# AIR POLLUTION MODEL SYSTEM TO SIMULATE PM2.5 DISPERSION IN VENICE AREA

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Understanding Air Pollution dispersion is difficult but essential to estimate air quality and health impacts. To this purpose specific measurement devices for sampling are required which entail high costs and involve a consistent number of people. The use of mathematical models, despite their limitations, enables to study regions of different sizes and to provide information when there is a shortage of data in non-controlled areas. These models describe the causal relation between emissions, atmospheric circulations and concentrations, and deposition. In fact they provide quantitative information about concentrations and deposition and they can give a more complete and consistent description, including an analysis of the causes and emissions sources, meteorological processes, physical and chemical transformations that led to these concentrations/deposition.

With this view, it was decided to use a model chain in a project which studies both primary and secondary $PM_{2.5}$ particulate in the Venice area as complementary device to experimental researches carried out between January 2009 and February 2010.

The model system, distributed by ARIANET S.p.A., consists of three main components: a diagnostic meteorological model (*MINERVE*) [1], a turbulence model (*SURFPRO*) [2] and a photochemical-eulerian dispersion model (*FARM – Flexible Air quality Regional Model*) [3].

Minerve is a 3D wind field model for complex terrain. It produces a mass consistent wind field using data from a dispersed meteorological network. Temperature and humidity fields can also be interpolated. Surfpro produces dry deposition velocities and turbulent diffusivities fields needed by the eulerian model. FARM is used to calculate concentration and deposition of reactive emissions including photochemistry gases and particles, it calculates dispersion using either a one or two way nesting within multiple grids.

The model chain has been used to simulate principal pollutants dispersion in Venice area with specific attention to $PM_{2.5}$ fraction.

Four periods has been considered during different seasons for which both organic and inorganic measured data was available. Emissions used as model input have been referred to EMEP/CORINAIR Emission Inventory Guidebook [4] groups in Venice area during year 2005. Even though experimental period refers to 2009-2010, 2005 emissions are the only data guaranteed by public administration. A work in progress is focusing on calculating 2009's emissions for principle sources in Venice area. These data will be used to simulate air pollution dispersion during measurements periods so to compare calculated results with experimental data.

References. [1] ARIANET (2001): *Minerve Wind Field Model*, *version 7, General Design Manual,* Aria Report, Aria Technologies; [2] ARIANET (2004): *Surfpro Manual*, Aria Report, Aria Technologies; [3] ARIANET (2005): *FARM, Flexible Air quality Regional Model, version 2.12, Model formulation and user manual*, Aria Report, Aria Technologies; [4] EMEP, 2007: *Joint EMEP/CORINAIR Emission Inventory Guidebook, third ed.*, October 2002 (updated 2007), http://www.eea.europa.eu/publications/EMEPCORINAIR5).