

Topography and Nightlight-Based National Flood Risk Assessment

Bharath Raja & Amin Elshorbagy

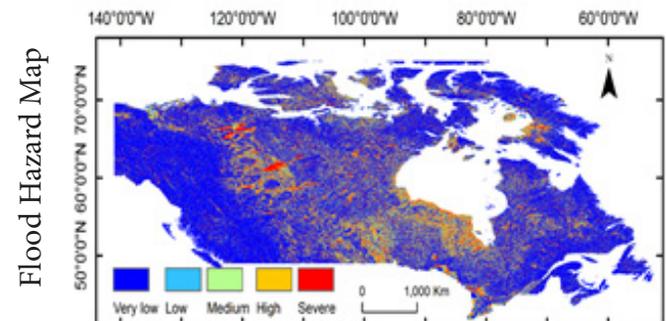
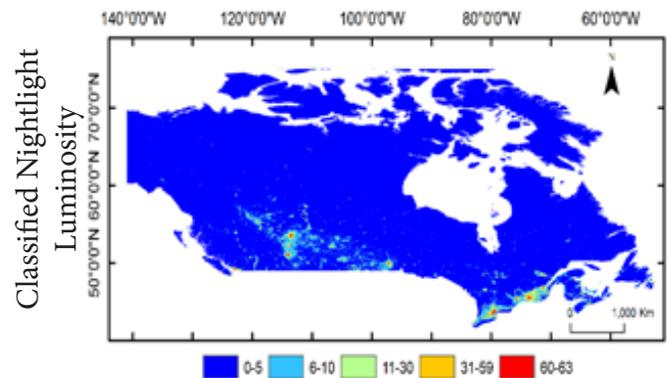


Research Summary

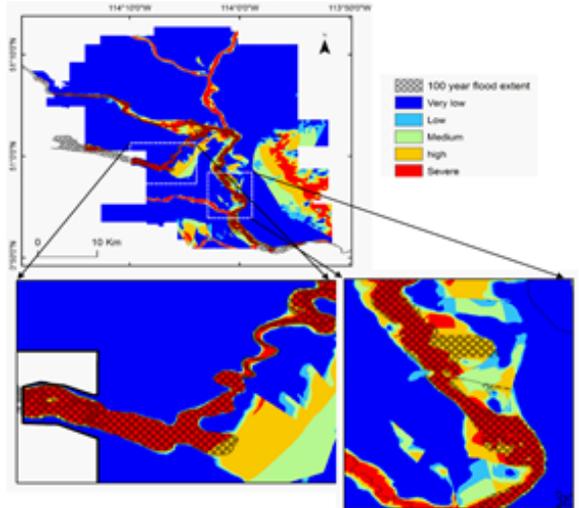
In Canada, floods are a costly natural hazard and have caused over \$7 billion in damages over the recent five years (2010-2015). Flood analysis and water resource management in Canada are tasks conducted at the provincial level; therefore, unified national-scale approaches to water-related problems are uncommon. In one of our FloodNet research studies, a national-scale flood risk assessment approach for Canada is proposed and developed by integrating several and relevant sources of information to develop a flood risk assessment approach with affordable computational cost and data requirements. It leads to national flood hazard and risk maps that benefit from topographic information, remotely sensed nightlight data and, as an option, local information. For this purpose, parameters representing the concepts of hazard and exposure were identified and subsequently, a flood risk index was developed based on the integration of both hazard and exposure. Flood hazard was estimated using two parameters: elevation above the nearest drainage (EAND) and distance from the nearest drainage (DFND) that were derived from a digital elevation model (DEM). Flood exposure was estimated using Nightlight satellite imagery as a proxy for human activities, and a land-use map for Canada. The hazard and exposure parameters were reclassified into 5 classes based on their importance and finally, flood risk was calculated as the product of hazard and exposure.

The approach is practical and reliable for large scale flood risk analysis over Canada. The flood hazard map, when compared with existing flood extent map for the city of Calgary, was found to be in close agreement with flood maps produced using detailed hydraulic modeling. The nightlight data are useful proxy for exposure and risk mapping in Canada.

It is also demonstrated that the flood risk map can be updated by incorporating local information (e.g. population density) to arrive at “socioeconomic” flood risk map. Such maps are useful products as they allow for evaluating the spatial distribution of the expected flood damage, and thus, can help in prioritizing government intervention and strategic resource allocation.



Calgary 100yr Flood Extent (Hatched) Compared to Present Flood Hazard Map



Elshorbagy, A., Lakhanpal, A., Raja, B., Ceola, S., Montanari, A., and Lindenschmidt, K.-E. (In Review) Topography-and nightlight-based national flood risk assessment in Canada. *Hydrol. Earth Syst. Sci. Discuss.*, doi:10.5194/hess-2016-524.