

Figure 1: *S*-wave velocity anomalies for the lowermost 250 km of the mantle [Masters *et al.*, 1996], with spherical harmonic degree and order up to 10. Dark (light) regions represent higher (lower) velocities within a range of approximately $\pm 2.5\%$, corresponding to possible temperature variations of several hundred degrees in the lower mantle thermal boundary layer.

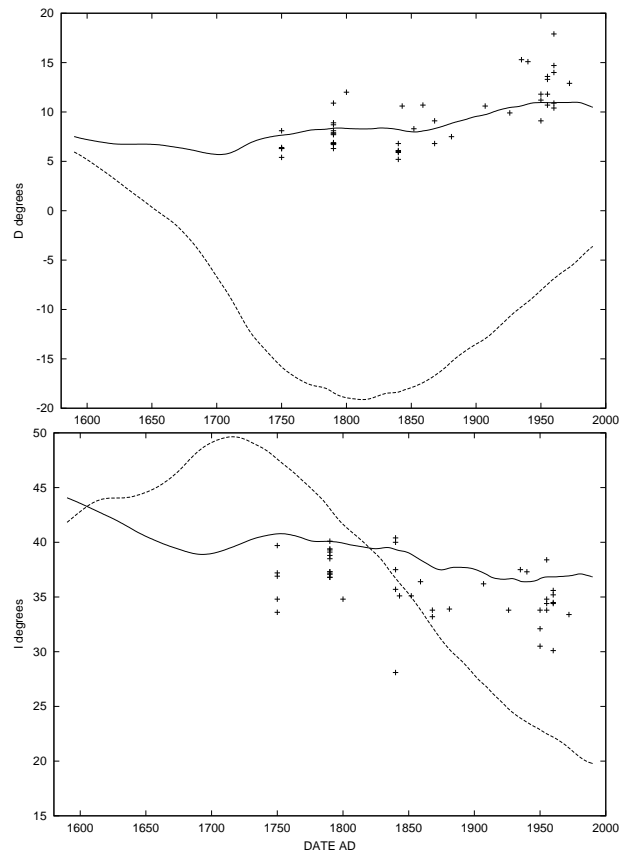


Figure 2: Comparison of magnetic field components on Hawaii (solid line) and representative point on same latitude in the Atlantic hemisphere (dashed). (a) D (b) I . Points give paleomagnetic measurements on historical lava flows.

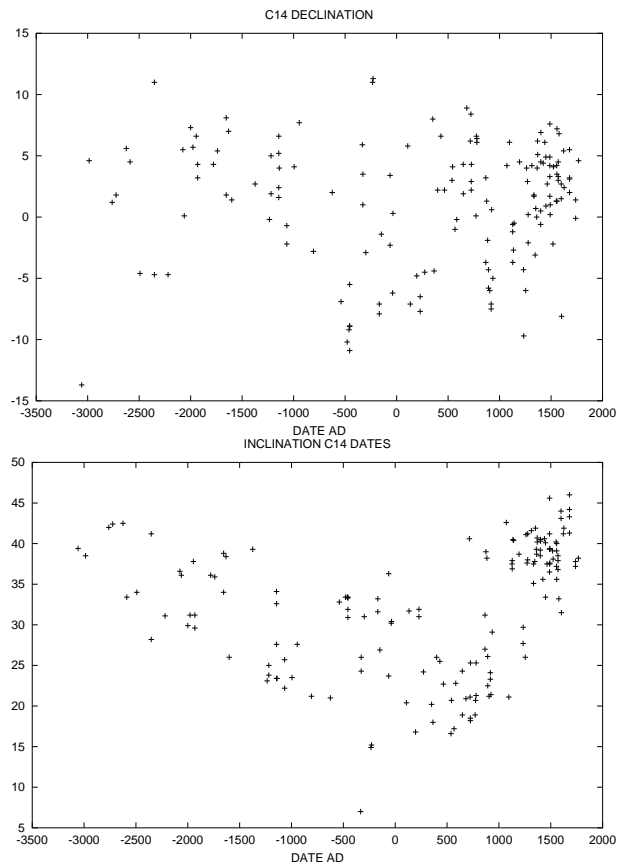


Figure 3: D and I from Hawaiian lavas with C^{14} ages less than 5 ka. Note the scale on the y -axis: D varies by only $\pm 5^\circ$ over 5 kyr compared with over 30° change in Figure 3(b). I dips by just 15° from 0–1000AD, compared with a 30° change in 300 years in Figure 3(c).

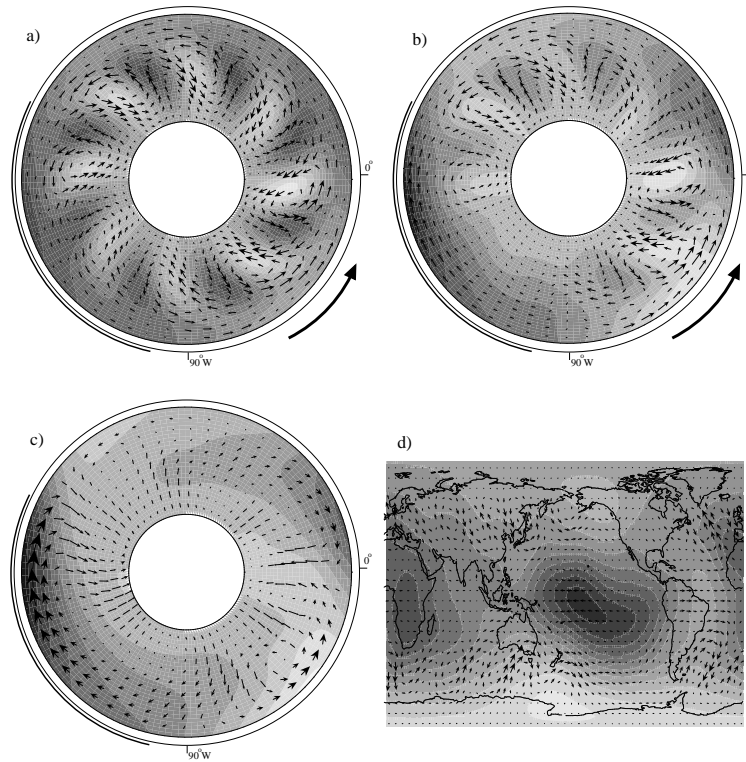


Figure 4: Snapshots of convective solutions subject to lateral heat-flux variations at the outer surface. Plots (a), (b), and (c) show contours of temperature perturbations and arrows of flow in an equatorial section for $Ra^H = 0.1Ra^V$, $Ra^H = 0.3Ra^V$, and $Ra^H = 0.7Ra^V$ respectively. Darker shades represent higher temperatures. The large arrows indicate the direction of propagation of the convection rolls and the thick arc indicates the approximate extent of the Pacific Ocean. Plot (d) shows temperature and flow at the outer surface corresponding to the solution in (b).