

Synchronization between lightning activity in the Maritime Continent and OLR in tropics

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Lightning activity is an excellent proxy of atmospheric circulation in thunderstorm. Therefore, the research of global lightning activity leads to understanding of the global atmospheric circulation. However, there has been no objective global lightning data set. We have developed and been operating the global ELF observation network named GEON. Yamashita et al. (2011) analyzed GEON data recorded in the period of August 2003- July 2004 and estimated location and charge moment change of each lightning stroke with uniform sensitivity over the world for the first time.

We performed correlated analysis between the number of the lightning strokes derived from GEON and Outgoing Longwave Radiation (OLR) in the tropical regions, focusing the variation with about month periodicity.

It was found that the number of lightning strokes in the Maritime Continent (MC) varies with about month periodicity in the period from February to June 2004 and shows positive correlation ($R \sim 0.8$) with OLR in the Western Pacific Warm Pool (WPWP). That is, when thunderstorm activity in the MC is enhanced, the OLR in WPWP becomes large, meaning less cloud amount. On the other hand, OLR in the central Africa shows negative correlation with the number of lightning strokes in the MC in that period ($R \sim -0.7$). Furthermore, in the central Africa OLR seems to reflect the number of lightning strokes, showing good correlation between them. This implies that the activities of thunderstorms both in the central Africa and in the MC oscillate in the same phase. Also OLR in the central of Pacific Ocean, America and the Atlantic Ocean show negative correlation ($R \sim -0.6$). In the central of Pacific Ocean and the Atlantic Ocean, OLR shows low amplitude except the period of negative correlation. Such a synchronization of thunderstorms or cloud amount in global scale without phase difference has not been reported.

Keywords: lightning activity, GEON, OLR, Maritime Continent, teleconnection