The SIMM model chain and its development

The SIMM is a cascade of numerical atmospheric and marine models, running on a SGI-Altix parallel platform. The hydrostatic BOLAM (BOlogna LAM, Buzzi et al., 1994), fed by ECMWF initial and boundary conditions, provides 10-grid step input to a wave model on the Mediterranean Sea and to two sea elevation models over the Adriatic Sea and the Venice Lagoon. A few parallel version of the BOLAM code, developed at ISAC-CNR, was implemented and updated from 2009, replacing the former one (QBOLAM) originally tailored for the massively parallel SIMD platform QUADRICS and operational since 2000. The native SIMM configuration – a 30-km “father” LAM nested to a 10-km “son” LAM, starting 12h later as a spin-up – is planned to be improved (in terms of vertical, horizontal and time resolution of input data, as well as of resolution and domain extension) after hardware upgrade. Thus, we need to evaluate the added value of possible model configuration improvements.

Statistical verification: Experiments and data sets

A robust evaluation of the effects of model configuration changes on forecast skill can be performed through a statistical precipitation verification. The 6-month observational dataset collected during the MAP D-PHASE Operations Period (DOP, Jun–Nov 2007) gives the base for this study. Thus, a 6-month DOP reforecast has been built with the present SIMM configuration (QBOLAM11, EXP10) and with two experimental configurations (EXP1, EXP2) tailored in order to resume all possible improvements of the system design. A similar verification study was recently performed to evaluate the added value of QBOLAM11 with respect to the previous QBOLAM model (see box below).

Although a true sensitivity study require to test separately each factor, we group all them in two categories: “Initialization” and “Model grid”. EXP1 uses improved ECMWF data (91 hybrid levels, every 3hrs, 0.3°grid) to drive the present son model (no father); while in EXP2 the original father (EXP1) produces a higher-res. (0.07°) BOLAM on a domain larger than the father one (see paper on the left).

Geographical mapping (on a 0.5° grid) of contingency table elements to physical interpretation of the scores.

Rain gauge distribution

Verifi cation domain

Conclusions and future work

Results suggest that a suitable configuration tuning should be required in order to exploit the potential added value of input data / resolution / domain enhancement. An added value has been found anyway, even if it is unlikely to be so strong as the one from BOLAM code update was. Further studies are needed to complete this work:

- Statistical verification on EXP3 and EXP4 configuration.
- Extensive case-study verification employing also object-oriented methods and intercomparison with satellite data, focusing on “critical areas” displayed by CT maps.
- Spectral analysis of model output is needed to define the appropriate grid scale for statistical intercomparison.

References

- Accadia et al., 2003, Wse. Forecasting, 18, 918–932.