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Atmospheric Measurement Techniques Discussions

Interactive comment on "Averaging kernel prediction from atmospheric and surface state parameters based on multiple regression with MOPITT CO and TES-OMI O_3 multispectral observations" *by* H. M. Worden et al.

Anonymous Referee #2

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The paper "Averaging kernel prediction from atmospheric and surface state parameters based on multiple regression with MOPITT CO and TES-OMI O3 multispectral observations" by Worden et al. provides a method for rapid computation of state-dependent averaging kernel (AK) estimates for Nadir sounding instruments. This method has been developed for its application to Observation System Simulation Experiments (OSSE) but could easily be employed to other applications such as climate model and instrument validation studies. The performance of this new method has been tested by means of a case study and improvements compared to the conventional use of a

"mean AK" are clearly demonstrated. The paper is well written and structured and the methodology used is sound. This work is of high value for both atmospheric observation and climate modeling communities as it provides the basis for a computationally affordable way to consider state-dependent AKs in OSSEs and validation activities. I have only a few minor comments listed below:

minor specific comments:

Introduction p 2753 l2: OSSE is only one (important) potential target for application of the proposed method. Others are climate model validation, instrument validation, etc. The interest of the scientific community in this important paper could be substantially broadened if the Introduction was less focussed on OSSE and other application were also discussed in more detail.

p 2759 l1: "Aks are highly corrrelated". Do you mean that the AK columns are broad (i.e., highly correlated non-diagonal elements)?

p 2762 l2-3: I don't understand this sentence. The MR predictor contributions are always a linear combination to the MR fit (this is by definition the case in linear regression).

p 2764, Section 6: I agree that the metrics used here is more intuitive by using a single mean CO (O3) reference and a priori profile. On the other hand, the "true" CO (O3) profile might be correlated with the predictors (and hence predicted AKs) used in this study which would alter the statistics. Therefore, it would be important to check if the histograms in Figures 15-17 change when applying the AKs to the actual CO profiles corresponding to each observation (instead of the mean). It could also be interesting to look at maps (similar to Fig 1) for the CO differences introduced by the AK proxies at different pressure levels.

technical comments:

abstract, l26: I wouln't define CONUS in the abstract (it is not used there) but in the

Introduction. As CONUS is (to my knowledge) not a commonly used acronym, it would be good to introduce it by "the continental United States (hereinafter referred to as CONUS)"

Fig 17: It should be stated in the caption that it is the same as Fig 16 but with O3 error expressed in ppb (instead of %)

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 2751, 2013.