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Atmospheric Chemistry and Physics Discussions

Interactive comment on "On the relationship between total ozone and atmospheric dynamics and chemistry at mid-latitudes – Part 2: The effects of the El Niño/Southern Oscillation, volcanic eruptions and contributions of atmospheric dynamics and chemistry to long-term total ozone changes" *by* H. E. Rieder et al.

Anonymous Referee #1

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The discussion paper by Rieder et al. applies the methods presented in a companion paper by Frossard et al. to the ENSO and volcanic eruptions. The paper fits well in ACP, but it depends on the companion paper by Frossard et al. I have no concerns w.r.t. the relevance and the science aspects, but in some places the presentation could be clearer in some places. I suggest publication after consideration of the following

specific comments:

The abstract is very clear and concise, a pleasure to read.

p13204 p20: The authors might wish to add some references here (the term “commonly used”) suggests that there exists a sufficient number of references.

p13206 p12: I suggest to replace Part 1 by “provided in the companion paper by Frossard et al.”

p13206 l18: The acronym “ARMA” should be defined. Also a short description and a reference (possibly to Frossard et al.) would be appropriate.

p13206 l19: The purpose of the design matrix is hard to understand here, because its meaning becomes obvious only later in the paper. I doubt that the use of the design matrix is necessary because an explicit formalism for calculation of $\mu(x,t)$ is given anyway. Perhaps the design matrix formalism is necessary to technically communicate the model used to a particular software for optimization of the β coefficients but for the paper I think its use only adds unnecessary complication, since the model is given explicitly in Eq. 2. In the paper, the design matrix is actually never used. One can easily go directly from Eq. 2 back to p13207 l1 or to Eq 3 without involving the design matrix.

p13207 l1: This expression contains undefined terms; at least I did not find a definition of $\sigma(x)$. It should be said in the text that the extreme values $y(x,t)$ are a function of the expected (modeled) values, $\sigma(x)$ (whatever it is, probably some standard deviation) and ξ (probably an autocorrelated noise term; but the text says that this is used only in the ARMA investigation. What is ξ here?).

p13208 l1: Here the definition of ARMA is given but the acronym is already used on page 13206.

p13208 l3: Are multiple linear regression models which consider error covariances (e.g. von Clarmann, Atmos. Chem. Phys., 10, 6737-6747, 2010 not called multiple

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linear regression models? I find this statement misleading (but I do appreciate that autocorrelations are considered).

p13208 l5 and Eq 3: “design matrix” see above.

p13208 l10: The notation in the beginning of this line is confusing and probably not known be many atmospheric scientists. Wouldn’t it be much clearer just to say ... is Gaussian white noise with $\sigma(x)^2$ variance? Is this meant to be the definition of the σ term in the 1st line of p 13207? If so, it comes a bit late.

p13208 l13: I would prefer an explicit reference to the Frossard et al, paper here, see above.

p13209 l16: The meaning of the p-values should be explained. In this paper it is not even said that they refer to a z-test. A short description what the meaning of the p-value is and what we can learn from them would be helpful.

p13211 l19: Is there a particular reason to write the SATO-index with capital letters, although it is not an acronym but obviously borrows its name from its inventor?

p13214 l2: The statement on ozone transport may be a bit oversimplifying, considering the lifetime of ozone (c.f. Brasseur and Solomon, Aeronomy of the middle atmosphere, Springer, Sect 5.2.3.).

Figures 1/2/3/5/6/9/10: The axis labels and tick marks are far too small.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 13201, 2012.