Evaluating aerosols impacts on Numerical Medium-Range and Subseasonal Prediction – 2nd Phase of the WGNE-S2S-GAW Aerosol project

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WGNE = Working Group on Numerical Experimentation
S2S = Subseasonal-to-Seasonal project
GAW = Global Atmosphere Watch

Answers for the main questions

1)The importance of aerosols for predicting the physical system: Direct effect is important - improvements in NWP skill considering interactive aerosols

2)The importance of atmospheric model quality for air quality forecasting: Important (Ex: JMA and ECMWF lower erros) - more investigation is needed

3)Capabilities of NWP models to simulate aerosol impacts on weather prediction

Only one center used climatological aerosol: miss-representation of intense cases

Motivation for second phase

- First phase of the project (WGNE-Aer) found improvements in NWP skill considering interactive aerosols
- Several participating members (BSC, CPTEC, ECMWF, ESRL/NOAA, JMA, NASA, NCEP, …)
- Large differences between models
- Results were based on test cases (dust over Egypt, pullution over China; smoke over Brazil) – not enough simulations to have statistically significant outcomes
- More investigation needed

The Second Phase of the WGNE-S2S-GAW Aerosol Project

Medium-range experiments

- Higher resolution regional/global configurations in order to address the importance of interactive aerosols on medium-range predictability

- Longer periods to test different situations (not case-based)

S2S experiments

- Subseasonal re-forecasts experiments based on ensemble approach in a global scale in order to address the importance of interactive aerosols on subseasonal predictability

Goals of the Project

This project aims to improve our understanding about the following questions:

How important are aerosols for predicting the physical system (at short-range, medium range and S2S time scales) as distinct from predicting the aerosols themselves?

What are the current capabilities of NWP models to simulate aerosol impacts on medium-range and subseasonal prediction?

How important is forecast skill for air quality forecasting?

Are the S2S air quality forecasts useful for impacts purposes?

Limited area domain (focus on medium-range predictability)

Proposed years: 2016-2018
Forecast lenght: 72h from 00:00 UTC
Time resolution: 3h

Configuration: as in operation
Variables: meteorological and aerosol variables

Event	***Period***	***Domain***	***Center of domain***	***Effects to be analysed***
Dust	Mar-Apr-May	from Eq. to 50°N, Eq. to 60°E	30°E, 25°N	Direct Indirect (optional) No Aer
BB S. America	Aug-Sep-Oct	32°W to 76°W 33°S to 6°N	60°W, 10°S	Direct Indirect (optional) No Aer
BB S. Africa	Aug-Sep-Oct	0°E to 60°E 40°S to 10°N	30°E, 15°S	Direct Indirect (optional) No Aer

An Asian domain is under definition, suggestions are welcome

Protocol

S2S experiments: re-forecasts will cover 2003-2018, focus will be on monthly runs with start dates of 1 May-Jun-July (Saharan dust) and 1 Aug-Sep-Oct (biomass burning aerosols), 5 ensemble members (minimum)

Variables to be analysed: T2m, surface winds, precipitation, AOD, etc.

Storage: data will be collected and stored at CPTEC, format: netcdf

Verification: classical statistical scores Root mean Square Error (RMSE), Bias (Forecast-Observation: F-O), Contingency table scores, Scorecards (rank/probabilistic scores)

Ongoing tasks

- Adopt specific statistical scores for air quality and optical properties evaluation

- Finish the draft protocol by end of July with a time-line of the experiments

- Choose a regional domain for Asia

- Share the protocol with partners to receive their feedback

- Launch the protocol with WGNE, S2S, GAW Scientific Advisory Group on APPlications and Aerosol SAGs Centers