

Small-scale magnetic fluctuations of lower atmospheric origin as observed by low Earth orbit satellites ~ Identification of lower atmospheric phenomena ~

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We recently found small-scale (0.1~5 nT) magnetic fluctuations above the ionosphere in middle and low latitudes with period about 20-30 sec along the satellite orbit observed by the low Earth orbit satellites such as the CHAMP (2000~2009) or the SWARM (2013~) having precise magnetometer (resolution: 0.065 nT). We name these magnetic fluctuations the "Magnetic Ripples" (MRs). The magnetic fluctuations are perpendicular to geomagnetic main field. By comparing the magnetic fluctuations observed by two SWARM satellites at the same latitude, we could confirm that they are the manifestation of the spatial structure of small scale field-aligned currents along the satellite orbit. The amplitude of the MRs have local time, geographical and seasonal dependence, therefore we suppose that localized field-aligned currents are generated by the ionospheric E-layer dynamo driven by the atmospheric gravity waves propagated from lower atmosphere. Typhoons and volcanic eruptions are known to generate gravity waves, and we report the characteristic of the MRs probably generated by a volcanic eruption, typhoons, rain fronts etc.. We try to identify the lower atmospheric phenomena which cause the MRs.

Keywords: ionospheric dynamo, field-aligned current, acoustic resonance, SWARM, CHAMP, magnetic ripple