Storm Surge or Tsunami?

Geological evidence for past, and historically undocumented giant wave events, in the form of boulder fields and coastal debris ridges, has been recorded from six locations on the north, east and southwest coastlines of Jamaica. The sites occur on raised Pleistocene reef terraces, at heights of up to 10 m above sea level and face zones where deep water extends relatively close inshore. Most lack the protection afforded by modern reef development. Boulder lithologies closely resemble that of the platforms on which they rest, and they appear to have been torn from the front of the platforms and transported to their present locations by giant waves. The waves may have been caused by storm surge and waves from very powerful hurricanes, or from the large waves generated by tsunami (often, and incorrectly called tidal waves).

The Boulders

Our investigations at Galina showed that the storm/tsunami-generated boulders are scattered over the raised coral-reef platform in a broad swathe extending for some one and a half kilometres along, and some way back from the coastal cliff, which varies in height from about one metre to some eight metres above sea level. The largest of the boulders measured nearly 6 metres in length, and was estimated to weigh over 100 tonnes, although most examples were much smaller, in the one to twenty tonne range. The boulders were made of hard limestone, mainly containing the fossilized remains of elkhorn corals. Today, elkhorn coral grows most profusely at the crest of the modern reefs. However, these boulders were evidently not from any modern reef, as the rock forming the boulders was dense and well lithified. They probably originated from near the crest of a fossil coral reef. Now, the modern platform on which the boulders rest is composed of rock that had originated as an ancient coral reef, that has since been raised above sea level. These boulders, in fact, closely resembled those parts of the platform nearest to the sea. It seemed likely, therefore, that they had been torn from the seaward edge of the platform and rolled across it to finally rest further inland. The two largest, 100 tonne boulders lie at 40 and 75 metres from the shoreline, and nearly all the rest of them are found between 80 and 180 metres from the shore. In fact, only three of the 180 boulders measured were less than 30 metres from the shoreline. Many of the blocks had plants, even shrubs growing on them, suggesting they had been there for some time. Observations at other localities include the largest boulder seen so far, at Manchioneal, estimated at more than 200 tonnes.

Debris Ridges

At Galina the boulder field is backed backed by a low vegetated ridge consisting of unsorted coral debris, sand, blocks and small boulders. Although this is the only ridge studied so far in any detail, we have observed similar ridges near Discovery Bay and along the south coast, between Negril and Savanna-la-Mar.

A pilot study carried out at two localities on Grand Cayman indicated that the size ranges, distribution patterns and physical environments of the boulders there are similar to those observed in Jamaica.

References


Beach Erosion and Coastal Hazards: Ensuring Safety

Evaluation of coastline changes and hazards in Jamaica to improve hazard reduction strategies for coastal communities

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