

Planetary Atmosphere studied by millimeter and submillimeter wave band observations

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Constituents and isotope ratios of the planetary atmosphere provide us with useful information on the physical and chemical environment and evolution of the planets as well as the origin of the solar planetary system. We are performing millimeter/submillimeter wave bands observations of terrestrial planets and ice and gas giant planets by using the Atacama Submillimeter Telescope Experiment (ASTE) of the National Astronomical Observatory of Japan and the NANTEN2 telescope of Nagoya Univ. which were constructed at Pampa La Bola of Atacama highland (alt. 4800 m), Chile.

In Aug. 2005 and Aug. 2006 we carried out atmospheric observations toward Mars, Jupiter, and Neptune at the 330-360 GHz frequency band with ASTE (10 m) in order to search spectral lines useful for monitoring observations of planetary atmosphere. The pointing accuracy was checked by observing the continuum emission scanning the disk of Jupiter and Uranus every two hours. The pointing error was 2 arcsec, sufficiently lower than the telescope beam width (22 arcsec FWHM at 345 GHz). As expected the CO absorption line from Mars and the CO and HCN emission lines from Neptune were easily detected using a conventional position switching mode. Here frequency parameter-sets were carefully decided to avoid interference from the earth's atmospheric lines on the basis of a radiative transfer model simple enough to be used on a laptop computer. In parallel we are now developing the hardware and software tool of NANTEN2 telescope (4 m) to perform routine monitoring observations of millimeter/submillimeter wave band emission lines from Martian atmosphere.

In this conference we will present current progress in above observations, developments and our future plans.