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Severe Droughts in Taiwan and its Related Atmospheric and Oceanic Environments

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Droughts have always been one of the top issues being discussed under the climate change. A drought is generally defined as a period without rainfall, and it can widely strike the balance of local hydrology systems. A drought index, Taiwan Meteorological Drought index (TMD index), was proposed in the present study and is applied to identify historical severe droughts in Taiwan in order to clarify the corresponding large-scale backgrounds as a potential alert to the society in future.

Through the TMD index, several historical severe drought cases in Taiwan are detected and characterized by significant seasonal variability in the annual cycle. Composites for large-scale atmospheric and oceanic environments over different periods within the dry season are conducted. From October to December, the colder sea surface temperature (SST) pattern of Pacific Meridional Mode (PMM) and the PMM-induced local anomalous anticyclones over the South China Sea are both in charge of the extremely dry conditions in Taiwan. From January to February, cold SST in the South China Sea and its adjacent oceans dominates local atmospheric conditions above these regions and creates an unfavorable environment for convection systems. From March to May, a massive anomalous anticyclonic circulation centering beside Alaska and extending its properties to East Asia and Taiwan generates a descending environment and in turn suppresses convection systems to develop. Therefore, the extremely dry conditions under this system are expected.

The results discussed in this work have exposed the possible large-scale factors in different seasons which may trigger another severe dryness on the island in the nearly future. Moreover, as for practical use, the results send valuable information to the government and the society to establish better countermeasures to prepare for the future droughts, which can largely reduce the loss and impact in many fields.