

## ***Interactive comment on “Advanced error diagnostics of the CMAQ and Chimere modelling systems within the AQMEII3 model evaluation framework” by Efisio Solazzo et al.***

**Anonymous Referee #2**

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General Comment: This study pursues to outline the evaluation methods applied during the three phases of the AQMEII activity in view of building an evaluation strategy. Annual simulations of the WRF-CMAQ and IFS-Chimere are evaluated, as well as runs with perturbed emissions or boundary conditions or ozone deposition. The analysis focuses on ozone simulations over selected European and North American subregions. The validation is based on (a) the decomposition of the mean square error into bias, variance and covariance (to isolate the sources of error into systematic, variability and phasing) and (b) the decomposition of the time series into spectral components (to investigate the temporal characteristics of the error and elicit the associated misrepresented processes). The authors conclude that both decompositions can aid under-

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standing of the causes of model error, when sensitivity simulations or process analysis simulations are not available. The study is addressing an interesting problem and I recommend it should be published. Few comments may be helpful to improve the paper presentation.

Specific Comments: (a) [Eq 1, L174] Please include some explanations for Eq 1. Is it an identity? Are there any assumptions behind it? (b) [ACF & PACF discussion, paragraph 4.2] Please include in the text only arguments arising from significant correlations. In the same manner, significant correlations should be distinguishable in Figures 15 and 16. (c) [kz filter, paragraph 4.3] Please provide an estimate for the error leakage from the use of non-independent spectral components and discuss its impact on the results. (d) [regression, paragraph 4.4] The attempt to explain the ozone error using the error of selected variables through linear regression analysis achieves very low R<sup>2</sup>. I would suggest to remove any inference built from this linear model (as it fails to explain the variability of ozone error) and remove figures 17 and 18. Alternatively, the authors can augment the statistical model with the errors from more explanatory variables.

Technical Comments: (a) [L175] Replace 'Where' with 'where' (b) [L370-372] Please expand or rephrase (c) Figures: please increase the font size in the majority of figures.

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