R009-17
Zoom meeting D ：11/1 PM1 (13:45-15:30)
15:00-15:15

Initial results of HCl abundance at the cloud top of Venus retrieved from IRTF/iSHELL spectra

#Takao M. Sato[1)], Hideo Sagawa[2)]
[1)]Hokkaido Information University,[2)]Kyoto Sangyo University

The atmosphere of Venus can be divided into three altitudinal regions with different chemical conditions. High temperature and pressure and the absence of effective photolysis processes are dominant in the lower atmosphere up to 60 km where solar radiation longer than UV can reach. The middle atmosphere between 60 and 110 km is controlled by photochemistry driven by solar UV radiation. In the upper atmosphere above 110 km, dissociation, ionization, and ionospheric reactions are important processes.
HCl is the primary chlorine reservoir in the Venus atmosphere bellow 110 km. Highly reactive chlorine species (ClO_x) is produced by solar UV photolysis of HCl and has been proposed to play an important role in catalysis of CO and O recombination to CO_2, thereby stabilizing the CO_2 atmosphere. Chlorine chemistry is also linked to sulfur chemistry and its understanding is necessary to explain the observed vertical distribution of SO_2.
Interestingly, there is a large inconsistency between the HCl abundances measured by spacecraft and ground-based telescopes. The SOIR instrument onboard Venus Express measured its abundance as less than ~50 ppb at the cloud top (~70 km) increasing to 1 ppm in the upper atmosphere (~110 km). Such a vertical trend conflicts with the vertically constant profile (up to ~80 km) reported by sub-mm ground-based observations. Near-infrared ground-based observations also showed the HCl abundance at the cloud top as ~500 ppb, which are nearly one order of magnitude larger than the SOIR results. The reason for this inconsistency has not been understood yet.
In order to re-examine HCl abundance at the cloud top, we carried out a high-resolution spectroscopy of Venus' dayside at wavelengths of 3.18-3.46 μm and 3.58-4.16 μm with IRTF/iSHELL on August 5-7, 2018 (UT). Taking the full advantages of its high spectral resolution of R ~ 75,000, iSHELL resolved individual HCl lines with sufficient separation from terrestrial lines. In this presentation, we will show initial results of HCl abundance at the cloud top, retrieved from processed spectra and compare them with previous studies. A preliminary report of additional iSHELL observations planned on August 18-20, 2020 (UT) will also be included.