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Pacific seamount volcanism in space and time

J. K. Hillier (1), A. B. Watts (1)
(1) University of Oxford

The spatial and temporal distribution of oceanic volcanism reflects the geodynamic interaction between the lithosphere (i.e. tectonic environment) and the fluid mantle beneath. Eruptions of submarine volcanoes, via seawater chemistry (e.g. anoxia), probably also adversely affect life. However, relatively few ($\sim$250), mostly young, Pacific seamounts are radiometrically dated, so the patterns are unclear.

Using independent estimates of gravity anomaly and topography, we date 2720 ($\times$ 10 more) volcanoes using their ratios of gravity to topography (GTR's). The GTRs reflect the strength of the oceanic lithospheric *at the time of volcanic loading (i.e. edifice formation)*. Previous compilations show that this strength increases with seafloor age. Strength therefore relates to Δt (Δt = seafloor age - edifice age). Geophysical strength estimates are calibrated against Δt from radiometric ages (78 pts.) to yield Dt predictions and absolute seamount ages (seafloor age + Δt).

Whilst uncertainties for individual seamounts are substantial (10's of Ma), the presence of established patterns gives us confidence in trends within the data. The strengthening lithosphere is well shown by basin-wide West-to-East, off-ridge (high Δt) to on-ridge (low Δt), progressions within time intervals (e.g. 80-40 Ma). Established off-ridge "hot-spot" chains (e.g. Hawaii) and on-ridge features (e.g. Hess Rise, Musician Seamounts) are also clear. This demonstrates that automated, self-consistent, basin-wide dating of seamount volcanism is possible.

Selected patterns of note with regard to geodynamics and plume-ridge interaction appear to be 1) On-ridge to off-ridge progression in the Cook/Austral chain as the ridge moves away 2) Prolonged volcanism in both the NW Pacific and south-central Pacific "superswell" region. 3) Coincidence of current volcanism west of America ($\sim$30N) and region of abnormally shallow seafloor 4) Relative quiescence (80-40 Ma) and recent (0-40 Ma) reactivation of the Line Islands after their formation on-ridge.