Geophysical Research Abstracts
Vol. 13, EGU2011-9465, 2011
EGU General Assembly 2011


# Relationship between ozone destruction efficiency and PSC types characterized by ground-based FTIRs at Syowa Station, Antarctica and at Ny-Ålesund, Norway and CALIPSO data

Hideaki Nakajima (1), Manami Ohya (2), Kosuke Saeki (3), and Michael C. Pitts (4)

(1) National Institute for Environmental Studies, Japan (nakajima@nies.go.jp), (2) Tsukuba University, (3) Tohoku University, (4) NASA Langley Research Center

Chlorine amount in the atmosphere has peaked at around 2000 thanks to the international regulations by the Montreal Protocol after the recovery of Antarctic ozone hole in 1980s. However, it has not yet firmly proved that the Antarctic ozone hole had begun to recover in a statistical manner. Therefore, we need to monitor the stratospheric ozone layer at least for few more decades.

On the other hand, there has been substantial ozone loss in the Arctic in 1995, 1996, 2000, and 2005. In other years, especially in 1999, 2001, and 2002, there were almost no ozone loss in the Arctic. Such a large annual variation in ozone loss amount in the Arctic is caused by higher stratospheric winter mean temperature by $\sim$10 degrees compared with that in the Antarctic, due to higher planetary wave activity, which is caused by geographical distribution of continents. Mean winter stratospheric temperature in the Arctic is just around the threshold of polar stratospheric cloud (PSC) formation temperature. Since PSC plays key role in polar ozone depletion, Arctic ozone loss amount highly depends on winter stratospheric temperature in the Arctic in that year.

Characteristics of PSCs, such as types, radius, mixture, and composition still remains unclear due to the difficulty of direct measurement, because normal research aircraft cannot reach the appearance altitude of PSCs (15$\sim$25 km). To date, it is suggested by remote-sensing and laboratory experiments that there are several types of PSCs, such as NAT (Type-Ia), STS (Type-Ib), and Ice (Type-II). However, there is no data on chlorine activation power, nor ozone destruction power, by each type of PSC. Therefore, we made comparison study to characterize PSC types and ozone loss by using a match analysis method.

We made PSC measurements with a low resolution Fourier-transform infrared spectrometer (FTIR) at Syowa Station, Antarctica in 2007 winter and at Ny-Ålesund for 2009/2010 winter. The purpose of this FTIR measurement is to characterize PSC types. Also, PSC types determined by the CALIPSO data were used for the analysis.

From the location where certain type of PSC was observed, a trajectory was calculated, and matched observation points were searched for the Aura/MLS measurements locations. By the MLS ozone data, ozone change amounts were estimated for different types of PSCs. It was found that ozone loss efficiency differs for different types of PSCs, and moreover, they differs between Antarctica and Arctica. The cause of the ozone loss efficiency will be discussed.