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Influence of ENSO on coastal flood hazard

Sanne Muis (1), Ivan Haigh (2), Ted Veldkamp (1), Jeroen Aerts (1), and Philip Ward (1)

(1) Institute for Environmental Studies (IVM), Vrije Universiteit Amsterdam, Amsterdam, Netherlands, (2) Ocean and Earth Science, National Oceanography Centre, University of Southampton, Southampton, UK

ENSO is the most dominant interannual signal of climate variability. While ENSO-induced climate anomalies may result in changed probabilities of coastal flooding, little is known about how interannual variability affects the occurrence of extreme sea levels, and the probability of coastal flooding around the world. With this contribution, we will show in which areas El Niño or La Niña can result in significantly higher/lower extreme sea levels than during neutral years, and how this influences flood hazard.

To assess this, we developed a model framework to assess the influences of the El Niño Southern Oscillation (ENSO) on coastal flood hazard at the global-scale. This approach is based on a new dynamically-derived global dataset that contains sea levels along the entire world's coastline for 1979-2014 (GTSR dataset). However, the modelled sea level variations in GTSR are strictly due to gravitational tides and barotropic changes (changes in wind and pressure): baroclinic effects (density differences) are not considered. Subsequently, we used satellite altimetry data and ocean reanalysis data to reconstruct the interannual signal in mean sea level, and combined this with the GTSR sea level timeseries.

Using this timeseries we calculated the anomalies in sea level extremes during El Niño years and La Niña years (compared to all years) and we assess the correlation between the sea level extremes and ENSO driven variability. In this contribution, we show our first results on the influence of ENSO on coastal flood hazard around the world, and we discuss potential applications in, for example, disaster planning.