

Interactive comment on “Ensemble flood simulation for a small dam catchment in Japan using nonhydrostatic model rainfalls. Part 2: Flood forecasting using 1600 member 4D-EnVAR predicted rainfalls” by Kenichiro Kobayashi et al.

Seed (Referee)

alan.seed@bom.gov.au

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Review of “Ensemble flood simulation for a small dam catchment...” by Kobayashi et al
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The paper describes the application of a large (1600 members) ensemble of high-resolution rainfall forecasts for flood forecasting in a small (72 km²) catchment where the lead time required to respond to a flood warning is longer than the characteristic response time of the catchment. This is an important issue for urban catchments

C1

where hydrological predictions need to be based on rainfall forecasts and not observed rainfall.

The temporal resolution should always be included when discussing resolution. I assume that the ensemble had 10-minute resolution since this is used by the hydrological model.

Section 2 – details of the rainfall event. I looked up the 2016 paper for more details of the meteorological situation, but found very little extra. It would be very helpful to understand better the meteorological situation. I am assuming that, since this case is in Japan and summer, the situation was mostly orographic triggering of severe convection in a very moist airmass. This implies that the model rainfall forecasts are closely forced by the topography where the storms are initiated in the near vicinity of the catchment and are likely to be slow moving? This is important because advection nowcasts will not be able to provide accurate nowcasts in these circumstances.

I really missed some radar rainfall images, say the 10 (or 30)-min rain rates at the times of the three peaks in the hydrograph, just so that we can get a feeling for the space-time structure of the rainfall fields. Actually, the spatial and temporal correlation functions would also be interesting, at least to me as a rainfall person.

Section 6 – Results. It would be very good to extend the results to include a basic analysis of the rainfall forecasts before going to the hydrological verification. In particular, how reliable are the probability of precipitation estimates for the extreme rain rates, especially as a function of ensemble size? This is very important if we are running an ensemble prediction systems to predict the probability of extreme rainfall.

The paper should include some results that show the skill of the model, say the reliability diagram for a high rain rates, as a function of lead time. Did subsequent model runs reproduce the second and third maxima in the hydrograph?

I really liked Figures 7, the probability of the inflow exceeding a critical threshold, and

C2

10, the probability of an emergency operation, as examples of probabilistic products that meets the needs of an end-user. Once again, it would be interesting to see these products for a range of lead times.

Regarding Figure 7, moving the forecasts around in time did not improve the results, but what about moving the ensemble in space? Generally I find that the NWP rainfall forecasts that I work with have limited skill at scales that are below around 100 km. I assume that the rainfall in this case is strongly influenced by the topography so you would not want to shift the rainfall fields too much, but it would still be interesting to move them around by a few tens of km.

The conclusion that it is difficult to select a “set of best ensemble members” based on past performance is significant, if a little discouraging.

Alan Seed

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