R009-11
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12:00〜12:15

KOSEN-1 Jupiter radio observation campaign with ground-based radio telescopes

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Jupiter produces auroral radio emissions at frequencies below 40 MHz from both north and south polar regions of the planet. The highest frequency radio component is called decametric (DAM) radiation covering in a broad frequency range of a few through 40 MHz. Jovian DAM radiation is partially controlled by the Jovian moon Io, thereby being called Io-related DAM (Io-DAM) emissions. The Io-DAM comprises of millisecond-varying bursts called short-bursts or S-bursts. Because the ground-based radio reception is sensitive down to 10 MHz, there are several long-baseline interferometer studies for Jovian S-bursts in understanding the radio beaming structures with thickness of beaming. According to the previous studies, the minimum thickness of the DAM emissions is estimated at least larger than a 2.75” east-west size (Imai et al., 2016, 2019) and a 1.8” north-south size (Lynch et al., 1976) using several radio telescopes (including LWA1). However, the length of the baseline in a usable pair on the ground is physically limited by the diameter of Earth and the U-V coverage is biased due to a sparse low-frequency radio telescope network. Expanding the baseline provides a benefit to further constrain the size of the S-burst beam thickness.

KOSEN-1 is the first 2U CubeSat developed by 10 colleges of the National Institute of Technology (NIT) in Japan. This CubeSat is equipped with a software-defined radio (SDR) receiver that can monitor the electric fields of the waves around 20 MHz by means of a 7-m long dipole antenna. The SDR receiver can provide both waveforms and spectra in a 2-MHz bandwidth depending upon the available telemetry to the ground, while the timing of the records is synchronized with the GPS 1 Pulse-Per-Second. Since its launch in 2021 fiscal year, KOSEN-1 will have maintained its polar orbit around Earth, freely observing Jovian DAM radiation. We propose to observe a total of 16 Io-DAM S-burst events with KOSEN-1 and ground-based radio telescopes, including LWA1 and LWA-Sevilleta. Also, additional ground-based support is planned with the Deployable Low-band Ionosphere and Transient Experiment (DLITE; Helmboldt et al., 2021) in New Mexico, Maryland, and Florida, as well as, Radio JOVE citizen scientist observers. These multi-baseline observations would give a new way of probing the Jovian S-burst beam thickness. In this presentation, we will review the radio observation system onboard KOSEN-1 and show the plan of KOSEN-1 Jupiter radio observation campaign with the ground-based radio telescopes in 2021 fiscal year.

References

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