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## ***Interactive comment on “The role of aerosol in altering North Atlantic atmospheric circulation in winter and air-quality feedbacks” by F. S. R. Pausata et al.***

### **Anonymous Referee #2**

Received and published: 26 October 2014

This manuscript by Pausata et al is investigating the role of aerosols in changing NAO atmospheric circulation in a future climate accounting for chemistry-climate feedbacks in a general circulation model coupled to a mixed layer ocean model. It makes the point that due to aerosol-climate interactions, more stagnant conditions will prevail in the West Mediterranean leading to air pollution accumulation and thus requiring to strengthen air pollution abatement measures in the affected countries. This is a very important demonstration and deserves publication after major revisions.

As referee #1 mentioned in the published report, the cause-effect relationships are not convincingly described in the ACPD published version. The authors in their replies to

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the reviewer #1 comments have made a clear step in improving the manuscript in this direction. Thus I encourage them to pursue this effort in the revision of their manuscript. I am looking forward to reading the revised manuscript that will clearly demonstrate the cause-effect relationships.

In addition to reviewer #1 replies, I would like to see a figure/sketch that summarizes the findings of the study in terms of shifts/extensions of SLP centers and blockings.

Also it would have been very useful to the reader to see on a map (can be in one of the existing figures) the four regions that are analyzed for air quality impacts, regions for which the longitudes and latitudes are provided in p22489 l15-18. In addition, there, please check the borders – for instance EM does not extend to 40W, the authors might mean 40E. Can the authors explain why the specific boundaries have been chosen for these 4 regions? Why the ‘central Mediterranean’ is left out or the south Mediterranean Sea/North Africa is not part of the Mediterranean regions.

Minor comments: P 22490, l 27: Could it be that the long range transport pollution source region is differently affected in the Western than in the Eastern Mediterranean?

P 22488,l19-22: Is this finding statistically significant for 2030AER?

P 22488, l221-22: this statement requires supporting evidence.

P 22483, l1-2: Can you provide an estimate on the errors induced in sulfate and more generally PM calculations by the assumption of prescribed oxidant fields?

P 22483: l3-5: Provide reference of the model using this module for aerosol radiative properties.

P 22484, l12,13: GHG concentrations and aerosol emissions . . . , respectively.

P 22486, l24: show

P 22492, l3: Hori et al reference is missing.

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