

U-Th-Pb zircon ages of Early-Middle Devonian metavolcanic rocks in northwestern Patagonia

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Early to late Paleozoic igneous and metamorphic arc-related rocks have been documented in the north Patagonian region. Silurian to Carboniferous igneous and metaigneous rocks are particularly constrained to the northwestern edge between 39° and 43° S, encompassing the pre-Andean basement. The tectonic evolution of this middle-late Paleozoic basement is warmly debated, with diverse model proposals including variations in proto-Pacific plate subduction, island arc accretion, and continent collision (Marcos et al. 2023 and references therein). The main Early-Middle Devonian extensional stage was evidenced, for instance, by the rising juvenile isotopic source signature in igneous rocks (Marcos et al. 2023) and subsequent contractional stage marked mainly by a magmatic gap during the Early Carboniferous (Renda et al. 2021). These changes have been attributed to the transition from the Terra Australis Orogen to the Gondwanide Orogen in the Patagonia region (e.g. Oriolo et al. 2023). In this contribution, we report two new U-Th-Pb zircon crystallization ages of Devonian metaigneous rocks from Cañadón Bonito, northwestern Patagonia, Argentina. The significance of these results concerning the Devonian magmatism evolution is also summarized.

The Cañadón Bonito area is characterized by igneous and metamorphic rocks including schists, amphibolites, metadiorite-metagabbro dikes, orthogneisses, leucocratic dikes, and mylonites. Most of these rocks share the same structural pattern where metamorphic and mylonitic foliations and dikes strike in the NW-SE direction, except for a few randomly oriented leucocratic dikes. Previously, an Early-Middle Devonian U-Th-Pb zircon crystallization age was reported for a metadiorite dike sample (390.5 ± 3.6 Ma; CC66B; Marcos et al. 2023). In this work, we analyzed a schist (CB5) and an amphibolite (CB19C) sample revealing the first Early-Middle Devonian metavolcanic rocks in the extra-Andean Patagonia region.

The schist (CB5) is a medium-grain rock with Bt-Qz-Pl-Ep mineral assemblage and millimetric to micrometric lepidoblastic texture. A few larger and randomly distributed plagioclase crystals are considered relics of volcanic phenocrysts. Zircon crystal ranging from 120 - 350 μm in length, with most of them displaying concentric oscillatory zoning, while a minor group exhibits partial

reabsorption textures. Twenty-two analysis shows a Th/U range of 0.4 to 1.9 compatible with an igneous origin and ages ranging from 390 to 410 Ma, allowing us to obtain an Early Devonian crystallization age (400 ± 3 Ma). A few pre-Devonian inherited zircons were identified, whereas a group of younger zircons could be related to a post-magmatic process such as Devonian-Carboniferous regional metamorphism.

The amphibolite (CB19C) is a medium-grain rock with lepidoblastic-nematoblastic (Bt, Chl, Amp, Ep) and granoblastic (Qz, Pl, Grt) microbands. Garnet and plagioclase are also present as porphyroblast. Zircon crystal ranging from 100 - 225 μm in length, with concentric oscillatory zoning in most crystals, while only a few show slight reabsorption towards their boundaries. Eleven analyses show a Th/U range of 0.7 to 2.06, compatible with an igneous origin and ages ranging from 380 to 405 Ma, allowing us to obtain an Early-Middle Devonian crystallization age (393.6 ± 4.3 Ma).

The new U-Th-Pb zircon ages indicate that Early-Middle Devonian magmatism is not only limited to dikes and granitoids in extra-Andean Patagonia, but also includes metavolcanic rocks such as the schists and amphibolites of Cañadón Bonito. In addition, the crystallization age results fall within the most widespread Devonian magmatism event constrained between 400 and 385 Ma suggesting that this magmatism in Patagonia is an example of a flare-up magmatic event.

References

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