Geophysical Research Abstracts
Vol. 18, EGU2016-8529, 2016
EGU General Assembly 2016

A global flash flood forecasting system

Calum Baugh, Florian Pappenberger, Fredrik Wetterhall, Tim Hewson, and Ervin Zsoter
ECMWF, Reading, United Kingdom (calum.baugh@ecmwf.int)

The sudden and devastating nature of flash flood events means it is imperative to provide early warnings such as those derived from Numerical Weather Prediction (NWP) forecasts. Currently such systems exist on basin, national and continental scales in Europe, North America and Australia but rely on high resolution NWP forecasts or rainfall-radar nowcasting, neither of which have global coverage. To produce global flash flood forecasts this work investigates the possibility of using forecasts from a global NWP system. In particular we: (i) discuss how global NWP can be used for flash flood forecasting and discuss strengths and weaknesses; (ii) demonstrate how a robust evaluation can be performed given the rarity of the event; (iii) highlight the challenges and opportunities in communicating flash flood uncertainty to decision makers; and (iv) explore future developments which would significantly improve global flash flood forecasting.

The proposed forecast system uses ensemble surface runoff forecasts from the ECMWF H-TESSEL land surface scheme. A flash flood index is generated using the ERIC (Enhanced Runoff Index based on Climatology) methodology [Raynaud et al., 2014]. This global methodology is applied to a series of flash floods across southern Europe. Results from the system are compared against warnings produced using the higher resolution COSMO-LEPS limited area model.

The global system is evaluated by comparing forecasted warning locations against a flash flood database of media reports created in partnership with floodlist.com. To deal with the lack of objectivity in media reports we carefully assess the suitability of different skill scores and apply spatial uncertainty thresholds to the observations.

To communicate the uncertainties of the flash flood system output we experiment with a dynamic region-growing algorithm. This automatically clusters regions of similar return period exceedence probabilities, thus presenting the at-risk areas at a spatial resolution appropriate to the NWP system. We then demonstrate how these warning areas could eventually complement existing global systems such as the Global Flood Awareness System (GloFAS), to give warnings of flash floods.

This work demonstrates the possibility of creating a global flash flood forecasting system based on forecasts from existing global NWP systems. Future developments, in post-processing for example, will need to address an under-prediction bias, for extreme point rainfall, that is innate to current-generation global models.