MLS-related Scientific Publication

Scientific Theme: Atmospheric Chemistry

Comparison of ER-2 aircraft and POAM III, MLS, and SAGE II satellite measurements during SOLVE using traditional correlative analysis and trajectory hunting technique. M. Y. Danilin, M. K. W. Ko, R. M. Bevilacqua, L. V. Lyjak, L. Froidevaux, M. L. Santee, J. M. Zawodny, K. W. Hoppel, E. C. Richard, J. R. Spackman, E. M. Weinstock, R. L. Herman, K. A. McKinney, P. O. Wennberg, F. L. Eisele, R. M. Stimpfle, C. J. Scott, J. W.Elkins, and T. V. Bui, *J. Geophys. Res.*, **107**, 8315, doi:10.1029/2001JD000781, 2002 [printed 108(D5), 2003].

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Summary and MLS contribution

This paper describes comparisons of various aircraft and satellite measurements made in the Northern Hemisphere in Jan.-Feb. 2000 during the SAGE III Ozone Loss and Validation Experiment (SOLVE) campaign. Various measurements were taken from the ER-2 aircraft instruments, and the satellite data are from the Microwave Limb Sounder (MLS), the Polar Ozone and Aerosol Measurement II (POAM II), and the Stratospheric Aerosol and Gas Experiment II (SAGE II). A "trajectory hunting technique" (THT) is used in order to increase the number of "coincident" profiles by analyzing the same air mass sampled by 2 different instruments at different locations and times. Fig. 1 below illustrates the usefulness of the technique and the level of agreeement for average comparisons between MLS and ER-2 aircraft ozone data. Fig. 2 is an example for more challenging comparisons of gaseous nitric acid (HNO_3), in which case changes can occur as temperature varies along the trajectories connecting the satellite and aircraft profiles and nitric acid is partitioned between polar stratospheric clouds and the gas phase. Several other comparisons are given in the paper.

This work benefits society through continuing and improved understanding of the quality of measurements of stratospheric ozone and related gases, as well as their variations.

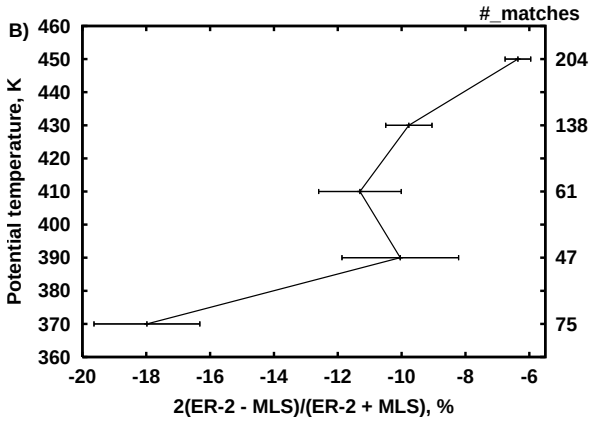

Fig. 1. Average ozone differences (in percent) between ER−2 and UARS MLS measurements in Jan.−Feb. 2000 in the Northern Hemisphere during the SOLVE campaign. Numbers of matches at various potential temperatures (or altitudes) along trajectories connecting the ozone measurements are shown along the right axis. Error bars shown above only give the random component.

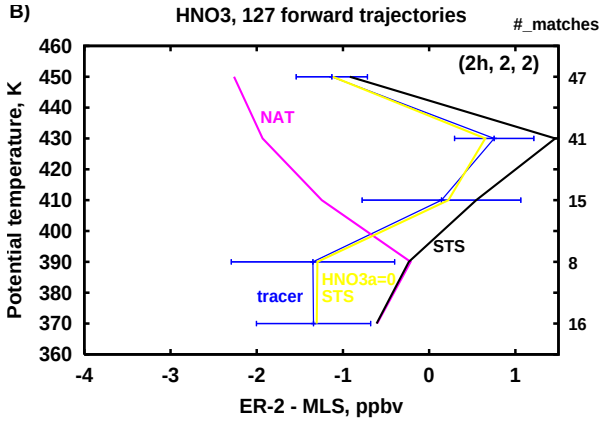

Fig. 2. Difference (in parts per billion) between the ER−2 and UARS MLS measured profiles of gaseous nitric acid during the SOLVE 2000 campaign. The blue line with error bars assumes that HNO3 is a passive tracer (no changes in its abundance along trajectories). Other lines provide estimated differences for differing assumptions for modeled polar stratospheric clouds (NAT or STS type; see article).