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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Modeling natural emissions in the Community Multiscale Air Quality (CMAQ) model – Part 1: Building an emissions data base" *by* S. N. Smith and S. F. Mueller

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General Comments: Incorporation of natural emissions to air quality models is a challenging issue. Particularly, when the major goal is to understand the levels and formation of secondary pollutants, the contribution of natural sources may be as important as of the anthropogenic emissions. However, estimation of these emissions may introduce high uncertainties and should be carefully handled and evaluated. In this study, the authors compile a natural emissions inventory that covers lightning, oceans and other sources that are not widely considered in regional air quality practices, as well as presenting a general overview of the current state of knowledge. The results show

significant contributions from these sources.

Specific Comments: The paper presents a new natural emissions database for the continental United States to be implemented in CMAQ chemistry and transport model. It brings together data from other databases and the default SMOKE emissions model profiles to produce temporally resolved emissions. Although the authors do not introduce new methodologies for the estimations of these emissions, they compile a detailed and model-ready natural emissions inventory to be assimilated in regional air quality models.

The authors come up with important conclusions pointing out that these natural emissions may play important roles in the photochemical mechanisms, particularly concerning secondary pollutants. Their calculations show that depending on seasonality, significant amounts of emissions may be produced that are comparable with the total emissions. Thus, their results are sufficient to support their conclusions. However, the contributions of these new emissions on the simulated pollutants levels are not discussed. Although the title clearly emphasizes the aim of this manuscript, a short discussion might be added on the impacts of this new database on model results – if there are any results available. The authors provide a comprehensive review of the current state of knowledge and previous work.

I have minor comments and suggestions on the presented work.

Abstract and : The authors say that SMOKE processes windblown dust. However, dust is not a part of SMOKE model unless modified. It should be processes offline and added to the final emissions. The authors should be more clear on this issue.

Section 1: Some more references may be provided, especially for the part that discusses the disadvantages of neglecting natural emissions.

Section 2.3: As a global inventory, the authors may discuss MEGAN natural emissions as a vey updated source for biogenic NMVOCs.

Line 268: Reference should be corrected as Kaynak et al., (2008)

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 1755, 2010.