What are the best natural analogues for former subducted oceanic crust?

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Subduction zones are key areas on Earth where a range of processes lead to chemical fractionation of subducted material. One controversial aspect here is the role of major and trace element transport from the downgoing slab by means of H_2O-rich fluids into the forearc mantle. Comparing the oceanic crust before and after subduction allows us to address the importance of this process. However, exposed high pressure rocks come from a variety of different environments and it is therefore important to evaluate exhumation models for these rocks with respect to their use as analogue models for subducting slabs.

Without a doubt their is a large bias between what is going down and what is coming back (e.g. Alpine eclogites are from former incipient ocean basins and not sections from a fully developed oceanic crust). Perhaps the best analogues are high pressure rocks that were subducted oceanic crust transferred to the hanging wall by offscraping and then exhumed rapidly to the surface. The two known exhumation vehicles for scraped off oceanic material are serpentinite mud volcanoes (e.g. Mariana blueschists) and melange zones inside accretionary wedges. Evidence for cooling during exhumation is an ideal indicator for exhumation of oceanic material in an ongoing subduction environment (e.g. hairpin PT path of lawsonite eclogites from Guatemala [1]).

However, rising of mafic and pelitic material in an ultramafic matrix leads to strong chemical gradients driving metasomatic reactions (e.g. chlorite and tourmaline formation in lawsonite eclogites from Turkey [2]). Extraction of the geochemical signals of such rocks at peak metamorphic conditions requires recognition and separatıon of later metasomatic events. Here, texturally controlled in-situ geochemical analysis is obviously the method of choice. Results from Mariana blueschists and lawsonite eclogites from various localities will be shown as examples for such an approach.

References

[1] Tsujimori T., et al. *Lithos*, in press.

[2] Altherr R., et al. (2004) *CMP* **148**, 409-425.