Asian Monsoon Years (2007-2012): Interdecadal rainfall variability associated with typhoon and monsoon over the western north Pacific

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Over the western north Pacific (WNP) region the main contributor of rainfall is typhoon and monsoon. The variability of typhoon and monsoon directly influences the rainfall variability in this region. Longterm dataset of typhoon and rainfall are necessary to understand the interdecadal variability of the rainfall. In this study typhoon track data and station rainfall data are recovered from paper records during the 20th century. We divided typhoon related rainfall from non-typhoon monsoon related rainfall using station rainfall data and investigated the interdecadal rainfall variability. Historical typhoon track data are collected from Philippine Weather Bureau, Central Meteorological Observatory of Japan, Hong Kong Observatory, and Zi-Kai-Wei Observatory over the WNP back to 1884. The locations of these historical typhoon dataset are digitized from the printed papers. Quality check of the typhoon definition and density of typhoon numbers are performed by referring station pressure data. Typhoon was defined as minimum pressure of 1000 hPa in the historical typhoon data and the difference from current maximum wind definition of 35 kt is about 15.3% in acceptable level. Typhoon density is checked through the pressure perturbation when typhoon passed nearby the station. Typhoon track dataset is created by connecting present available typhoon best track data from 1910 to 2009 of the target area over the WNP where the quality of typhoon numbers is satisfied. Daily station rainfall and pressure data are recovered from Philippine Weather Bureau in the Philippines and South Seas Bureau in the western north Pacific Islands and obtained from Central Weather Bureau of Taiwan and Japan Meteorological Agency from 1901 to 2009. Typhoon rainfall is defined when typhoon is located within 600 km radius from the station. Non-typhoon (monsoon) rainfall is defined as a residual of typhoon rainfall. The north-south islands chain along Philippine, Taiwan and Okinawa are chosen for investigation. In climatology, about 30 % of the annual rainfall comes from typhoon in Taiwan. Other area has 10 to 20%. Orographic rain is prevailed in Taiwan and Philippines of monsoon rainfall with summer rain in the west and autumn and winter rain in the east. Typhoon rainfall is stronger in the east of the islands because the main track of typhoon comes from the Philippine Sea. Typhoon rainfall has large amount during 1930s in the Philippines and 1950s to 1960s in Taiwan and Okinawa. After 1970s increasing typhoon rainfall area tends to shift northward from Philippines to Taiwan and Okinawa. Monsoon rainfall has large amount during 1910s to 1930s in Philippines and Taiwan, 1940s to 1950s in Taiwan and Okinawa. During 1960s all region of monsoon rainfall decreased. After 1970s northern islands of Taiwan and Okinawa has decreasing trend but southern islands in Philippine has increasing trend with opposite sign. The second mode of empirical orthogonal function analysis of sea level pressure using HadSLP shows northwestern subtropical high mode. This mode denotes intensifying trend after 1950s and is significantly correlated to monsoon rainfall in Taiwan and Okinawa region. Therefore the expansion of northwestern subtropical high may have some influence to the summer monsoon in this region.