Interactive comment on “Simulating Lightning NO$_X$ Production in CMAQv5.2 Using mNLDN, hNLDN, and pNLDN Schemes: Performance Evaluation” by Daiwen Kang et al.

Anonymous Referee #1

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This article appears to be the evaluation side of GMD-2019-33 “Simulating Lightning NOX Production in CMAQv5.2: 2 Evolution of Scientific Updates”, which is cited numerous times in the manuscript, and with similar authors (although the order is not exactly the same). I would suggest to make the link more specific and make these two papers companion papers, possibly entitled “Simulating Lightning NOX Production in CMAQv5.2: part 1, new parameterizations”, and part 2: evaluation for example.

The paper is well written, concise, and of good scientific quality, with a thorough evaluation of the impact of the three new schemes that have been implemented into CMAQ. I have a few remarks that should in my opinion be addressed before final publication:

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â€¢ Please add a short descriptive summary of the three lightning schemes that are evaluated in the paper,

â€¢ It would be desirable to remind the reader of the different chemical links between NOx, O3 and nitrate precursors; this is partially done at the beginning of section 3.3 for nitrate.

â€¢ Perhaps a discussion on the skill of the forecasts of convective precipitations in the WRF forecast (and possibly of its diurnal cycle) should be discussed or at least mentioned since this is a critical input of the three schemes,

â€¢ For nitrate, perhaps it would have been simpler to evaluate the nitrate concentrations against observations from the CASTNET network, rather than nitrate wet deposition, which depends again on modelled precipitation: this adds another layer of error/uncertainty.

â€¢ Tables 1 and 2 are very big; the bold parts are not always easy to spot. Is there a way to present this key information in graphics?