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Decadal Record of Satellite Carbon Monoxide Observations

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Atmospheric carbon monoxide (CO) distributions are controlled by anthropogenic emissions, biomass burning, chemical production, transport and oxidation by reaction with the hydroxyl radical (OH). Quantifying trends in CO is therefore important for understanding changes related to all of these contributions. Here we present a comprehensive record of satellite observations from 2000 through 2011 of total column CO using the available measurements from nadir-viewing thermal infrared instruments: MOPITT, AIRS, TES and IASI. We examine trends for CO in the Northern and Southern hemispheres along with regional trends for E. China, E. USA, Europe and India. Measurement and sampling methods for each of the instruments are discussed, and we show diagnostics for systematic errors in MOPITT trends. We find that all the satellite observations are consistent with a modest decreasing trend around -1%/year in total column CO over the Northern hemisphere for this time period. Decreasing trends in total CO column are observed for the United States, Europe and E. China with more than 2σ significance. For India, the trend is also decreasing, but smaller in magnitude and less significant. Decreasing trends in surface CO have also been observed from measurements in the U.S. and Europe. Although less information is available for surface CO in China, there is a decreasing trend reported for Beijing. Some of the interannual variability in the observations can be explained by global fire emissions, and there may be some evidence of the global financial crisis in late 2008 to early 2009. But the overall decrease needs further study to understand the implications for changes in anthropogenic emissions.