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Validation of ozone measurements from the Atmospheric Chemistry Experiment (ACE)

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Abstract. This paper presents extensive {bias determination} analyses of ozone observations from the Atmospheric Chemistry Experiment (ACE) satellite instruments: the ACE Fourier Transform Spectrometer (ACE-FTS) and the Measurement of Aerosol Extinction in the Stratosphere and Troposphere Retrieved by Occultation (ACE-MAESTRO) instrument. Here we compare the latest ozone data products from ACE-FTS and ACE-MAESTRO with coincident observations from nearly 20 satellite-borne, airborne, balloon-borne and ground-based instruments, by analysing volume mixing ratio profiles and partial column densities. The ACE-FTS version 2.2 Ozone Update product reports more ozone than most correlative measurements from the upper troposphere to the lower mesosphere. At altitude levels from 16 to 44 km, the average values of the mean relative differences are nearly all within +1 to +8%. At higher altitudes (45–60 km), the ACE-FTS ozone amounts are significantly larger than those of the comparison instruments, with mean relative differences of up to +40% (about +20% on average). For the ACE-MAESTRO version 1.2 ozone data product, mean relative differences are within ±10% (average values within ±6%) between

18 and 40 km for both the sunrise and sunset measurements. At higher altitudes (~35–55 km), systematic biases of opposite sign are found between the ACE-MAESTRO sunrise and sunset observations. While ozone amounts derived from the ACE-MAESTRO sunrise occultation data are often smaller than the coincident observations (with mean relative differences down to −10%), the sunset occultation profiles for ACE-MAESTRO show results that are qualitatively similar to ACE-FTS, indicating a large positive bias (mean relative differences within +10 to +30%) in the 45–55 km altitude range. In contrast, there is no significant systematic difference in bias found for the ACE-FTS sunrise and sunset measurements.

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