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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "A meteo-hydrological modelling system for the reconstruction of river runoff: the case of the Ofanto river catchment" *by* Giorgia Verri et al.

Anonymous Referee #1

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Title: A meteo-hydrological modelling system for the reconstruction of river runoff: the case of the Ofanto river catchment Authors: Verri et al.

Recommendation: Major revisions

The paper describes the implementation, tuning and application of WRF-HYDRO to a selected watershed in southern Italy. The paper describes in detail the problems found in the implementation of the system and is interesting, especially for researchers facing with similar tasks. Anyway, I think that some points should be clarified to make the paper more mature for publication.

MAJOR POINTS: - P(page)5 L(line)7: "nested in two-way mode": in my experience

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Discussion paper

a two-way coupling is not the best way to deal with precipitation, since it improves the coarse grid results but makes worse the output in the inner grid, which is your target (you did not show the simulated precipitation in the outer domain, but I expect that it is very similar to that in the inner domain, isn't it?): did you play with these options? - P5L23: "... convection is assumed to have been solved explicitly, was found to perform better in the inner domain...": since the tuning is an important part of your study, please could you provide some additional information? In which way does the run without parameterization in the inner grid perform better? Did you try also the case with parameterization active in none (or in both) of the grids? (since you are in the grey zone for convection, it is difficult to anticipate which of these implementations would give better outputs); - P6L12: from what you write later (P8L28), I understand that an optimal range for precipitation simulation is 36-72 hours; however, from Fig. 4, it appears that the WRF runs start every 3 days, making the model skill dependent on the initial time of the simulation (i.e., a simulation starting the same day as the heavy rain will reproduce the event worse than a run starting 36 hours earlier); on the other hand, you show in Table 2 that Experiment 2 starts on the same day as the heavy rain event 2...: I am quite confused; - P7L30-...: I think the meteorological description would greatly benefit from adding mean sea level pressure contour lines in the right side of Figs. 6 and 7; also, temperature at 850 hPa is more relevant than at 2 m from a meteorological perspective; - P12L11: I do not see much change by comparing Fig.9 with Fig. 12: can you quantify the improvement?

MINOR POINTS: - P2 L20, P6L24:Âă"where the power spectrum of the turbulence reaches its peak and thus the convective motions and precipitation are only partially resolved": the fact that convection is not properly resolved is not only a consequence of turbulence, but mainly depends on the fact that the grid spacing is not sufficient to explicitly resolve the individual convective cells/systems; - P3L14:Âă" ... characterise southern Italy ..." - P3L29: what do you mean with "local"? Is it a single point climatology or a basin-average? - P4L14: "...Âăis frequently subject to lee cyclogenesis...": are you sure? If yes, you need to add a reference showing this point from a climatologi-

cal perspective; - P4L20: a more appropriate reference for the case of November 2004 is Mastrangelo et al. (2011): Mechanisms for convection development in a long-lasting heavy precipitation event over southeastern Italy, Atmospheric Research, 100, 586-602, 2011; - P4L30: “The WRF and WRF-Hydro systems are coupled 1-way”; - P5L20 and elsewhere: YSU, not YUS; - P5L23: microphysics not mycrophysics; - P5L24: the proper reference is: Thompson et al., 2008. Explicit forecasts of winter precipitation using an improved bulk microphysics scheme. Part II: Implementation of a new snow parameterization. Mon. Weather Rev. 136: 5095–5115. The reference you put refers to an older version of the scheme. - P6L20: “uncertainties are large in mesoscale models due to unresolved meso-scale processes”: although they may contribute, this is not the only reason for possible model failures; - P6L21: “grid spacing” is more appropriate than “horizontal resolution”; - P7L12: Is the OA+LS method based on 30 minute raingauge data or 24 hour cumulated rainfall? - P7L29: “. . .trough . . . which is due to a cold front. . .”: is it the cold front responsible for the trough or the opposite? I suggest to use “associated” instead of “due”; - P8L2: again: is the cyclone triggered by the winds or the opposite? - P8L5: “mesoscale convective systems. . .”: I do not see mesoscale convective systems: do you mean cyclones? - P9L19: WRF-ASS: this is not really assimilation, but the result of a post-processing technique; - P11L22: are you comparing the result of your post-processing technique with the results of a simulation starting from a 3DVAR analysis? In that case, the comparison is not fair; - P11L27: “. . . observed water level peak . . .”; - P12L20: are the flash floods really frequent in the area? Can you quantify their frequency? - P13L10: “. . .Âăan operational meteo-hydrological forecasting system . . .”: how do you think this technique can be used operationally? If you adjust the precipitation field at the initial time, you should adjust also the dynamic and thermodynamic fields to be compatible with this . . .

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