Tectono-stratigraphic, isotopic, and geochronological constraints on the Amora Fault System, central Southern Alps (BG)

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The central Southern Alps (N Italy) preserve stratigraphic evidence of the Early Jurassic rifting related to the opening of the Alpine Tethys, despite its later involvement in the Alpine orogeny. Here, the extensional tectonics produced rapid facies and thickness changes of the Liassic succession, interpreted as syn-rift deposits, documenting a horst and graben architecture postdating a Rhaetian shallow-water homogeneous succession. Despite the identification of several extensional syn-depositional faults bordering structural highs, no geochronological constraints were until now available to confirm the Early Jurassic age of these faults. In this work geochronological constraints obtained by LA-ICP-MS U-Pb dating on syn-tectonic carbonate veins associated with extensional faults are presented for the first time.

Field work (Seriana Valley, N Italy) led to the identification of N-S trending syn-depositional faults, the Amora Fault System, that borders a deep half-graben filled with Lower Jurassic cherty limestones (Moltrasio Limestone). The syn-depositional activity of these faults is documented by stratigraphic evidence, different thickness of the hangingwall and footwall successions, and facies association (such as abundant slump overfolds and mass flow deposits).

In the study area, clear cross-cutting relationships between structures and middle Eocene magmatic bodies document three main tectonic events: 1) the E-W oriented extensional phase; 2) a N-S oriented extensional phase characterized by the emplacement of andesitic dikes; 3) the N-S oriented Alpine compression. The relative age constraints permitted to focus on the E-W extensional phase, related to the opening of the Lombardian basin.

Carbonate syn-tectonic veins and slickenfibers were sampled in the Norian to Lower Jurassic successions, both in the footwall and in the hangingwall of the Amora Fault System.

O-C stable-isotopes analyses and U-Pb dating were performed on 21 samples, based on previous microstructural analyses with transmitted light and cathodoluminescence microscopy. The data revealed the occurrence of several precipitation events, related to polyphasic and chemically heterogeneous fluids circulation. Specifically, it is possible to distinguish two types of fluid circulation events: the first, Early to Middle Jurassic age, with a $\delta^{13}C$ signature buffered by the host-rocks, the second, starting from the Late Cretaceous, with meteoric affinity associated to a negative $\delta^{13}C$ and dedolomitization processes.

Finally, our analyses demonstrate that the Amora Fault System developed in the central Southern Alps in the Early Jurassic and was re-activated during the Alpine compression.