A Quantitative Link Between Recycling and Osmium Isotopes
Alexander V. Sobolev,1,2* Albrecht W. Hofmann,2 Gerhard Brügmann,2,3
Valentina G. Batanova,1 Dmitry V. Kuzmin,2,4

F ormation, subduction, and incomplete mixing of oceanic crust produces chemical and isotopic heterogeneity in Earth’s mantle (1, 2). The signature of these processes in the mantle over time and the importance of recycling behavior between recycled (oceanic) crust and mantle. Whereas mantle peridotite invariably contains large proportions of olivine, recycled (eclogitic) crust reacts with the surrounding peridotite and forms an olivine-free hybrid, pyroxenite similar to estimates of present-day oceanic mantle 187Os/188Os = 0.125 (4). The calculated isotopic composition of pyroxenite is 187Os/188Os = 0.140 to 0.155. The analogical correlation based on Mn (Fig. 1B) is consistent with this result, although the scatter is slightly greater. These values can be modeled as 1.1- to 1.8-billion-year-old oceanic crust reacted with present-day oceanic peridotite shortly before final melting (10). The calculated age range for recycled component in Icelandic mantle is consistent with similar age estimates from Pb isotopes (11) and Os and He isotope relationships (6). The obtained isotopic compositions of the peridotitic and pyroxenitic components for Iceland also support independently “olivine-based” estimates of source proportions (9), as well as the qualitative idea of the presence of ancient recycled materials in Icelandic mantle sources (5–7, 11).

References and Notes
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Materials and Methods
Table S1
References
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*To whom correspondence should be addressed. E-mail: sobolev@geokhi.ru