Verification of Jovian ionospheric Alfven resonator by event analyses of ground-base observation

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Jovian decametric (DAM) radiation has been studied based on event analyses of a simultaneous S-burst event in multiple frequency bands and continuous occurrence of S and L bursts obtained by ground-based observation in order to verify Jovian ionospheric Alfven resonator (IAR) hypothesis.

Ergun et al. [2006] and Su et al. [2006] proposed Jovian IAR model. According to these previous studies, eigenfrequencies of Jovian IAR are also expected to determine the repetition rate of S-burst of Jovian DAM radiation. This Jovian IAR hypothesis was based on the theory and observations of the Earth's IAR. However, due to lack of the observational evidences, Jovian IAR hypothesis has been controversial since its proposal. In order to verify the Jovian IAR hypothesis, we have observed Jovian DAM radiation with a logperiodic antenna at Yoneyama observatory and a wideband receiver, whose frequency range is from 20 MHz to 40MHz. Previous studies reported that intense S-burst events increase were often found in Io-B source condition. So, we have scheduled observation in Io-B source condition.

In this study, we focus on following two events: The first one is a simultaneous S-burst event in two different frequency bands (˜23.5 MHz and ˜27 MHz) found around 15:56 UT on 24 November, 2014. Assuming that the emission frequency is equal to the electron cyclotron frequency at the source, the geometric distance of the emission sources at 23.5 MHz and 27 MHz are estimated to be 82500 km and 74800 km. The estimated Alfven wave length in Jovian IAR is from 7200 km to 12000 km by using Alfven speed of 0.80 c and 0.52 c, and the eigenmodes is ˜20 Hz [Ergun et al., 2006; Su et al., 2006]. The distance between the two sources is about 7700 km, which is as large as Alfven wave length trapped at Jovian IAR.

The second one is continuous occurrence of S-burst and L-burst of Jovian DAM for ˜30 minutes found in 12:00-12:30 UT on 2 January, 2015. At first there were L bursts. Then S bursts emissions overlapped came with L busts. Finally, L bursts faded away and there were only S bursts. When the both S-burst and L-burst occurred, complex structures called inverted tilted-V events [Riihima and Carr, 1981; Oya et al., 2002] were found in the spectrogram. The event suggests that there are upward-moving plasma which cause shadowing of background emissions.

In the presentation, we will show some results of further analyses of observation data for verification of Jovian IAR.