KERGUELEN PLATEAU—BROKEN RIDGE: A MAJOR LIP RELATED TO THE KERGUELEN PLUME. D Weis[1] and F. A. Frey[2], [1]Dépt. Sciences de la Terre et de l'Environnement, CP.160/02, Univ. Libre de Bruxelles, Av. F. D. Roosevelt 50, 1050 Brussels, Belgium (dweis@resulb.ulb.ac.be), [2]EAPS, MIT, Cambridge, MA 02139, USA (fafrey@mit.edu).

The formation of Large Igneous Provinces (LIPs) on the ocean floor may reflect fundamental changes in convective processes within the earth's interior. In turn, the eruption of large magma volumes during a brief time interval has major effects on the terrestrial atmosphere and hydrosphere. The Cretaceous period is characterized by the formation of two giant LIPs: the Kerguelen Plateau-Broken Ridge (KP-BR) and the Ontong-Java Plateau (OJP). The submarine surface exposure of the KP-BR is 2.3 x 10^6 km^2 with a crustal thickness of about 25 km. A hypothesis for the formation of LIPs such as the once contiguous KP-BR in the SE Indian Ocean (fig.) is that they result from the initial "impact" of a mantle plume at the base of the lithosphere. At ~115 Ma, the Kerguelen Plume initiated formation of the KP-BR LIP as a subaerial plateau in a young oceanic basin after continental breakup. This is a very different tectonic setting than that of the Icelandic-North Atlantic LIP or that of the OJP. From ~82 to 38 Ma, the plume generated a 5000 km long hotspot track (Ninetyeast Ridge, NER) followed by ocean island volcanism on the Kerguelen Archipelago and Heard Island from ~40 to 0 Ma, which are superimposed on the northern part of the KP (fig.). This 115 myr volcanic record of the Kerguelen Plume is one of the best long-lived records of plume volcanism; at Hawaii, a hotspot track is present but the LIP is absent, and at the OJP, the LIP is evident but the hotspot track and the present plume location are not obvious. The Kerguelen Plume has a very distinct geochemical signature and carries the Dupal anomaly. The isotopic ratios of lavas erupted over the ~115 myr are consistent with a common yet isotopically heterogeneous source related to the Kerguelen Plume, and the interaction of this enriched plume with various spreading centers in the Indian Ocean. We have recently found significant isotopic heterogeneity in ~30 Ma lavas forming the Kerguelen Archipelago. Sampling of KP basement at 3 sites in the central KP shows that each site (747, 749 and 750) is isotopically distinct but that the range of Sr and Nd isotopic heterogeneity is similar to that found in ~30 Ma lavas of the Kerguelen Archipelago. In contrast, lavas from the Kerguelen Plateau and Kerguelen Archipelago have very different Pb isotopic ratios. Like Indian Ocean MORB, KP lavas range to low $^{206}Pb/^{204}Pb$ (≤17.5). Another important difference between <82 Ma and >85 Ma lavas associated with the Kerguelen Plume is that the >85 Ma basalts from the southern Kerguelen Plateau (Site 738) and eastern Broken Ridge (Dr 8) have distinctive Sr, Nd and Pb isotopic compositions, and trace element abundances indicating the presence of a continental component. At present, interpretations for the origin and changing proportions of source components for KP-BR lavas is hampered because the sampling density over this LIP is too meagre to determine the spatial and temporal variations of these geochemical characteristics. The age range, ~115 to 85 Ma, for lavas from the Kerguelen Plateau has major implications for addressing the question of the flux of magma: it is clear that KP-BR did not form during a single magmatic "burst". The age of the northernmost part of the plateau surrounding the Kerguelen Archipelago is a critical issue for determining the magma production rate vs time as this large 425.000 km^2 area may be coeval with volcanism on the Archipelago. An ODP drilling program consisting of a series of drill sites (fig.) with 200 m basement penetration in the KP-BR will define spatial variations in age and geochemistry of the volcanic basement