Abstract

AIRFOBEP is the regional air quality agency in charge of the survey of the air pollution over the Berre pond region, which is one of the two main industrial areas in France. AIRFOBEP has developed an operational automated platform which routinely monitor and forecast air pollution over its territory. This paper discusses the operational tools associated with particle matter (PM10) and sulfur dioxide (SO2). These tools are based on local air dispersion modelling to account for numerous local emission sources, considering a large simulation domains. A description of each tool will be given as well as an overall view of the performance of the system in terms of ground-level concentration.

Monitoring and forecasting pollutant dispersion at AIRFOBEP

AIRFOBEP is the regional air quality agency in charge of the monitoring of air pollution over the Berre pond area, including the western part of the Bouches-du-Rhône department (south-east France).

- **AIRFOBEP mission**: monitoring in real-time the majority of air pollutants that may impact human health and environment, forecasting air quality over the whole Berre pond region.

- **Air quality forecasts** (http://previsions.airfobes.org):
  - They are designed both to inform populations about the air quality which is expected in the next few days and to take preventive measures of reduction of pollutant emissions associated with industries located on the border of the pond.
  - AIRFOBEP has developed an operational numerical platform to perform daily forecasts of air pollution at local scale over the whole Berre domain: automated predictions of concentrations of O$_3$, NO, NO$_x$, SO$_2$, and PM10 which are based on local dispersion simulations which may be coupled to mesoscale photochemical simulation.

Monitoring and forecasting SO$_2$ pollution over the Berre pond region

**Methodology**
- **Main functionalities of the platform**: providing daily SO$_2$ forecasts for D, D+1 and D+2 and daily analysis for D-1.
- **Methodology for D to D+2**: realization of 10 ADMS4 simulations (one for each industrialist of the Berre area).
  - 3D meteorology is derived from high resolution weather forecasts.
  - Emission rates are considered as constant.
  - Results are finally interpolated (merged) over a same grid.
- **Methodology for D-1**: as for D to D+2 but takes into account SO$_2$ measurements.
  - Meteorology is derived from observations.
  - Plumes directions and predicted concentration values are corrected considering that wind directions and emission rates are uncertain.
  - SO$_2$ measurements are kriged to predicted concentration fields.

**Example of results at D-1**

Monitoring and forecasting PM10 pollution over the Berre pond region

**Methodology**
- **Main functionalities of the platform**: providing daily PM10 forecasts for D and D+1 and daily analysis for D-1.
- **Methodology for D to D+1**: realization of ADMS-Urban simulation.
  - Meteorology is derived from high resolution weather forecasts (Δx = Δy = 1 km).
  - Emissions derived from an inventory of 2001 (contains each type of source).
  - Background pollution is derived from a statistical model based on measurements provided by the AIRFOBEP network.
  - Simulation results are then bias-corrected.
- **Methodology for D-1**: as for D to D+1 but takes into account PM10 measurements.
  - Meteorology is derived from observations.
  - PM10 measurements are interpolated (innovations kriging) to predicted concentration fields.

Conclusions

- PM10 platform shows very good agreement with ground based measurements: real benefits from the bias and background pollution methods.
- PM10 platform exhibits a strong negative bias in comparison with large PM10 concentrations.
- SO$_2$ platform is operational but still under development for the generation of D-1 maps (correction of plume direction and emission rates / assimilation of SO$_2$ measurements).
- The method of innovations kriging does not seem to be fully applicable to the SO$_2$ platform, in particular because SO$_2$ plume fields are discontinuous.

Future work for the SO$_2$ platform

- Testing the application of individual plumes direction corrections that may differ between industrialists.
- Taking into account the spatial direction when applying kriging of innovations. Such a methodology may bring valuable improvements for discontinuous concentrations fields that exhibit anisotropic structures.
- Developing a statistical module that will provide quantitative assessments of SO$_2$ predictions. Such a quantitative evaluation module already exists for the platforms that have been developed for PM10, O$_3$ and NO$_x$ monitoring.