Crustal melting: working with enclaves

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Crustal anatexis, accompanied by melt extraction and ascent of magma to upper crustal levels, constitutes the most important mechanism of geochemical differentiation of the continental crust. Hence knowledge of the mechanisms, as well as of the composition of anatectic melts, is essential for characterizing the internal differentiation of the Earth's crust.

Despite the important role of crustal anatexis in the chemical differentiation of our planet, from a petrological and geochemical point of view there is the strong urge for a better chemical characterization of natural crustal melts.

We aim at characterizing the processes accompanying the anatexis of the continental crust in a world renowned setting where recent volcanic rocks (≈ 1.5 Ma) bring to the Earth's surface abundant and fresh enclaves witnessing crustal make-up in active subduction: Mercaderes in SW Colombia. Like big experimental charges, enclaves and xenoliths offer unaltered snapshots of the deep crustal high-T and high-P conditions, devoid of the post-peak reequilibration processes commonly observed in migmatite terrains.

The candidate will investigate the petrological processes of crustal anatexis in metasedimentary protoliths by a multidisciplinary approach combining 1) petrography and microstructural study of thin sections; 2) mineral chemistry; 3) study of melt and fluid inclusions; 4) thermodynamic modelling of phase equilibria; 5) experimental simulation of melting of selected compositions.

This study will involve fieldwork, microscopy, experimental petrology and lab characterization with integrated methodologies (FEG-based SEM and EMP, LA-ICP-MS, FIB-SEM, Raman spectroscopy, NanoSIMS, SIMS).

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