**Caloculation of Aeolus winds with HARMONIE-AROME operational NWP-data:**

The Aeolus winds will be investigated by using outputs of high-resolution limited-area numerical weather prediction (NWP) models. Through the data assimilation cycling the model implicitly integrates information from other available observation data. Also, the NWP model error statistics are usually well-characterized. The focus is on utilization of model and observation data on high latitudes, in particular in the North-East Atlantic and part of the Arctic. Since Aeolus is a polar orbiter, the orbit pattern gives increasing Aeolus observation density with increasing latitude, up to the maximum latitude near the North Pole.

We plan to produce collocations of Aeolus with NWP data from versions of the HARMONIE-AROME (Bengtsson et al., 2017) convection permitting model with 2.5 km horizontal resolution, for two different domains, one covering Scandinavia and adjacent ocean areas, and one covering an Arctic domain. This framework will also development and test assimilation of Aeolus winds.

**Cal-val of ADM Aeolus aerosol products is planned to include:**

- Performing a near-real-time quick-check of ADM-Aeolus data using the EMEP MSC-W model in an operational Chemical Weather Prediction (CWP) regime.
- The regional EMEP/MSC-W model (Simpson et al., 2012), which is run operationally as part of the Copernicus Atmosphere Monitoring Service (CAMS), will provide near real-time data for co-location and evaluation with the satellite products.
- Evaluation of ADM-Aeolus performance and consistency with other satellite data for analysis of long-term changes in atmospheric aerosol loads.

ADM-Aeolus aerosol backscatter and extinction profiles and AODs are to be compared with calculations results from the EMEP/MSC-W model as well as with observations from AERONET and EARLINET networks, and also from CALIOP’s (and other satellites). This comparison will be facilitated by the use of the AeroCom validation/visualisation tool (Schulz et al., 2009).

The discrepancies between ADM-Aeolus data with other observations and model simulations will be examined on a global scale, focusing on geographic regions influenced with different aerosol types and different seasons facilitated by the additional model information on aerosol physical and chemical characteristics.

**NRT aerosol data check:**

- A Virtual Laboratory for Radiative Transfer for model runs.
- Co-location with ADM-Aeolus observation.
- Co-check with available NWP observation.

**Cal-val of ADM-Aeolus aerosol products**

- Backscatter/extinction profiles, AOD.
- 3D aerosol data check:
  - AERONET EARLINET
  - Data exchange with other AERONET EARLINET networks
  - Comparison of ADM-Aeolus with other observations

**plans for development of assimilation of ADM-Aeolus in HARMONIE-AROME**

The implementation will include:

- Handling in HARMONIE-AROME, including observation operator, quality control, tuning of error statistics etc. Implementation will take already existing code from ECMWF in the IFS system as a starting point.
- After launch: Data denial experiments in HARMONIE-AROME 3DVAR, possibly also in 4DVar or other more advanced schemes.
- Goal is to have assimilation of Aeolus running in the operational system after demonstration of positive impact.

**References:**

