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Predictability and uncertainty of the GloFAS forecasts in the Pacific region of Peru

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GloFAS is a global flood awareness system based on a distributed hydrological model forced with numerical ensemble weather predictions (Alfieri et al. 2013). Results are published on a password-protected website. Forecasts from the GloFAS are currently limited in resolution and quality, but are nonetheless being used by humanitarian and aid organisations and a small number of forecasting agencies. One such agency is SENHAMI in Peru. To get around the limited accuracy issue, SENHAMI are applying a simple bias correction to the initial conditions of the GloFAS forecasts. This process is reliant on in situ measurements being available and reliable, therefore limiting the locations which can be corrected. Also, the uncertainties of the initials conditions are reduced but the remaining uncertainties will continue limiting the predictability of the forecasts. This research aims to understand and quantify the inaccuracy and uncertainties in the GloFAS forecasts for the Pacific region of Peru. The work will explore ways of improving the predictability of the forecasts within the GloFAS framework.
The research will start with looking at the performance of the three main components of the GloFAS forecasting system: the forcing data, the runoff component and the flow routing component. The forcing data, consisting of the ERA-Intrim (Dee et al. 2011) and Variable Resolution Ensemble Prediction System (Miller et al. 2010),will be validated. The starting point will be finding if the weak rainfall along the Pacific coast caused by the large-scale mid tropospheric subsidence over the southeaster subtropical Pacific Ocean and enhanced by the coastal upwelling of cold air (Garreaud, Rutliant, and Fuenzalida 2002), is present in the forcing data. The representation of the hydrological processes, as done by HTESSEL, will be analysed focussing on the surface runoff, subsurface runoff and soil moisture. The results of the flow routing model, LisFlood-Global, will be validated, focussing on the channel and subsurface flow components. Performance of the model will be quantified with as a starting point using the performance indicators available in the Ensemble Verification System (Brown 2010). The uncertainty will be quantified and alternatives to the bias correction methods reliant on in situ measurements will be trialled, starting with the nonparametric data-based approach (Van Steenbergen, Ronsyn, and Willems 2012). The increased understanding of the flow predictability in the Pacific region of Peru will allow a widening of the use of forecasts to catchments which do not contain in situ measurements and potentially to catchments without any measurements at all.