Hotspots: A view from the swells

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The central problem is satisfactorily defining normal.
Menard (1969)

ABSTRACT
The magnitude of inferred depth and heatflow "anomalies" at hotspot swells relative to "normal" seafloor plays a major role in constraining the causes of these swells. Hotspot heatflow anomalies were first believed to be large and consistent with the uplift expected from thermal thinning of the lower lithosphere. However, these anomalies were overestimated because reference thermal models predicted greater depths and lower heatflow than was typical of lithosphere older than 70 Ma. In contrast, models GDH1 and GDH2, derived by joint fitting of heatflow and bathymetry (and geoid slope for the latter) yield a hotter and thinner lithosphere than previous models and fit depth, heatflow, and geoid data significantly better. Hence heatflow on the Hawaiian and other swells is at most slightly high relative to GDH1 and GDH2. The absence of a significant heatflow anomaly favors a primarily dynamic or compositional rather than thermal swell origin. Similarly, the depths and heatflow for the Darwin rise are consistent with thin-plate models, and thus it is not thermally different from lithosphere of similar age. In younger lithosphere, where observed heatflow is less than that predicted from conduction-only models, the observed heatflow at hotspots can be compared to its global average. The heatflow for the south Pacific superswell is consistent with unperturbed lithosphere, and hence excludes significant lithospheric thermal thinning. Near Iceland, heatflow west of the Mid-Atlantic Ridge is consistent with the global average, but to the east is higher, the opposite of that predicted by models that involve an eastward-migrating plume.