Workshop 2019 ITM September 26

AQMEII4 FAQ, version 1 (October 1, 2019)

P.A. Makar, based on notes taken from the September 24th 2019 meeting in Hamburg.

1. Q: Our model runs start on January 1, but we need to start our model 2 weeks to 1 month before that time, in order to allow for spin-up. What emissions do we use for that December spin-up period? Similarly, what should we use for chemical lateral boundary conditions?

   A: Our recommendation is to use the given year's emissions for December. i.e. for a 2009 year simulation, use the December 2009 emissions for the spin up period in December of 2008; for a 2016 year simulation, use the December 2016 emissions for the spin-up period in December of 2015. With regards to the chemical lateral boundary conditions, Christian has contacted ECMWF and they will be able to provide fields to generate the lateral boundary conditions for the spin-up periods in December.

2. Q: In the past, AQMEII recommended that the ECMWF MOZART reanalysis values for sea-salt should NOT be used. Has that changed?

   A: Two important considerations with regards to the ECMWF particulate matter boundary conditions arose during the Hamburg meeting. These are further documented at https://confluence.ecmwf.int/display/CKB/CAMS+global+sea+salt+aerosol+mixing+ratios

a. The sizes specified in the ECMWF information are in radius, not diameter – this needs to be taken into account when transferring the ECMWF particle speciation to the participant model speciation.
b. The mass reported by ECMWF as sea salt mass is the wet aerosol mass. In order to determine the corresponding dry sea-salt mass, the ECMWF values need to be divided by a factor of 4.3.

   Given the above considerations, we are recommending that participants use the ECMWF CAMS reanalysis data, including the sea-salt values, for their boundary conditions.

1. Q: How do we map from our own model's land use categories to the AQMEII-4 categories? We are not expected to run our models with the AQMEII-4 categories, are we?

   A: Participants should run with their own "native" land use categories! The transformation to the AQMEII-4 land use categories should happen as part of the post-processing. Participants will need to construct the mapping between their land use categories and the AQMEII-4 categories, then create land-area-fraction weighted values for reporting, in the AQMEII-4 categories. For example, for the resistance quantity R, the contribution of the native land-use categories i to AQMEII-4 category j at grid-cell x,y can be represented by the following equation:

$$R_j(x,y) = \sum_{i \in j} \left\{ \frac{A_i(x,y)}{\sum_{i \in j} A_i(x,y)} \, R_i(x,y) \right\}$$

   That is, the user must determine which of the native land use categories i contribute to AQMEII4 land use category j (i.e sums over all i which contribute to j in the above equation, then use the native land use mode area fractions Ai to determine the fractional contribution of the I'th land use category to the j'th AQMEII-4 category, locally for each grid-cell on the AQMEII-4 destination grid and at the station locations. The reported values are thus area-

weighted according to the contributions of the native land use categories to the AQMEII-4 categories, at each grid cell.

2. Q: We understand that our models are to be run using their native land use categories, and the results are to be mapped by area fraction into the 16 AQMEII4 land use categories. However, what do we do if there is no contribution to an AQMEII4 category from the model's own land use category?

   A: The value in that case should be reported using the "no data" code, -9.0. We note that different participants will be using different sources of land use data, and as a result, the location and relative fraction of the AQMEII-4 land use categories may vary between participants. However, both the native land use categories and resulting AQMEII-4 land use categories are to be reported in gridded form by each participant, which will help determine the extent of overlap and the regions of the grid that are most suitable for direct comparison, and part of what the reporting will determine is the extent to which differences in deposition relate to differences in the underlying land use databases.

3. Q: Our model domain extends beyond the boundaries of the region defined for emissions by AQMEII-4. What should we use outside of the defined region?

   A: We leave this choice up to the participant. We note that this can introduce an additional source of uncertainty in the model intercomparison.

Other issues identified during the meeting in Hamburg:

a. There needs to be a meeting or series of meetings organizing the EU participants – many are using the same modelling platforms, so pooling resources regarding model setup and in particular emissions processing, and harmonization of input data, is worthwhile . One issue that arose was whether AQMEII-4 will be providing temporal profiles for emissions for Europe – the consensus was that the European groups should use the same temporal profiles if possible.
b. With regards to critical load data: there will need to be more follow-up on this by Johannes. The issue: the databases moved from Netherlands to Germany, but there are some problems in the protocol for accessing them at their new location. There are also two possible sets of CL data, one based on modelling, and another based more on observations – it would be good to obtain both on the AQMEII-4 grid.

<u>Tentative Timeline for Activity 1 Based on Participant Feedback</u>

October 2019: Start regular participant conference calls; coordinate on EU emission temporal allocation and filling regions outside coverage of TNO MACC3; initiate contacts/coordination between groups running the same/similar models

November 2019 – Aim for most groups to finalize emissions processing, some groups may take until January

December 2019 – finalize model code to ensure the requested variables can be obtained from the simulations (coordinate between groups running the same model); prepare boundary conditions

December 2019 – some groups may start model simulations, some groups in January, two in March

Expected time to run the annual simulations – typically one calendar month per domain/year, CAMx 1.5-2 months, WRF/Chem may be a bit slower than that

February-March 2020: first models may be able to start postprocessing

April 2020 First data uploads

May 2020 Screening of data on ENSEMBLE to fix potential errors in postprocessing approaches

Summer 2020 Begin intercomparison analysis

Spring 2021 Preparation of manuscripts

Discuss whether to aim for an "AQMEII4" special issue: - ACP would be preferred option – contact ACP to discuss timeline (lead time, when to open, time it can be kept open). May look at JGR-atmospheres (no, probably not open access) or JAMES (open access) - Stefano/Christian/Paul to contact journal(s) to learn more about require lead times, length the SI can be open, etc.

b. Should this include results from "activity 1", "activity 2", and "activity 3", or separate publication targets for different activities – preference would be for the same target journal.