# CHEMICAL OZONE LOSS MECHANISM IN WINTER/SPRING IN 1997 OVER THE ARCTIC DERIVED BY CSMT ANALYSIS: ON RELEVANCE TO DENITRIFICATION

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Chemical Species Mapping on Trajectories (CSMT) is a new technique combining a chemical box model and trajectory analysis [Kagawa and Hayashida, submitted to JGR]. The CSMT incorporates 'trajectory mapping' [Morris et al., 1995, 2000] with a photochemical box model, and minor constituents are time-integrated in a photochemical box model along trajectories that start from satellite measurement points until a target time. (See also our companion paper on CSMT scheme). The photochemical box model was generated by the tool developed by the Atmospheric Chemistry Division of the National Center of Atmospheric Research (ACD/NCAR). The chemical solver called RODAS was applied with 59 chemical species, 101 gas-phase reactions, 48 photodissociations, and 7 heterogeneous reactions. We also included PSC growth governed by the temperature change along trajectories. Super-cooled ternary solutions (STS) and nitric acid trihydrate (NAT) are suumed based on thermodynamic equilibrium. Though there are many uncertainties in the PSC formation mechanism and our PSC scheme is still preliminary, our model can involve denitrification implicitly, because actual data of denitrified gaseous nitric acid can be used as initial values. In this study we utilized Improved Limb Atmospheric Spectrometer (ILAS) data to investigate the effects of denitrification on chemical ozone loss. ILAS could observe ozone and ozone-related species including nitric acid, nitric dioxide, nitrous oxide, water vapor, methane and aerosols over both polar stratospheres from November 1996 through June 1997. *Irie et al.* [2001derived a significant denitrification of 43 % at 19 km (near 475 K) in late February of 1997 over the Arctic. In our study the chemical box model was initialized by ILAS-observed ozone and nitric acid, and the chemical ozone loss rate was estimated based on the chemical model along with the change in nitric acid. The ozone loss rates in late February are scattered considerably with high and low values in late February, indicating that denitrification caused two opposite processes: (1) prolonged activation of chlorine due to less NOx and (2) low additional activation of chlorine due to less PSC formation. Recently version 6 of ILAS data was released including ClONO2 as a new product. ClONO2 can be used to identify each air parcel as activated or deactivated in the form of chlorine. Preliminary analysis shows CSMT-derived ClONO2 well correlated to the ILAS-observed ClONO2. CSMT-based analysis incorporating actual nitric acid and ClONO2 data will throw new light on chemical processes in polar ozone destruction.

[References]

Irie, H. et al., J. Geophys. Res., 106, 23139-23150, 2001.

Morris, G.A. et al., J. Geophys. Res., 100, 16491-16505, 1995.

Morris, G.A. et al., J. Geophys. Res., 105, 17825-17894, 2000.