

## Status of Millimeter-wave Band Ground-based 10m-SPART Telescope for Monitoring Observations of the Middle Atmospheres of Terrestrial Planets in the Solar System.

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To understand the influence of activities of central stars on the atmospheres of terrestrial planets in the solar system and of exoplanets, we are performing monitoring observations of millimeter-waveband spectral lines of carbon monoxide,  $^{12}\text{CO}(J=1-0, J=2-1)$  and  $^{13}\text{CO}(J=2-1)$  of the Martian and Venusian atmosphere with a 10-m telescope, Solar Planetary Atmosphere Research Telescope (SPART). Heterodyne spectroscopy with high frequency resolution is a powerful tool to trace the weak and narrow spectral lines of minor constituents in the middle atmosphere of planets.

The results obtained with SPART suggest that the disk-averaged mixing ratio of carbon monoxide derived at an altitude of 80 km in Venus was about 60 ppmv during 2012 and 2015. This observing period corresponds to the solar cycle 24 maximum phase. The mixing ratios of CO seem to be lower than those observed during the solar cycle 22 maximum phase. These may suggest that the abundance variations of CO are related to solar activities. For understanding of the CO production induced by solar energetic particles (SEP) events, we performed a numerical model on the basis of the Bethe-Bloch formula under conditions of typically great solar-proton events with incident-proton energies of less than 1 GeV. The obtained results suggest that the ionization rate reaches its maximum at an altitude of 80-90 km in the Venusian atmosphere. However it was found that the production rate of CO is smaller than that induced by incident ultraviolet radiation at the altitude. Although currently the operation environment of the SPART telescope is renewed for opening to the general public at Nobeyama Radio Observatory, we will restart the monitoring observations soon after the construction within this year in anticipation of integrated researches with the AKATSUKI.

In this conference, we will present the current status of the SPART project briefly.

Keywords: Venusian atmosphere, Radio Telescope, Solar Activity