

# **HIRLAM-C activities and plans on coupling with aerosols, sea state and hydrology**

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With input from HIRLAM colleagues.**

# Coupling with aerosols (1/2)

- Several meetings have been held between Hirlam-Aladin and the EuMetChem atmospheric chemistry community on establishing a framework in Arome/Harmonie for aerosol/chemistry experimentation, as a fine-scale extension of the C-IFS/MACC activities.
- A strategy document exists by Francois Bouyssel, Bent Hanssen Sass et al. **“Discussion document to precise ALADIN/HIRLAM strategy on coupled aerosols-chemistry-meteorology modelling at kilometric scales (10/08/2015)”**
- The interest is to develop simple in-line aerosol parametrizations in order to describe, and assess the impact of, parametrizing aerosol direct and indirect effects on radiative fluxes, cloud development and cloud-radiation interactions.
- The parameterization of aerosol optical properties is identified as a crucial aspect for modelling aerosol-radiation interactions.

# Coupling with aerosols (2/2)

- Computational resources have been requested at ECMWF for experimentation with in-line coupling with aerosols and to some extent chemistry. To ensure sufficient staff for the relevant research activities, the options for joint NWP-ACM preparation of proposals for external (H2020) funding should be considered.
- The development of active chemistry is beyond the scope of the Hirlam programme, but most of the above activities are already of great interest to the ACM community, and mutually beneficial interactions on these topics appear likely.
- **R&D activities on in-line aerosols modelling should be a part of the ALADIN/HIRLAM future coordination activities. It is recommended to create a working group to coordinate the developments on aerosols modelling and their introduction in official IFS/Arpege cycles.**

# Coupling atmosphere/ocean

- Three steps with low to high development cost have been identified:
  - Activate (investigate) already existing 1D ocean mixed layer parameterization in SURFEX (Gaspar et al., 1990), as a step forward from prescribed SST.
  - Couple the atmospheric model to a wave model. Preliminary studies of coupling Harmonie with WAM have indicated possible benefits for the description of surface drag and winds over sea.
  - At a later stage, coupling with a multi-layer ocean model, NEMO, can be considered, using e.g. OASIS coupler.

**Suggestion that R&D activities on coupled ocean/atmosphere modelling should be a part of the ALADIN/HIRLAM future core activities.**

# Coupling with hydrology

- See presentation from Patrick Samuelsson.