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Comparison of magnetometric observational data with theoretical model of ballooning eigenmodes in the inner magnetosphere of the Earth

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In the papers (Cheremnykh and Parnowski, 2006; Agapitov et al, 2006) we developed a theoretical model of generation of ballooning modes in the inner magnetosphere of the Earth and conducted corresponding numerical simulations. In particular, it was determined that eigenmode spectra are discretely continuous and equidistant, with the lowest frequency corresponding to $\sim$1 Hz for Alfvén and $\sim$1 mHz for slow magnetosonic modes. It was also demonstrated that in stable situation the decay rate is the largest in dawn/dusk sectors, and is much lower in noon/midnight sectors. In this paper, we will try to determine, how much this model corresponds to actual wave processes in the inner magnetosphere of the Earth.

The discrete frequency spectrum of the geomagnetic field disturbances was observed both in ground and in satellite magnetometric data (see (Mathie et al., 1999; Kepko and Spence, 2003; Villante et al, 2001) and references therein). Usually, processes with frequencies 1.2-1.4, 1.8-2.0, 2.4-2.6, 3.2-3.4 mHz (also known as CMS frequencies) are assosiated with cavity or waveguide modes. FLR frequencies are larger and have strong latitudinal dependence. Leonovich and Mazur (2005) associate such frequencies with eigenmodes in the magnetotail, Kepko and Spence (2003) insist that they are caused by direct solar wind influence, but we believe that these frequencies are connected with magnetosonic eigenmodes in inner magnetosphere.

Basing on the Intermagnet geomagnetic data archive, it is shown that discrete spectrum of range 0.2-3.7 mHz in the morning and evening sectors is transitive and varies from day/night regime. Discrete frequencies latitudinal variation may occur in narrow band. When L is more than 2.4 discrete spectra become less evident. Reported stability of the frequencies remains controversial. In the morning sector the discrete structure is more expressed, though in day sector the overall spectral capacity is higher. These peculiarities can be explained by diurnal variation of ionospheric parameters. The dependence on solar wind parameters takes place, but it is rather energetic than direct. Strong correlation is present only during periodic changes of solar wind dynamic pressure or during very intensive events such as magnetic cloud event on January 11, 1997 (Villante et al, 2001).

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