Geoscientific
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Discussions

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Interactive comment on "Evaluation of the offline-coupled GFSv15-FV3-CMAQv5.0.2 in support of the next-generation National Air Quality Forecast Capability over the contiguous United States" *by* Xiaoyang Chen et al.

Anonymous Referee #1

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General comments

This study uses Global Forecast System with the new Finite Volume Cube-Sphere dynamic core (GFS-FV3) to drive the CMAQ v5.0.2 and evaluates the model results with observational data. The forecast system shows good agreement in meteorological variables and pollutants. This manuscript fits the scope of the journal of Geoscientific Model Development. However, more detailed and in-depth descriptions are expected in several places (see below comments).

Specific comments

1. Line27-28: As mentioned here, NAM model is the current meteorological model. Can authors explain more in-depth why chose the GFS-FV3? Please also present some comparison results between these two models. 2. Line 50: "semi- or intermediate-VOCs" is mentioned as the missing sources of PM2.5 in abstract. However, none of the S/I VOCs sources are analyzed in the rest of the manuscript. Please double check whether the analysis of this part is omitted. 3. Line 173-174: What is the purpose to only extracting the first 24-hour results from each 72-hour forecast? If the first 24-hour results are only needed, why still simulate the next 48 hours? 4. Line 192-193: What are the criteria or references for setting this threshold (120 ppb and 100 μg m-3 for O3 and PM2.5)? How about those abnormal low data? 5. Line 259-263: What is this "artificial temporal allocation algorithm"? Please introduce more details about this algorithm. 6. Line 335: What is "Higher predicted PM2.5, typically SOA, in California is expected in the future using GFS-FV3-CMAQv5.3." means? Does it mean that GFS-FV3-CMAQv5.3 would predict higher concentrations than GFSv15-CMAQv5.0.2 for PM2.5? If so, what leads to these higher concentrations in GFS-FV3-CMAQv5.3? An updated mechanism or some updated PM sources? Which one is more important for the PM2.5 prediction? 7. Line 347-359: It's better to move the method introduction to the section 2. 8. Line 383-385: As mentioned above, GFS-FV3-CMAQv5.3 will have higher PM2.5 concentrations. Since the significant overprediction of PM2.5 leads the poor performance in capturing the category of "Unhealthy for Sensitive Groups" in cooler months mentioned here, whether the updated system GFS-FV3-CMAQv5.3 would have worse prediction? Can authors provide any suggestion to avoid this? 9. Section 3.3: What is the difference of the meteorological prediction among regions? Please introduce it. It would be helpful to explain the pollutant prediction bias in different region.

Technical corrections

1. Line 1: "GFSv15-FV3-CMAQv5.0.2" should be "GFSv15-CMAQv5.0.2" to be con-

sistent with the expression in other part of the manuscript. 2. Line 214:215: the term "ozone season" should be rewrite as "O3-season" to be consistent with the expression in other part of the manuscript. 3. Line 419: the term "overpredicted" should be "underpredicted". 4. Line 539: "nemsio" should be "NEMSIO" to be consistent with the expression in other part of the manuscript. 5. Figure 2, Figure 8b and 8d: Some labels and lines are overlap. Please modify these pictures and make it clearer. 6. Figure 8: The serial number of the figure ((a), (b), (c), (d)) should be in front of the title. 7. Figure 8a, 8c: The term "CONUS" should be "Overall". 8. Figure 9b, 9d: Part of the labels of the figure is missing. Please modify it.