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Atmospheric Measurement Techniques Discussions

Interactive comment on "New dynamic NNORSY ozone profile climatology" *by* A. K. Kaifel et al.

Anonymous Referee #2

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This paper discusses 4 different neural network-based methods of creating a dynamical climatology (DC) of ozone profile based on several input parameters. In the simplest TLL approach the input parameters are time, latitude and longitude. In the other three methods total column ozone and temperature profile are added as input.

Reference profiles are needed in various applications. They are often used by instruments that have limited vertical information in their measurements (called degrees of freedom of signal, DFS) to produce a vertical profile that is consistent with the measurements. They can be used as a convenient database for model validation, atmospheric correction, and as reference standard to inter-compare measurements. For the stratosphere the simplest way to construct such reference profiles is to create monthly zonal means using available data, for there is very little systematic variation of ozone with longitude in the stratosphere. Henceforth, I will call the profiles constructed this way "simple" climatology (SC). Error covariance (EC) of the anomalies- difference between

individual profiles and a chosen climatology- are an important measure of the uncertainty associated in using that climatology. When one tries to go beyond the SC and adds dynamical variables to create a DC, the primary purpose is to reduce the EC.

My main problem with this paper is that it fails to compare ECs computed using one of the published SCs, or the TOMS climatology (TC) that depends on total ozone, with the 4 methods of constructing the DCs that are presented. For example one needs to know by how much adding longitude or total ozone, reduces the variance at different altitudes to make it worthwhile to consider going from SC to DC for a particular application. The focus in the paper seem to be on characterizing the biases. This is a complicated problem and is beyond the scope of this paper, for the biases between sensors are often not well understood. For example, the biases in the upper stratosphere and mesosphere can come from systematic diurnal variation of ozone and poor quality of temperature climatology that is currently available from operational sources, such as NCEP. Temperature climatology is needed to convert density vs altitude profile measured by occultation sensors into mixing ratio vs pressure profile measured by many limb viewing sensors, such as MLS. In the lower stratosphere, where the dynamical variability is large the biases can be caused by sampling errors. Ozonesondes and occultation sensors have poor sampling and there are large biases between ozone sensors in the UTLS (upper trop-lower strat) region. Satellite data show hemispherical and longitudinal differences in tropospheric ozone column that are not well captured by ozonesondes.

I think that parts of the paper and the figures need to be completely redone to show how the ECs, in particular their diagonal elements, reduce in going from SC to TC to the 4 DCs that are discussed in this paper. To do this evaluation I suggest using data from Aura MLS and/or ENVISAT MIPAS. Though there are biases between these two sensors, as well as between them and the data that have used for training the neural net, such biases should not significantly impact the calculation of ECs. Since ECs provide error bars associated with a DC, it is just as important to provide them as the

DCs.

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 775, 2012.