**Supplementary Data S2 XRF analysis of Gasadalur 1989 borehole samples.**

Because of the time taken in preparing samples for XRF analysis, and the number of samples for analysis, a second suite of techniques was first tried in parallel. These techniques were used and cross correlated on Columbia River Basalt Province samples by Jolley et al, (2008).Concentrations of major elements were determined by XRF at the Open University on fused glass discs manufactured from the fusion of 1 part rock powder (dried at 110˚C) with 5 parts of dried lithium metaborate/tetraborate flux (Johnson Matthey Spectroflux 100B) in Pt-5%Au crucibles at 1100°C. Percentage loss on ignition (LOI) of volatile components (e.g. H2O, CO2 etc.) was determined separately by calculating weight loss after ignition at 1000°C for 1 hour. Analyses were performed using an ARL 8420+ dual goniometer wavelength-dispersive XRF spectrometer employing routine XRF procedures and analytical packages. Elemental intensities were corrected for background and known peak overlap interferences and medium-term instrumental intensity drift was taken into account using a drift normalisation monitor. Large LOI are common in carbon-rich and clay-rich materials. To allow for direct comparison of elemental abundances within the current sample suites, the XRF major element concentrations were re-normalised to 100% on an LOI-free basis.  
Limits of detection (i.e. the smallest signal that can be quantitatively measures) are typically reported at the 6 confidence level (Potts et al., 1987); the LoD for major elements determined using fused beads manufactured from a range of basalt-derived alteration products are, in most instances, calculated as significantly less than 0.05 wt%. Conventionally, ensuring accuracy of XRF analyses is achieved by calibrating the instrument against a suitable range of reference materials. In this case, these reference materials included USGS basalt standards AGV-1, BCR-1 and BHVO-1, and also the laterite standards VL-1 and VL-2 (LaBrecque & Schorin 1987). After calibration, these basalt and laterite standards were then analysed as unknowns, and produced values typically < 0.5% of the recommended values. The precision of XRF major element analysis is extremely high, and can be verified by replicate analyses (Potts et al., 1987). Replicate analyses (n > 20) were performed upon the standard materials and demonstrate that error in reproducibility for major elements is typically less than 0.2 wt%.