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Comparison of CMAM simulations of CO, N_2O, and CH_4 with observations from Odin/SMR, ACE-FTS, and AURA MLS

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Simulations of CO, N_2O and CH_4 from a coupled chemistry-climate model (CMAM) are compared with satellite measurements from ACE-FTS, Odin/SMR and AURA MLS. Pressure-latitude cross-sections and seasonal time series demonstrate that CMAM reproduces the observed global distributions and follow the polar evolutions seen in the CO, N_2O, and CH_4 measurements. Generally, excellent agreements are found in CO monthly zonal mean profiles in the stratosphere and mesosphere for various latitudes and seasons. The difference between the simulations and the observations are generally within 50%. Comparisons of N_2O show that CMAM follows the measurements very well, usually within 15% of the relative difference, in the lower and middle stratosphere but has negative bias with factors as small as 0.1 in the upper stratosphere. The CMAM CH_4 profiles also follow the observations as the N_2O, but have negative biases in the the upper stratosphere too. These negative biases are prob-

ably due to a transport problem from the lower stratosphere to the upper stratosphere. CO measurements from 2004 and 2006 by SMR and MLS show evidence of descent of air from the mesosphere into the stratosphere in the Arctic after strong stratospheric sudden warmings. CMAM also captures this feature. At the end, we are also going to show the “tape recorder” and the Quasi-Biennial Oscillation (QBO) signal from the SMR N_2O observations. CMAM can produce the “tape recorder” signals with CO and N_2O but cannot produce the QBO signals. Nevertheless, this study confirms that CMAM has an overall good capability to simulate middle atmospheric transport processes beside identifying its deficiencies.