A comparative analysis of low-latitude Pi2 pulsations observed by Oersted and ground stations and their possible mechanisms

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The Oersted satellite is a low-altitude polar orbiting satellite and has an advantage in investigating the spatial variation for low-frequency events like Pi2 pulsations. Using one-second vector magnetic field data from April 1999 to May 2002 obtained from the Oersted satellite and Kakioka (KAK) observatory, we found that the field aligned component (B//) of Pi2 pulsations at the satellite has good correlation with the H component on the ground, but the other two components at the satellite, i.e. eastward component (BE) and the perpendicular component to ambient field on meridian plane,do not show any clear correlation with any components on the ground. We found 62 Pi2s whose correlation coefficient between B// and H are higher than 0.6. Most of the 62 events were observed when the satellite located within 75 degrees (i.e., 5 hours LT) in longitude from KAK, but there also have some cases that the satellite was far away from KAK over 5 hours and even near 12 hours in LT. We also found some cases on the night-side for which excellent correlation between the satellite and ground last over a large L range at low-latitudes. For some night-side events, the phase observed by the satellite reversed 180o with that observed on the ground when the satellite flew from low- to mid-latitude or from mid- to low-latitude at L=3~4. These observations provide evidences that night-side Pi2s at low-latitude are cavity resonance mode. Two cases observed by the satellite when it located on the morning side or dusk side also show cavity resonance properties, so the cavity mode also can be established on both the morning and the dusk sides. But when the satellite was on the dayside, the oscillations observed by the satellite are out of phase with that observed on the ground, which suggest that the dayside Pi2s are more likely related with some dayside ionospheric current system rather than caused by global cavity resonance mode. The amplitude variation recorded by the satellite show a peak at equatorial region, which for the first time gives clear observational support for the model calculation made by Allan et al. (1996) and indicate that the compressional/fast-mode wave component at low-latitude maps directly to the H component on the ground. We also simply estimated screening effect of the ionosphere for MHD waves and suggest that when the cavity resonance mode is valid for generation of Pi2 pulsations at low-latitude, the screening effect is negligible, that is, the compressional waves are incident to the ground directly.