Spatial distributions of carbon dioxide and ozone in the mesosphere as derived from CRISTA1 and CRISTA2 satellite experiments

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Carbon dioxide and ozone are important atmospheric constituencies, which monitor the thermal regime of the middle atmosphere. Better understanding of climate variability and global change requires monitoring of the concentrations of these gases on global scale in wide altitude ranges. In November 1994 and August 1997 two experiments with the CRISTA instrument (Cryogenic Infrared Spectrometers and Telescopes for the Atmosphere) were successfully performed. The infrared limb spectra in 15 um and 9,6 um regions were interpreted at St.Petersburg University by the original method accounting for nonlocal thermodynamic equilibrium conditions. As a result, the quasi-global distributions of temperature, CO2 and O3 at mesospheric altitudes were obtained. The two experiments clearly demonstrate that CO2 abundance begins to deviate from the lower atmosphere mixing ratio at significantly lower altitudes (70-75 km) than predicted by models (about 90 km). This result is important since the altitude, up to which the CO2 volume mixing ratio is nearly constant, is an indicator for turbulent mixing. The ozone vertical distributions and diurnal variations are in good agreement with previous observations (however certain differences between the obtained mean ozone profiles and several model profiles exist). The ozone concentration as a function of zenith angle is presented and analyzed during sunrise and sunset at altitudes where diurnal variations are present (higher than 55 km).