

ENVIRO-HIRLAM Integrated System: strategy and current progress

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The strategy of new generation integrated Meteorology (MetM) and Atmospheric Chemical Transport (CTM) modeling systems for predicting atmospheric composition, meteorology and climate change on example of the DMI-ENVIRO-HIRLAM integrated system is discussed. It is suggested to consider the air quality as a combination and integration at least of the following factors: air pollution, urban climate/meteorological conditions and population exposure. This is reasonable to consider them together due to the facts that:

- (i) meteorology is the main source of uncertainty in air pollution and emergency preparedness models,
- (ii) complex and combined effects of meteorological and pollution components on human health (e.g., hot spots in Paris, July 2003),
- (iii) effects of pollutants, especially aerosols, on climate forcing and meteorological events (precipitation, thunderstorms, etc.).

In this context several levels for the integration strategy are considered in the paper:

1) off-line models:

- separate CTMs driven by meteorological input data from meteo-preprocessors, measurements or diagnostic models,
- separate CTMs driven by analysed or forecasted meteodata from NWP archives or datasets,
- separate CTMs reading output-files from operational NWP models or specific MetMs with a limited periods of time (e.g. 1, 3, 6 hours).

2) on-line models:

- on-line access models, when meteodata are available at each time-step (it could be via a model interface as well),
- on-line integration of CTM into MetM, when feedbacks are possible to consider. We will use this definition as on-line coupled modelling.

The on-line integration of meso-scale meteorological models and atmospheric aerosol & chemical transport models gives a possibility to utilise in CTM all meteorological

3D fields at each time step and to consider the feedbacks of air pollution (e.g. urban aerosols) on meteorological processes and climate forcing. This very promising way for future systems of atmospheric environment forecasting is considered in the COST Action 728 (<http://www.cost728.org>) and realised at DMI in the ENVIRO-HIRLAM system. This will lead to a new generation of models for "chemical weather forecasting".

ENVIRO-HIRLAM is developing as an open system with both off-line and on-line integration. Several sensitivity tests of the off-line versus on-line coupling of MetM and CTM in ENVIRO-HIRLAM as well as their verification versus the ETEX experiment are considered and results discussed. Current progress in the ENVIRO-HIRLAM system development and its different applications are also discussed in the paper.