

## On-line Meteorology-Chemistry/Aerosols Modelling and Integration for Risk Assessment: Case Studies

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On regional level, and especially in areas with potential diverse sources of industrial pollutants, the risk assessment of impact on environment and population is critically important. During normal operations, the risk is minimal. However, during accidental situations, the risk is increased due to releases of harmful pollutants into different environments such as water, soil, and atmosphere where it is following processes of continuous transformation and transport.

In this study, the Enviro-HIRLAM (Environment High Resolution Limited Area Model) was adapted and employed for assessment of scenarios with accidental and continuous emissions of sulphur dioxide ( $\text{SO}_2$ ) for selected case studies during January of 2010. The following scenarios were considered: (i) control reference run; (ii) accidental release (due to short-term 1 day fire at oil storage facility) occurred at city of Atyrau (Kazakhstan) near the northern part of the Caspian Sea; and (iii) doubling of original continuous emissions from three locations of metallurgical enterprises on the Kola Peninsula (Russia). The implemented aerosol microphysics module M7 uses 5 types – sulphates, sea salt, dust, black and organic carbon; as well as distributed in 7 size modes. Removal processes of aerosols include gravitational settling and wet deposition. As the Enviro-HIRLAM model is the on-line integrated model, both meteorological and chemical processes are simultaneously modelled at each time step.

The modelled spatio-temporal variations for meteorological and chemical patterns are analyzed for both European and Kazakhstan regions domains. The results of evaluation of sulphur dioxide concentration and deposition on main populated cities, selected regions, countries are presented employing GIS tools. As outcome, the results of Enviro-HIRLAM modelling for accidental release near the Caspian Sea are integrated into the RANDOM (Risk Assessment of Nature Detriment due to Oil spill Migration) system.