There have been recent reports in the media that particular shorelines in Vanua Levu have experienced significant erosion from wave action since Tropical Cyclone Tomas in March 2010, threatening infrastructure and ancient burial sites. As a result, villagers have been advised to take into account global warming and to relocate to higher grounds (Fiji Times, Saturday, May 15, 2010)

Cyclones are among the most frequently occurring natural disasters in the tropical Pacific, and they are characterised by high waves and strong winds. At the time of tropical cyclone Tomas ocean surface waves up to eight meters high were reported to inundate villages on Vanua Levu. Such an extreme event can lead to coastal erosion or accretion, depending on the configuration of the particular shoreline. It is however difficult to imagine such large waves, and even more difficult to assess their impact without direct measurements in the location concerned.

We do however have access to satellite data that can help us quantify the wave climate during tropical cyclone Tomas. One such satellite system is called altimetry. Altimetry is one of the most important tools for monitoring the oceans and their response to climate variability and change. The parameters derived from altimeter data include significant wave height, which is the average of the largest one-third of observed waves in a particular location.

The map of significant wave heights made from the live access server housed on www.aviso.oceanobs.com
shows significant wave heights of more than 4 m under the path of the cyclone. It is generally accepted that maximum wave heights can be twice as large as significant wave heights in the open ocean. The media reports of 8 m waves in Vanua Levu may therefore be realistic estimates.

According to the Intergovernmental Panel on Climate Change (IPCC), tropical cyclones may increase in intensity under a future warmer climate, but there may not necessarily be an increase in the total number of tropical cyclones. Similarly, projections for significant wave height under increased greenhouse gases remain at their early stages, with great uncertainties. It is therefore often difficult to assess how a particular beach may change without first examining coastal evolution, processes, geology, and hazards.

While relocating to higher grounds or implementing coastal set back rules are advisable in some communities as a way of adapting to climate variability and change, it is equally important to manage and maintain the health of the coastal ecosystem. Coral reefs and mangroves provide a first line of defence against extreme events such as cyclone-generated waves and are productive habitats that ultimately help maintain the stability of our shorelines.

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Figure caption.

Significant wave height in metres computed from merged satellite altimetry data for 15th March, 2010, when tropical cyclone Tomas was directly east of Vanua Levu (near the centre of the image). The colour band of the image shows that significant wave heights in excess of 4 m were generated as a result of the category four tropical cyclone.