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www.geosci-model-dev-discuss.net/3/C642/2011/

Geoscientific
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Discussions

Interactive comment on "Modeling framework for exploring emission impacts of alternative future scenarios" *by* D. H. Loughlin et al.

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The authors appreciate the thoughtful comments from this referee. We would like to respond to the referee's comments and hope that our response will successfully address his or her concerns.

Comment: ". . .. This work should probably be published elsewhere. . . the submission does not describe the development of a geoscientific model. If it did, the computer code would be included with the submission. . .. More appropriate journals would be Int J Enrg Res, J Air Waste Manage, or B Am Meteorol Soc."

Response: In the description of the GMD review process (http://www.geoscientific-model-development.net/review/review_process_and_interactive_public_discussion.html)

the text states that “The Topical Editor is asked to evaluate whether the manuscript is within the scope of the journal and whether it meets basic scientific quality.” Since the manuscript was published in GMDD and the review process for GMD was started, these criteria appear to have been met.

As the authors of this manuscript, we put considerable thought into the target journal. The manuscript describes a methodology, implemented as a component to a multi-model framework. As such, we felt that the manuscript was an appropriate submission under the “Framework/component papers” manuscript type described in the GMD guidance (www.geoscientific-model-development.net/submission/manuscript_types.html). This manuscript type includes “frameworks and utility tools used to build practical modelling systems”, a description that we believe is applicable to our methodology and its implementation.

The guidance does suggest that “submission of user manuals and source code is encouraged,” although it is not indicated that this submission is required. For our methodology, the crosswalk that translates MARKAL emissions categories to emission inventory source classification codes (SCCs) is specific to the EPA MARKAL database and the U.S. EPA National Emission Inventory, and we feel that providing a detailed description of the methodology is much more important to most readers than the code itself. We have received communications from a number of researchers (both in the U.S. and abroad) indicating their interest in how we link MARKAL and SMOKE, and one of our main goals in developing the manuscript was to highlight the method and relevant issues related to implementation. We will modify the description of our objectives and conclusions sections of the paper to discuss how the methodology can be more generally useful.

The referee provides suggestions of alternative journals to which he or she feels the manuscript is more appropriate. Our feeling is that these journals would be excellent targets for descriptions and analyses of emission scenarios generated using the larger framework of which the MARKAL-to-SMOKE methodology is a component. We are

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currently developing a separate manuscript for that purpose. The follow-up manuscript will be submitted to one of the listed journals or a similar journal. Length limits on that manuscript likely will preclude a detailed description of the MARKAL-to-SMOKE linkage, however. Our hope is that we could point to the methodological description within the framework/component-type manuscript submitted to GMD.

Comment: "Why do you apply the methodology only to the United States? (This restriction should be mentioned in the title of the paper, by the way, which currently promises more than the content of the paper delivers.) My understanding is that the MARKAL and SMOKE models are not specific to the USA, but could be run more generally for any nation, or even for the entire globe. If this could be done, I think a much more influential paper would result. . . . Why do you run the analysis only until the year 2050? If the emission inventories calculated in the paper are intended to be used by climate modelers, for example, then extending them out to the year 2100 would make them more useful."

Response: It is true that MARKAL and SMOKE are both being used for a wide range of temporal and spatial scales (local, state, regional, national, global) and that they are used by researchers and scientists for applications in many different countries. There is not a uniform dataset of inputs across these applications, however, and thus the data inputs that drive the models must be tailored for the particular application.

Our work falls under the U.S. Environmental Protection Agency's Global Change Research Program. Within this program, a primary goal of MARKAL and SMOKE modeling is to generate alternative air pollutant emission scenarios for the U.S. through the mid-21st century, with the alternatives differing with respect to assumptions about U.S. population growth and migration, economic growth and transformation, land use change, technology change, climate change, and policy. These air pollutant emission scenarios will then be used to examine potential impacts of different assumptions about the future on air quality. The Global Change Research Program objectives thus drive the choice of models, modeling time horizon, etc. Climate model-

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ers are not the primary intended audience, although projections of CO2 emissions associated with alternative scenarios may be of use to portions of the climate modeling community, such as in the context of mapping mitigation targets to relatively short-term technological pathways. (For more information about the emission scenario project, please see "Assessment of the impacts of global change on regional U.S. air quality: A synthesis of climate change impacts on ground-level ozone" at http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=203459. The appendices of this document describe the objectives of the MARKAL modeling component.)

We will modify our manuscript to clarify the purpose of the overall framework and the role of the specific methodology and models that are used within that framework. Further, we will examine whether an alternative title more adequately conveys the work presented in the manuscript.

Comment: "As the authors themselves admit, the scenarios considered represent only two of a large number of potential futures. Since the models are run so quickly, why not include a more diverse portfolio of scenarios, to give a better representation of uncertainty."

Two primary objectives of this particular manuscript are to describe and demonstrate the MARKAL-to-SMOKE linkage methodology. For this latter objective, we sought to provide a relatively straightforward example that demonstrates how regional emissions can change in response to alternative assumptions. In the follow-up manuscript, mentioned previously in this response, we will use the MARKAL model to examine regional pollutant emission impacts for a considerably larger set of scenarios. We feel that space limitations do not allow us to fully describe both the methodology and its application to a large number of scenarios. Similarly, space limitations in the subsequent applications paper would not allow us to describe the methodology in sufficient detail. We believe that developing one paper focused on methodology and one or more focused on application is the best approach.

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Comment: “The computational time is going to depend upon not only the options and resolution of MARKAL, but also on the processing speed of the computer (p2025). This speed should be specified.

Response: The goals of this text in the manuscript was to convey the order of magnitude of runtime (minutes for the national model database and tens of minutes for the regionalized database) and that the model can be executed on a typical desktop computer. We agree that this discussion could be improved if more information is provided to the reader as desktop computer configurations vary widely. We will modify the text to specify that processing speed, computer configuration, and a variety of other factors (e.g., settings for the optimization solver) also impact runtime. We will specify the processing speed/configuration that we use and that resulted in the observed runtimes (e.g., We are currently running MARKAL on a Windows XP laptop with a dual core 2.4 GHz processor and 3.45 GB of RAM).

Interactive comment on Geosci. Model Dev. Discuss., 3, 2021, 2010.