



Bimodal Variability of East Asian Summer Monsoon Viewed as Atmospheric Hydrological Cycle

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The summer vertically integrated moisture flux (VIMF) and its convergence have been estimated by using ECMWF reanalysis (ERA-40) data for the period of 1958-2002. Physical linkages between moisture flux by East Asian summer monsoon (EASM) and summer rainfall anomalies in China have been also investigated. A multivariate EOF (MEOF) analysis reveals that EASM-related VIMF anomalies are mainly regulated by two dominant modes, referred to as MEOF1 and MEOF2. These two modes exhibit significant oscillations on decadal time scales. VIMF anomalies related to these two modes display different wave-like features in magnitude and location. An anomalous east-west elongated cyclone along 22.5N and an anomalous anticyclonic ridge along 40N are associated with the MEOF1 mode, while an anomalous anticyclone around northern SCS, an anomalous cyclone around the subtropical western North Pacific and an anomalous anticyclone centred at (40N, 170E) correspond to the MEOF2 mode. The low-level circulation anomalies associated with these two modes also display similar wave-like patterns. Regression analyses disclose a close coupling between summer VIMF convergence and rainfall anomalies in central and eastern China. Associated with the MEOF1 mode, positive VIMF convergence anomalies induce positive rainfall anomalies in South China, while negative VIMF convergence anomalies cause negative rainfall anomalies in the middle and lower reaches of the Yangtze River valley and Northeast China. Corresponding to the MEOF2 mode, positive VIMF convergence anomalies result in positive rainfall anomalies in the Yellow River valley and most of central China, but negative VIMF convergence anomalies.