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Forecasting SO2 pollution : bypassing the limits of meso-scale modelling by analysing local features and creating quality indicators

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A whole environmental impact prediction system has been gradually developed during the last years in order to prevent SO2 pollution. The system uses meteorological forecasts to initialise a dispersion model and then predicts the pollutant concentration in the vicinity of the industrial site. It is quite successful as more than 80% of the pollution peaks are well forecasted and thus avoided. However, the overall performance of the system highly depends on the localisation of the industrial site.

For a specific place located in northern France, even the meso-scale forecasts with a horizontal resolution of 1.5 km are not sufficient enough to capture all local features. Indeed, the site is close to the sea and the Seine river. This huge amount of water firstly enhance fog formation. The boundary layer height is also completely heterogeneous in the area, when changing from the maritime boundary layer to the land boundary layer. Then, cliffs along the river can channel the atmospheric flux leading to major changes in wind directions from the river's edge to a few kilometres away from it. Finally, thermal inversions are frequent specially during winter. Thus, modelling the pollutant dispersion in the area is a hard challenge.

This work firstly tries to characterize atmospheric situations that let local effects take place. The aim is to describe precisely these local effects, their frequency and also assess the limits of the meso-scale forecasts. The issue is to be able to recognise and predict those situations by analysing either previous observations or the available forecasts. The meso-scale forecasts could then be completed with some additional information indicating when local effects are likely to take place. This is equivalent to a quality indicator highlighting situations when the meso-scale model is not sufficient enough to capture all local features.