The analysis of Taiwan dry-season precipitation patterns and frontal system variations

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Generally, there is relative less precipitation during the months between winter to next spring, December to April, in Taiwan. Therefore, we usually define these months as dry-season. . The historical drought events show that most events are occurred between February to April and lead to a huge economic loss in agriculture. The major synoptic weather events which affect Taiwan during this period is the frontal system. Therefore, understanding the correlation between the spatial-temporal variations of frontal systems and the seasonal rainfall amount and frequency is important.
In this study, the surface weather maps were used as the subjective analysis of synoptic scale frontal systems, which affected Taiwan, from 1980 to 2015. We also used the hourly data of precipitation from21 meteorological stations in Taiwan which operated by the Central Weather Bureau (CWB). Those stations are equally distributed over the island which including 5 mountain stations. The rainfall distribution of 21 stations is approximate match with detailed rain gauge observations and only may underestimated over the CMR southern slope.
The preliminary results show that the frontal systems have strong inter-annual variations in spatial and temporal characteristics for both front numbers and affecting days and there was a decreasing trend in past 36 years. We also noticed that the frontal properties have different varies between the seasons which may related to the temporal and spatial shifting of the large-scale circulations. Generally, 25% of days per year were affected by the frontal system. Moreover, 40% to 50% days during the Spring and Mei-Yu season were also affected by frontal system. The average affecting duration of each front was 12-24hrs of the Mei-Yu season and about 5hrs for other seasons.
The spatial and temporal variations of frontal systems were correlated to the seasonal precipitation. The seasonal total rainfall amount in the dry-season has significant correlation with the frontal numbers and frontal days (0.56/0.55). As speculation, the frontal extreme rainfall events are also highly related to the frontal numbers and days during the dry-season. Furthermore, we observed that there are two different types of precipitation patterns associated with frontal system. The extreme rainfall events are highly associated with frontal-terrain which is induced deep convections and the light/moderate rainfall are related with the stratiform components.
We also noticed that there are some large-scale patterns which may also play important roles to influence the spatial and temporal variations of frontal systems in Taiwan. The preliminary results show that large-scale patterns are different between seasons. For example, there is a low-level of anticyclonic circulation anomaly at northwest pacific region during the winter time for more fronts year, but it will change to the cyclonic circulation anomaly for more fronts year in spring time. The south-west flow also show an obvious feature for more fronts year in spring time.

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