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Pre-flight characterization of the OCO (Orbiting Carbon Observatory) instrument from heliostat observations

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The goal of the Orbiting Carbon Observatory (OCO) mission is to provide global, space-based, measurements of atmospheric $CO_2$with the accuracy, coverage, and resolution needed to quantify surface sources and sinks on regional scales. OCO will carry a single instrument that incorporates three bore-sighted high-resolution spectrometers designed to measure reflected sunlight in the 0.76-micron O_2 A-band and in the CO_2 bands at 1.61 and 2.06 microns. The instrument has recently undergone assembly and pre-flight characterization including verification of the instrument design specifications, radiometric and spectral calibration, and the acquisition of atmospheric spectra via a heliostat coupled to the thermal vacuum chamber. The heliostat observations direct sunlight into the instrument, enabling end-to-end pre-flight testing of the OCO measurement/retrieval system using the flight instrument and operational retrieval algorithm on real atmospheric data.

We will describe the OCO heliostat measurement set-up and discuss the analysis of the atmospheric measurements with the OCO retrieval algorithm. The obtained spectra and the CO_2 retrievals will be compared to observations from a co-located ground-based Fourier Transform Spectrometer from the Total Column Carbon Observing Net-

work (TCCON) that will be used to validate OCO measurements post-launch. We will assess the overall performance of the flight instrument for the retrieval of the column averaged CO_2 dry air mole fraction, X_{CO2}, and establish a baseline comparison of the OCO flight instrument against a TCCON FTS for observing conditions where effects of aerosol and cloud scattering are minimal.