Total Column Carbon Observing Network: Variability in Total Column CO2 and CO

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The Total Column Carbon Observing Network (TCCON) is a growing network of ground-based high resolution Fourier Transform Spectrometers optimized to observe gases, including CO2, CO, CH4, N2O, HF, H2O, and O2, with transitions in the near-infrared (details at tccon.caltech.edu). In this presentation we focus on two sources of variability to the total column CO2 record: synoptic-scale weather and biomass burning. First, we present 3.5 years of total column carbon dioxide data from the first dedicated TCCON site at Park Falls, Wisconsin. This represents the longest time series of measured total column CO2 and provides new information on the variability of mid-latitude CO2. We find that synoptic scale variability dominates the CO2 column variability, particularly during summer. We regress CO2 anomaly against potential temperature anomaly, a dynamical signal, to find that synoptic activity contributes +/- 2 ppm to the total column signal on top of the seasonal cycle. The observed range of synoptic-scale variability is not captured in transport models such as MATCH, or reanalysis products such as CarbonTracker. Second, we demonstrate the influence of burning on CO2 observations at three sites in the TCCON network: Park Falls, Wisconsin; Darwin, Australia; and Pasadena, California. Simultaneous observations of total column CO enable us to better understand the influence of biomass burning on CO2 variability.

Figure 1. Total column carbon monoxide retrieved from ground-based FTS spectra obtained at Darwin, Australia.