

Ground-based Millimeter-wave Observations of Water Vapor Emission (183 GHz) at Atacama, Chile

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We report a ground-based mm-wave observation of the stratospheric and mesospheric water vapor in Atacama, Chile in December 2005. Stratospheric water vapor is an important trace gas in the middle atmosphere, because it is a source of odd hydrogen influencing ozone chemistry and is one of the greenhouse gases which affect the radiation balance in the middle atmosphere. Previous observations suggest that the stratospheric water vapor had increased at a rate about 1 %/yr since 1950s (e.g., SPARC Report 2000), whereas in 2000s, it decreases at ~ -0.1 %/yr (e.g., Nedoluha et al. 2003). We forward a plan of observing mm-wave spectra of water vapor (183.310 GHz) at Atacama (northern part of Chile at an altitude of 4,800 m) in order to understand the mechanism of temporal variations of stratospheric water vapor. In December 2005, we succeeded in obtaining water vapor spectra at Atacama with the mm-wave radiometer equipped with a superconductive (SIS) receiver developed by Nagoya University and NAOJ. A vertical profile of the water vapor mixing ratio from 40 to 70 km was retrieved by using a modified optimal estimated algorithm (Nagahama et al. 1999). The retrieved mixing ratio was systematically smaller than the climatological value because of underestimation of tropospheric optical depth caused by less suppression of image side band sensitivity. For accurate estimation of the optical depth, we are developing a sideband separation receiver by using a waveguide split block (e.g., Asayama et al. 2004).