PROJECT TITLE: Advancing flood risk mapping from global modelling systems in small islands

DTP Research Theme(s): Changing Planet

Lead Institution: University of Bristol

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Project keywords: Flood risk, small island developing states, remote sensing, hydraulic modelling

Modelled flood extents of the TanDEM-X DTM (AMP/PMF) and MERIT in comparison to the LiDAR model for the 50-year return period event in the Ba Catchment Fiji.

Project Background

Flooding is a major hazard globally and a particularly acute problem for small island developing states (SIDS) due to high exposure as a proportion of wealth and limited coping capacity. Understanding the risks posed by flooding in small island communities is therefore on the critical pathway towards many development goals. Recent advances in flood hazard and risk mapping have provided complete coverage of these islands for the first time. However, such top-down risk assessment methods have undergone limited validation over small islands and almost certainly lack sufficient accuracy to be useful in many places. Furthermore, there has been a focus on large events such as tropical cyclones, with less known about small but frequent events such as pluvial flash flooding in communities. These small events erode resilience of a community over time, reducing the capacity to cope in dealing with larger events. This is defined by the UNISDR as extensive disaster risk (UNISDR, 2017). This extensive risk leads to an accumulation of losses and risk, and communities do not usually fully recover from one event before the next event occurs. Extensive risk often undermines development outcomes, and is closely related to the vulnerability and resilience of a community (UNISDR, 2015).

Project Aims and Methods

This project aims to advance the mapping of flood hazard and risk in small islands and assess the potential of emerging data sets to identify hotspots of extensive disaster risk and how such data might be used in conjunction with community level information. This will be achieved via three steps:

1) Utilising emerging high-resolution datasets to improve flood risk estimation in SIDS from island to community scales

2) Investigating risk accumulation and everyday hazards/extensive disaster risk at community scale

3) Meeting in the middle: assessing the utility of emerging risk modelling methods for the identification of everyday hazards in SIDS
Several emerging high-resolution elevation and population datasets are becoming available that might enable community resolving flood risk modelling in data-sparse but high-risk locations such as SIDS. It is important to identify and understand how these datasets can be used in a flood modelling test case, and whether these datasets can improve flood risk estimates over currently-available datasets. How far can we go with the ‘top down’ remotely sensed data before we need information from the bottom up community level (e.g. community local knowledge on areas of flooding, drain location, expert knowledge from key actors, ground truth information on infiltration or frequently flooded locations)? How could we incorporate local knowledge to inform our models so that we can take the modelling further than just top-down inference? Where is this intersection between the top-down and the bottom-up and can they be used in synergy? What are the implications of improved risk estimation technology for applications in small catchments including insurance? Skills developed addressing these problems should provide training for a wide range of careers related to disaster risk reduction, risk assessment and catastrophe risk modelling.

**Candidate Requirements**
Candidates should have a background in geography, hydrology or other related subjects. Technical experience with remotely sensed digital elevation data (e.g. TanDEM-X and SRTM), flood inundation modelling and disaster risk reduction in small islands is desirable.

**CASE or Collaborative Partner**
The Collaborative partner has extensive expertise regarding the use of catastrophe risk models in the Re insurance sector. In the case of flood catastrophes, risk models are highly dependent on the quality and resolution of elevation data and assumptions regarding exposure and vulnerability.

**Training**
A Successful applicant will join the hydrology research group at the University of Bristol, currently ranked 9th globally and 1st in the UK for water resources by the Shanghai Ranking’s Global Ranking of Academic Subjects. In addition to GW4 training, opportunities will be made available for training in hydrodynamic modelling. Community level fieldwork is envisaged with a preference for test cases in Fiji given previous research in the group.

**References / Background reading list**

**Links:**
School URL  http://www.bristol.ac.uk/geography/courses/postgraduate/
NERC GW4+ DTP Website: http://nercgw4plus.ac.uk/
Bristol NERC GW4+ DTP Prospectus: http://www.bristol.ac.uk/study/postgraduate/2019/doctoral/phd-great-western-four-dtp/
Application deadline:  16:00 GMT, Monday 7 January 2019
How to apply to the University of Bristol: http://www.bristol.ac.uk/study/postgraduate/apply/
General Enquiries: Bristol NERC GW4+ DTP Administrator
Email: bristol-nercgw4plusdtp-admin@bristol.ac.uk