

## ***Interactive comment on “Decadal record of satellite carbon monoxide observations” by H. M. Worden et al.***

**Anonymous Referee #1**

Received and published: 12 December 2012

The study by Worden presents a comprehensive study of trends in CO concentrations observed in the last decade by multiple satellite instruments. At the same time the study presents useful information about the consistency and the validity of the 4 different sensors, which is crucial in order to start obtaining robust and coherent multi-decadal datasets on CO. I think the paper would gain strength if the authors also inform us on the (quantitative) mean biases of the various CO products relative to one another. Such information is important to those intending to use the CO data for model evaluation or inverse modelling.

The observational evidence put forward by the authors is convincing, and clearly points in the direction of reducing CO throughout the world, with strongest reductions over the polluted areas of the world. It is striking that the satellite instruments witness a

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‘clean-up’ in CO over China. As acknowledged by the authors, the reasons for the trends are not fully explained, which is somewhat of a missed opportunity, but fewer fires, environmental measures, and less incomplete combustion all point in the right direction. To complete that list, I think the authors should also point out that the steeper decreases in CO in 2008–2009 coincide with the economic recession (Fig. 6, Fig. 8 for China, U.S., and Europe), as suggested by Castellanos and Boersma [2012] for NO<sub>2</sub> over Europe, and by Russell et al., 2012 over the US. Overall, the Worden-study is very interesting and it should be published in ACP. Besides the above two points I only have a few minor issues left.

Minor issues:

P25711, line 12: the text says ‘September, 2004’ but the Figure itself mentions ‘March 2005’. Please correct.

P25713, line 3-4: please comment why routine sampling of the SH was limited to northward of 30 deg S for TES in 2010.

P25714, line 9: I have some reservations about using the 12-month running average. Of course, using a 12-month smoothing filter removes much of the seasonal variation, but the implicit assumption is that every successive annual cycle lasts 12 months, whereas for some regions or periods, an annual cycle may actually take 11 or 14 months. Smoothing over a longer window will improve the chances of cutting off the higher frequencies that may still seep through with the current approach. This might be especially relevant for CO with a relatively long lifetime in winter.

Reference: Castellanos, P., and K. F. Boersma, Reductions in nitrogen oxides over Europe driven by environmental policy and economic recession, Sci. Rep., 2, 265; DOI:10.1038/srep00265 (2012).

Russell et al., Trends in OMI NO<sub>2</sub> observations over the US: effects of emission control technology and the economic recession, Atmos. Chem. Phys. Discuss., 12, 15419-

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15452, 2012.

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Interactive comment on *Atmos. Chem. Phys. Discuss.*, 12, 25703, 2012.

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