

Review of the manuscript "Heavy rainfall episodes over Liguria of Autumn 2011: numerical forecasting experiments"

by A. Buzzi, S. Davolio, P. Malguzzi, O. Drofa, and D. Mastrangelo

published in a preliminary form in the Journal Nat. Hazards Earth Syst. Sci. (NHESS)

Recommendation

To publish the paper in the final form after some minor corrections

General comments

The study is focused on the evaluation of the ability of a two-model quasi-operational system of the atmospheric models (BOLAM and MOLOCH) to successfully describe the real physical developments in the atmosphere over Italy during two synoptic episodes with intense precipitation in 2011. With this aim in mind, the authors perform a detailed analysis of the synoptic events with the aim of determination of the main dynamical processes responsible for the onset, lifespan, intensity, localization and propagation of the precipitation systems responsible for the rainy events. Results of the analysis are then used by the authors for an understanding of the main factors directions for the optimization of the quantitative precipitation prediction with the two model configuration used.

Specific comments

Results of the study demonstrate a critical importance of accurate representation of the cold air outflow from the Po Valley to the Ligurian Sea, determining the position and intensity of the mesoscale convergence lines over the sea area. Performing a number of well-planned sensitivity evaluations allows the authors to determine an optimal configuration of the system, characterized in particular by an increased spatial resolution. The analysis is certainly convincing and its publication appears necessary.

At the same time the authors stress that in addition to the process (cold air outflow) the both cases investigated were characterized by a number of a number of common synoptic-scale characteristics (P. 7098, L 11-25). It may be speculated that the accuracy of the description of the large-scale processes is mainly determined at the coarse-resolution step of your experiments. The issue is not addressed however in the paper (or I do not see it). From the reviewer's point of view it would be helpful to consider possibility of providing the reader with your opinion on subject and in particular:

- (a) what is the role of the synoptic scale characteristics in the formation of extreme precipitation events over Liguria (i.e. if the combination of the characteristics listed by you may be seen as a sufficient precursor for the episodes with heavy precipitation);
- (b) what is the necessary level of accuracy of description (prediction) of the synoptic-scale developments for accurate representation of the processes.

Technical corrections

P. 7094 L. 13: "forecasting quantitative precipitation" - please consider rephrasing as "quantitative precipitation forecasting"

P. 7096

L 1: "...chosen two case studies..." - do you mean "chosen two cases"?

L 5: " near the coast of at..." - must be "near the coast or at..."

L 9: " ...to study such problems.." - please consider " .. to study such processes.."

L 16-18: "the latterminutes" - the sentence is not clear – please rephrase.

L. 19: (me-)teorology processes between... - do you mean "interactive processes" ?

L. 23: ".. possibly triggering " - please consider "possible are triggering.."

L. 24-25: "empirically seem to be allowed to numerical weather prediction tool" - please rephrase.

P. 27: "predictability of QPF" - please consider rephrasing – possibly to " ability of the model to predict precipitation"

P. 7097

L 4-5: "point that stimulate this research was to note " - bad English

L. 20 – 23: "both events(hereafter GE)" - consider moving the names of the events after "both events".

P. 7095

Reference to Ralph et al. 2011 must be Raph and Dettinger 2011?

P. 7098

L. 22: "CAPE " – the term not yet explained.

P. 7099

L. 7: "density current topology"- please rephrase or explain.

P. 7100-7101

P. 7100 L. 21 – P. 7101 L.8: - Please consider moving the text to Conclusion section.

P. 7102:

L. 1: "shallow convection scheme" – please explain the reason – possibly this is done since at this spatial resolution convective scales are resolved?

P. 7105

L. 9 – 12: "starting at the same time of the orography" - please rephrase.

P. 7117

The paper by Rebora, N., Molini, L., Casella, E., Comellas, A., Fiori, E., Pignone, F., Siccardi, F., Silvestro, F., Tanelli, S., and Parodi, A.: Extreme rainfall in the Mediterranean: what can we learn from observations?, J. Hydrometeorol., 14, 906–922, 2013.

must go not before but after

Ramis, C., Romero, R., and Homar, V.: The severe thunderstorm of 4 October 2007 in Mallorca: an observational study, *Nat. Hazards Earth Syst. Sci.*, 9, 1237–1245, doi:10.5194/nhess-9-1237-2009, 2009.