Enviro-HIRLAM consists of gas-phase chemistry CBMZ (Zaveri & Peters, 1999) and aerosol microphysics M7 (Vignati et al., 2004), which includes sulfate, mineral dust, sea-salt, black and organic carbon (Nuteeman et al., 2013). There are modules of urbanization for land surface scheme, natural and anthropogenic emissions, nucleation, coagulation, condensation, dry and wet deposition, and sedimentation of aerosols. The Savijärvi radiation scheme (Savijaervi, 1990) has been improved to account explicitly for aerosol radiation interactions for 10 aerosol subtypes. The aerosol activation scheme (Abdul-Razzak and Ghan, 2000) was also implemented in STRACO condensation-convection scheme. The nucleation is dependent on aerosol properties and the ice-phase processes are reformulated in terms of classical nucleation theory.

Enviro-HIRLAM runs in a downscaling chain, for the outer model domain (run at low resolution) the initial and boundary conditions for meteorology and atmospheric conditions are taken from ECMWF; vertical levels vary between 40-60; finest horizontal resolution is about 1.5 km; model can be run in both research and operational modes. Emissions include anthropogenic, biogenic, and natural; and these are pre-processed. Different parts of the model were evaluated vs. ETEX-1 experiment, Chernobyl accident, Paris summer/winter campaigns, etc. The model was tested in FPs FUMAPEX, MEGAPOLI, TRANSPHORM, PEGASOS, MACC, MarcoPolo, etc. projects & currently is used within frameworks of the Pan-Eurasian EXperiment programme (PEEX; https://www.atm.helsinki.fi/peex).

**Model Setup includes**: period to be studied; boundaries of modeling domain; selected projection; horizontal & vertical resolutions; chemical & meteorological initial & boundary conditions; emissions (anthropogenic, biogenic, natural); chemical & aerosol modules.

**Emission Inventories**: used depend on research projects MEGAPOLI, TRANSPHORM, PEGASOS, MarcoPolo, EnsCLIM, CarboNord, etc. **Anthropogenic**: TNO-MACC (species: SO\textsubscript{2}, PM; Temporal profile: hour-of-day, day-of-week and day-of-year (depends on country time zone/shift); Vertical profile: according to TNO; PM emissions scaling following TNO). **Biomass burning**: IS4Fires by FMI (species: SO\textsubscript{2} and TPM split into PM2.5 and PM10; vertical profile is as follows (approx. recommendation of emitting 50% in lowest 200 m and 50% between 200 and 1000 m). **Natural**: Interactive sea-salt (Zakey et al., 2008) and mineral dust (Zakey et al., 2006) emission modules.

**Boundary (BC) and Initial (IC) Conditions Data**: **Meteorological IC/BC**: taken from operational ECMWF IFS model at N-hr temporal & N\textsuperscript{xN} horizontal resolutions for domain specified in geographical coordinates and N-vertical levels; parameters need to be retrieved from ECMWF to force model are: 2D surface fields: soil moisture, snow depth, surface pressure & roughness, geopotential, land-cover/use classes, albedo, vegetation & soil types; and 3D fields: specific humidity, temperature, winds. **Chemical IC/BC**: taken from IFS-MOZART output. The two mineral dust size bins of IFS-MOZART are treated. The aerosol number concentration is computed from the aerosol masses according to the Hatch-Choate conversion equations. The following variables of IFS-MOZART are used: O\textsubscript{s}, NO\textsubscript{2}, HNO\textsubscript{3}, H\textsubscript{2}O\textsubscript{3}, SO\textsubscript{2}, OH, SO\textsubscript{4}, dust, black and organic carbon.

**References**


