FloodTags have used reports of extreme weather events in GloFAS: which provides predictions of floods in large world lakes. Lake Kyoga in the south west of Uganda is one such example, where flooding occurs on the African Flood Extent Depiction (AFED) peaks. FloodTags, shown below. In general there does not appear to be a relationship between the two datasets.

The selected AFED events can be plotted together with the GloFAS flow series to see if the forecast peaks coincide with the recorded flood events in FloodTags, shown below. In general there does not appear to be a relationship between the two datasets.

1. Introduction
Interest from the humanitarian and insurance sectors into using global flood forecasts in remote areas means that questions around the uncertainty, reliability and skill of global flood forecasts at a local scale are becoming increasingly relevant. The International Federation of Red Cross and Red Crescent Societies (IFRC) and the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) are running the Forecast-based Financing (FbF) program that aims to enable access to humanitarian funding for preventative action which can decrease impact of a disaster. Funds will be released based on forecast information and risk analysis. FbF has been piloted in 16 locations including Uganda. For flood warning FbF uses the Global Flood Awareness System (GloFAS). This piece of work looks into the performance of global flood forecasts for users at a local scale.

2. Location, data and models
The regions where the Uganda Red Cross Society uses GloFAS forecasts include the north-eastern part of the Lake Kyoga catchment in which the Rivers Okel, Oker and Lake Bisina are located. The centre of the catchment is characterised by an extensive system of seasonal and permanent wetlands. Flooding takes place in this area owing to runoff from the mountains slopes in the east and the backwater effect from Lake Kyoga in the south west. Data and models used for this assessment include:

- GloFAS which provides predictions of floods in large world river basins (Alfieri et al., 2013). GloFAS version 2 – 30 days – is a probability or seasonal ensemble streamflow forecast (forecast length of 30 days). GloFAS version 2 consists of a chain of input data and models that together produce a stream flow forecast (see flow diagram). For this research GloFAS forecast return are used. The figure shows the Rivers Okel, Oker and Lake Bisina as represented in GloFAS version 2.
- The African Flood Extent Depiction (AFED) dataset is created by Atmospheric and Environmental Research (AER) and uses satellite data to detect flooding. The AFED was created for African Risk Capacity (ARC) (ARC, 2019). The AFED uses inundation data from satellite remote sensing data (microwave sensors) to map the flooded fraction of a pixel on a daily time scale from 1992 to 2019.

FloodTags have used reports of extreme weather events in local newspapers to produce records of historic flooding for the North East of Uganda (Kotido, Amuru, Katakwi and Soroti). Automated procedures were used to read and interpret articles from newspapers. Two newspapers, Daily Monitor and New Vision, were analysed. (FloodTags, 2019).

3. Event identification from inundation data
Values of the AFED are inundation fraction per grid cell with values ranging between zero and one, where one is fully inundated (open water) and zero is dry. Different methods of extract the AFED data were tested and extracting location specific inundation at the catchment outlet was considered most effective. The figure shows how the AFED peaks correspond to the recorded flood events from FloodTags.

4. Results
The selected AFED events can be plotted together with the GloFAS flow series to see if the forecast peaks coincide with the recorded flood events in FloodTags, shown below. In general there does not appear to be a relationship between the two datasets.

The figure below shows the number of ensembles crossing the 90th percentile threshold as a time series, with the events from the AFED data as points. When the line goes above 6 and warning would be issued. If warnings were issued during events, events would coincide with the line being >6, this is not the case.

For the event to be classified as a hit, the flood data in FloodTags has to coincide with the flow series in GloFAS at the same time. For the event to be classified as a false alarm, the forecast has to be higher than the median discharge for five days or more.

FAR calculations are performed for both GloFAS version 2, since this is the version used in the humanitarian context, and the previous version.

5. Discussion and conclusion
Global models have been found to be able successfully reproduce the hydrology of major river basins (Siderius et al., 2018). However, global models can struggle to capture local hydrological processes (Fließmann, 2018), especially in regions with river deltas, arid and semi arid zones and wetlands (Trigg et al., 2016). When applied regionally, global models can provide a first approximation of the hydrology, but this doesn’t necessarily mean the performance is good enough for the decision making they are aimed at. GloFAS ver2 has shown to be able to simulate seasonal trends and recorded flood events for North-East Uganda. Further analysis using the AFED data as a best representation of observations indicates that GloFAS forecast are likely to result in too many false alarms in order for the forecasts to be applied for humanitarian action.

References
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