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Hydrology and Earth System Sciences Discussions

Interactive comment on "GloFAS – global ensemble streamflow forecasting and flood early warning" *by* L. Alfieri et al.

T. Hopson (Referee)

hopson@ucar.edu

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general comments

This paper discusses the global daily probabilistic ensemble river flood forecasting system, Global Flood Awareness System (GloFAS), that has been running operationally since 2011. The system relies primarily on the ECMWF reanalysis, 15-day ensemble forecasts, water fluxes from the land-surface component of the ECMWF GCM, along with the Lisflood hydrologic model overlay, and a "model space" reference to reanalysis-derived flow thresholds for forecasts of extreme flood events. Although the restricted data relied upon by the system (missing global coverage of in situ river flows, high resolution river basin characteristics, satellite-derived precipitation products, etc.)

limit the utility of the system to forecast absolute river discharges, the system is overall well-conceived and well-implemented given the data resources used in the model, and is a potentially useful source of information for institutions involved with flood monitoring and mitigation, and makes a positive contribution to the field of global hydrologic forecasting. After revisions, I recommend this paper for publication.

specific comments

The system's bias-correction method of ERA-Interim to GPCP needs to be discussed further; in particular, the issue of spatial and temporal scale-mismatch and the accounting of rain/no-rain frequency mismatch (especially important for dry regions with pronounced nonlinear catchment response).

It appears there are no temperature forecast (among other variables) corrections applied to the varEPS (at least as compared to ERA-Interim). The significance of this on the accuracy of snowmelt-derived discharge (in particular) should be discussed. The authors do discuss very briefly an "initial condition" bias adjustment for the early warning system, but the discussion on this needs to be expanded, along with potential sources of error in this approach (even though some errors are less important given the authors are concerning themselves primarily with forecasting "model-space" relative frequencies).

The interface between HTESSEL and Lisflood needs further discussion. In particular, given that HTESSEL itself produces surface and sub-surface runoff through its four-layer subsurface model, clarify what missing features (besides overland flow and river routing) require the inclusion of the additional Lisflood 2-layer subsurface model.

A discussion needs to be included on calibration and parameter estimation for HTESSEL and Lisflood land-surface and sub-surface schemes, along with the Lisflood routing scheme.

How the 45 day forecasts are produced needs further discussion; i.e. what assump-

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tions are used (persistence? Climatology?) to extend beyond the 15-day varEPS forecast horizon?

Are individual discharge ensemble members used in any way in the warning system or in the forecasting scheme evaluation (besides just in generating the ensemble mean forecast)?

In section 3.2, I presume all CRPSS and AROC values apply to daily values of the forecasts; or are forecasts averaged (or exceeding a threshold) over a window of time, e.g. a 5-day forecast window at lead-times 41- to 45-days?

technical corrections

Note: "P" refers to the page number; "L" refers to the line number within the page

P12299 L6 "...given in the following sections"

P12300 L10 – how does surface runoff account for subgrid variability of orography? Explain.

P12301 does Lisflood use a separate grid resolution than HTESSEL?

P12301 L6-8 – is the surface runoff routed to the outlet of each cell via overland flow, or assumed to be in-channel flows, and thus, what do the surface roughness coefficients apply to?

P12301 L16 – discuss the limitations of having all subsurface flows routed to the outlet in one time step.

P12301 L16-18 – is the kinematic wave approach discussed here a repeat of what is discussed in L8 above?

P12302 L23-26 – is 2-yr return period based on daily-averaged discharge values? This section not entirely clear.

P12303 L3-5 – how do you define the "medium warning threshold"? Does this imply

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that you only issue warnings if the reach is already in a “medium” flood stage?

P12307 L27 to P12308 L5 – how the quantile matching is performed on the initial conditions is not clear; are you applying this to the soil moisture states, rainfall fields, etc.?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 12293, 2012.