

## Interlab comparison of double spike lead isotope ratios for basaltic standards

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Recent advances in lead double spike procedures have significantly improved the precision and accuracy of Pb isotope ratio measurements. We have made a 207Pb-204Pb double spike (SBL74: Southampton-Brest-Lead 207-204) to enable high precision isotopic measurements in a number of laboratories. As well as enabling several laboratories to share and independently calibrate a common double spike, the objectives of this study are to measure Pb isotope ratios of international basaltic standards on a number of different instruments, and to verify previous determinations of NBS981. As with previous work, the spike calibration procedure hinges on a fixed <sup>208</sup>Pb/<sup>206</sup>Pb of 1.00016 for NBS982.

Three independent NBS982 calibrations of the SBL74 double spike all produced Pb isotope ratios for NBS981 that are within error of the Galer (1999), Thirlwall (2000) and Doucelance and Manhès (2001) values. Each of the calibrations of SBL74 resulted in different (~1%) isotopic ratios for the spike, and yet all the calibrations produce the same results for NBS981 on any of the instruments used. All of the calibration values for the spike lie along a "truth" vector in <sup>208</sup>Pb/<sup>206</sup>Pb space and if values are used in the double spike algorithm that deviate slightly from this vector, the results for reference materials are inconsistent. This vector does not correspond to blank mixing, errors relating to measurement of smaller isotopes, or to instrumental fractionation.

We present a comparison of results obtained on thermal and plasma multicollector instruments for NBS981 and basaltic standards such as BCR-2, JB-2, BRR1, and MAPCO-DR11 following double-pass anion exchange purification. We also compare the TI-spiked data with the double spike data for the basaltic standards determined by plasma-source instruments. Double spike Pb data for each of the above basaltic standards determined on the two thermal and one plasma instrument agree within plus or minus 200ppm for <sup>208</sup>Pb/<sup>204</sup>Pb ratios.

### References

- Galer, S.J.G., (1999). *Chem Geol* 157 (3-4), 255-274.  
 Thirlwall, M.F., (2000). *Chem Geol* 163 (1-4), 299-322.  
 Doucelance R. and Manhès G., (2001) *Chem Geol* 176 (1-4), 361-377.

## High-MgO basalts and picrites from the Kerguelen Archipelago: inferences for the composition of the Kerguelen mantle plume

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High-MgO rocks are exceedingly rare on the Kerguelen Archipelago, where the vast majority of basalts average 3-5 wt.% MgO. The flood basalts range in composition from 26-29 Ma tholeiitic-transitional basalts in the northwest to 24-25 Ma mildly alkalic basalts in the southeast. The isotopic compositions of the younger basalts have been interpreted as representative of the Kerguelen plume source because of their extremely radiogenic Pb isotopic compositions (<sup>206</sup>Pb/<sup>204</sup>Pb ~ 18.6), whereas the heterogeneous and relatively depleted older basalts appear to reflect mixing with a depleted mantle component (<sup>206</sup>Pb/<sup>204</sup>Pb < 18.4). We are studying ol-cpx-phyric high-MgO basalts (6-10 wt.% MgO) and picrites (13-17 wt.% MgO) from the Kerguelen Archipelago in an effort to better characterize the composition of the Kerguelen mantle plume.

Geochemical trends in the high-MgO basalts and picrites indicate that they crystallized from mildly alkalic high-MgO basaltic parental magmas (~9-10 % MgO) controlled by ol+cpx segregation and accumulation. In incompatible trace element abundance diagrams, the younger and older Kerguelen Archipelago flood basalts typically form two distinct trends, which reflect differences in extents and depths of melting and parental magma compositions. The trace element systematics in the high-MgO basalts and picrites closely match those of the younger enriched basalts. Their Sr and Nd isotopic compositions are similar with an average <sup>87</sup>Sr/<sup>86</sup>Sr of 0.70521±6 and <sup>143</sup>Nd/<sup>144</sup>Nd of 0.51263±3, which are representative of the Kerguelen plume composition (Weis *et al.*, 2002). Except for one sample, all of the high-MgO basalts and picrites form remarkably linear trends in Pb-Pb isotopic diagrams towards lower ratios (<sup>206</sup>Pb/<sup>204</sup>Pb = 18.3-18.5, <sup>208</sup>Pb/<sup>204</sup>Pb = 38.7-39.2), i.e. less radiogenic compositions than those inferred for the plume. Such strong linear relationships do not reflect small-scale heterogeneities in the plume itself, but are interpreted as reflecting mixing of the enriched Kerguelen plume with depleted material that is the source for basalts of the Southeast Indian Ridge. This study, combined with new Hf isotopic results to be presented, will yield important new insights on plume-ridge interaction processes and the evolution of the Kerguelen mantle plume.

Weis, D. *et al.*, (2002), *G-cubed*.