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.

We agree with the reviewer, and we have now changed the title to “Simulating Lightning NO Production in CMAQv5.2: Performance Evaluations” to match the companion paper that has been published.

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.

We thank the reviewer for the overall positive assessment.

I have a few remarks that should in my opinion be addressed before final publication:

âA˘ c Please add a short descriptive summary of the three lightning schemes that are ´ evaluated in the paper

The other reviewer also made the same suggestion, so we have now added this information in the Methodology section as “2.1 The LNO schemes” in the revised manuscript on Page 4.

âA˘ c 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.

We thank the reviewer for this suggestion. Even though the role of NOx in the atmospheric chemistry is well known, we agree that for completeness it would be useful to briefly summarize the role for broader readership. We have now incorporated the information in the introduction section by stating that “it is expected that the relative contribution of LNO to the tropospheric NO_x burden and its subsequent impacts on atmospheric chemistry as one of the key precursors for ozone (O_3), hydroxyl radical (OH), nitrate, and other species will increase in the United States and other developed countries”.

âA˘ c 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,

The reviewer makes a good point. However, there are no observations to distinguish convective precipitation from non-convective precipitation, and usually for precipitation measurements, only aggregated daily or even longer-period products such as PRISM (a combination of rain gauge and modeling results) and STAGE (a combination of radar and rain gauge observations) are available. Therefore, it is not readily possible to assess the forecast skills for convective precipitation, and even more so for the diurnal cycle. For this

reason, we provided the monthly accumulated precipitation assessment in Figure 12 for WRF precipitation and computed the statistics over the NTN sites to form the basis for our nitrate wet deposition evaluation.

âA˘ c 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.

We agree that the CASTNET network offers another source of evaluation for model estimated nitrate. The advantage of using the NADP/NTN network is that it is larger with more spatial coverage (196 NTN sites compared to about 75 CASTNET sites). The top row in Figure 12 provides the model bias in annual total precipitation compared to NTN observations so that it can be compared against the wet deposition bias. These plots indicate that, while there is some underestimation of precipitation in the eastern half of the US, errors in modeled precipitation do not account for 35% normalized mean bias in modeled wet deposition of nitrate across the country. This consistent bias suggests missing regional-scale emissions sources such as NO from lightning. Additionally, direct evaluation of modeled wet deposition estimates is used to inform national scale assessments of nitrogen budgets and comparison of deposition loads with critical loads. The evaluation again the NTN network is used to demonstrate how the addition of NO from lightning can help reduce bias in modeled nitrate deposition levels, increasing the credibility of using model output for critical loads analyses. It should also be noted that comparisons of aerosol NO3 predictions with ambient observations (from CASTNET and other networks) can be influenced by errors in modeled gas/aerosol partitioning influenced by uncertainties in NH3 emissions. Comparisons of total NO3 wet deposition also helps circumvent those other model error influences and better isolate the impacts of LNO emissions on total nitrate atmospheric budget.

âA˘ c 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?

We agree that the tables contain a lot of information, but as a supplementary to the information that has presented in other graphics and plots, interested readers can get more detailed information from the tables for model performance over different geographical regions.