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Meteorological analyses data set for air quality assessment modelling from national to local scale: verification and applications.

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Since 2002, on behalf of the Italian Ministry of the Environment, ENEA has been leading a national Project, named MINNI (National Integrated Modelling system for International Negotiation), for the development of an Integrated Assessment Modelling system. The objective of the project is to support policy makers in the elaboration and assessment of air pollution policies at international, national and local level, by means of the more recent understandings of the atmospheric processes. The project activities include the realisation of air quality analysis and assessment at national and sub-national scale through model simulations with space resolution of 20x20 and 4x4 km^2 and hourly time step on different target years.

A Eulerian Atmospheric Modelling System (AMS), built around the chemical transport model FARM, has been applied to years 1999 and 2005 during the first phase of the project, while a second phase is presently ongoing and foresees simulations for years 2003 and 2007. The meteorological analyses used to drive the quality model have been produced by means of the meteorological models RAMS (http://atmet.com/) and LAPS (http://laps.noaa.gov/) using ECMWF synoptic analyses and surface observations as main input data. The meteorological data set is being used for MINNI project but also distributed to Regional Environmental Protection Agencies and other users to support air quality simulations at local scale employing different air quality model types.

To verify the meteorological fields reliability and possibly define the usability limits of the dataset, model results have been compared with independent observations over different areas of the country (Friuli, Piedmont, Sardinia, Lazio and Puglia). The comparison confirmed that analysed meteorological fields can be considered representative over most part of the country, even if some critical areas emerged mainly due to the limited density of the input observations network and to the coarse resolution of simulations over very complex topography. Moreover the verification activities highlighted the difficulty to identify verification data due to the large differences observed among measurements from different meteorological network stations located within the same area, setting in evidence the need of meteorological networks harmonisation and integration.

The assessment has been completed by air quality applications at local scale. The positive results of long term air quality simulations verification has indirectly confirmed the reliability of meteorological fields and the possibility to use them to support and facilitate air quality assessment with both Lagrangian and Eulerian dispersion models. The drawbacks identified can be used to warn users about the data set limitations and its possible misuse.