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Nickel isotopes in eclogites: investigating inputs to deep mantle $^{60/58}$Ni heterogeneity

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Nickel stable isotope data for unaltered basalts and peridotite xenoliths have demonstrated a wide range of mantle heterogeneity (-0.19 to +0.36 ‰) [1-6] that is surprising for such a compatible element. Lighter $^{60/58}$Ni values have been associated with indicators of incompatible element and Fe enrichment. Light Ni is also found in some mantle pyroxenites (down to -0.38 ‰) [4]. To explore whether this heterogeneity is related to recycling of ocean floor materials we have studied eclogites, eclogitic serpentinites and metagabbros from SE France-NW Italy, metamorphosed and exhumed during the Alpine orogeny. The only published eclogite $^{60/58}$Ni data [6] average +0.03±0.02 ‰ (2SE, n=7), isotopically lighter than average mantle peridotites ($^{60/58}$Ni = +015±0.02 ‰, 2SE, n=93) [1-4,6]. Many of our new data are similar to these published results. However, examples of Ni rich eclogitic serpentinite are isotopically heavy (+0.25 ‰), whereas some low [Ni] eclogite are very light (-0.18 ‰). The data encompass the range of incompatible trace element, and $^{60/58}$Ni compositions found in N- and E-Type MORB, consistent with the theory that pervasive mantle Ni isotope heterogeneity is created by recycling of subducted materials.

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