

Correlation analysis of plasma waves simultaneously observed by Arase and Van Allen Probes

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The Arase satellite was a Japanese scientific satellite launched in December, 2016 to explore the plasma environment in the inner magnetosphere. On the other hand, Van Allen Probes (RBSP-A, RBSP-B) have been in operation since 2012 mainly in the equatorial region in the inner magnetosphere. Because the inclination of the Arase is larger than the ones of Van Allen Probes, we expect to clarify global characteristics of the inner magnetosphere by comparing the simultaneous observation data. So far we conducted collaborative observation during more than 200 conjunction periods from June 2017 to July 2018 and obtained huge amount of waveform data.

We could identify correlated wave spectra such as chorus and lightning whistlers among some portion of the waveform data during the conjunction periods, and quantitative correlation analysis is necessary to study the propagation characteristics of these waves. In this research, therefore, we aim to develop an environment for correlation analysis of the waveform data simultaneously observed by the Arase and the Van Allen Probes.

In the correlation analyses, we first convert the waveform data into spectrum by performing FFT. As a next step, we interpolate the spectrum data of the Van Allen Probes in order to match up the time and frequency resolution to the ones of the data of the Arase. Finally we calculated the cross-correlation to estimate the time difference of the wave spectra as a function of frequency.

In the present study, we analyzed result of the data measured around 20:54 UT on September 3, 2017, when similar chorus elements were simultaneously observed by Arase and RBSP-A. At this time, both satellites were located around L-value of ~ 4 and magnetic local time of ~ 16 , and the Arase was located at higher magnetic latitude (18.6 degree for the RBSP-A and 28.8 degree for Arase). We found the chorus elements detected by the Arase were about 0.6s delayed from the ones detected by the RBSP-A, that suggests the chorus elements were propagating from equatorial region toward higher latitude region. In the presentation, we will also show the variations of delay times depending on the frequency and observation time to clarify the propagation characteristics of the chorus.