

Interactive comment on “Present and future nitrogen deposition to national parks in the United States: critical load exceedances” by R. A. Ellis et al.

Anonymous Referee #1

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This manuscript characterizes nitrogen deposition in the United States, in both present-day and future (2050), in the context of critical load exceedances at national parks. This is a concise topic, appropriate for publication in ACP and the manuscript is well written. I include below a few relatively minor comments and suggestions to consider prior to publication in ACP.

1. While the focus of the manuscript is on critical load exceedances, it would be useful to include the estimates of total N deposition over the US and how this is projected to change by 2050 in the abstract and in the text. These absolute values are not subject to the relativization of harm associated with the (uncertain) CL metric, and may be more

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informative for those interested in atmospheric inputs to terrestrial (i.e. soil/riverine) ecosystems.

2. Abstract: It would be helpful to clarify in the abstract that the CL values used here are designed to protect the most sensitive reception in an ecosystem (and thus that exceedance does not necessarily imply broad ecosystem damage). The current phrasing of “with the goal of protecting the most sensitive ecosystem receptors” is a little unclear: one might assume that it is a natural “goal” to protect the most sensitive elements of the ecosystem but it’s not clear from the text that the metrics have specifically been defined to determine when these most sensitive elements are at risk.

3. Abstract & Section 4: The authors should be careful to clearly state that all future projections consider ONLY anthropogenic emission changes. The authors have not included changes in soil NO_x, lightning NO_x or biomass burning emissions (as described in the RCP scenarios or predicted to respond to a future climate) which could impact future nitrogen deposition. Sentences in the abstract and throughout should be modified (e.g. page 9153, line13-14: “We then project future changes in N deposition using the RCP anthropogenic emission scenarios of 2050”).

4. Abstract, line 19: Clarify that these numbers are based on two RCP scenarios (8.5 and 2.6)

5. Page 9156, lines 7-8: Why do the emissions differ from Zhang et al? You indicate that the same years and model configuration were used. Different emission inventories?

6. Page 9161, lines 6-8: Confirm that the present-day GEOS-Chem 2006 and RCP 2006 emissions agree spatially as well (such that relative changes in regional CL exceedances can be attributed solely to growth/decline of local emissions)

7. The analysis presented here focuses on annual means. Is the model performance of equal skill throughout the year? Or are there some compensating seasonal biases?

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8. What are the implications of the recent GEOS-Chem model studies suggesting ammonia emissions underestimates in the United States - esp California and the Midwest (Walker et al., 2012; Heald et al., 2012; Zhu et al., 2013) on this study?

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 9151, 2013.

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