Dynamical analysis in the Southern Hemisphere associated with a three-week total ozone reduction over the southern tip of South America in November 2009

Hideharu Akiyoshi[1], Masanao Kadowaki[2,1], Haruna Nakamura[3], Takafumi Sugita[1], Toshihiko Hirooka[4], Yayoi Harada[5], and Akira Mizuno[6]

[1] *National Institute for Environmental Studies, Tsukuba, Japan*

[2] *Japan Atomic Energy Agency, Tokai-mura, Japan*

[3] *Fujitsu FIP Corporation, Tokyo, Japan*

[4] *Department of Earth and Planetary Sciences, Kyushu University, Fukuoka, Japan*

[5] *Meteorological Research Institute, Tsukuba, Japan*

[6] *Institute for Space-Earth Environmental Research, Nagoya University, Nagoya, Japan*

A three-week long total ozone reduction over the southern tip of South America occurred in November 2009. Analyses of ERA-Interim reanalysis data and the total ozone observed by Ozone Monitoring Instrument indicated 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. The migration was associated with an enhanced wave flux from the troposphere in the west of the South American continent at around 120–150 °W and 50–60 °S to the stratosphere over the southern part of the continent. In November, a blocking was diagnosed on the 500 hPa geopotential height in the west of the South American continent. These results suggest a relation between the long-term low total ozone event over the southern tip of the South American continent and a blocking phenomenon in the troposphere of the Southern Hemisphere through wave propagation from the blocking region. Future risk of low total ozone over South America is discussed based on the analysis of total ozone and geopotential height data for 1979–2015, and based on outputs from a 500–ensemble simulation under the concentrations of ozone depleting substances for the year 2000.

Key words: Ozone hole, South America, polar vortex, geopotential height, blocking