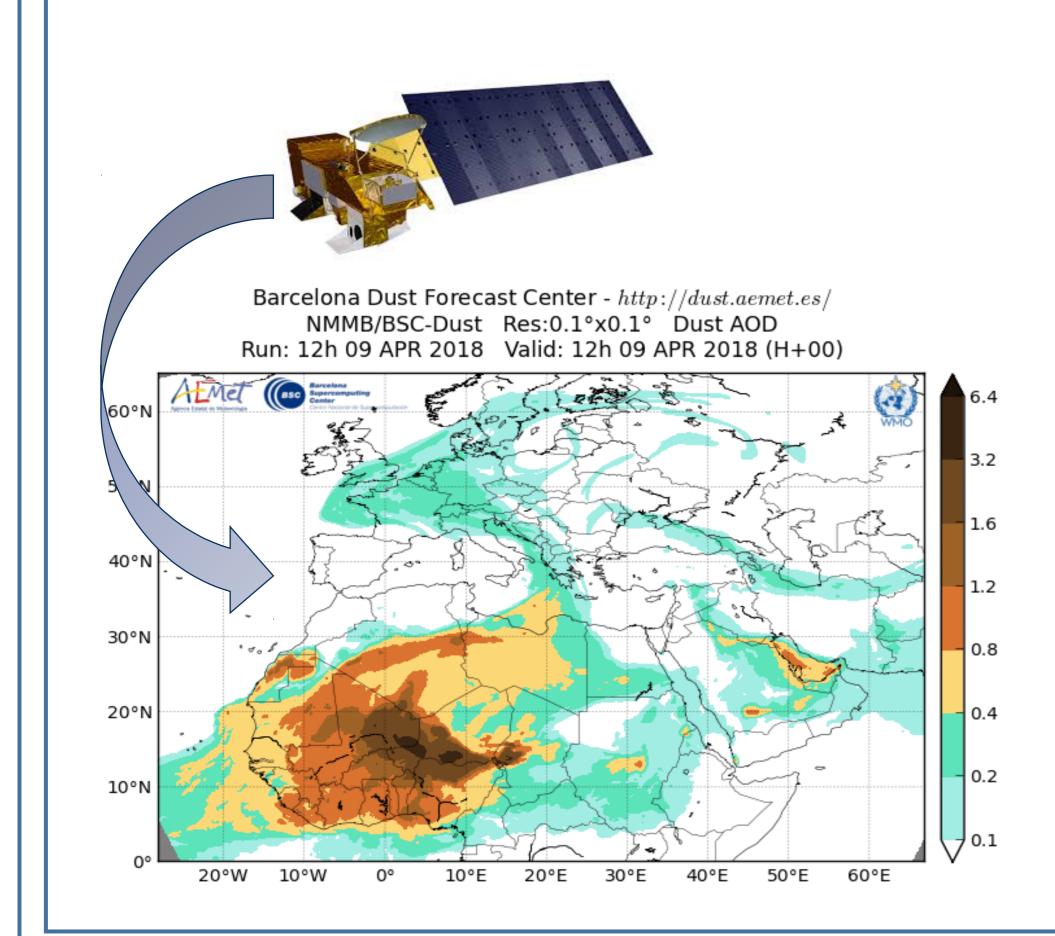
Towards the production of a high-resolution regional dust reanalysis for Northern Africa, the Middle East and Europe

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A high resolution dust reanalysis for Northern Africa, Middle East and Europe is currently in production at BSC in the framework of the ERA4CS DuctClim project (2017-2020). It covers the satellite era of quantitative aerosol information, and will be linked to development of **dust-related services** tailored to key socio-economic sectors (transport, energy, health)



Assimilated observations

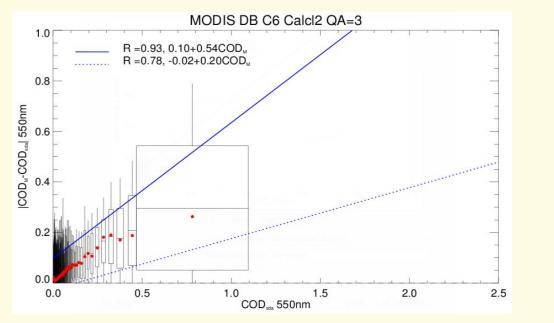
MODIS Deep Blue Coarse AOD



- AE, ω filter, coarse AOD retrieval
- highest quality flag (Ginoux et al., 2012; Pu & Ginoux 2016)

- uncertainty model based on Sayer et al., 2014

Observation uncertainty characterization



NMMB-MONARCH model (Pérez et al., 2011; Haustein et al., 2012; Jorba et al., 2012; Spada et al., 2013;

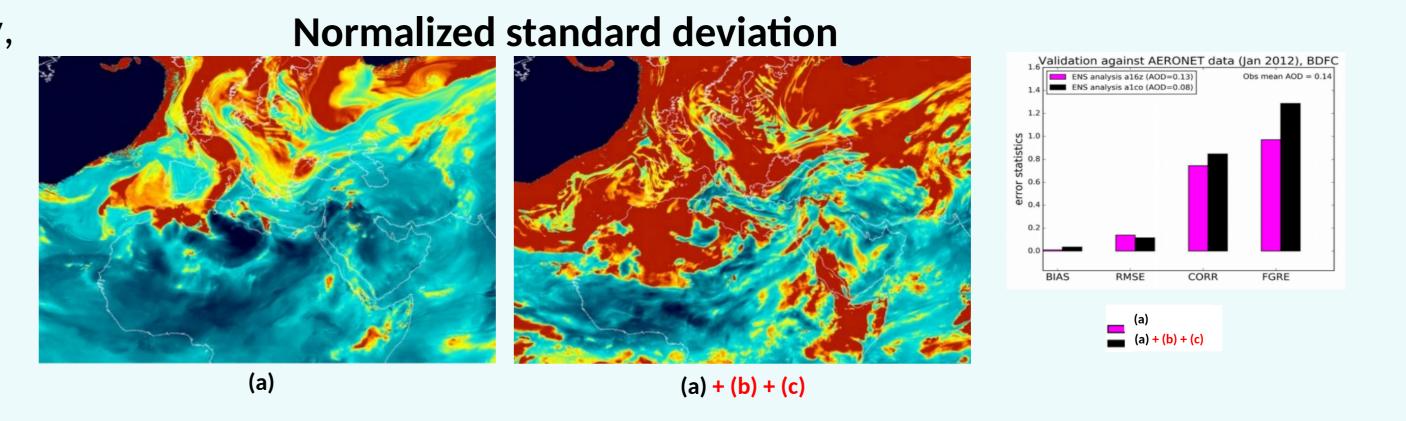
Badia and Jorba, 2016; Di Tomaso et al., 2017)

The atmospheric composition NMMB-MONARCH system is built on the meteorological driver NMMB:

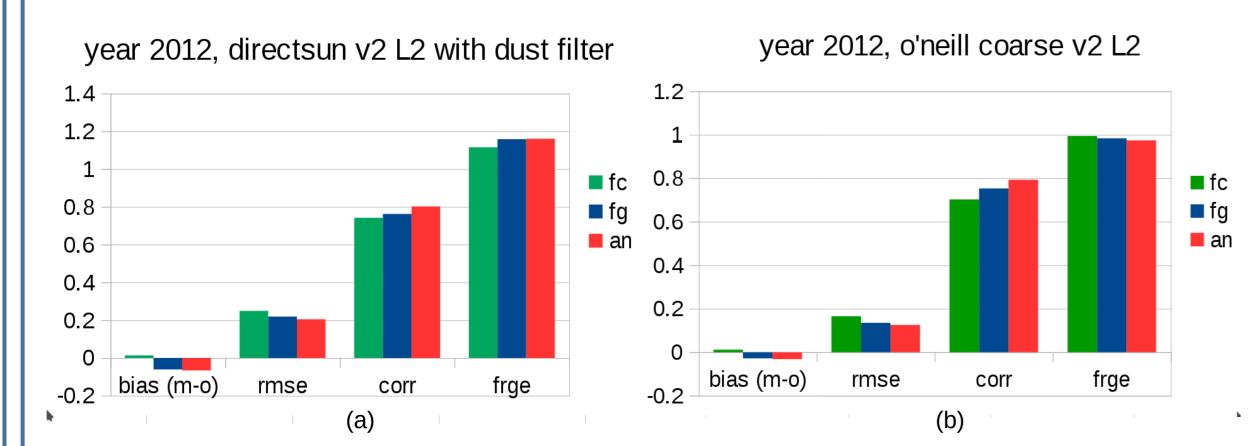
- Multiscale: global to regional scales allowed (nesting capabilities)
- Nonhydrostatic dynamical core: single digit km resolution allowed
- Fully on-line coupling: weather-chemistry feedback processes allowed
- Enhancement with a data assimilation scheme

Dust ensemble forecasts are used to estimate **flow-dependent forecast uncertainty**, which is used by our data assimilation scheme to optimally combine model prior information with satellite observations

NMMB-MONARCH ensemble forecast is based on: (a) multi-parameter source perturbations (b) multi-physics source perturbations (c) multi-meteorological initial and boundary conditions



Validation of the 2012 analysis



Independent observation datasets

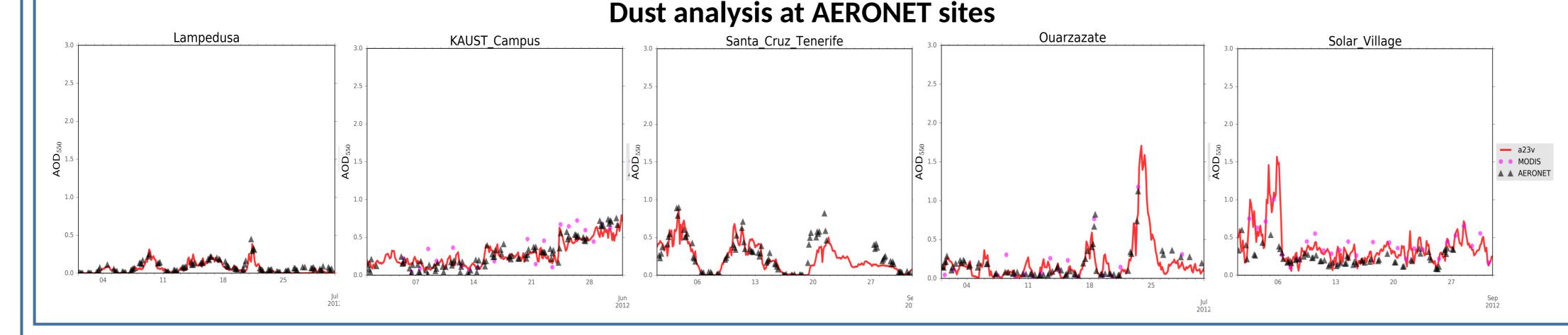
(a) AERONET coarse AOD values from the spectral deconvolution algorithm (SDA, level 2; O'Neill et al., 2003),

(b) AERONET AOD values from the direct sun algorithm (version 2, quality-assured - level 2.0; Holben et al., 1998). Dust-dominated conditions are identified using the approach of Basart et al. (2009) as follows:

- AOD is classified as 'Dust' AOD when the associated Angström Exponent AE<0.75;

- we set 'Dust' AOD to 0 when the associated AE>1.3;

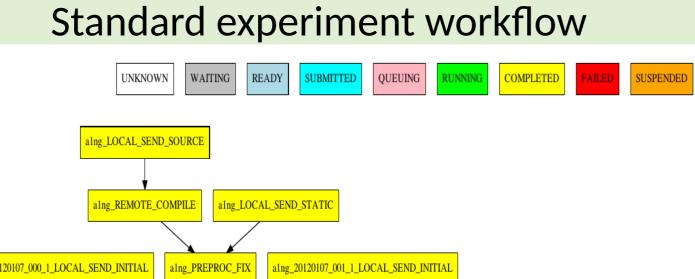
- we identify a mixed aerosol type when the associated 0.75<AE<1.3.



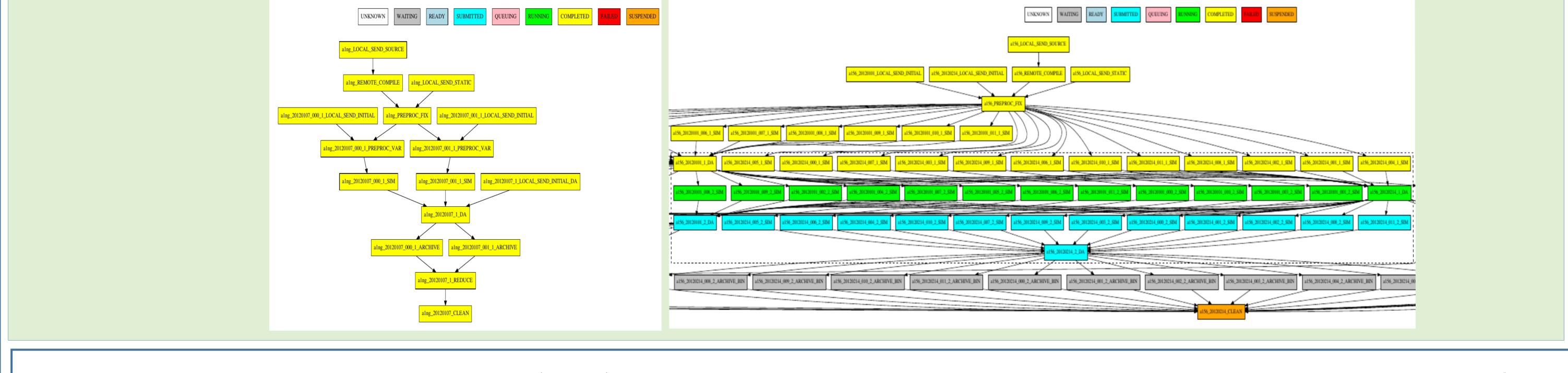
Time collocation

Validation results are obtained using the AERONET value closest to the model time step and within a ±30 minute interval

Autosubmit experiment workflow manager (Manubens-Gil et al., 2016)



Workflow with hybrid wrapper and crossing-date strategy



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