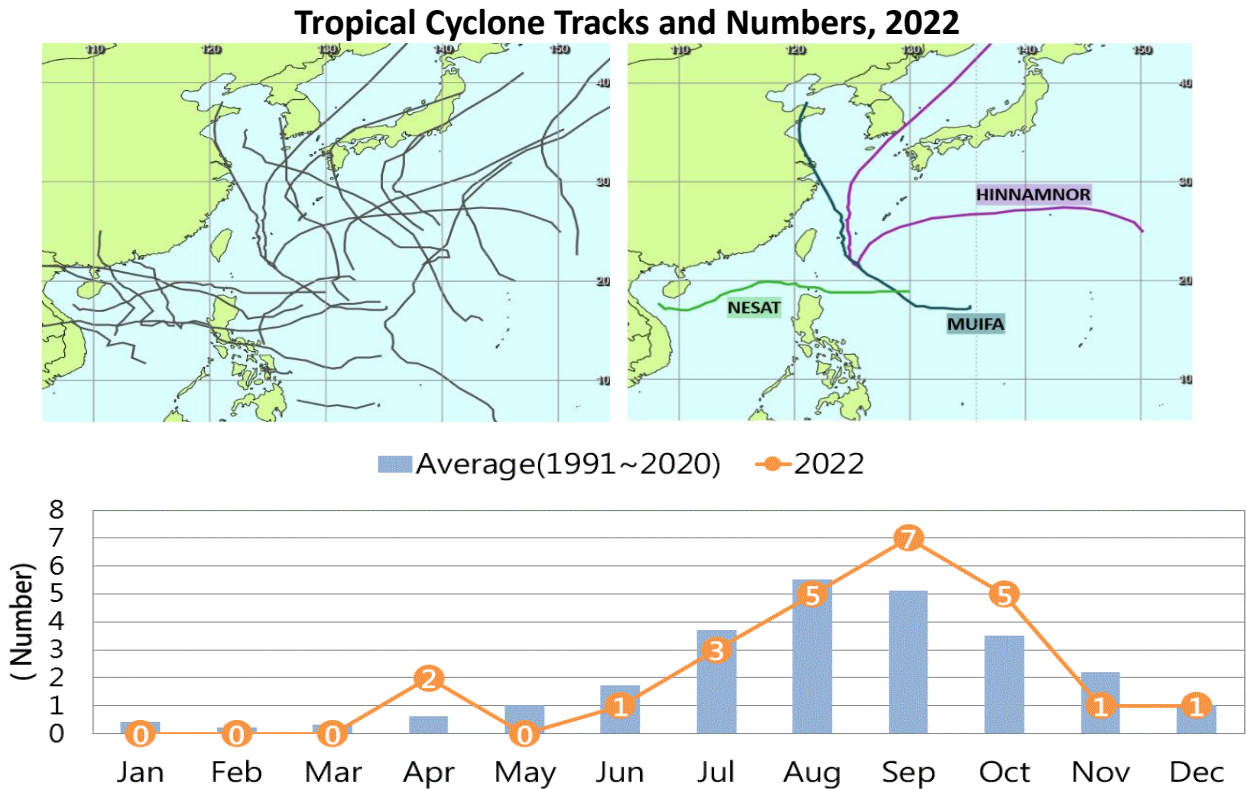


FIG. 4. Tracks of 25 named TCs over the western North Pacific in 2022 (upper left) and 3 for which warnings were issued (upper right). Monthly number of named TC formation for 2022 and monthly average as calculate over 1991-2020 (lower).

Annual Number of Named Tropical Cyclone That Approach Taiwan

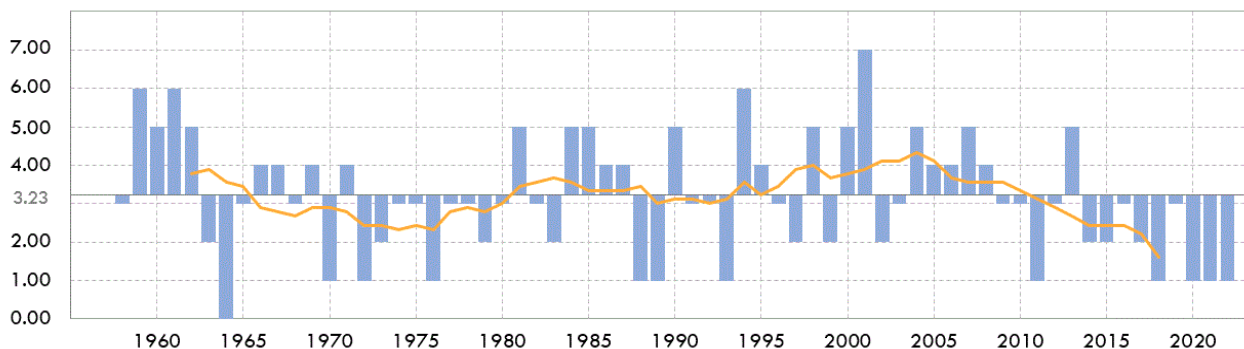


FIG. 5. Annual number of named TC that approach Taiwan (bar chart) and smoothed annual number by 9-year running mean (line graph) since 1958 as compared to 1991 -2020 average (3.23).

Special Climate Event in 2022:

The Cause of Drought in Southern Taiwan

During late 2022, when Taiwan had just recovered from the severe drought event from June 2020 to May 2021, water levels of the southern Taiwan reservoirs were gradually decreasing again, while most reservoirs were nearly full. This is due to the slight north shift of the stationary front and southwesterly wind in May to June 2022, which above-normal rainfall in central and northern Taiwan and below-normal rainfall in the south were observed (FIG. 6a).

From July to August, the western North Pacific was influenced by extremely strong subtropical high. Consequently, fewer tropical cyclones were generated and 2022 broke the record for the latest typhoon warning issuance in a year, resulting in significantly less rainfall all over Taiwan (FIG. 6b).

In September and October, during the active period of tropical cyclones in the western North Pacific, five tropical cyclones approach Taiwan accompanied by the northeast monsoon, resulting in significant rainfall in the northern and eastern regions, while southern Taiwan receive relatively less precipitation due to their leeward location (FIG. 6c). As to November and December, these months are the dry seasons of central and southern Taiwan, so rainfall mostly only occurred in the northern and eastern parts (FIG. 6d). In conclusion, the drought event of the southern Taiwan during late 2022 was the result of various factors that occurred concurrently and sequentially.

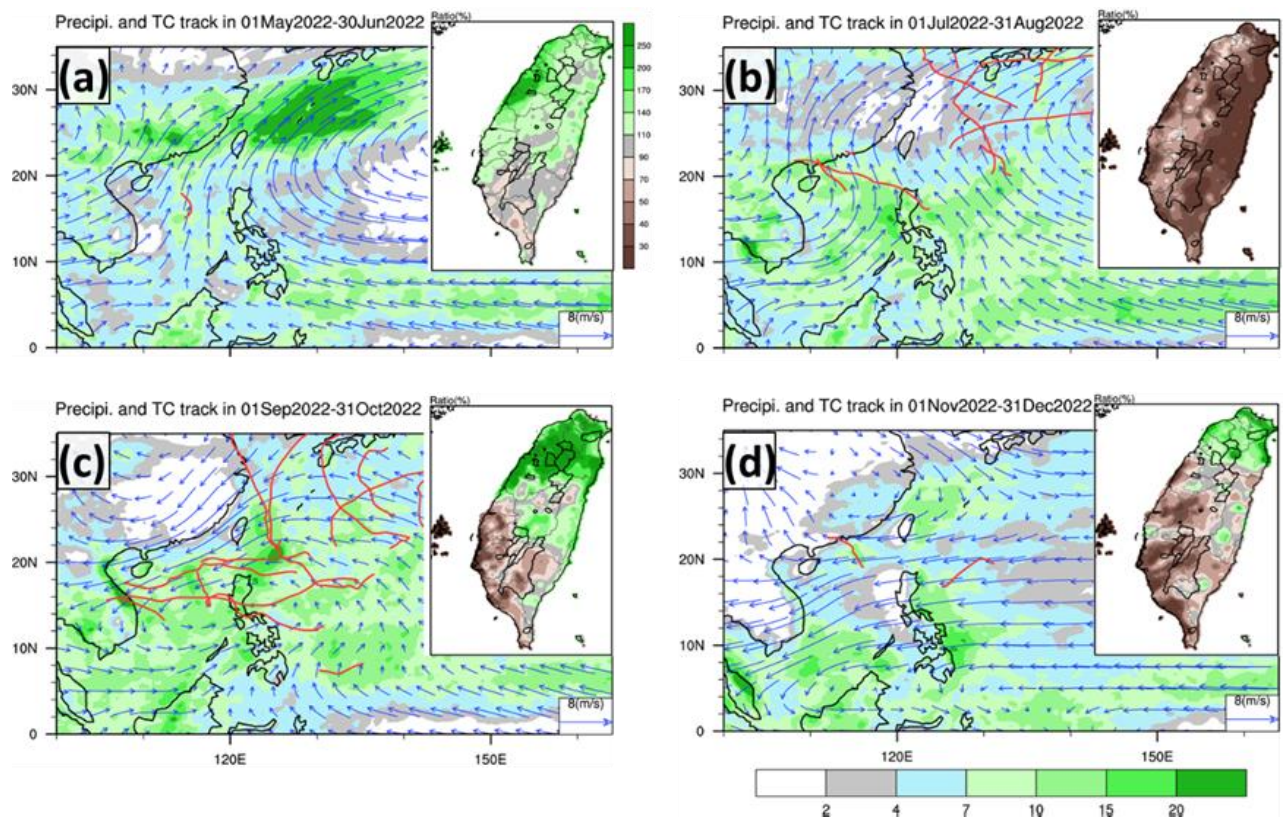


FIG. 6. Rainfall ratio of rainfall in Taiwan (%) and 850hPa wind (blue vectors), precipitation (colors, mm/day), tropical cyclone tracks over East Asia in (a) May to Jun., (b) Jul. to Aug., (c) Sep. to Oct. and (d) Nov. to Dec. in 2022.