



The diurnal cycle of lightning and storms during the pre-Meiyu, Meiyu and post-Meiyu period over Yangtze-Huaihe River Basin, China

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Using 5 years of operational Doppler radar, cloud-to-ground lightning observations and NECP reanalysis data, this study, for the first time for such a purpose, examines the spatial and temporal characteristics of and correlations between summer storm and lightning over the Yangtze-Huaihe River Basin (YHRB), with a special emphasize on their diurnal cycles. The sub-seasonal variability of the lifetime, storm top, max reflectivity and cell-based vertical integrated liquid (VIL) water of storms are also investigated using the Storm Cell Identification and Tracking algorithm. Results show that storms over YHRB occur most frequently during the Meiyu period. Storms are largely associated with Meiyu fronts during the period and show a fast-moving speed and moderate intensity (proxies including storms top, max reflectivity and VIL). The diurnal variations of storms embedded in Meiyu front are weak. The storm intensity becomes much stronger in the post-Meiyu period due to the increased atmospheric instability. Higher occurrence frequency of CG lightning can also be found during the post-Meiyu period. The diurnal cycles of storm and CG lightning in the post-Meiyu period show a unimodal pattern with an afternoon peak corresponding to solar heating effect. An inverse correlation between the lightning numbers and the mean value of peak current (MPC) for the negative CG lightning is found during the pre-Meiyu and Meiyu periods. The diurnal variation of MPC for the negative CG lightning agrees well with the storm intensity to some extent.