

A three-week total ozone reduction over Rio Gallegos in Argentina in November 2009 and its relation to blocking in the troposphere

*Hideharu Akiyoshi¹, Masanao Kadowaki², Haruna Nakamura^{3,1}, Takafumi Sugita¹, Yayoi Harada⁴, Toshihiko Hirooka⁵, Akira Mizuno⁶

1. National Institute for Environmental Studies, 2. Japan Atomic Energy Agency, 3. Fujitsu FIP Corporation, 4. Meteorological Research Institute, 5. Kyushu University, 6. Institute for Space-Earth Environmental Research, Nagoya University

A three-week total ozone reduction over the southern tip of South America in November 2009 was reported by de Laat et al. (2010). Such long lasting low total ozone is unusual for this region and season. Ozone vertical profile measurements at Rio Gallegos, Argentina (51°S, 69°W), by ozone LIDAR suggest that isentropic surfaces of 675K and 475K over Rio Gallegos were inside the Antarctic polar vortex around November 13-14 and 22-23, respectively (Wolfram et al., 2012); thus, the low total ozone lasted for three weeks. Analyses of the total ozone observed by OMI, and ERA-Interim and JRA-55 reanalysis data indicate that the low total ozone event was caused by a polar vortex migration toward the South American continent at the time of the vortex breakup, and that the migration is associated with an enhanced wave flux from the troposphere to the stratosphere at around 120-150°W and 50-60°S. In November, a large positive deviation of a 500 hPa geopotential height from the zonal-mean was evident. This large positive deviation was considered to be a blocking by diagnosing the geopotential height field in accordance with the method of Mendes et al. (2012). These results suggest a relation between the long-term low total ozone event over Rio Gallegos and a blocking phenomenon in the troposphere of the Southern Hemisphere through wave propagation from the blocking region.

Keywords: ozone, polar vortex, South America, blocking, wave flux