

## Plasma sounder observations in space for plasma diagnosis and planetary environment

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Since the launch of the first topside sounder satellite Alouette-I in 1962, ionosphere structure of the topside region has been disclosed as the region of variable plasma structures depending on the local time, season and cycle of the solar activity. After the successive launches of the topside sounder satellites, knowledge of the topside ionosphere region has extensively covered the regions of polar ionosphere, middle and low latitude ionospheres. The sounder instruments have been installed on-board the Japanese scientific satellites since the launch of JIKIKEN satellite into the inner magnetosphere region in 1978.

As a by-product of success of the ionosphere sounding, concept of active experiment was born, since the plasma sounder observes a reaction from the plasma environment. Indeed Warren and Hagg (1968) showed that the topside sounder data reveal existence of the electrostatic waves in space plasma. Then, it has been recognized as an important methodology of plasma diagnosis. On the other hand, the sounder instrument has been significantly developed to be installed on-board planetary missions to measure the moon and planetary surface and subsurface echoes. In future plasma sounder instrument will be developed for the purpose of plasma diagnosis in the field of plasma science as well as tool for the planetary science.