



Tectonic movements in Torres Islands may raise regional sea-levels

Satellite data from the Torres Islands in the southwest Pacific suggest that rising sea-levels in the region widely attributed to climate change is also partly caused by sinking of the islands following earthquakes in the 1990s, according to recent research.

Coastal flooding in the Torres Islands has been linked to climate change and widely cited in the media as an example of its effects. In 2002-2004, the Canadian International Development Agency helped villagers living in Lataw, Tegua Island, to relocate inland as part of a climate change adaptation programme. Although the Torres Islands are in a region of high seismic and volcanic activity, subsidence was not originally considered a factor in the apparent rise in sea-levels.

The islands are situated directly above the boundary of the Australian and Pacific tectonic plates, which are pushing against each other as one moves below the other. Sometimes this results in violent earthquakes, which may change the vertical position of the overlying islands. Previously, the sea-level rise between 1992-2010 – on average, less than 1cm a year – had been attributed to climate change.

To test the theory that subsidence played a part, the researchers used a steel rod driven into the ground on Linua Island in 1997 as a benchmark. The rod was being used to monitor plate movements following an earthquake that had shaken the island in April that year. Its position was measured using positioning data from satellites in October 1997, then again in 1998 and twice in 1999.

After a gap, the researchers measured its position again in 2009 before and after the three earthquakes of that year. Although the series of measurements is incomplete, the researchers' calculations suggest that the island subsided by nearly 12cm between 1997-2009. This accounts for almost half of the total change in sea-level measured during this period. Therefore, the researchers argue, the 1997 earthquake was a major cause of sea-level rise and flooding in the region. Data from later in the series suggest the earthquakes in 2009 lifted the islands back up to about the same position they sat at in 1998.

The gradual flooding of coconut plantations on Loh Island beginning in the late 1990s provides an argument for gradual change related to climate. However, the researchers propose an alternative explanation whereby the relative sea-level rise caused by the earthquake and subsidence affected the exposure of the coastline to erosion.

The researchers believe their work should be communicated to governments and local communities so that they can better understand environmental change and make more informed decisions about the management of coastal areas.

Source: Ballu, V., Bouin, M-N., Siméoni, P. *et al.* (2011). Comparing the role of absolute sea-level rise and vertical tectonic motions in coastal flooding, Torres Islands (Vanuatu). *Proceedings of the National Academy of Sciences*. 108(32): 13019-13022.

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