

## Millimeter/Submillimeter-Wave Band Observations of Venus' Atmosphere by Using Ground-Based Telescopes

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We are carrying out millimeter/submillimeter wave band observations of planetary atmosphere by using NANTEN2 (aperture:4m) telescope of Nagoya University and Atacama Submillimeter Telescope Experiments (ASTE) (aperture:10m) of National Astronomical Observatory. These ground-based telescopes have been operating at Atacama highland (alt. 4800), Chile in the Southern Hemisphere.

In November and December 2008 we tested the monitoring observation of 230 GHz band CO (J=2-1) rotational line toward Venus with the NANTEN2 telescope. The 230GHz band SIS mixer receiver is cooled by a 4 K closed-cycle Gifford-McMahon/Joule-Thomson cryocooler. The intermediate frequency signal down-converted by the mixer is spectrally analyzed by 250 MHz and 40 MHz band acousto-optical spectrometers. The telescope is remotely operated, and the observed data and instrumental status are transferred to our domestic laboratory by satellite. The beam size of NANTEN2 at 230GHz band is 90 arcseconds, while the Venus' apparent diameter is 13 to 16 arcseconds during the observing period. For every observing day, we performed the pointing correction of the telescope by the cross scanning of the planet, and checked the intensity of CO (J=2-1) line toward Orion KL for the system calibration and the validation of the spectral reproducibility. As a result, the relative error of the observed spectral lines was less than 3 %.

The thermal continuum level and CO absorption spectral lines observed toward Venus were typically 8 K and 0.5 K, respectively. From the continuum level we estimated the microwave brightness temperature of Venus to be 288 K at 230GHz band. In addition, based on the analysis of our simple radiative transfer model the observed absorption feature of CO line was found to be sensitive to the change of the CO mixing ratio at around alt. 80 km. These results are well consistent with that studied by Clancy et al.

Based on these results achieved to date we will soon undertake millimeter/submillimeter wave band periodical and long-term monitoring toward the terrestrial planets, which will provide us with an important information about the influence of various solar activities on the photochemical reaction network, chemical compositions and physical dynamics of the terrestrial atmosphere.

In this meeting we will present the preliminary results of the observation of Venus' atmosphere.