

**A New Look at Changma using equivalent potential temperature analysis**

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This study revisits the definition of Changma, which is the major rainy season in Korea and corresponds to a regional component of the East Asian summer monsoon system. In spite of several decades of researches on Changma, questions still remain on many aspects of Changma that include its proper definition, determination of its onset and retreat, and relevant large-scale dynamical and thermodynamical features. Therefore, this study clarifies the definition of Changma (which is a starting point for the study of interannual and interdecadal variability) using a basic concept of air mass and front by calculating equivalent potential temperature that considers air temperature and humidity simultaneously. A negative peak in the meridional gradient of this quantity signifies the approximate location of Changma front. This front has previously been recognized as the boundary between the tropical North Pacific air mass and cold Okhotsk sea air mass from the traditional point of view. However, this study identifies three more important air masses affecting Changma: the tropical monsoon air mass related to the intertropical convergence zone over Southeast Asia and South China Sea, the tropical continental air mass over North China, and intermittently polar continental air mass. The variations of these five air masses lead to complicated evolution of Changma and modulate intensity, onset and withdrawal dates, and duration of Changma on the interannual time scale. Importantly, use of equivalent potential temperature, 500-hPa geopotential height and 200-hPa zonal wind fields for determining Changma onset and withdrawal dates results in a significant increase (up to ~57%) in the hindcast skill compared to a previous study.