

The return of subducted continental crust in Samoan lavas

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H. Fukui, NS seminar on 27 Sept, 2007

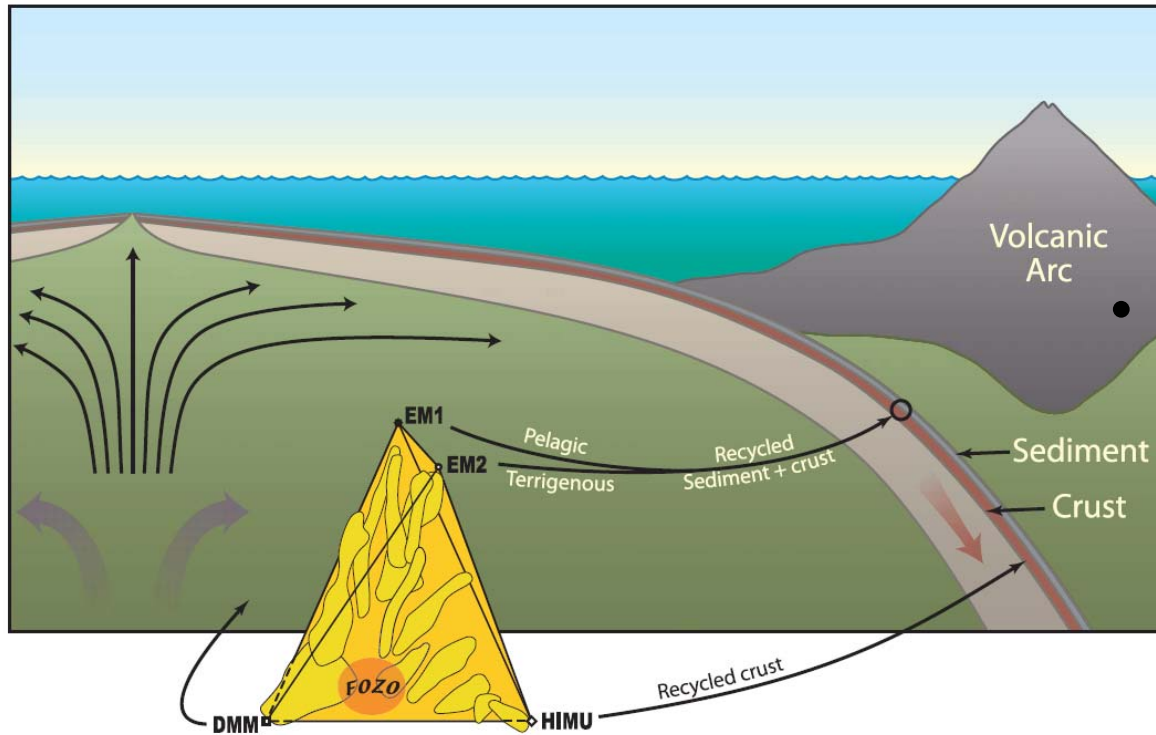
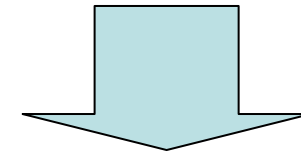


Figure 1. Schematic diagram of the Standard Model for the origin of isotopically defined mantle components. DMM (the Depleted MORB Mantle) is the melt-depleted upper mantle that supplies melts to mid-ocean ridges; HIMU (high U/Pb mantle) is a reservoir derived from recycling and long-term storage (billions of years) of oceanic crust; EM1 and EM2 are derived from recycling and long-term storage of oceanic crust along with pelagic or terrigenous sediment, respectively. Major contributions to the model have been from *Armstrong* [1968], *Chase* [1981], *Hofmann and White* [1982], *Cohen and O'Nions* [1982], *White* [1985], *Zindler and Hart* [1986], *Weaver* [1991], and *Hart et al.* [1992].

Workman et al. (2004)

Substantial quantities of terrigenous sediments are known to enter the mantle at subduction zone.



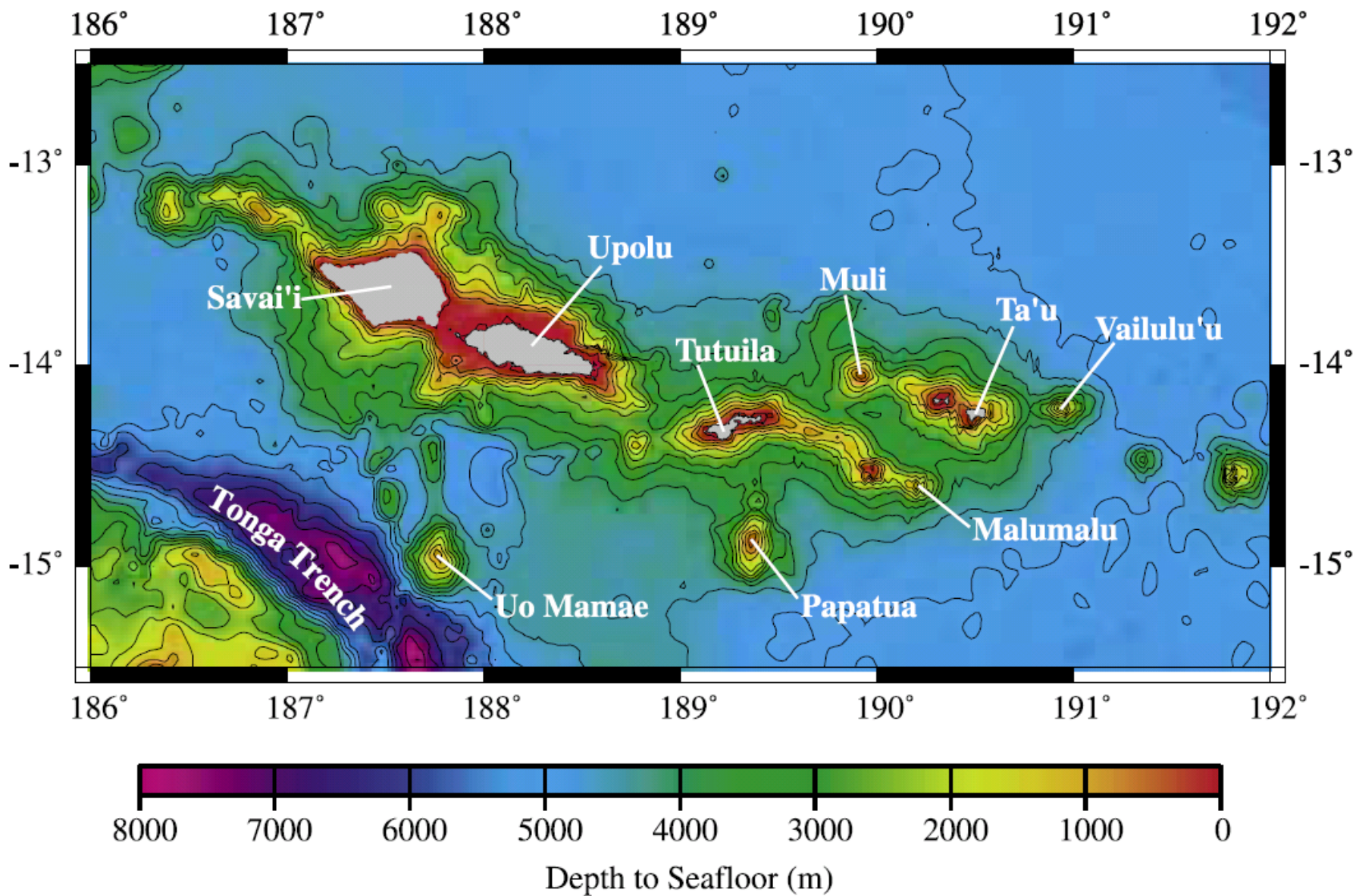
The reason of geochemical heterogeneous mantle found in ocean island basalts from hotspots?

Hypothetical isotropic endmembers

- HIMU (high μ)
 - High $^{238}\text{U}/^{204}\text{Pb}$ value
- EM1 (enriched mantle 1)
 - Sr and Nd rich, lower continental crust component?
- EM2 (enriched mantle 2)
 - Sr and Nd rich, upper continental crust component ?
- DMM (depleted mid-ocean-ridge basalt mantle)
 - Primitive mantle component

Samoan lava

- Track with a classical EM2 pedigree
- Recently, however, the origin of enrichment is questioned (recycled or metasomatized lithosphere?).



Workman et al. (2004)

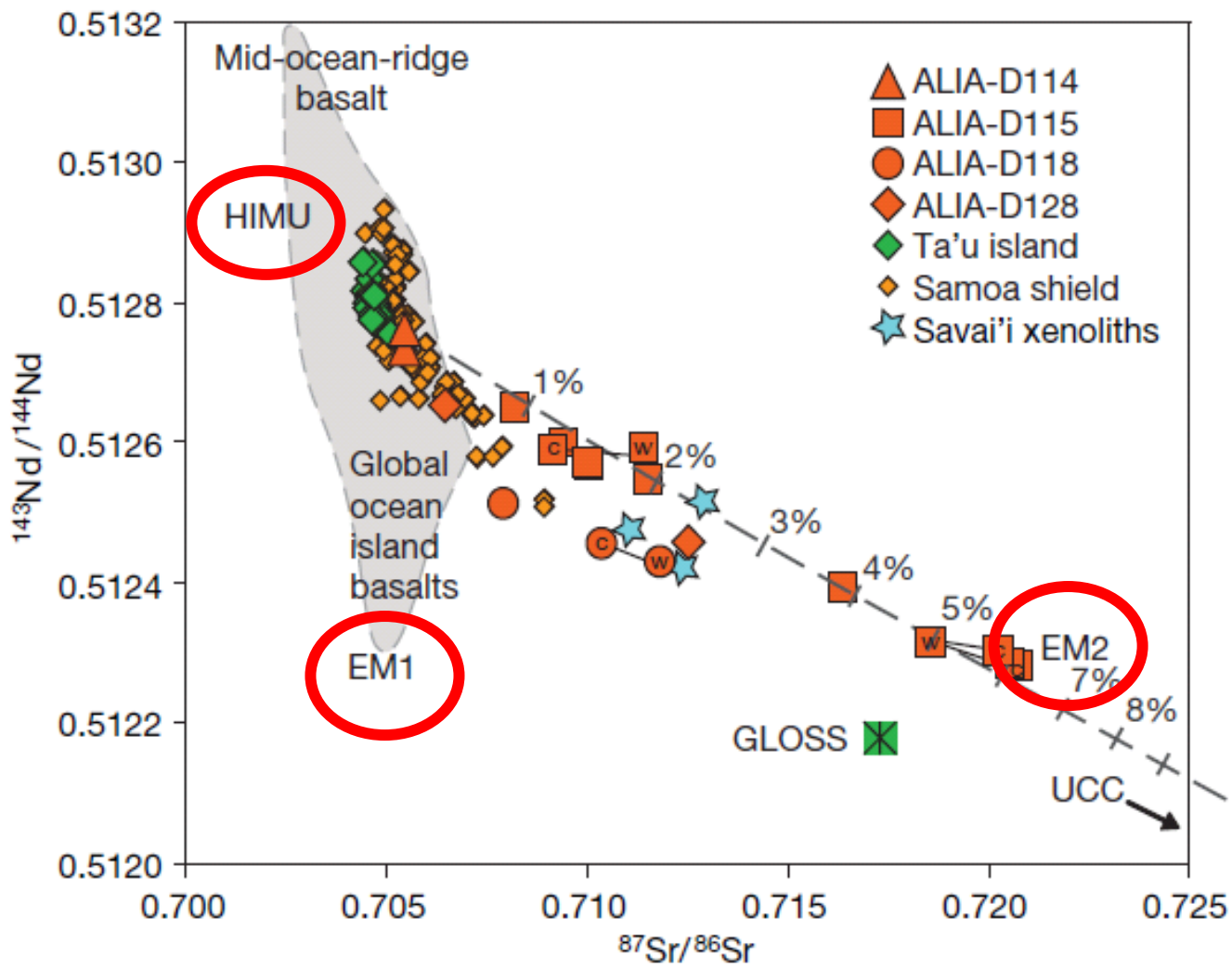
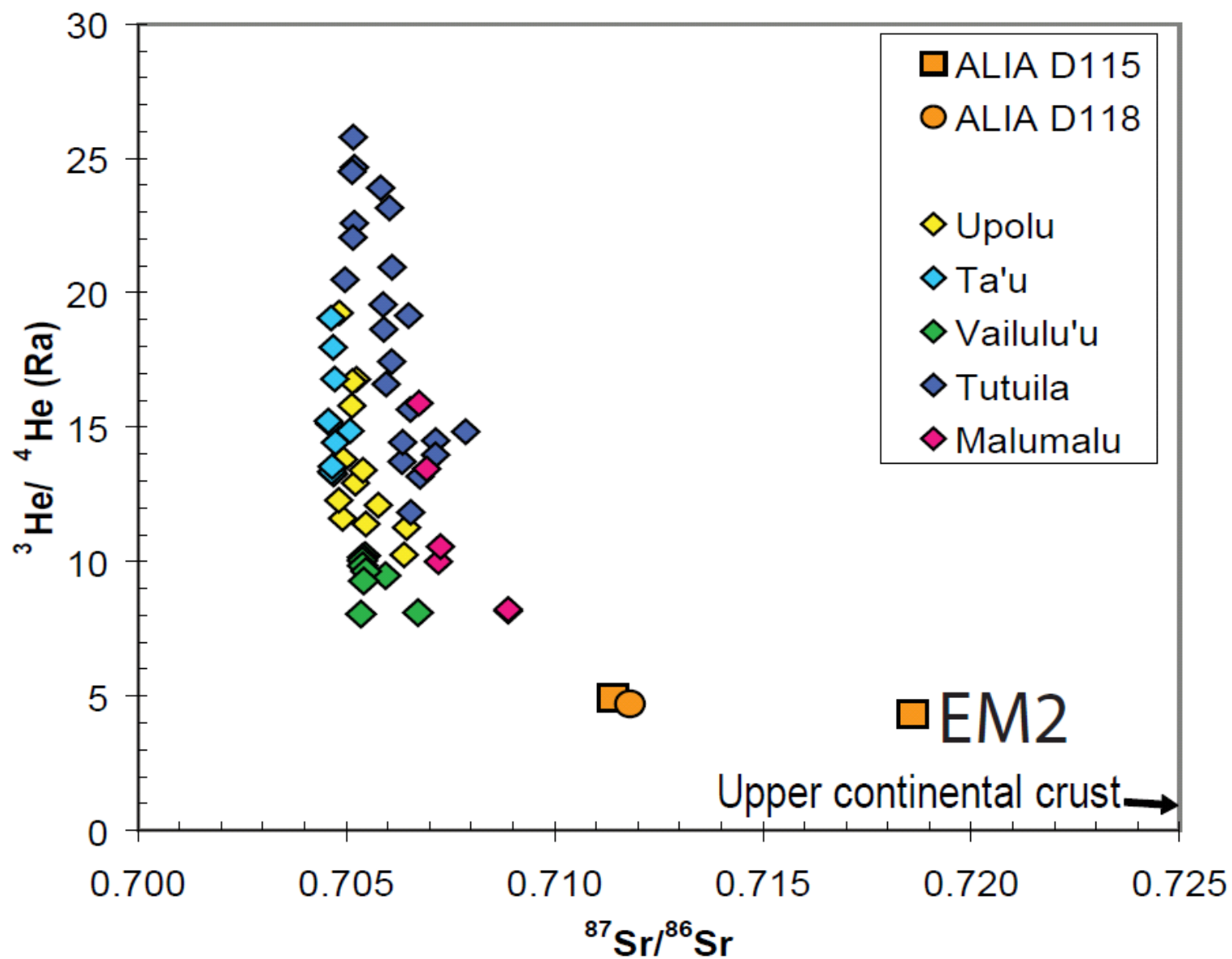


Figure 1



Suppl. Figure 1

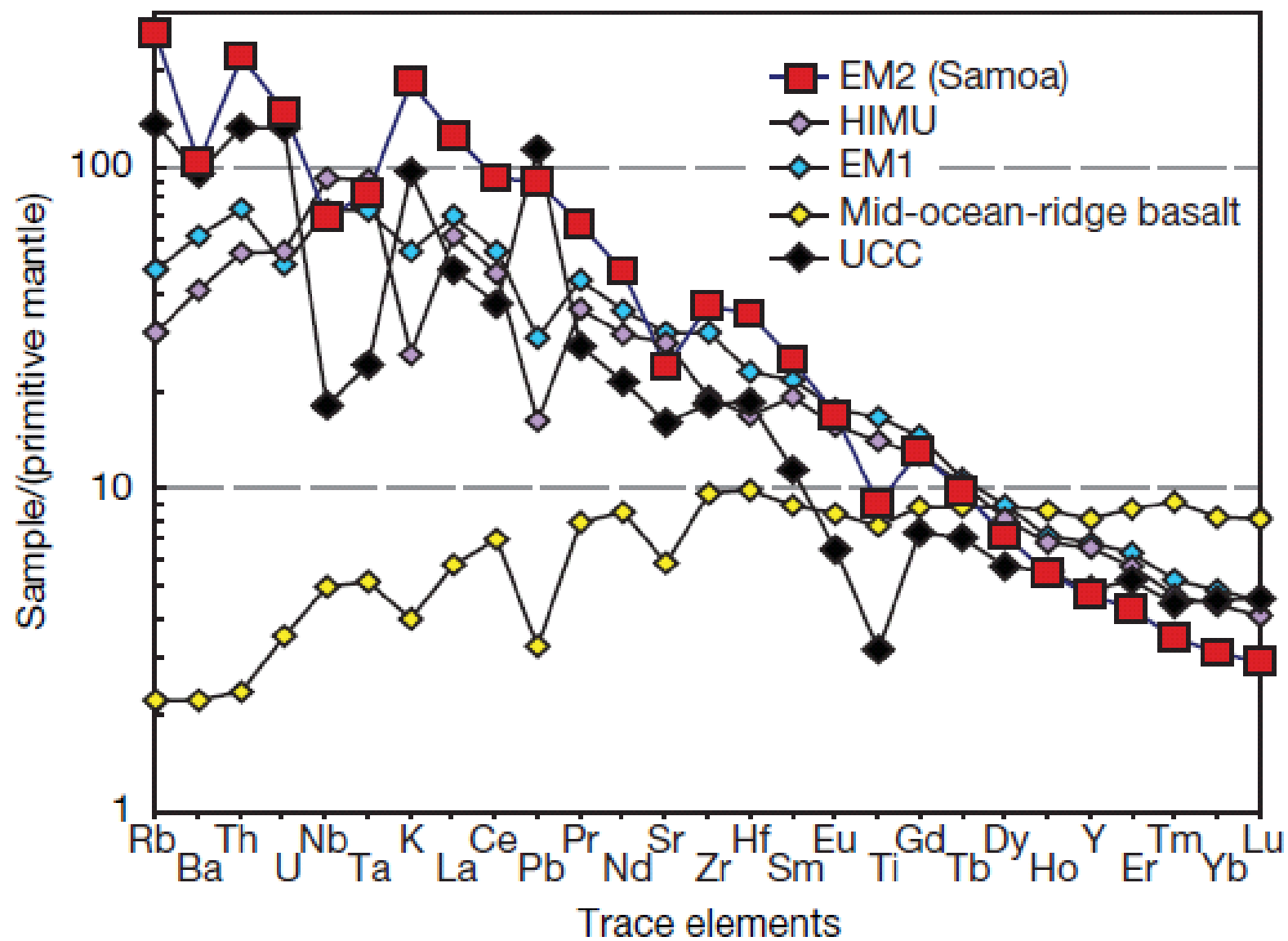


Figure 2

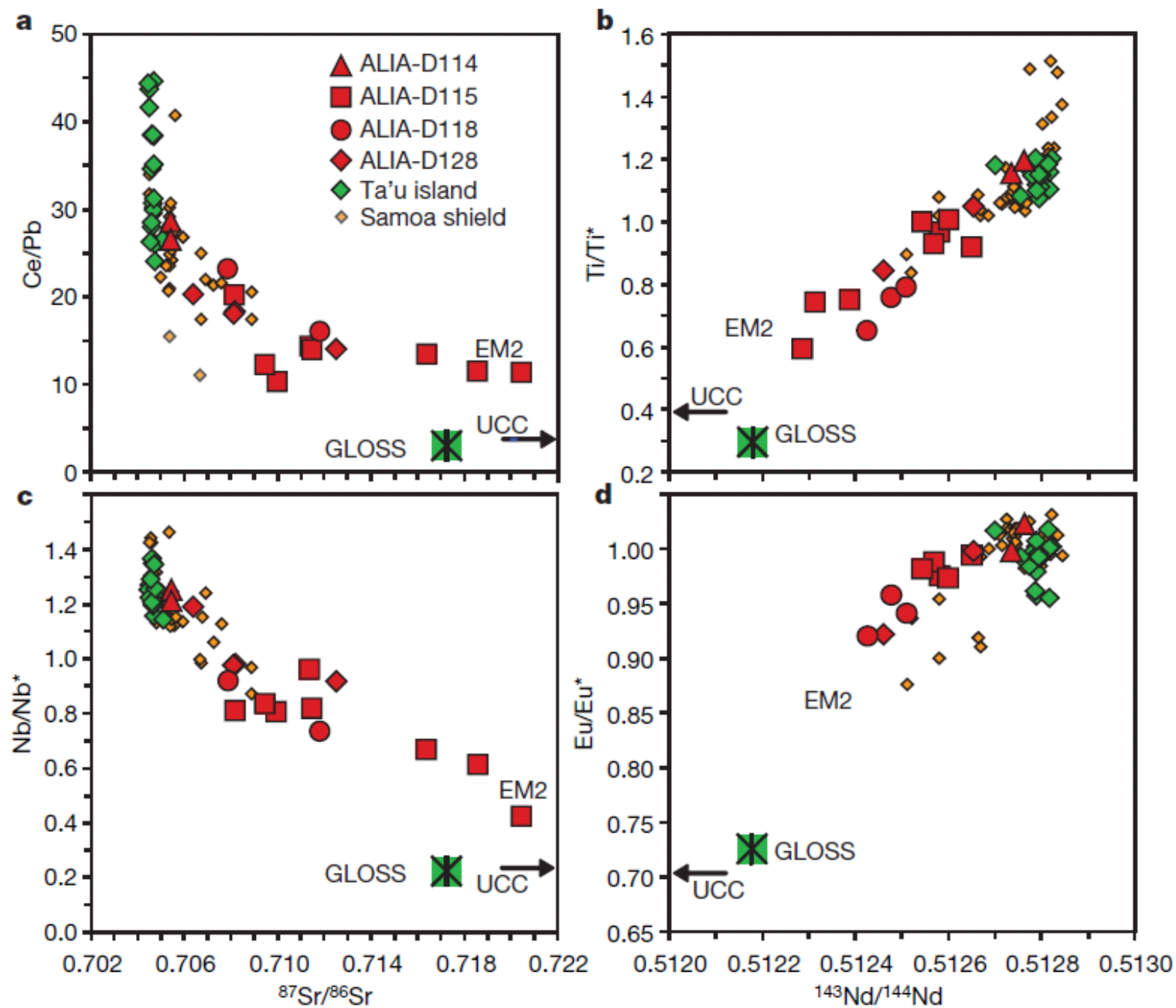
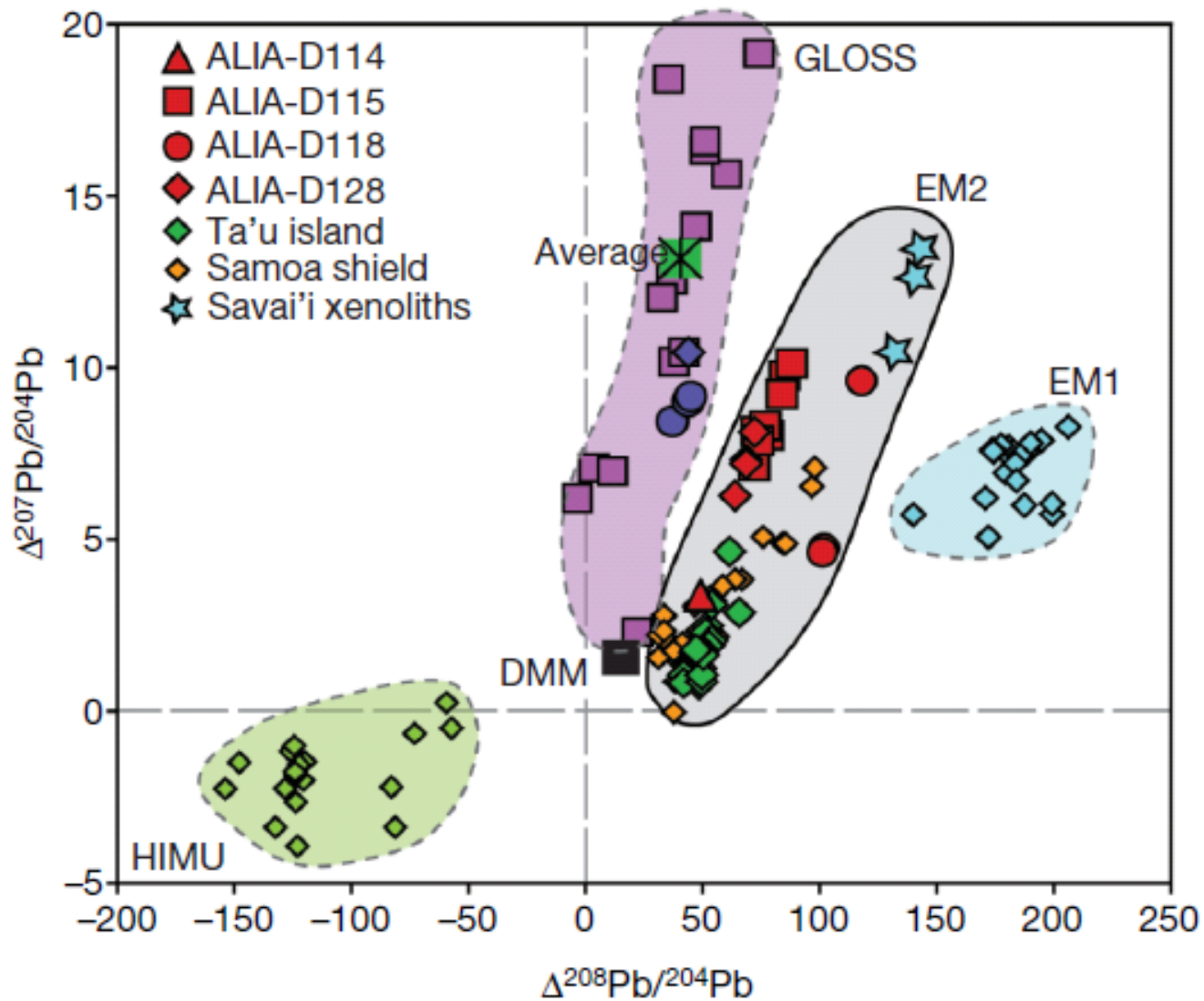


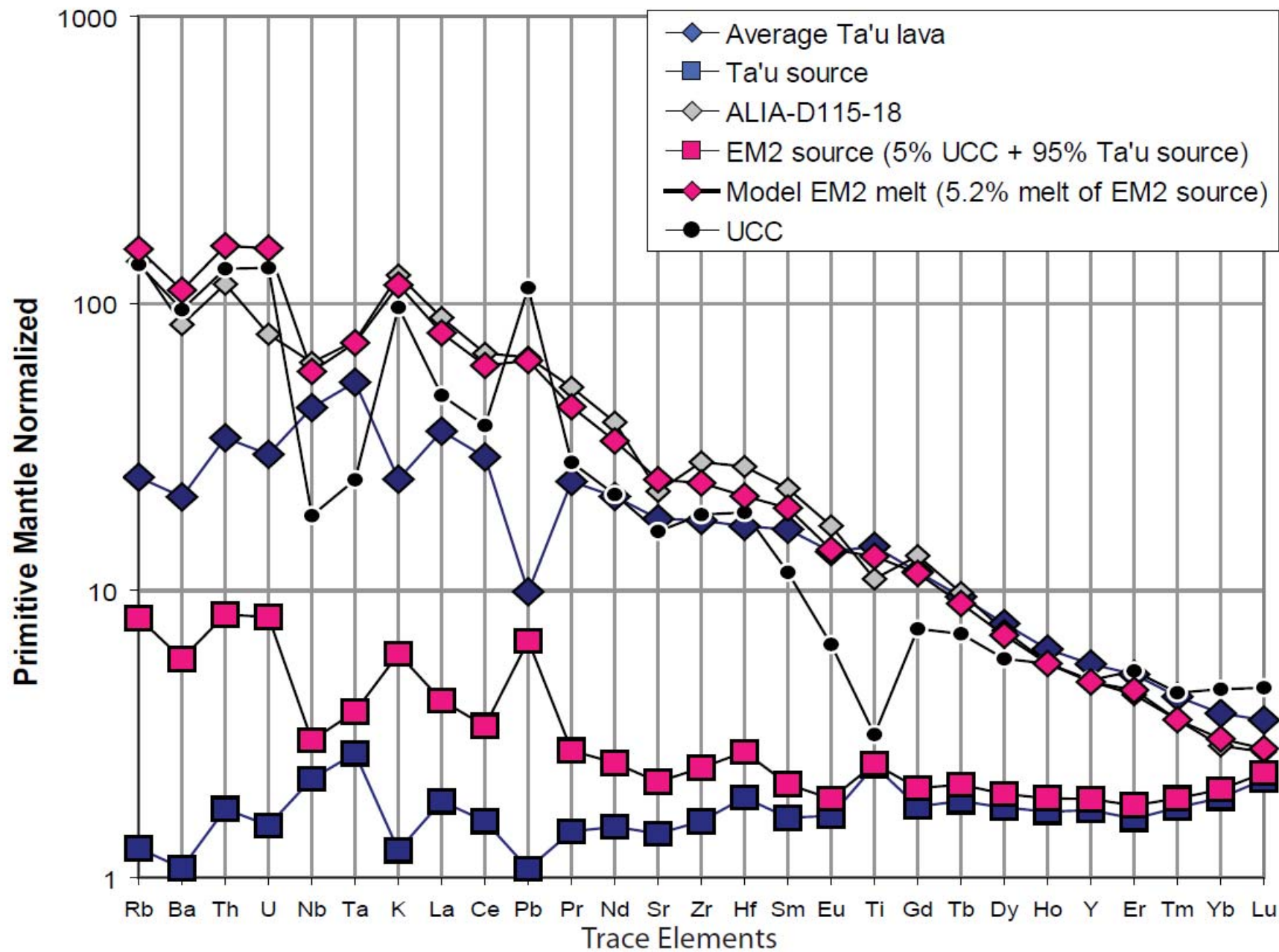
Figure 3



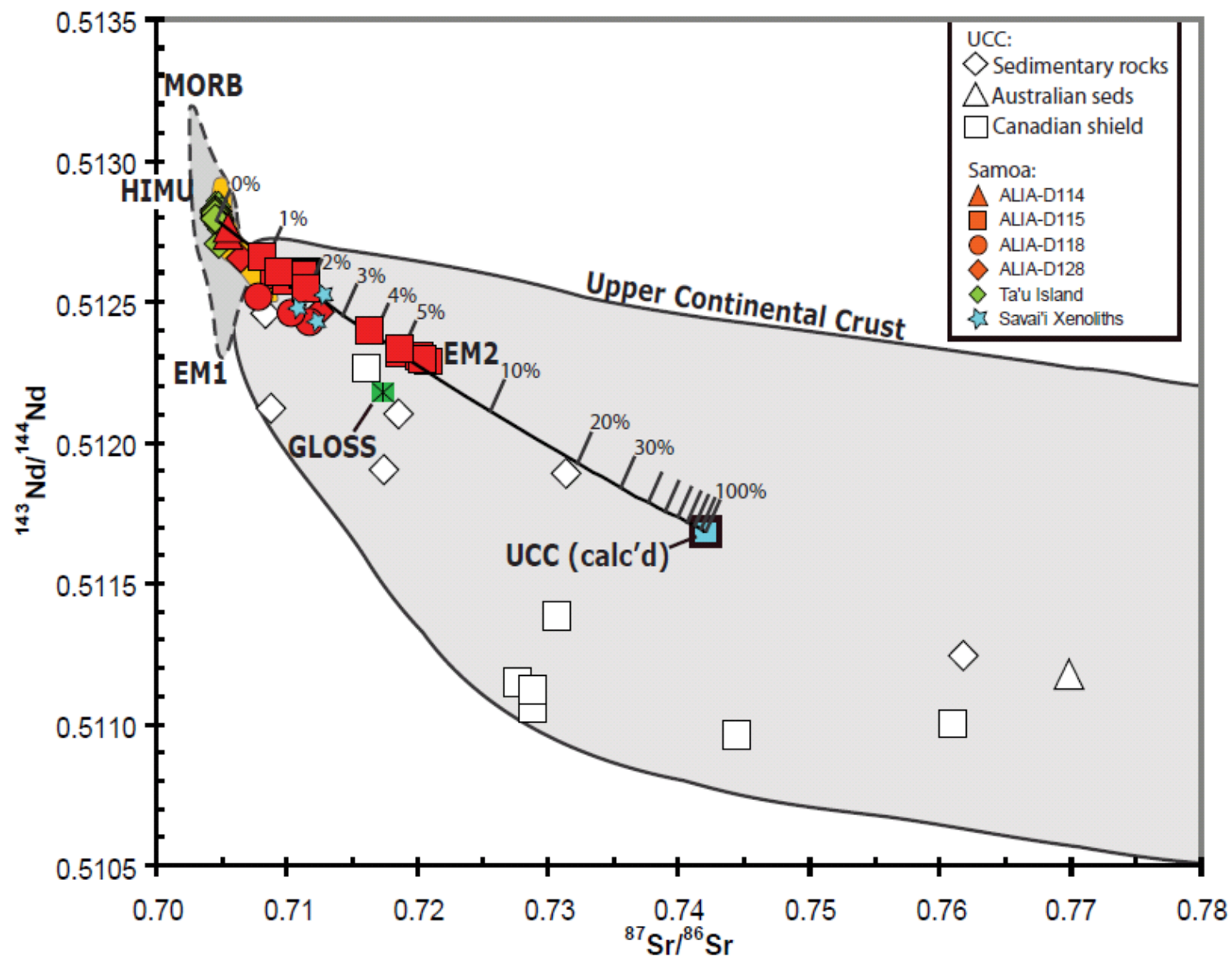
$$\Delta^{20X}\text{Pb}/^{204}\text{Pb} = \left[\left(^{20X}\text{Pb}/^{204}\text{Pb} \right)_{DS} - \left(^{20X}\text{Pb}/^{204}\text{Pb} \right)_{NHRL} \right]$$

Figure 4

DS: Data Set, NHRL: Northern Hemisphere Referenced Line



Suppl. Figure 3



Suppl. Figure 2

Summary

- Samoan lavas consist of recycled sediment with composition of upper continental crust.
- The composition of EM2 has been redefined.
- The portion of the enriched component in mantle is very small. Samoan lava shows an anomalous amount of survived UCC.