

A morphological study on the relationship between electron density fluctuations and magnetic fluctuations observed by low altitude satellites in low and middle latitudes

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Polar orbiting low-altitude satellites such as the Swarm satellites observe magnetic and electron density fluctuations in low and middle latitudes along satellite orbit. The magnetic fluctuations typically have the period about 10-30seconds along satellite orbit and they are mostly small-scale field-aligned current effects and named as 'magnetic ripples'. They are supposed to be generated in lower ionosphere by dynamo mechanism caused by neutral atmospheric waves from lower atmosphere. On the nightside, they still exist with smaller amplitude because of lower ionospheric conductivity. Plasma bubbles also exist on the nightside and they normally accompany magnetic fluctuations to keep pressure balance. If we trace down to the dynamo layer around 120km altitude from magnetic ripples and compare the electron density fluctuations, they correspond better than the correspondence on the orbit. This indicates vertical propagation of atmospheric waves which causes both magnetic ripples and electron density fluctuations. On the other hand, in well-developed plasma bubbles, plasma density fluctuation and magnetic fluctuation occur at the same location on the orbit. In this study, we present morphological relationship between the two phenomena. That is, we investigate how magnetic ripples relate to plasma bubbles.

Keywords: magnetic ripples, ionospheric electron density, plasma bubbles