



A worldwide analysis of human exposure to floods by using satellite nighttime lights

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The recent occurrence of flood events across the globe, which represent the first cause of economic losses and human fatalities among natural disasters, has highlighted the urgent need of mitigation strategies to reduce flood risk. To date, expeditious procedures for a worldwide detailed spatio-temporal identification of human exposure to floods are still incomplete. To this end, we propose the use of satellite images of nighttime lights to identify the areas across the globe most at risk for flood damages. Nightlights are indeed a widely used proxy for population density and economic activity.

Worldwide nocturnal lights along the river network, available as yearly average values from 1992 to 2012 at 1 km² resolution, are first analysed from a temporal perspective in order to estimate their temporal trends. Our results revealed that the temporal evolution of nightlights can be reasonably associated with the temporal pattern of human exposure to floods. Nightlights are then correlated with global data of economic losses caused by flooding events. Our outcomes showed that nocturnal lights close to rivers are consistently related to flood damages. In particular, we found that increasing nightlights are associated to flood damage intensification. Our analysis may thus provide valuable information for better understanding the interactions between hydrology and society and identifying priorities for flood risk management.