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Seafloor topography, isostatic compensation, and volcanism in the western Pacific Ocean

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Bathymetry, together with gravity anomaly data, can be used to determine the effective elastic thickness (T_e) of the lithosphere, and in turn help constrain the age of the overlying features. We begin by exploring how different bathymetry data sets affect the observed admittance between gravity and topography and thus affect the observed T_e. In particular, we compare the results using predicted bathymetry (e.g. Sandwell and Smith) and those using only depth measurements (e.g. GEBCO). We then use a moving window technique to examine the spatial variations in $T_e$across the western Pacific. Traditionally, the forward admittance, using bathymetry to predict gravity, has been used to find the T_e. However, with the emergence of satellite-based gravity anomaly measurements, it has become possible to use the inverse admittance, or predicted bathymetry, to constrain the T_e. Initial results showed a systematic difference between the results from the forward and inverse admittances, so we explore the source of this discrepancy using synthetic data and then compare the results across the Pacific region. Among the most striking results is a broad swath of low $T_e(<$12km) extending from the Wake seamounts south to the Caroline Islands and east to the Ratak seamount trail. Because these low values of T_e are generally associated with volcanism at or very near a spreading ridge, this suggests that these seamounts are approximately the age of the underlying seafloor, 140-170 Myr old. After an area-age correction is applied, this raises the possibility of a major volcanic episodic in the Middle to Late Jurassic, before the better known event in the Middle Cretaceous.