AKR modulation and Global Pi 2 oscillation: Jan. 24, 1997 event

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A transient geomagnetic pulsation Pi 2 is well recognized to occur accompanied with auroral breakup [e.g. *Sakurai and Saito*, 1976], and accepted as an onset indicator of magnetospheric substorm [e.g. *Rostoker et al.*, 1980]. Some Pi 2 are associated with small nightside auroral transient events (pseudo-breakups) [e.g., *Liou et al.*, 2000]. *Morioka et al.* [2005] demonstrated that a clear auroral kilometric radiation (AKR) sometimes occurred without any typical substorm signatures characterized by auroral electrojet enhancement on the ground, tail current disruption in the near-Earth plasma sheet, and energetic particle injection from the plasma sheet. Then they emphasized that the onset of AKR is one of the elementary components of the contracted substorm same as auroral brightening on the contracted oval and Pi 2 occurred with pseudo-breakup.

In order to investigate a temporal relationship between Pi 2 and AKR, we analyzed an isolated substrom event (AL˜30nT, AE˜40nT) occurred around 1019UT on January 24, 1997, which was accompanied with isolated Pi 2 and AKR. The Pi 2 event was observed at six stations located in the dusk sector from high-latitude to near-magnetic equatorial region along 210deg magnetic meridian and one midnight low-latitude station belonging MAGDAS/CPMN. The initial movement of Pi 2 occurred concurrently among all the stations in both H and D components. The D component Pi 2 oscillation synchronized among all the station and also low-latitude H component Pi 2. The oscillation behavior of the initial movement of the H component in high- and mid-latitude and entire D component oscillation can be explained by the well-known substorm current wedge (SCW) model for Pi 2, though the propagation mechanism of the magnetic perturbation from the oscillating SCW to ground stations has not been specified yet. On the other hand, the H component oscillation in the high- and mid-latitude Pi 2 exhibited the propagation signature. We found that the time-derivative of the height-integrated AKR power flux, which was observed by Polar satellite, oscillated in similar wave form to the mid-latitude D component and the low-latitude H component Pi 2 without any significant phase delay (correlation coefficients were 0.76 and 0.74, respectively, with the delay time of ˜3s). Pi 2 onset preceded the AKR breakup about 40s. The temporal relation between the time-derivative of AKR power and ground Pi 2 suggests that the integrated AKR power was modulated synchronously with the oscillation of the SCW, which was inferred from the ground Pi 2 signature.