# Helium Isotope Signatures of Peridotites from Atlantis Bank, Indian Ocean

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Helium isotopic compositions have been measured in clinopyroxene separates from a suite of abyssal peridotites including a harzburgite, a websterite and 6 lherzolites, collected from Atlantis Bank during R/V Kairei KR00-06 cruise in 2000. The Atlantis Bank is an oceanic core complex, flanking the Atlantis II Fracture Zone at 57_E on the Southwest Indian Ridge (SWIR), Indian Ocean. Along the AII Fracture Zone, a massive mantle section is exposed at 32_50'S, between 5000 and 3000 m water depth. The samples were selected from two ROV-Kaiko dive traverses: the uppermost section of Dive 173 and the entire length of Dive174 with intervals of several hundreds meters.

Throughout the sample suite, the range of 3He/4He ratios overlap with that of MORB, falling between 7.9 and 8.5 RA. In two plagioclase-free lherzolite 10K173R02 and R20, 3He/4He ratio were not determined due to their very low helium concentrations (ca. 5x10^-10ccSTP/g). With the exception of these helium-depleted samples, 4He concentrations vary from 3.0x10^-8 to 6.5x10^-7ccSTP/g. Duplicate measurements of clinopyroxenes of lherzolite 10K173R23 show significant variation of 4He content, exceeding a factor 4. Comparison of He released by crushing in vacuo with furnace melting of crushed powders (hereafter powder melting), shows that most of the helium was released by powder melting in the sample. This suggests that helium may not be contained in fluid inclusions, and that helium is heterogeneously distributed, e.g. dissolved in melt inclusions distributed throughout the clinopyroxenes.

For comparison, two young basalts were selected from neighboring localities. Both glass samples have helium isotope signatures close to MORB: 8.69RA. One of the glasses contains 3x10^-5ccSTP/g of 4He, a very high concentration that is almost equivalent to gas-rich 'popping rocks'. The helium isotopic differences between the peridotite/clinopyroxene separates and the related basalts and gabbros are very small. We have found no evidence of the extreme low 3He/4He values (down to 6.2RA) that were recently reported from the western region of SWIR (Georgen et al., EPSL, 2003). These results indicate that an area of 'normal' helium isotope signature found around the Rodriguez T.J. and the SE Indian Ridge, with values greater than 8RA, may extend at least as far as the AII Fracture Zone, in contrast to the low helium isotopic signature from 9_E to 25_E on the western SWIR.