Field-line resonance caused by lower atmospheric disturbances

Kent Taira[1]; Toshihiko Iyemori[2]; Mitsuru Matsumura[3]

[1] Dept. of Geophysics, Kyoto Univ; [2] WDC for Geomag., Kyoto Univ.; [3] Dept. of Geophysics, Kyoyo Univ.

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The higher the altitude is between the ionosphere and the magnetosphere, the faster the Alfven speed becomes. As a result, even if a magneto hydrodynamic wave is generated

in the ionosphere and propagates upward, it may be reflected and can't reach the magnetosphere.

Two types of magnetic pulsations were observed at the 2004 Sumatra earthquake (Iyemori et al., 2005). The paper reported magnetic pulsations having periods about 3.6min and 30sec. The former was supposed to be caused by the dynamo process at the ionosphere, because it was in accord with the resonance period of acoustic wave between the ground and the thermosphere, whereas the latter might be caused by the field-line resonance.

The detection of the effects of lower atmospheric disturbances in the magnetosphere as the variation of the magnetic field has been attempted, though any clear evidence has not been found (e.g. Balasis and Mandea, 2007; Matthews,1985). If the 30sec pulsation is the field-line resonance caused by the disturbance of lower atmosphere, it may be the first time to show the effect of lower atmospheric disturbances to the upper ionosphere (or to the magnetosphere).

We try to reveal the feature of the magnetic pulsations caused by the lower atmospheric disturbances and detect their effect in space. We compare the period of field line resonance expected at the observation site with the observed one in order to confirm that the 30sec (20 sec) pulsation is caused by the field-line resonance. We calculate the resonance period of magnetic field line at the low latitude observatory (Tong Hai, M.Lat=13.79N, 174.81E) where the pulsation was observed. In the calculation, a realistic model ionosphere (IRI2007) is used to incorporate the distribution of heavy ions at the ionosphere. The result of comparison is consistent with the field-line resonance. We will also show other cases such as Mount Pinatubo eruption in 1991 etc.