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Characteristics of Lightning Activities over the Tibetan Plateau and the Capacity of the FY-4A LMI Lightning Detection in the Plateau

Wen Hui and Fuxiang Huang
National Satellite Meteorological Center, Beijing, China (hwen97@126.com)

The Tibetan Plateau, where is called as “the third pole” with a mean elevation of more than 4000m above sea level, has unique weather phenomena and climate characteristics. The temporal and geographical variations of lightning activities over the Tibetan Plateau are firstly analyzed by using the TRMM LIS 0.1° Very High Resolution Gridded Climatology (VHRcC) data set from 1998 to 2013. The results show that the convective processes mainly occur on the central and eastern plateau during June to August, and most of them have small scale structure and quite short duration of lightning discharging. A lightning flash usually consists of 7 groups and a group consists of 4 events, which is obviously less than those on the same latitude of China. Furthermore, the mean size of these flashes is only 217.3km^2, and their mean duration is 0.2s, which is also much less than the other regions on the same latitude of China. For further investigating the characteristics of lightning activities over the plateau, we carry out intercomparison of the FengYun-4A (FY-4A) Lightning Mapping Imager (LMI) observations with the International Space Station (ISS) LIS from March to September 2017. The FY-4A LMI, which was launched in December 2016, is the first Chinese satellite based lightning detection sensor, and one of the world’s first two geostationary satellite lightning imagers. The ISS LIS, which was launched in February 2017, is identical to the TRMM LIS. The comparisons validate the FY-4A LMI observations over the Tibetan Plateau, but its detection capacity is clearly lower than that of the ISS LIS at the same targets. When the matching criterion is set to less than 10s and 0.2°, their consistency is about 30%. The comparisons also show that the lightning radiance detected by the FY-4A LMI is quite weak. Over the plateau, the mean radiance of LIS events is 19.7uJ/sr/m^2/nm, but that of LMI events is only 0.4uJ/sr/m^2/nm. Big difference between the FY-4A and ISS orbits makes the difference of the lightning radiance observations, especially over the Tibetan Plateau, where the lightning flashes have relatively weaker radiance and shorter duration. Theoretically, the in-orbit algorithm of the Real Time Event Processor (RTEP) to extract events from the frame to frame raw data may partly accounts for the FY-4A LMI’s relatively lower lightning detection capacity over the Plateau. It indicates that the algorithm needs smaller threshold and more sensitive background estimation over the Tibetan Plateau. In future, we plan to further investigate the applicability of the RTEP algorithm of FY-4A LMI, and its effects on lighting detection over the FY-4A LMI coverage.