A SUPPRESSION OF POLAR STRATOSPHERIC WARMING DUE TO PLANETARY WAVE SATURATION (ABSTRACT)

Hiroshi TANAKA and Shinji USHIMARU

Water Research Institute, Nagoya University, Furo-cho, Chikusa-ku, Nagoya 464-01

Based on the fact that the total ozone content is highly correlated to the atmospheric temperature, a model simulation was carried out to produce a cold core pattern over the Antarctic lower stratosphere, which is sustained during ozone hole events. The Matsuno model, originally used to simulate the stratospheric sudden warming, is adopted here, together with incorporation of Newtonian cooling. A key factor to suppress the stratospheric warming and, instead, to form a cold core pattern is Lindzen-Schoeberl-type saturation condition of stationary planetary waves, which is a simplified form of barotropic instability.

Results of the simulation demonstrate that reasonable constraints of the wave saturation (*e.g.*, 700 m in the maximum) for the wavenumber 1 planetary waves lead to a typical cold core pattern if realistic forcing in the southern hemisphere (*e.g.*, 200 m) is set at the tropopause level. Rapid rotation of the pattern, which is quite analogous to the observed rotation of total ozone pattern by Nimbus 7 TOMS, is also well simulated. A significant acceleration of westerly wind and poleward shift of its axis, which could be induced by EP flux divergences associated with the planetary wave saturation, seem to be responsible for formation of indirect meridional circulation, upward in the polar region and downward in mid-latitudes, and the resulting formation of cold core pattern over Antarctica. This mechanism also seems to be responsible for rapid rotation of the pattern.

The suppression of polar stratospheric warming tends to result in a recent dramatic ozone decrease over Antarctica only if some heterogeneous chemical reaction processes are superposed. We need to include nonlinear wave interactions of planetary waves for the next step.

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DESCENDING MOTION OF PARTICLES AND ITS EFFECT ON OZONE HOLE (ABSTRACT)

Yasunobu IWASAKA[1], Kouji KONDOH[2] and Kohji KAWAHIRA[3]

[1] *Water Research Institute, Nagoya University, Furo-cho, Chikusa-ku, Nagoya 464-01*
[2] *Aerological Observatory, 1-2, Nagamine, Tsukuba 305*
[3] *Toyama National College of Technology, 13, Hongo-machi, Toyama 939*

The descending motion of the aerosol layer was observed by a lidar at Syowa Station. The particle size would be about a few micrometers or larger, if the descending motion was due to a gravitational sedimentation (Y. IWASAKA: Tellus, **38B**, 364, 1986). As shown in Fig. 1, the condition of super-saturation was not always satisfied for pure water vapor or nitric acid vapor even in mid-winter if the density profiles in mid-latitudes are assumed. Therefore the particle which settles to the region of $P<P_D$, where P and P_D are partial pressure of water vapor (or nitric acid vapor) and saturation pressure of them, respectively, evaporates the gases condensed in the particles.

IWASAKA and KONDOH (Geophys. Res. Lett., **18**, 87, 1987) showed that ozone depletion rate was largest near 15 km and the second peak was near 10 km and lower. The heights of these