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Meteorological input for air quality simulations in Northern Italy

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Chemical Transport Models (CTM) are a powerful tool for air quality evaluation, and they are widely applied for operational forecasts, to assess air quality standards and to estimate the effectiveness of emission reduction policies. The meteorological input is very important in these simulations, since atmospheric conditions affects near-surface concentrations of pollutants in a variety of ways: horizontal transport, turbulent diffusion, depositions, formation of secondary species, heterogeneous chemistry, are all influenced by meteorological parameters. Moreover, the Po Valley is an aerological basin surrounded by reliefs, where weak winds and strong anthropic emmissions often lead to very intense air pollution episodes; there is therefore a strong need for accurate air quality forecasts and evaluations. To produce operational air quality forecast at local scale (5 to 10 km resolution), the meteorological input must come from a meteorological Limited Area Model (LAM), which is able to predict all the fields required for a CTM simulation. Nevertheless, since most LAM are mainly used for weather forecast, care is needed in using predictions of near surface turbulence, boundary layer height, cloud water and other parameters which affect pollutant concentrations but are seldom observed and verified. This work investigate the operational building of the meteorological input for a CTM (Chimere) starting form the outputs of a LAM (Lokal Modell - LM). Some crucial parameters are selected, namely boundary layer height, friction velocity, Obukov length, cloud water and soil humidity; 1-year values from LM are analysed and compared with available observations (from measuring campaigns and operational measurements) and with estimates made with parametric schemes; finally, the sensitivity of Chimere is evaluated, and its overall performance is verified against surface air quality observations.