

How are sediments incorporated into lower continental crust? A monazite-based P-T-t investigation of the Ivrea Zone

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The Ivrea-Verbano Zone (IVZ) in northwest Italy is an archetypal section of lower continental crust. Contrary to geochemical-, wavespeed- and heat flow-informed estimates of lower continental crust composition, the IVZ is dominated by metasedimentary rocks that equilibrated at depths between 15 and 28 km [1]. This poses the question: How are sediments incorporated into lower continental crust?

Here, we present the results of a combined phase equilibria and laser ablation split stream inductively coupled plasma mass spectrometry (LASS ICP-MS) study of monazite grains found in amphibolite to granulite facies metapelitic rocks from Val Strona di Omegna, IVZ. Trace element data and U/Th-Pb dates from 5 amphibolite facies metapelites record the Permian to Jurassic history of the region. In this investigation we focus on the pre-300 Ma population of monazite grains, characterized by higher yttrium and heavy rare earth element concentrations than <295 Ma monazite population. We use mass balance constraints and trace element partitioning calculations to couple monazite trace element concentrations with phase equilibria calculations. This approach allows us to place constraints on the prograde P-T-t evolution of the Ivrea Zone and, in doing so, test competing models for its assembly.

[1] Redler et al. (2011) Journal of Metamorphic Geology 30(3) 235–254.