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TITLE: Geomorphological impacts of high-latitude storm waves on low-latitude reef islands ? Observations of the December 2008 event on Nukutoa, Takuu, Papua New Guinea

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ABSTRACT:

Low-latitude reefs and reef islands usually experience relatively benign climatic and hydrodynamic conditions due to their location near to the equator, outside of the major storm belts, and they typically exhibit geomorphological traits that reflect the prevailing low-energy conditions. For example, algal ridges are poorly developed, reef flat boulder zones are modest or lacking, rubble banks are rare, and reef islands tend to be low and dominated by sand. Nukutoa is a low-lying triangular-shaped reef island of ~ 6 ha located on the eastern rim of Takuu atoll (4°45?S, 157°2?E), Papua New Guinea, approximately 300 km northeast of Bougainville. The approximately 450 residents of Takuu all live on Nukutoa. In December 2008 Takuu was struck by several days of very high water levels and waves, which washed completely over approximately 50% of Nukutoa. GPS shoreline mapping and topographic surveys of the island were undertaken in the days immediately prior to the event, and were repeated immediately after. Homes and village infrastructure were damaged during this event, which eroded around 60% of the shoreline, and deposited a sand sheet averaging around 50 mm thick over approximately 13% of the island. This event was generated by two distant storms ? one located > 6000 km away near 50°N, and affected a wide area of the Western Pacific. Oral histories record at least five similar events since the 1940s. In this paper we document the geomorphic impacts of the December 2008 event and discuss the possible significance of similar events in the past, and in the future.

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