

Interactive comment on “CESM/CAM5 improvement and application: comparison and evaluation of updated CB05_GE and MOZART-4 gas-phase mechanisms and associated impacts on global air quality and climate” by J. He et al.

Anonymous Referee #3

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This manuscript documents the comprehensive evaluations and comparisons of two chemistry mechanisms (CB05-GE and MOZART-4) in CESM/CAM5. The topics are well within the scope of GMD. I recommend the acceptance for the publication after following comments are addressed.

1. Many fields related to chemical species, aerosol species, CCN, clouds are discussed and evaluated in the study. To improve the clarity and readability, the authors may consider to use another way of presentation in section 4. For example, you may consider to add subtitle for different types of gas and aerosol species, e.g., NO_x, NO_y,

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O₃, HNO₃, aerosols (BC, OC, SOA, SO₄ and associated precursors), CCN, cloud, radiation. 2. The organization of section 4 is somehow confusing. How about putting all the evaluations in one subsection 4.1 and all the comparisons in the other subsection 4.2. Within each subsection there are different components (e.g., surface, vertical profile, column evaluations..).

Specific comments: 1. Abstract. Line 19, what is CONUS? 2. Abstract. Line 23, why the biogenic emissions are different between the two mechanisms. 3. Page 7198. Line 12, which analysis fields are nudged? 4. Page 7201. Line 13-14, please compute PM_{2.5} accurately since the MAM aerosol scheme predicts the aerosol size distributions for different aerosol modes. 5. Page 7203 and follow many pages. There are many “likely”. I would like to have more certain assessments. 6. Page 7208. Line 26, change “include” to “included” 7. Page 7211. Please compare your SOA treatment with the Shrivastava et al. (2014) “Global transformation and fate of SOA: Implications of low-volatility SOA and gas-phase fragmentation reactions” in JGR for treatment of SOA in CAM5 and simulation results if possible.

Interactive comment on Geosci. Model Dev. Discuss., 8, 7189, 2015.