

**European Geosciences Union General Assembly 2019**  
**Splinter-meeting: Coupled Atmospheric Composition - Meteorology/Climate Modelling**  
**(CCMM) and Aerosol feedback model study - a joint coordination meeting of WMO GAW,**  
**WWRP and WCRP WGNE, S2S and APP SAG teams**

**12 April, 12:45 Europe time**

<https://meetingorganizer.copernicus.org/EGU2019/session/30595>

**Meeting Minutes**



**List of participants**

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### Meeting Agenda:

Alexander Baklanov: Introduction to the meeting goals

Greg Carmichael: View from GAW programme

Angela Benedetti: View from S2S, SDS-WAS, Aerosol and APP SAGs

Georg Grell: GAW APP SAG CCMM activities and EuMetChem/AQMEII phase2 experience

Ariane Frassoni: WGNE Aerosol study and planning the Phase 2 model exercise

Joint discussion: Planning the model exercise on Aerosol feedbacks: domains, time period, models, observations, protocol to run and evaluate

Comments from Xin Huang – view from China

Comments from Stefano Galmarini / Paul Makar / Yang Zhang (by teleconf): AQMEII and EuMetChem experience and protocol

Recommendations for joint studies and modeling exercise protocol and plan

### Alexander Baklanov welcomed all participants and introduced the meeting goals

Informed about the previous EGU2018 splinter meeting on the coupled chemistry-climate/meteorology modelling (CCMM) coordination between relevant projects, WGs/SAGs and tasks of WWRP, WCRP and GAW research programmes of WMO, in particular for the CAS priority task: Aerosols: effects on NWP, environment and climate. It was highlighted that WMO is under restructuring with WMO Constituent Body Reform (CBR) that will happen in June 2019. With the

aim to advance science in an integrated Earth-System approach, it is necessary increase research focus, capacity for communication and cross-cutting activities. Specifically linked with the Global Atmosphere Watch (GAW) programme, the development of joint collaboration between WMO groups is necessary to understand aerosols impacts on a seamless prediction and their impacts for society.

#### **Greg Carmichael: View from GAW programme**

Cross-cutting activities are conducted focusing in the development of models that add links with atmospheric composition. Systematic evaluation was mentioned as important to identify the importance of aerosols for different regions and time scales. Regarding WGNE exercise, it should be coordinated to cover weather, climate and environmental issues.

#### **Angela Benedetti: View from S2S, SDS-WAS, Aerosol and APP SAGs**

The S2S program aims to fill the gap between medium-range and seasonal forecasting. The S2S Project phase 2 proposal includes activities for a sub-project on aerosols. Results from Benedetti and Vitart (MWR, 2018) paper around the impact of direct effect of dust and carbonaceous aerosols on subseasonal time scale indicate improvement on the ECMWF model skill at the monthly time scale. The modulation of aerosols by the MJO is also an important result found which is consistent with observed studies. Several questions regarding regional S2S systems were asked - very few at the moment, CORDEX will coordinate some activities about this. With global runs provided by WGNE Centers, regional experiments could be performed using global models as boundary conditions. Nothing was decided around this subject.

#### **Georg Grell (and Paul Makar by teleconf): GAW APP SAG CCMM activities and EuMetChem/AQMEII phase2 experience**

S2S has the best chance to see an impact of aerosols because the aerosols forcing can be felt more at the extended range. The NOAA/ESRL/GSD group is going to participate in both the medium-range and the S2S exercise.

For S2S forecasting applications most models treat only radiation interaction. The indirect effect is less studied, more expensive to investigate, and most convective parameterizations do not consider aerosol interactions at all. For medium-range forecasting double moment microphysics schemes are being considered for implementation. It would be feasible for those approaches to use a more complex treatment of aerosols specially focusing on indirect effect. The question that arises is how to advance medium-range forecasts with a minimum effort in terms of aerosols and chemistry. Georg suggested different approaches:

- (1) A simple aerosol scheme in the model,
- (2) Use of complex aerosols and chemistry in the model to create climatologies,

(3) Use of a 3D analysis (assimilating AOD and other available observations) in the NWP model.

The indirect effect was highlighted as more important than direct effect at the medium-range in regional models. However, the impact is not always positive. Parameterizations are very sensitive in this case. There is a need for more evaluation.

Paul informed also about the previous experience of the AQMEII-Phase2 and EuMetChem experience with regional CCMs (see: eumetchem.info).

### **Ariane Frassoni: WGNE Aerosol study and planning the Phase 2 model exercise**

Ariane Frassoni presented the main results from the first phase of the WGNE Aerosol Project as well as the draft protocol for the second phase. She highlighted the joint collaboration between WCRP and WWRP, and also the support from the JWGFVR in order to define statistical metrics to assess deterministic and probabilistic model forecasts.

### **Joint discussion**

In S2S initial conditions may play a smaller role but emissions are very important. Johannes Flemming made the point that for events such as fires the climatology does not help, and then an impact in these cases is more obvious. Georg Grell commented that use of FireWeather Index (FWI) to modulate biomass burning emissions for the S2S could be an interesting approach. He emphasized that this is an open research question.

Regional analysis using the data provided by centers that will perform the aerosol S2S WGNE experiment should be considered. Interest in S2S for Arctic regions was pointed out. It could be looked at under the HTAP context (Kaminski Jacek). ECMWF can open the data to other groups to analyze specific regions. It is also expected from other centers that will produce global runs.

Johannes makes the point that the verification metrics normally used in NWP may penalize the aerosols/chemistry inclusion.

Questions rose related with the domain adopted in the protocol: a lack under polluted regions like Asia was pointed out. The importance of aerosols in urban areas and how they can impact PBL are motivations. Long-range transport processes are also important and should be addressed (interest of GURME SAG, Ranjeet Sokhi). A request was made to include a regional domain for the Central plain of Asia.

Several groups are performing intercomparison experiments that should be included (Greg Carmichael's comment). PREFIA initiative on Seamless Prediction of Air Pollution for Africa numerical experiment is under definition. Period to be considered can be aligned with the WGNE experiment.

Partners suggested a more standardized experiment, using the same configurations and boundary conditions. However, the goal of WGNE experiment is the understanding of aerosols effects on NWP and S2S under current model capabilities available at participating centers. GAW APP SAG (and possibly GURME SAG) can consider also aerosol effects on atmospheric composition. It should be better addressed on the introduction text of the protocol.

Nanjing University indicated interest in South East Asia biomass burning. The relationship between aerosols and ENSO was pointed out for Southeast Asia. China has data to be shared in order to evaluate model data. This is an important subject as in the first phase of the WGNE Aerosol project data to evaluate models were an issue. Discrepancies of ECMWF reanalysis and temperature profiles were observed over China, possibly due to the lack of aerosols feedbacks, and highlighted during the discussion. Vertical distribution of aerosols is very important. Inadequate vertical distribution of aerosols in models affects radiative forcing.

The 4<sup>th</sup> (annual) meeting of the WMO GAW Modelling Applications Science Advisory Group (APP SAG), which will be held at WMO in Geneva, Switzerland on 27-29 May 2019 was advertised. This could be a venue in which the experiment protocol can be discussed.

### **Actions**

- Coordinate the experiment between WGNE, S2S and APP SAG as a joint study
- Finish the draft protocol up to July
  - Define a time-line for regional and S2S experiments
- Include a regional domain for Asia
- Improve the introduction text of the protocol to clarify goals
- Share the protocol with partners to receive their feedback
- Launch the protocol with WGNE, S2S, APP and Aerosol SAGs Centers