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Assessment of instrument biases: ozone in the upper troposphere –lower stratosphere

The Upper Troposphere –Lower Stratosphere (UTLS) region is a chemically and dynamically active part of the atmosphere, characterized by large spatial and temporal variability. This variability complicates studies of trace gases, and in turn analysis of trends and key processes, such as stratosphere-troposphere exchange and the impact of radiatively active species on climate. While aircraft, ground-based, balloon-borne, and satellite instruments have all been used to record composition measurements of this region, each form of measurement has inherent biases that complicate combining these measurements for integrated analysis.

The aim of this project is to assess the biases between measurement datasets, made using numerous techniques and with varying spatial and temporal resolution and coverage. To this end, climatologies are created by subsampling the high-resolution gridded MERRA-2 reanalysis dataset using measurement times and locations for a selection of aircraft, ground-based, balloon-borne, and limb-viewing satellite instruments. These sub-sampled climatologies are compared against each other to estimate inter-instrumental biases in a manner that reduces the effects of differing measurement characteristics on these bias estimates. These bias estimates are compared against more traditional coincidence-criteria estimates to examine the consistency between these two approaches. Focus within this is specifically on ozone measurement biases in the UTLS. This work is done in part to support the Atmospheric Processes And their Role in Climate (APARC) Observed Composition Trends And Variability in the Upper Troposphere and Lower Stratosphere (OCTAV-UTLS) activity.

Topic

Current and past limb and occultation instruments: algorithms, products, validation

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