Geophysical Research Abstracts
Vol. 17, EGU2015-7038, 2015
EGU General Assembly 2015

Influence of El Niño Southern Oscillation on global scale flood and drought risk

Philip Ward (1), Brenden Jongman (1), Ted Veldkamp (1), Matti Kummu (2), Michael Dettinger (3,4), Frederiek Sperna Weiland (5), and Hessel Winsemius (5)

(1) VU University Amsterdam, Institute for Environmental Studies, Amsterdam, Netherlands (philip.ward@ivm.vu.nl), (2) Water & Development Research Group (WDRG), Aalto University, Espoo, Finland, (3) Scripps Institution of Oceanography, La Jolla, USA, (4) United States Geological Survey (USGS), La Jolla, USA, (5) Deltares, Delft, The Netherlands

In this contribution we demonstrate the influence of climate variability on flood and drought risk. El Niño Southern Oscillation (ENSO) is the most dominant interannual signal of climate variability, and has a strong influence on climate over large parts of the world. In turn, it strongly influences many extreme hazards and their resulting socioeconomic impacts, including economic damage and loss of life. Whilst ENSO is known to influence hydrology in many regions of the world, little is known about its influence on the socioeconomic impacts of either floods or droughts.

To address this, we developed new modelling frameworks to assess ENSO's influence on both flood risk and drought risk at the global scale. Flood risk is expressed in terms of annual expected damages and annual affected population. Drought risk is expressed in terms of water shortage and water stress. We show that ENSO exerts strong and widespread influences on flood hazard and risk, as well as drought risk. Reliable anomalies of flood risk exist during El Niño or La Niña years, or both, in basins spanning almost half (44%) of Earth's land surface. Significant correlations between ENSO and water scarcity conditions were found for 43% of the global land area, meaning that more than half of the global population is effectively affected by water shortage and stress events under 2010 conditions.

Our results show that climate variability, especially from ENSO, should be incorporated into disaster risk analyses and policies. Since ENSO has some predictive skill with lead times of several seasons, the findings suggest the possibility to develop probabilistic risk projections, which could be used for improved disaster planning. The findings are also relevant in the context of climate change. If the frequency and/or magnitude of ENSO events were to change in the future, this could imply changes in flood and drought risk variations across almost half of the world's terrestrial regions.

The flood part of this abstract is based on:
Ward, P.J. et al., 2014. Strong influence of El Niño Southern Oscillation on flood risk around the world. Proceedings of the National Academy of Sciences of the United States of America, doi:10.1073/pnas.1409822111.