

Common period oscillations in geomagnetic, GPS-TEC and micro-barometric variations observed just after sudden heavy rain fall in Thailand

Akiyasu Yamada¹, *Toshihiko Iyemori², Yasuharu Sano³, Yoko Odagi², Yoshikazu Tanaka⁵, Kornyanat Hozumi⁴, Tadashi Aoyama⁷, Yoshihiro Yokoyama⁷, Vijak Pangsapa⁶, Thanawat Jarupongsakul⁶

1. Faculty of Science, Kyoto University, 2. Data Analysis Center for Geomagnetism and Space Magnetism, Graduate School of Science, Kyoto University, 3. Asahi University, 4. NICT, 5. Kyoto University, 6. Faculty of Science, Chulalongkorn University, 7. Graduate School of Science, Kyoto University

Acoustic mode gravity waves generated by lower atmospheric disturbance can propagate vertically upward to the ionosphere and expected to generate dynamo currents and electron density variations there. From precise magnetic observation by the CHAMP and the Swarm satellites, it has been suggested that the acoustic mode gravity waves generated by cumulus convection cause ionospheric dynamo currents and they are the main source of “magnetic ripples” phenomenon, which is the spatial structure of a small scale field-aligned current system observed along the satellites in middle or low latitudes (Nakanishi et al., 2014; Iyemori et al., 2015; Aoyama et al., 2017). To confirm the above scenario, we examined the effects of strong rain fall in tropical region caused by strong cumulus convection, because strong rain fall causes rapid pressure variation above and below the rain cloud and the pressure variation propagates upward as acoustic and/or internal mode gravity waves. That is, we conducted simultaneous observation of rain fall, micro-barometric and geomagnetic field variations, and GPS-TEC observation in Phimai, north-east of Thailand. From the data, we found some events where the power spectra of micro-barometric, geomagnetic and GPS-TEC variation have common power spectral peaks with a few minute period at the same time. Such events strongly suggest that the acoustic mode waves generated by sudden heavy rain fall, propagate to upper atmosphere and generate dynamo currents and TEC variation.

Keywords: Acoustic wave, Micro-barometric variation, Ionospheric current, Magnetic ripples