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Geoscientific Model Development Discussions

Interactive comment on "Impact of a time-dependent background error covariance matrix on air quality analysis" *by* E. Jaumouillé et al.

Anonymous Referee #1

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General comments:

This article presents interesting and promising study of some characteristics of the assimilation system with special attention to background error covariance matrices (BECM). The area of study (assimilation systems in the troposphere) is relative new, so the article is quit important for the air quality community. Different configurations of the BECM are considered. Also a posteriori diagnostic technique based on Desroziers et al. (2007) work is useful tool and may be applied for other similar assimilation procedures and models. Artcle is well written, minor revision is proposed with following specific and technical comments.

Specific comments:

Section 3. Line 16: It is not sufficiently clear what autors mean under specific 3D-Var system? Is it the same 3D-Var assimilation procedure, which was applied for the Mocage CTM at the global scale? Please provide more details and description about specific implemenation of this system and its difference to previous assimilation studies with Mocage at the global scale.

Is the assimilation system the same 3D-Var FGAT Method as mentioned in previuos Mocage studies? If FGAT, then what about mentioned issues in Massart et al. (2010), that 3D-Var FGAT does not localize well (in space) the increment when the dynamics are rapid. Rapid dynamics are typical cases at regional scale. Are FGAT issues explored for the current analysis?

Section 4. Line 18: The note about values exclusion over ocean looks a little strange. Assuming that low emissions and small variability are the reasons of the inappropriate statistics over ocean, the autors should have similar problems over some land regions, like northern Europe, for example. So one should also exclude from current study these regions? From another point of view statistics and BECM typically is not able to "see" land/ocean difference. So the motivation to exclude ocean regions is not clear. To improve understanding, may be more details about inappropriate statistics over ocean should be provided in this paper.

Section 5.5 The Taylor diagramms in this study have not catched the difference between different versions for the BECM implementation. Presumably the results can be improved applying target-digammes instead of the Taylor diagramms. In this scope, at conclusion section was also mentioned that the impact of the BECM formulation has been also difficult to evaluate because the Mocage model shows a systematic bias in situations with low ozone concentration. This systematic bias in the model is one more argument for the target-plots, which are able to differ between systematic and unsystematic errors.

Technical corrections:

The plots of the domains on Fig. 9 are incosistent with previous plots (Fig. 1,2,3,6,8) and with domain definition at Section 3.1: longitudes 16° East to 36° West and latitudes 32° South to 72° North . Please use the same consistent map with North and South-East Europe regions for all plots.

Interactive comment on Geosci. Model Dev. Discuss., 5, 873, 2012.