

Magnetic ripples as observed by low altitude satellites, CHAMP and SWARM

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The low altitude satellites such as the CHAMP or the SWARM satellites have been observing the small amplitude (typically 0.5 – 5nT on the dayside) magnetic fluctuations with period of a couple of ten seconds. They exist almost all the time and at any local time (LT) in middle and low latitudes. They were named as “magnetic ripples” because the magnetic fluctuations like ripples exist globally.

They have the following characteristics: (1) They are perpendicular to the geomagnetic main field. (2) Their amplitude has the magnetic conjugacy. (3) The amplitude and the period along the orbit have latitudinal dependence, and they depend also on the geographic longitude. (4) The amplitude is larger on the day side than on the night side. (5) The amplitude doesn't have dependence on the solar wind parameters nor the magnetic disturbance. (6) The amplitude has the following seasonal and topographical characteristics. That is, the amplitude during the northern summer and northern winter is larger than those during the equinoxes. In the northern summer, the amplitude over South America, Eurasia, North Africa and Australia continents, and their magnetic conjugate regions is larger than those in the other regions. In the northern winter, the amplitude over the eastern Pacific Ocean is larger.

We assume that they are generated through the E-region dynamo driven by the acoustic mode of the gravity waves propagated from lower atmosphere. We discuss the consistency of the above mentioned characteristics and suggested mechanism of generation of the magnetic ripples with ground based observations such as the GPS-TEC, micro-barometric observation, etc..

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low-altitude magnetic satellite