Validation of HIRLDS level 2 data using data assimilation

Lessons from MIPAS

Methane [ppmv]

BADC

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Ozone assimilations have been validated against: Osiris, ozonesondes, SAGE III, SAGE II, HALOE, POAM III and SBUV. At 850K the comparisons against the sondes and Osiris show a lot of variability which is not present in the comparisons against SAGE III and POAM III. HALOE and SAGE II both show some short term anomalies, but these are not coherent between instruments. The comparison against SBUV shows a bias of around 0.4ppmv (SBUV high) which is fairly steady in time.

Summary: No evidence of drift or time dependent errors.
Vertical profiles of standard deviations:
For ozone: the standard deviations are smallest at 850K, down to 5% for several instruments [this is the sum of analysis plus validating instrument error, unless there is significant correlation between those errors]. Above 850K the standard deviation relative to HALOE remains close to 5%, but that relative to other instruments grows close to 10% or above. Either HALOE and MIPAS are more accurate than the other instruments or they share a common error.
Water vapour: thin lines show results from a "nearest neighbour" comparison. The analysis gives closer agreement, especially in the case of HALOE, showing that the assimilation can improve the precision of validation. The comparison against HALOE suggests combined analysis plus HALOE errors of around 5% for the middle stratosphere.
Methane: combined errors appear to be below 10% in the stratosphere.
MIPAS analysis below 850K, but are generally recording higher ozone between 850K and 2500K. The water vapour profiles suggest that MIPAS has a high bias of around 5% through much of the stratosphere.