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Coastal flood events in the Maldives

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The Maldives are low lying (mostly < 1m above mean sea level) coral islands in the Indian Ocean that are threatened by coastal flooding and sea-level rise (SLR). Protection of low-lying islands and climate change adaptation is optimum where physical systems are understood, yet there is a lack of basic physical information and data about coastal flooding and its causes in the Maldives, which this study addresses. We primarily focus upon an artificial island (Hulhumalé) built 2m above mean sea level to relieve population pressure on the nearby capital Malé. Records show that two severe coastal flood events affected the islands (although not Hulhumalé) in recent decades during April 1987 and May 2007. The primary data source was time series of still water levels at 3 tide gauges which span over 800km north-south across the archipelago (covering 1987-present). Wave conditions (2006-2014) were extracted from a model hindcast, since observational records are not available. The sea-level and wave data were analysed in relation to land heights and SLR, and by applying an overtopping model. This illustrated how the fundamental cause of the 1987 and 2007 floods was south-westerly swell events with wave periods of up to 20s combined with spring tides. Overtopping simulations based upon present-day extremes and projected SLR scenarios, suggest that a relatively small variation of background still water level can drastically increase overtopping and worsen flood impacts. This is partly due to the flatness of the island, although also highlights the sensitivity of flood risk in these islands to mean SLR. In this context of extreme events, projected SLR, and population growth, we briefly discuss adaptation in the context of socio-economic and environmental change. Recommendations are made for future data collection and monitoring.