Intra-oceanic subduction initiation recorded by the metamorphic sole of the New Caledonia ophiolite – preliminary structural and age constraints

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BACKGROUND

The New Caledonia ophiolite formed in a supra-subduction zone setting in the vicinity of an active spreading centre. A metamorphic sole, which represents the ancient subduction interface, is locally preserved beneath the ophiolite. Unravelling its tectono-metamorphic record is essential in order to determine the timing of subduction initiation and the tectonic processes operating at the plate interface during the early stages of subduction.

WHY STUDY METAMORPHIC SOLES?

Metamorphic soles are thin (<500 m), fault-bounded sheets of highly deformed meta-volcanic and meta-sedimentary rocks that structurally underlie many supra-subduction zone ophiolites. They are interpreted to be derived from the top of an oceanic slab that accreted to the base of the still hot overriding plate in the incipient stages of subduction.

Exposures of the metamorphic sole (red stars) are scattered across the island, over an area of 160 km × 50 km. We have sampled and studied amphibole-bearing rocks of the metamorphic sole that crop out in three newly found and three previously known localities.

THE METAMORPHIC SOLE

The metamorphic sole consists of amphibolites, which occur as discontinuous and thin (few meters to few tens meters) local outcrops.

· Petrology and thermodynamic modelling
· Dating of garnet-bearing samples

U-Pb zircon ID-TIMS geochronology

Zircons from the metamorphic sole yield a U-Pb age of 56.7±0.3 Ma. We interpret this age as crystallization of melt segregations within the metamorphic sole. Zircons from two other localities (Poum and Pinjien) yield overlapping ages. The obtained ages date post-peak conditions rather than burial, thereby underestimating the age of sole formation by a yet-unknown amount of time.

Microstructural data show well-developed shape preferred orientations, and symmetric crystallographic preferred orientations for amphibole, plagioclase and clinopyroxene.

NEW CALEDONIA

RESULTS