# Aerosol species in the AQ forecasting system of FMI: possibilities for coupling with NWP models

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A new version of the Emergency and Air Quality Modelling System SILAM is presented highlighting the various types of aerosols and their inter-actions represented in the model. Possibilities for 2-way interfacing of the SILAM output with the NWP models are discussed.

The SILAM system v.4 has two dynamic cores – Lagrangian and Eulerian – with corresponding structural elements, such as horizontal and vertical grid compilation, post-processors for the model output, etc. The underlying part of the system consists of meteorological and emission pre-processors, and also includes various supplementary routines.
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ince February 2006, the SILAM system is used in operational forecasts of air quality over Europe presented at http://silam.fmi.fi. Presently, the forecasts are generated using the Lagrangian core of SILAM v.3.8.1, while the Eulerian system v.4.0.1 is used for parallel runs and model-model inter-comparison. It is expected that the old system will be phased out providing the successful completion of the parallel runs and model inter-comparison at the end of May.

The species currently included into the Eulerian-system simulations are the following:

- primary EC and OC aerosol, which also includes conservative estimates of direct anthropogenic dust emission. Two size classes are considered after the EMEP emission inventory: PM 2.5 and PM 2.5 – 10.
- sulphur oxides, sulphates representing the fine-size (PM 2.5) secondary inorganic aerosol
- sea salt particles computed for 5 bins: PM 0.01, PM 0.01-0.1, PM 0.1-1, PM 1-2.5, PM 2.5-10
- birch pollen (22  m particles)

The extended chemical mechanism with $NO_x$ chemistry transformation and nitrates and ammonia completing the secondary inorganic aerosols is currently being tested. Possibilities for feedback from the SILAM system to NWP models can go along two main lines.

1. Direct aerosol effect on radiation, which can be easily computed via conversion of the 3D aerosol concentration to AOD. Both 2-D (bulk change of radiation at the surface) and 3-D (vertically resolved) impacts can be evaluated with appropriate influence onto temperature profiles. The effect, however, is believed to be limited and small for most of typical conditions, except, possibly, for the largest cities and desert areas during storm episodes.
2. Indirect effect of aerosols via cloud and precipitation formation. Potentially, it has much stronger impact than the direct radiate forcing but it is also much more complicated in implementation because in most NWP systems the cloud microphysics is treated in a simplified manner, which does not easily allow for detailed external information regarding the aerosol forcing.