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Interactive comment on "Linkage between an advanced air quality model and a mechanistic watershed model" *by* K. Vijayaraghavan et al.

Anonymous Referee #3

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Based upon the abstract and the paper, I thought that the purpose of the paper was to describe the linkage between two models - the AMSTERDAM version of CMAQ and WARMF. I expected a detailed discussion of both the scientific background of the fluxes that would be involved in the linkage and the methods employed in transferring data between the two models. In my opinion the paper was lacking in several key areas.

Also, the title and the abstract focus on the linkage between the models. However, the tables and figures focus on the differences in data and results of executing WARMF in two different configurations. This apparent inconsistency is confusing to the reader.

My biggest point of confusion in this paper is in Table 10 (p. 1538). If the two models are being linked such that mass that is deposited from the air quality model is input to the watershed model, then how can the quantities shown as AMSTERDAM output (col-

umn 3) be different from those shown as Input to WARMF air model linkage scenario (column 2)? Although the differences are more pronounced for the dry deposition, there are still differences in the wet deposition. Is mass being deposited other than from the atmosphere? By what mechanism does this occur and where do the data come from? I am similarly confused by Table 12 (p. 1540) where column 2 is labeled "calculated by WARMF air model linkage scenario". If deposition is transferred from AMSTERDAM to WARMF, then how is WARMF calculating deposition?

The remainder of my comments refer to specific passages that I give as P# L#-# format (page number line number range).

P1506 L17-21: The paper states that the references assume that the deposition in each grid cell occurred at the center of the cell. CMAQ, which is the air quality model in the reference, assumes that each grid cell is uniformly well-mixed. Therefore, the concentration with a grid cell is uniform and the deposition flux from a grid cell is uniform throughout that cell. This difference is very important when moving mass between the spatial representations of two models.

P1509 L15-16: Although the meteorology is consistent, is it adequate to capture localized events such as heavy rain from an isolated shower or a tropical system? This type of rainfall event does not occur uniformly throughout a watershed. What data were used to calibrate the stream flow in the watershed model?

P. 1511 L9-10: Regarding the phrase "constant altitudinal temperature gradation", does this mean that the lapse rate calculated by vertical grid cells in AMSTERDAM was not used? Why not? Was the constant temperature vs. altitude value compared to that obtained from the model?

P1513 L23-24: How was WARMF calibrated?

P1514 L20-22: There are issues in combining speciated modeled and monitored values. What effect was seen on mass?

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P1515 L6-8: Why was the spatial variability across the watershed eliminated by averaging across all grid cells in the watershed? How important might this be to model results?

P1519 L17: The last word should be changed from "covert" to "convert".

P1520 L5-8: This statement is confusing. What part of PM nitrate is and is not in the baseline scenario?

Tables containing columns for WARMF and for AMSTERDAM: The mass is transferred from AMSTERDAM to WARMF. So, why is WARMF shown as the column on the left and AMSTERDAM as the column on the right?

P1545 Figure 3: Inadequate information is provided in the caption. Is elevation important to the linkage between the air quality and the watershed models? If not, then why is it given such prominence in this figure?

Interactive comment on Geosci. Model Dev. Discuss., 3, 1503, 2010.