The Evolution of Nowcasting Models

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The theoretical basis of numerical meteorological forecasting was set in the first decades of the 20th century and led to the formulation of numeric models, operating until the advent of the first computers at the end of the 1940s. As a result, the evolution of the models continued hand in hand with the increase of the power of calculation, an increase of more than 100,000 times in the last 30 years. Not only has the spatial resolution of the models increased, both globally and in limited areas, but also much progress has been made in techniques of numerical integration, both in terms of efficiency and in precision. Above all, there has been an improvement in the descriptive systems of various physical processes that influence the evolution of the atmospheric system, including not only the atmosphere but also the soil and the ocean. Considering that the processes have not been explicitly worked out, they require rather complex “parameterization” systems.

The greater spatial resolution, necessary for describing and predicting meteorological phenomena at mesoscale, is obtained with models at limited area that require initial conditions supplied with models at a larger scale. Such models currently operate at a resolution of less than 10 km between gridlines. There are further non-hydrostatic models (partially derived from the so-called “cloud model”) that permit resolutions of less than a kilometre, therefore explicitly resolving the humid convection. Also, if it is not still possible to carry out predictions operating at such resolutions, there are interesting examples of explicit simulations of convection in terms of predictability.

The validation of the limited area models is not carried out in a comprehensive and systematic manner, as is the case for global models.

We will briefly describe the results of the comparative experiments of different models obtained from the same initial analysis, in meteorological episodes of a strong impact. Further, we will report some recent results obtained from a systematic comparison of numerous limited area models, hydrostatic and non-hydrostatic, that are in operation during the observation campaign of the Mesoscale Alpine Programme (MAP), particularly as concerns predictions in the field of rainfall.