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Simultaneous observations of stratospheric water vapor isotopometers with a ground-based superconductive radiometer

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Increase of stratospheric water vapor causes cooling of the temperature, leading to affect the ozone chemistry via increasing of polar stratospheric clouds in the Arctic and reduction of odd chlorine. Ground-based millimeter-wave radiometer is one of the most suitable tools to observe time variation of vertical profiles of water vapor mixing ratio in stratosphere and mesosphere.

We installed a superconductive (SIS) mixer radiometer at Las Campanas Observatory in Chile (29S, 71W, 2,300m altitude) in 1999 and have measured spectra of water vapor isotopomer ($H_2{}^{18}O$) at 203.4GHz since August 2003. In addition, we are improving the radiometer to be able to measure at least two spectra in separated frequencies simultaneously. We will install the new instrument in Atacama region, northern part of Chile at an altitude of 4,800m in June, 2004 and start simultaneous observations of water vapor isotopomers (H_2O at 183.3GHz and $H_2{}^{18}O$ at 203.4GHz). The isotopic ratio of water vapor varies by fractionation entering the stratosphere through the tropopause as well as by conversion due to the methane oxidization, and the simultaneous measurements of the isotopomers will provide us with new information on the behavior of water vapor to understand the mechanism of increase of water vapor in stratosphere.

We will present the results of water vapor ($H_2{}^{18}O$) measurements at Las Campanas and the current status of the development of the new instrument installed in Atacama, Chile.

Keywords: Ground-base; Water vapor; microwave; middle atmosphere