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Comparison of results of SAGE III atmospheric sounding with data of independent interpretation, measurements and numerical modeling

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The algorithm of combined retrieval of vertical profiles of ozone, NO_2, spectral aerosol extinction coefficient and different microphysical properties of stratospheric aerosol from multispectral slant path transmittance measurements by SAGE III device (Meteor-3M) is described. Principal features of the algorithm are:

- the statistical regularization (optimal estimation) method used for solving the nonlinear inverse problem,
- a simultaneous retrieval of profiles of all unknown parameters,
- the use of atmospheric transmittance functions (instead of optical densities) as an initial information and simulated statistical aerosol models as *a priori* information,
- a careful consideration of spectral and angular characteristics of the device.

A comparison of the two approaches for interpreting the SAGE III data (the use of slant path transmittance data (SPbSU method) and atmospheric optical depths (NASA method) as an initial information) illustrates some systematic discrepancies between parameters retrieved by two methods for the lower stratosphere, upper troposphere and mesosphere. Possible causes of these discrepancies are discussed. Different atmospheric parameters (ozone, NO_2, aerosol optical and microphysical properties)

retrieved from SAGE III data have been compared with independent measurements (ozonosondes, lidars, different satellite measurements – POAM III, HALOE, CRISTA, etc.).

The analysis of spatial and temporal variations of total ozone and stratospheric aerosol integral characteristics (the total surface area and volume) has shown considerable longitude variations at different altitudes and latitudes. Differences between distributions of aerosol characteristics in North and South hemispheres and their seasonal dependences for background stratosphere are discussed.

The ozone fields retrieved from SAGE-III measurements have been compared with the results of the transient simulation with the Chemistry-climate model SOCOL. This transient simulation covers 1975-2004 and was driven by the realistic forcing comprising of the time-evolving sea surface temperature, sea ice distributions, greenhouse gases abundance, ozone destroying substances mixing ratio, stratospheric aerosol loading and assimilated QBO and covers. In the paper we illustrate the main features of the observed and simulated ozone distribution in time and space and analyze how well is the agreement between them.