Ocean crustal thickness and chemistry correlated with the initial crestal depth when the crust formed at the mid-ocean ridge

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The major element chemistry and water depth of eruption of modern axial basalts of mid-ocean ridges are correlated (Klein and Langmuir, JGR, 1987). The relationship can be extended to old basalts, now off-axis, by restoring sites to their initial crestal depths, correcting for the effects of sediment loading and thermal subsidence since formation (Keen, Klein and Melson, Nature,

1990). Crustal thickness should also correlate with water depth at the time the crust is formed; crustal thickness as well as crustal chemistry and initial crestal depth depends on mantle temperature. We cannot test this hypothesis directly using observations from present active ridge crests where crust is still segregating from the mantle. Consequently we adopt the technique used by Keen, Klein and Melson, restoring sites where crustal thickness has been measured to their initial crestal depths, to show that crustal thickness as well as crustal chemistry correlates with the original water depth at the time of crustal formation.