

Asian Monsoon Year (2007-2012): Long-term changes in summer rainy season onset in the Philippines and its relation to the atmospheric circulation and SST patterns in the tropical Pacific

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The onset of the summer rainy season in the Philippines is a particularly important phase in the seasonal march of rainfall for Philippine agriculture because an early or delayed onset influences planting decisions. Therefore, it is of great concern to Philippine agriculture whether the onset timing of the summer rainy season will change with future global warming. To answer this question, we first investigated the longer-term changes in the onset of summer rainy season and its relation to the atmospheric circulation and sea surface temperature (SST) patterns in the tropical Pacific. To determine the summer rainy season onset during the 20th century, the empirical orthogonal function (EOF) analysis was applied to pentad rainfall data at 30 stations for 1910-1939 and at 35 stations for 1952-2000, respectively. As a result, the delayed onset of the summer rainy season frequently appeared especially since the mid-1970s, whereas the onset was relatively early during the 1960s. The mean onset of the summer rainy season occurred around the 27th pentad for 1952-1976 and the 29th pentad for 1977-2000. To clarify causes of the long-term change in the onset, the singular value decomposition (SVD) analysis was applied to geopotential height at 850hPa level and SST over the tropical Ocean during April-June 1961-2000. The heterogeneous correlation maps of the first SVD mode for spatial anomalies of geopotential height (SVD1(G)) and SST (SVD1(S)) show a pattern corresponding to the Walker circulation and significant signals related to a clear ENSO pattern, respectively. The time coefficients of SVD1 change slowly from below the normal to above after the late 1970s, with an apparently cyclicity of 4-5 years, corresponding to the ENSO cycle. Additionally, the time coefficients were significantly correlated with the onset timing of the summer rainy season from 1961-2000 at the 99% significance level. Thus, long-term changes in ENSO and the Walker circulation are closely related with those in the onset timing of the summer rainy season during the late 20th century. To reveal the characteristics of atmospheric circulation and SST fields related to the early/late onset of the rainy season, a composite analysis was also conducted to these fields for extreme years with the higher or the lower time coefficients of SVD1. As a result, it was found that an early onset of the rainy season is caused by enhanced convection around the Philippines related to warm SST in the western Pacific during April-May. Meanwhile, later onset of the rainy season is caused by the extended subtropical high over the northern South China Sea, which induces delayed shift of the western edge of the subtropical high in May. The onset situation for 2001-2008 will be shown in our poster.