Millimeter-wave observation of stratospheric ozone in 2015-2017 in Rio Gallegos at the southern tip of South America

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We had been carried out a trilateral international collaboration among Japan, Chile, and Argentina called SAVER-Net (South American Environmental Risk Management Network) project for five years under the JST-JIICA SATREPS program. The major aim of the project was establishing an observation network of UV/ozone and aerosols over Chile and Argentina where was a blank area of the measurement stations on a global scale. The southern tip region of South America is the southernmost habitable area in the world, and the local residents in this region directly suffers from the influence of ozone hole that sometimes overpasses the region. Although the project was terminated in March 2018, we continue collaboration to develop forecast system of ozone hole and UV indices.

In this presentation, we will report the results of ozone observation by using a millimeter-wave spectrometer installed at the atmospheric observatory in southern Patagonia (OAPA) in Rio Gallegos, Argentina. The observation period was from April 2015 to March 2016 and September 2016 to August 2017, and we obtained ~ 9,400 1-hour averaged vertical profiles. We compared the time series of ozone volume mixing ratio (VMR) profile obtained in September and October when the ozone hole passes over the southern tip with the meteorological parameters, such as atmospheric temperature, potential temperature, and potential vorticities that are derived from MERRA-2 reanalysis data. As a result of the comparisons, we revealed that

・Ozone VMRs and the absolute value of potential vorticities show a good correlation below ~ 1000 K in potential temperature corresponding to ~ 35 km in altitude.

・As the ozone hole reaches above Rio Gallegos, atmospheric temperature decreases around ~ 25 km due to the horizontal advection of cool air in the polar vortex, and the temperature above ~35 km increases due to atmospheric descent inside of the polar vortex,

and we can use these quantities to easily distinguish whether Rio Gallegos is located at inside or outside of the ozone hole.

We will also present more detailed results about the ozone hole activities in 2015 and 2016.

Keywords: ozone hole, millimeter-wave spectroscopy, South America, polar vortex

