

MLS-related Scientific Publication

Scientific Theme: Atmospheric Chemistry

Trajectory hunting as an effective technique to validate multiplatform measurements: Analysis of the MLS, HALOE, SAGE-II, ILAS, and POAM-II data in October-November 1996.

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Summary and MLS contribution

This paper describes comparisons and validation of multiplatform measurements of stratospheric profiles for O₃, H₂O, CH₄, HNO₃, and NO₂, for the period Oct. - Nov. 1996. The five instruments considered are the Microwave Limb Sounder (MLS), the Halogen Occultation Experiment (HALOE), the Polar Ozone and Aerosol Measurement II (POAM II), the Stratospheric Aerosol and Gas Experiment II (SAGE II), and the Improved Limb Atmospheric Spectrometer (ILAS). 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, possibly a few days apart. This method often greatly reduces the random errors by including many more profile comparisons; see Fig. 1 as an example, where traditional correlative analysis (TCA) for ILAS and MLS yields 10 profile matches, versus two to three thousand matches (depending on altitude) using THT. The authors show good agreement between the two methods, and overall good agreement between the various instruments. Fig. 2 gives an example for the trajectory-based comparisons between ILAS, MLS, POAM II, and SAGE II measurements in the NH vortex; excellent agreement (within ± 5%) is obtained through most of the altitude range.

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.

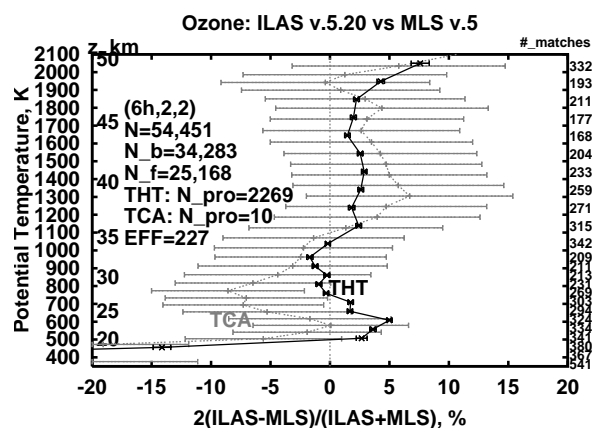


Fig. 1. Sample comparison between satellite ozone datasets. Percentage differences are shown for ILAS and MLS values. The trajectory hunting technique (THT) results are shown in black, traditional correlative analysis (TCA) results in grey. Note smaller (random) error bars for THT results, because of larger number of matched profiles (2269 vs 10 for TCA).

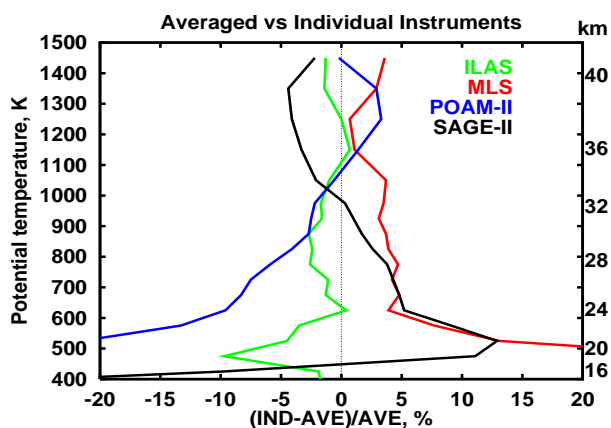


Fig. 2. Sample comparison of ozone measurements inside the NH vortex by ILAS, MLS, POAM-II, and SAGE-II, using the trajectory analyses. Percentage differences from the mean values are shown.