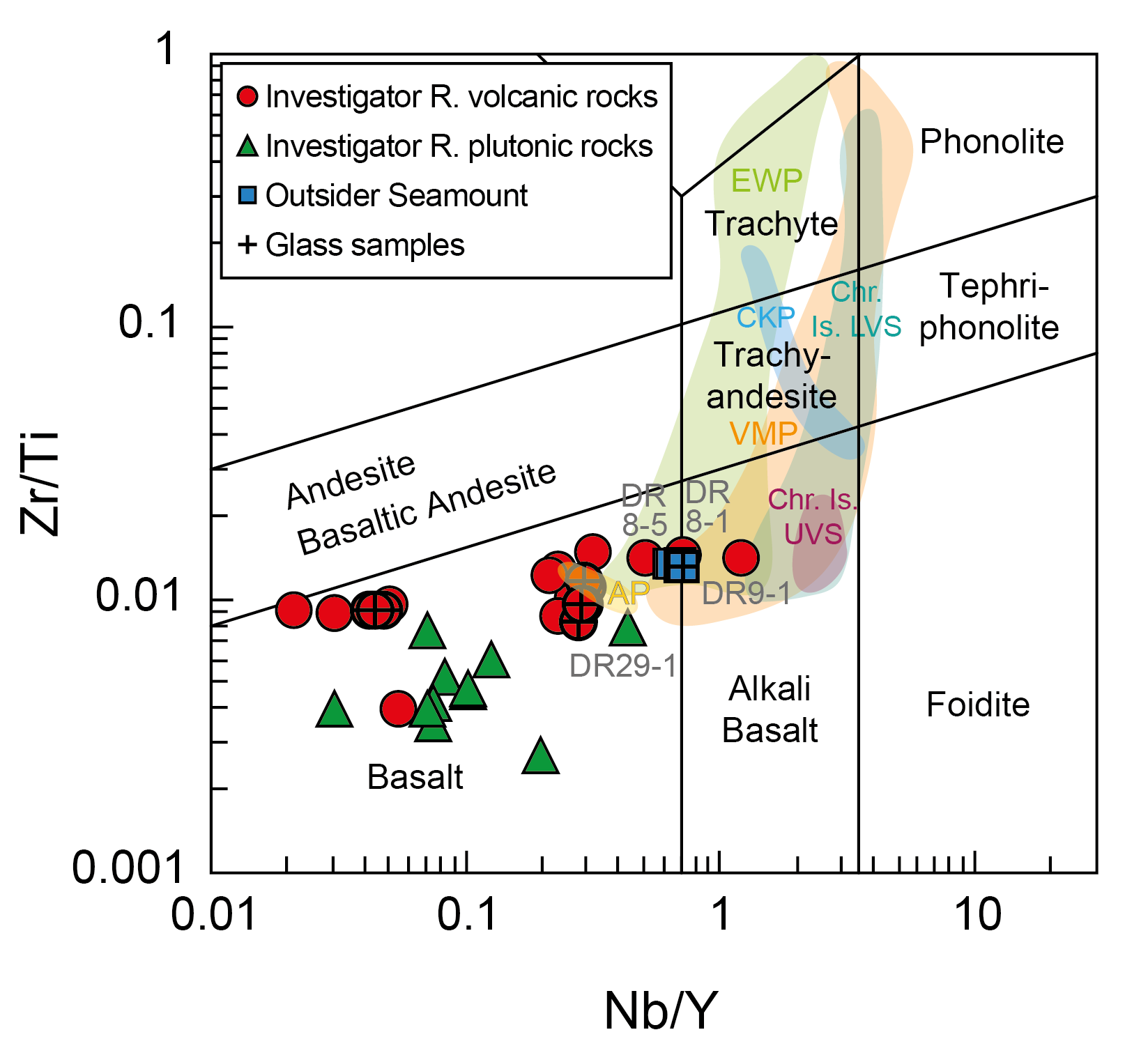
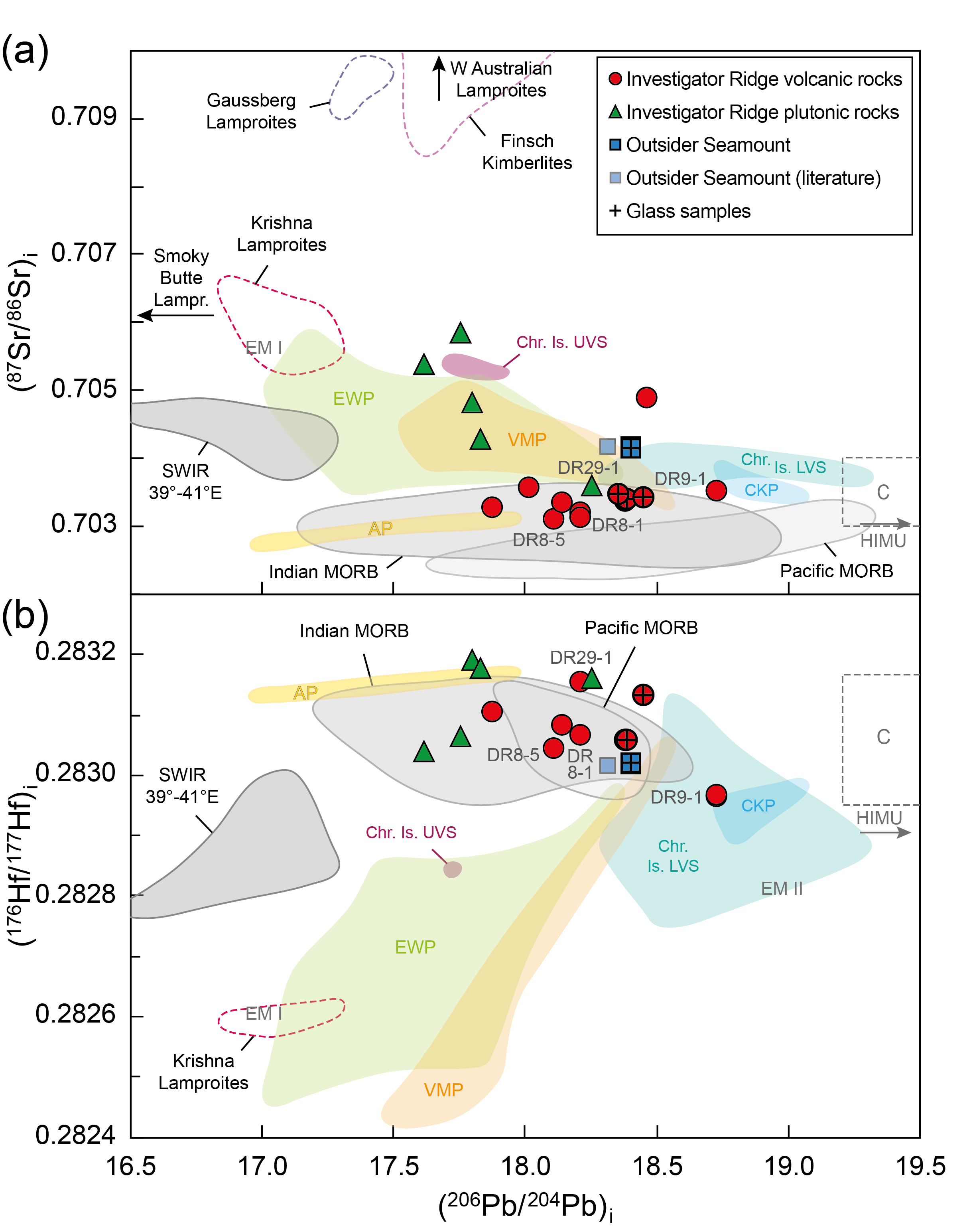
**Supplementary Data 1.**

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| --- | --- |
| Slightly altered, non-vesicular, aphyric basalt fragment. | Rounded clast of slightly altered olivine gabbro. |
| Fairly fresh basalt with filled vesicles. | Coarse, homogeneously textured gabbro. |
| Pillow lava fragment with glassy chilled margin and intra-pillow hyaloclastite attached. | Leucogabbro with feldspar abundance exceeding pyroxene. |

**Fig. 1.** Representative photographs of rocks collected by dredging during cruise SO199 at the Investigator Ridge in the NE Indian Ocean.



**Fig. 2.** Nb/Y versus Zr/Ti classification diagram after Pearce (1996). The volcanic and plutonic rocks from the Investigator Ridge generally plot within the basalt field. However, samples DR8-1 and DR8-5 from the central part of the ridge lie near or on the boundary to the alkali basalt field and overlap with the Eastern Wharton Province (EWP) as well as partly with the Vening-Meinesz Province (VMP), which both belong to the CHRISP. Sample DR9-1 can be classified as alkali basalt and overlaps with the VMP. The Outsider Seamount samples also plot at the transition between the basalt and the alkali basalt fields.



**Fig. 3.** Initial 206Pb/204Pb versus (a) 87Sr/86Sr and (b) 176Hf/177Hf diagrams calculated to an age of 100 Ma. Similar to the radiogenic isotope diagrams in Fig. 6 in the main text, the volcanic samples from the Investigator Ridge form an array between more unradiogenic and more radiogenic (206Pb/204Pb)i ratios mostly within the Indian MORB field. Most of the Investigator Ridge plutonic samples show (206Pb/204Pb)i ratios similar to, or lower than, the more depleted volcanic rocks. Except for sample DR29-1, the plutonic samples have distinctly elevated (87Sr/86Sr)i ratios probably largely caused by seawater alteration, although a magmatic signature cannot be excluded. Rocks from the Outsider Seamount have initial Hf isotope ratios similar to those from the Investigator Ridge samples but show slightly higher initial Sr isotope ratios. Data sources are the same as in Fig. 5 of the main text.