

Analysis of composition for polar stratospheric clouds inferred from ILAS version 7 dataset

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The Improved Limb Atmospheric Spectrometer (ILAS) was on board the Advanced Earth Observing Satellite (ADEOS), and started regular operation in November 1996. ILAS monitored profiles of ozone (O₃) and ozone-related species, on a regular basis, 14 times daily at high latitudes (57.1 - 72.7 N and 64.3 - 88.2 S) through June 1997.

The version 7 of the retrieval algorithm for ILAS successfully derived gas species and Polar Stratospheric Clouds simultaneously. Oshchepkov et al., [2002] reported details of the method for simultaneous gas and aerosol retrievals from limb-viewing multiwavelength-transmission infrared measurements. In the method, concentrations of gas species such as O₃, NO₂, HNO₃, N₂O, CH₄, and H₂O, and spectral dependences of the aerosol extinction coefficient are retrieved.

In the previous retrieval algorithms, transmission measurements at the gas IR window channels such as 7.12, 8.27, 10.60, and 11.76 micron were regarded as mainly from a nongaseous contribution. The aerosol extinction coefficients at these channels are estimated with additional gas climatological data sets to subtract the remaining gas contribution. Finally, a linear interpolation between these channels is used to obtain the extinction coefficients for all sensor channels needed for the aerosol correction in gas retrievals.

In reality, however, this technique could lead to biased estimations of the gas species. The biases depend on amount and type of aerosols, and are especially distinguishing for PSCs. The newest algorithm of version 7 revealed that the method has significant advantages for accurate gas retrievals and provides additional information on the particle size, volume density, and chemical component character of PSCs.

Preliminary analysis revealed the PSC appearance as follows:

- 1) Background STS profiles look reasonable in NH and SH
- 2) In Southern Hemisphere: STS enhancement was observed in June, and NAT and NAD were in May and June. Ice was abundant in June.
- 3) In Northern Hemisphere: both of STS and NAT/NAD enhancement were observed in January, February, and March. Ice was found in January and February.

Besides, many profiles of PSCs indicate the mixed state of multiple compositions in one PSC event (see Figure 1). The data set of ILAS version 7 including HNO₃, H₂O and chemical components of PSCs demonstrates enough possibility to elucidate micro-physical processes of PSC formation.

Reference

Oshchepkov et al., Appl. Opt., Vol. 41, No. 21, 4234-4244, 2002.