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# Long-term monitoring of the stratospheric and mesospheric ozone with the two ground-based millimeter-wave radiometers in NIES, Japan

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We report on results of the long-term monitoring of the stratospheric and mesospheric ozone with the two ground-based millimeter-wave radiometers conducted at the National Institute for Environmental Studies (NIES), Japan. One of the aims of the monitoring is to reveal the ozone depletion in the mid-latitude region in detail from long-term and much frequent measurements. Millimeter-wave measurements are of great advantage to these kinds of monitoring because they do not require any light sources unlike absorption measurements, and therefore, we can carry out the measurements continuously. These data will provide us better understanding of its mechanism, such as relation to the massive depletion of ozone over the Arctic in winter/spring. We have been measuring vertical profiles of ozone in the stratosphere and mesosphere over Tsukuba (36.1N, 140.1E) since 1995 and over Rikubetsu (43.5N, 143.8E) since 1999. Each radiometer is equipped with a superconducting (SIS) mixer receiver that provides an extremely low noise temperature and with an acousto-optical spectrometer (AOS). The bandwidth of the AOS is 1 GHz for Tsukuba and 500 MHz for Rikubetsu, respectively. Ozone spectra were obtained every 10 minutes with sufficient signal-to-noise ratio. The vertical profiles of ozone mixing ratio were retrieved with the optimal estimation method, and its coverage in altitude ranges from 14 to 76 km for Tsukuba and from 22 to 60 km for Rikubetsu, respectively. From the measurements, we clearly detected seasonal and short-term variations of ozone mixing ratio in the stratosphere and mesosphere. We analyzed temporal variations of ozone at various altitudes and identified their features. Further details of the features and correlations between the ozone mixing ratio and dynamical parameters such as a potential temperature will be presented.