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The Amatrice Fault System (central Apennines, Italy): calcite-rich fluid-flow in intrabasinal extensional faulting

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This work deals with styles and mechanisms of nucleation and development of the Amatrice Fault System (AFS), a regional intrabasinal structure running through the central part of the Amatrice Basin (central Apennines, Italy). The AFS defines a [U+F07E]10 km-long tectonic structure striking NNW-SSE and cross-cutting the late Messinian flysch sequence of the Laga Formation (sandstones and siltstones). The AFS is characterised by the interaction and linkage between structures belonging to a NNW-SSE set (alignment of subparallel fault segments disposed in an en-echelon-like geometry) and to an E-W set (isolated hundred m-long fault segments that interrupt and dislocate the NNW-SSE-striking segments). The occurrence of carbonate mineralisations (in the form of calcite veins and calcite fibres on fault surfaces) along both the NNW-SSE and the E-W sets testifies for fluid flow and fluid-rock interaction during the progress of the intrabasinal faulting. Selected calcite crystallisations were analysed for carbon and oxygen stable isotopes; oxygen isotopes provide evidence of a meteoric water circulation during development of the NNW-SSE-striking and the E-W-striking structures, whereas carbon isotopes of a variable contribution of soil CO_2 to the carbon species in solution in the circulating water. Preliminary geochronological (230Th/234U) dating provide Middle-Upper Pleistocene for the development of calcite-filled veins associated with the E-W-striking fault segments. The multidisciplinary dataset is used to depict the AFS as an outstanding intrabasinal fault system in which tectonic deformation and fluid circulation were active during the Pliocene-Upper Pleistocene evolution of the Amatrice Basin.