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Coastal Environmental Change  
During Sea-Level Highstands:  
A Global Synthesis with implications  
for management of future coastal change

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Quaternary coastal morphology and sea level changes



Project 437

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## Multiple Holocene highstands in the Philippines

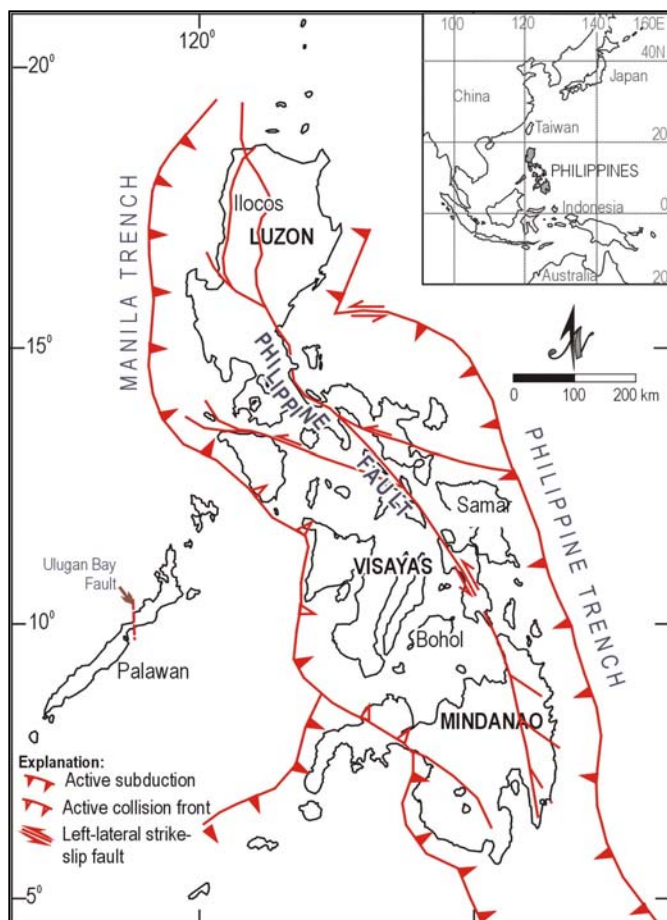
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### Abstract

Combined paleo sea-level data from sediment cores, uplifted tidal notches and coral reef terraces, constrained by  $^{14}\text{C}$  and  $^{230}\text{Th}/^{234}\text{U}$  age dates, are used to reconstruct sea-level changes during the Holocene in four widely separated sites in the Philippines – Ilocos, Palawan, Bohol, and Samar (Fig. 1).



**Figure 1.** Regional tectonic setting of the Philippines (modified from Ringenbach et al., 1993) and location of study sites.

Records dating back to 9.2 ky show at least four paleo sea-level stillstands in Ilocos, dating from 9.2 to 1.5 ky; possibly three in Samar, from 7.3 to 2.2 ky; and in Palawan, from 6.9 to 2.4 ky; and two in Bohol from 6.3 to 2.5 ky.

Variation in the regional tectonics may partly explain the elevation differences of paleo-sea levels between the study sites: relatively high paleo-sea levels in Ilocos, intermediate in Samar and Palawan and lowest in Bohol. Both northwest Luzon and Samar are characterized by significant seismicity that may considerably contribute to uplift. In contrast, Palawan and Bohol are relatively stable. Seismicity appears to be greater in Samar, but uplift is relatively higher in Ilocos. This is attributed to the significant thrust component along the northern segment of the Philippine Fault as opposed to the purer strike-slip motion in the Samar area. Although present seismicity is relatively low in Ilocos, the older and higher paleosea-levels in this region may indicate greater seismicity in the past.

Wide distribution of emergent Holocene sea-level indicators in the study sites and clustering of ages between 7 to 4 ky are consistent with the observed and predicted timing and elevation of the mid-Holocene sea level highstand in the Asia-Pacific region. Highstands dating back to 9.2 ky in Ilocos are attributed to the higher uplift rate. Well-defined double notches in Samar and Palawan suggest two emergent stillstands during the Holocene, with the older stillstand at a lower elevation. Across-site variation in the duration and timing of initiation and termination of stillstands can be due to tectonism and hydro-isostatic adjustment or an artifact of sampling.

### Reference

Ringenbach J.C., Pinet N., Deltiel J., Stephan J.F. (1993). *Structural variety and tectonic evolution of strike-slip basins related to the Philippine Fault System, Northern Luzon, Philippines*. Tectonics, 12, 187-203.

