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Interactive comment on "The Meteorology-Chemistry Interface Processor (MCIP) for the CMAQ modeling system" *by* T. L. Otte and J. E. Pleim

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We thank the reviewer for the positive and constructive comments on our manuscript. The feedback from the reviewer has improved the quality of the manuscript. The reviewer's specific comments (shown in *italics*) are addressed below.

Since MCIP development has to be in conjunction with the CTM developments, it is essential to know about the new science that is being introduced in the CTM and the role of MCIP in satisfying the implementation of the new science. The paper meets the expectations in this regard and covers new developments. The authors even go

further and comment on the suitability and compatibility of options to be used. They also offer recommendations as to what options are preferable. This is important for the user community as it delineates the limitations in the use of the model which even an advanced user of this modeling system may overlook. However, the manuscript is too long and at some points explains details that are more suited for a user's guide than a paper. Perhaps shortening the paper will add to its value and make the paper more focused on the overall structure of MCIP.

We agree that there are some details that have been included in the manuscript that may be more suitable for a user's guide than a paper. Unfortunately there is no user's guide that is specific to MCIP. Keeping both points in mind, we have taken a closer look at the manuscript to remove detail that we believe could be obtained from other sources or that detracted from providing a useful overview of MCIP. For example, in line with comment 1, below, we have followed the reviewer's suggestion to shorten the discussion of the windowing. We have also shortened the discussion of the fields that are required and recommended from the WRF model in Sect. 2.2. Overall, we believe that all of the information is valuable for the user community, and we did not believe that any sections or subsections were worth sacrificing entirely.

1. Page 1454: The discussion about windowing option can be summarized.

The discussion of the windowing option was shortened, as suggested by the reviewer. The final six sentences of the discussion were removed.

2. Page 1455: Layer collapsing uses interpolation and not averaging. There is no discussion to justify this.

Layer collapsing uses interpolation rather than averaging because it is easier to implement and it is more flexible. It gives the users more options for running the CTM based on ensembles of meteorology that have been obtained from different sources and not necessarily constrained to the same vertical structure or the target vertical structure for

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the CTM. Averaging would be more appropriate for mass conservation, but the current algorithm would need to be made considerably more sophisticated to account for collapsing more than two meteorological model layers into one CTM layer, for completely different vertical structures (i.e., layer interfaces that are not coincidental) between the meteorological model and the CTM, etc. We do not believe that using interpolation rather than averaging warrants further discussion in the text. However, at the end of that paragraph, we have added the caveat, "Layer collapsing will ensure mass conservation only when a CTM layer is comprised of no more than two meteorological model layers and when the layer interfaces of the CTM layers are coincident with layer interfaces from the meteorological model's vertical structure."

3. Page 1466: The justification for calculating some of the necessary cloud-related fields in MCIP is the lack of this information in the routine outputs from meteorological models. However, it is not clear whether or not MCIP is able to use such information if it was available from the meteorological model.

At this point, MCIP would not be able to use the diagnosed clouds fields directly from the meteorological models because it is not coded to expect those fields. It would be straightforward to modify MCIP to ingest cloud coverage, cloud base and top, and cloud liquid water content, if those fields were available, and then pass those four fields directly to the MCIP output rather than calculating them. Presumably one would want to use those fields directly if they were available. The effects of those fields in the photolysis calculations would need to be analyzed, though. The text was not modified to further develop this point because neither MM5 nor WRF-ARW typically includes any of these fields in the output files.

4. Page 1467: The discussion about dry deposition is concentrated on the engineering aspect of the connections of the met. model. There is a need to discuss the scientific aspect of the connection, i.e., what information is needed from the meteorological

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model for the dry deposition calculations and which land surface model can potential provide such information.

We agree with the reviewer that additional detail on the scientific aspects of the dry deposition velocity calculations would be valuable. That information was deliberately omitted from this manuscript for two reasons. Although the dry deposition calculations have historically been performed in MCIP, they are being transitioned to the CTM (beginning in CMAQv4.7, released in December 2008) to be coupled with chemical evasion, and dry deposition velocity calculations will be removed from MCIP in 2011. Second, the scientific aspects of the dry deposition calculations in M3Dry are detailed enough that they warrant a separate and focused paper, one which we have not published yet.

The fields that are required for the dry deposition calculations are briefly noted in Sect. 5.3, paragraph 2: "The algorithms in M3Dry make use of surface and surface-layer parameters generated by an LSM within the meteorological model, if available, such as leaf-area index, fractional vegetation coverage, canopy water content, bulk stomatal conductance, aerodynamic conductance, and roughness length." Most land surface models can provide that information, although some modifications may be required within MM5 and/or the WRF model to include those parameters in the output. Section 5.3, paragraph 3 explains that MCIP will calculate the missing near-surface fields, but not without a potential penalty: "When near-surface fields are unavailable in the meteorological model output, they are calculated internally in MCIP; however, the algorithms are likely to be unrelated to the LSM and other parameterizations in the meteorological model, which can result in an additional source of inconsistency."

5. Page 1468: Since the use of GOES data is explained in section 5.4, it would be useful to also list the website for GOES data (i.e., http:://satdas.nsstc.nasa.gov).

The reference to the website was added as suggested by the reviewer.

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