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Boron-rich hydrothermalism marking Early Permian extensional structures of the central Southern Alps, N Italy

Sofia Locchi¹, Robert B. Trumbull², Stefano Zanchetta¹, Marilena Moroni³, and Andrea Zanchi¹

¹University of Milan Bicocca, Earth Science, DISAT, Milan, Italy (s.locchi@campus.unimib.it)

²GFZ German Research Centre for Geosciences, Potsdam, Germany (bobby@gfz-potsdam.de)

³University of Milan Statale, Dipartimento di Scienze della Terra Ardito Desio, Milan, Italy (marilena.moroni@unimi.it)

During the Early Permian, the post-Variscan evolution of the present-day Alpine region was characterized by crustal extension combined with strong magmatic activity at different crustal levels (Schaltegger and Brack, 2007), which finally led to the development of intracontinental extensional basins filled with volcanoclastic sediments (e. g. the Orobic Basin). In the central Southern Alps (cSA) N Italy, the opening of these basins was controlled by low-angle normal faults (LANFs). We investigated several Early Permian faults of the Orobic Basin with emphasis on their original features, as they have exceptionally escaped most of the Alpine deformation (Blom and Passchier, 1997). The identified LANFs of the Orobic Basin are characterized by cataclastic bands sealed with cm to dm thick layers of dark, aphanitic tourmalinites (Zanchi et al., 2019). The tourmalinites formed in response to circulation of boron-rich fluids channelled along Early Permian fault systems related to opening of the Orobic Basin. The tourmalinized faults were first noted in various sites of the cSA during the 1990's: several authors linked them to the uranium mineralization of the Novazza-Val Vedello district (Slack et al., 1996; Cadel et al., 1996; De Capitani et al., 1999), although their genesis has never been fully characterized and the connection with U-ore bodies has also not been deeply investigated so far.

In this work, we further characterize the occurrence and assess the cause of the regional hydrothermalism in the context of intracontinental extension during the Early Permian. Field-based structural analysis are combined with mineral and whole-rock geochemistry, geochronology, microstructural studies and boron- isotopic analysis of tourmalinites from different sectors of the study area, in order to evaluate the origin of hydrothermal fluids. Preliminary results demonstrate a temporal relationship between tourmalinites and Early Permian magmatism in the cSA. Geochemical data on major and trace elements together with B isotope ratios suggest a direct connection between tourmalinites and the U-mineralization at the basement-cover contact and along LANFs within the Orobic Basin.

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