

Improvements to UCATS for the Atmospheric Tomography (ATom) Mission and Recent Results

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The NASA Atmospheric Tomography (ATom) Mission is designed to measure vertical cross sections of the atmosphere, to probe methane oxidation and ozone chemistry on large scales, and to challenge chemical transport models. The NASA DC-8 aircraft has been outfitted with a large payload of instruments for reactive and trace gases, aerosols, radiation and meteorology, with flights from north to south over the Pacific, returning over the Atlantic. For ATom, we made the following improvements to the UCATS instrument: 1) an upgraded ozone instrument with greater sensitivity and the elimination of artifacts caused by rapid humidity changes on aircraft ascents; 2) a new water vapor instrument for high precision and accuracy measurements from the surface to the stratosphere; and 3) upgrades to the gas chromatograph in UCATS, including improved detector electronics. We purchased a 2B Model 211 ozone instrument with a longer cell, and installed it in a new 3" section at the top of UCATS. To avoid water vapor artifacts, we use Nafion moisture exchangers to maintain sample air at a high enough humidity so the cells never dry out. The Nafion tubes are mounted in a sealed box at the same pressure as the sample gas passing through them, to avoid damage to the Nafion tubes. A new tunable diode laser (TDL) sensor was built by Port City Instruments, using different infrared lines and path lengths to cover the range of water vapor concentrations. For ATom-1, the new ozone instrument was implemented along with faster electronics on the gas chromatograph detectors, but benefits were not obvious because of much lower-than-anticipated pressures at our inlet over the wing. For ATom-2, the inlet was fixed, the new TDL added, and further electronics improvements were made, with much better results. Recent data and a few intercomparisons will be shown, along with future work.

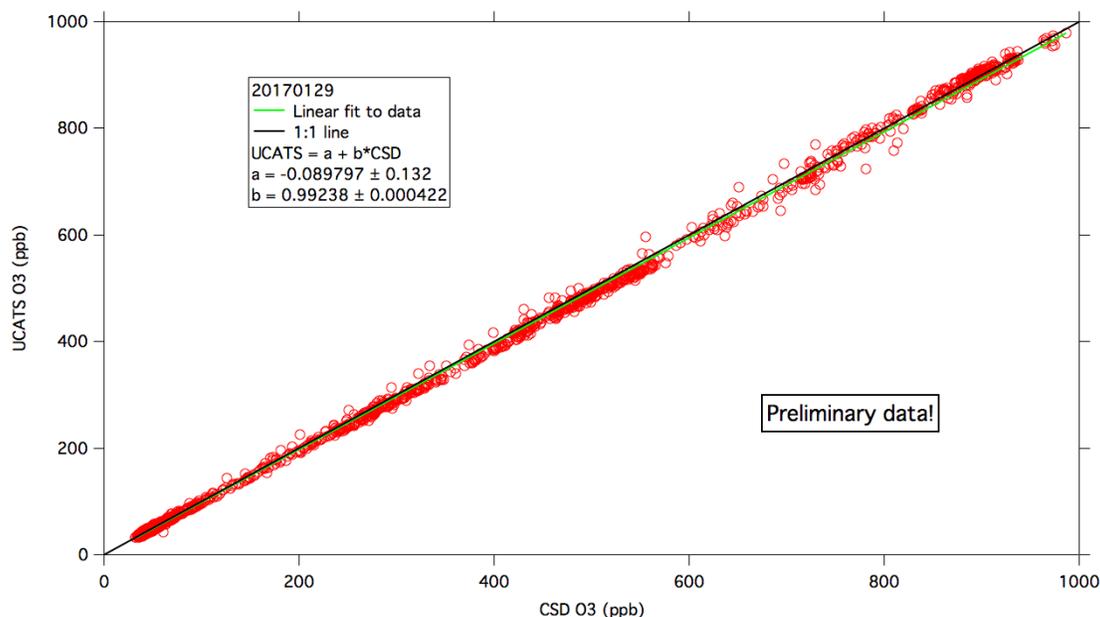


Figure 1. Comparison of preliminary ozone data from UCATS and NOAA Chemical Sciences Division from the DC-8 flight from Palmdale, CA to Anchorage, AK.