

Supplementary material

First in situ calcite U-Pb dating revealing the past episodes of the 2019 Le Teil Earthquake (France)

Première datation U-Pb in situ sur ciments de calcite révélant les épisodes antérieurs au séisme du Teil de 2019 (France)

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SMFigure 1: Location and detailed information on the first conducted exploratory drilling where the 11 November 2019 Mw 4.9 Le Teil earthquake occurred. A. Location of the exploratory drilling on a map extracted from Google Earth (44.5306°N-04.6690°E), B. photograph showing both, the location of the surface rupture and the exploratory drilling 10 m far away from it, and C. Stratigraphic column highlighting the lithologies encountered by the borehole as well as the location of our key and studied samples.

SMFigure 2: Photographs of our representative studied samples EC1 (21 m), EC2 (22 m), EC3 (22,20 m), EC4 (22,50 m) and EC5 (24 m) homogeneously distributed over the ~ 3 meters of core drilling. The diameter of each core sample is 102 mm.

SMFigure 3: A. Microphotograph of sheared stylolithes in samle EC4A. B. Microphotograph showing pervasive pressure solution along with concavo-convex clasts contacts in breccia 2. C. Scan of the entire EC5A thin-section displaying the sheared veins, partially “eaten” by pressure solution and forming an en-

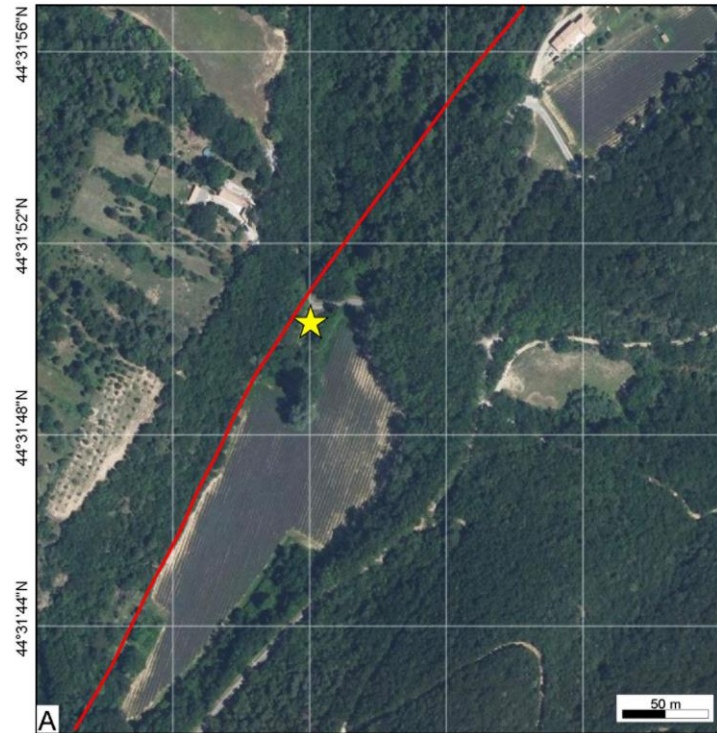
echelon pattern. D. Scan of the entire EC1B thin-section illustrating the 2 phases of brecciation (Br1:breccia 1; BR2:breccia 2), along with the breccia 2 material is injected in newly opened fractures (arrows). Inset: close-up of the compaction/shear bands between the clasts of Breccia 2.

SMFigure 4: A and B. X-ray elements maps for S, Fe, and As of pyrite from EC2 (see location in C). C. BSE SEM large scale image of pyrite crystals from which X-ray elements A and B maps have been done. Also, note in the B inset the location where the compositional profile shown in D has been performed. D. Compositional profiles showing that pyrites from the EC2 sample are heterogeneous and zoned. Quantitative analyses were performed with a CAMECA SX100 EPMA equipped with five WDS spectrometers, GeoResources analytical platform (See SMTable 2 for analytical setting).

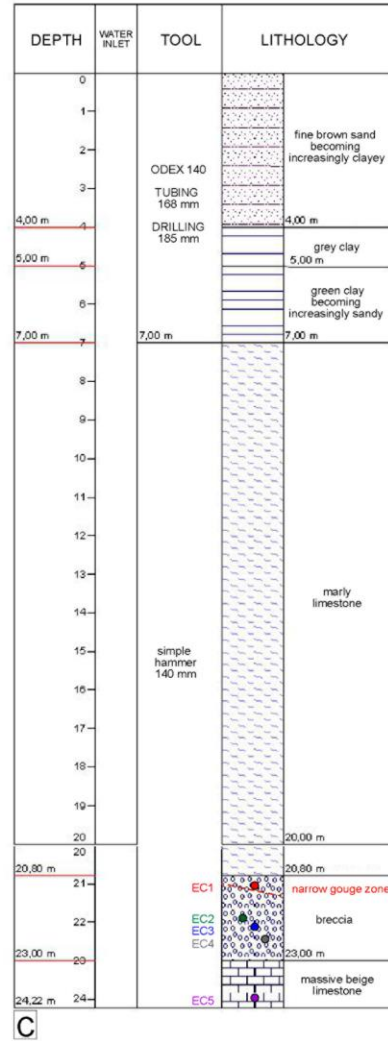
SMFigure 5: A. Microphotograph in reflected light mode of the EC2 sample showing pyrite crystallization (light color) on top of the dog-tooth calcite crystals (dark color) (see location in inset (small blue rectangle) and Figure 3D). Note that pyrite crystals are zoned at their tips. Numbers indicate locations where quantitative analyses have been performed on pyrite crystals (see results in SMTable 2). B. X-ray elements large scale maps for S, Fe, and As of pyrite located in A (pink rectangle) supporting the presence of zoning observed using the optical microscope (A).

SMTable 1: This table includes 1. the Summary of ages, 2. Table SX: The key instrument parameters, 3. Table SY: The Duff Brown Tank limestone (U-Pb age of 64.07 ± 0.67 ; Hill et al., 2016) and the B6 calcite breccia (U-Pb age of 43.0 ± 1.0 Ma; Pagel et al., 2018) standards, and 4. Table SZ: Detailed results.

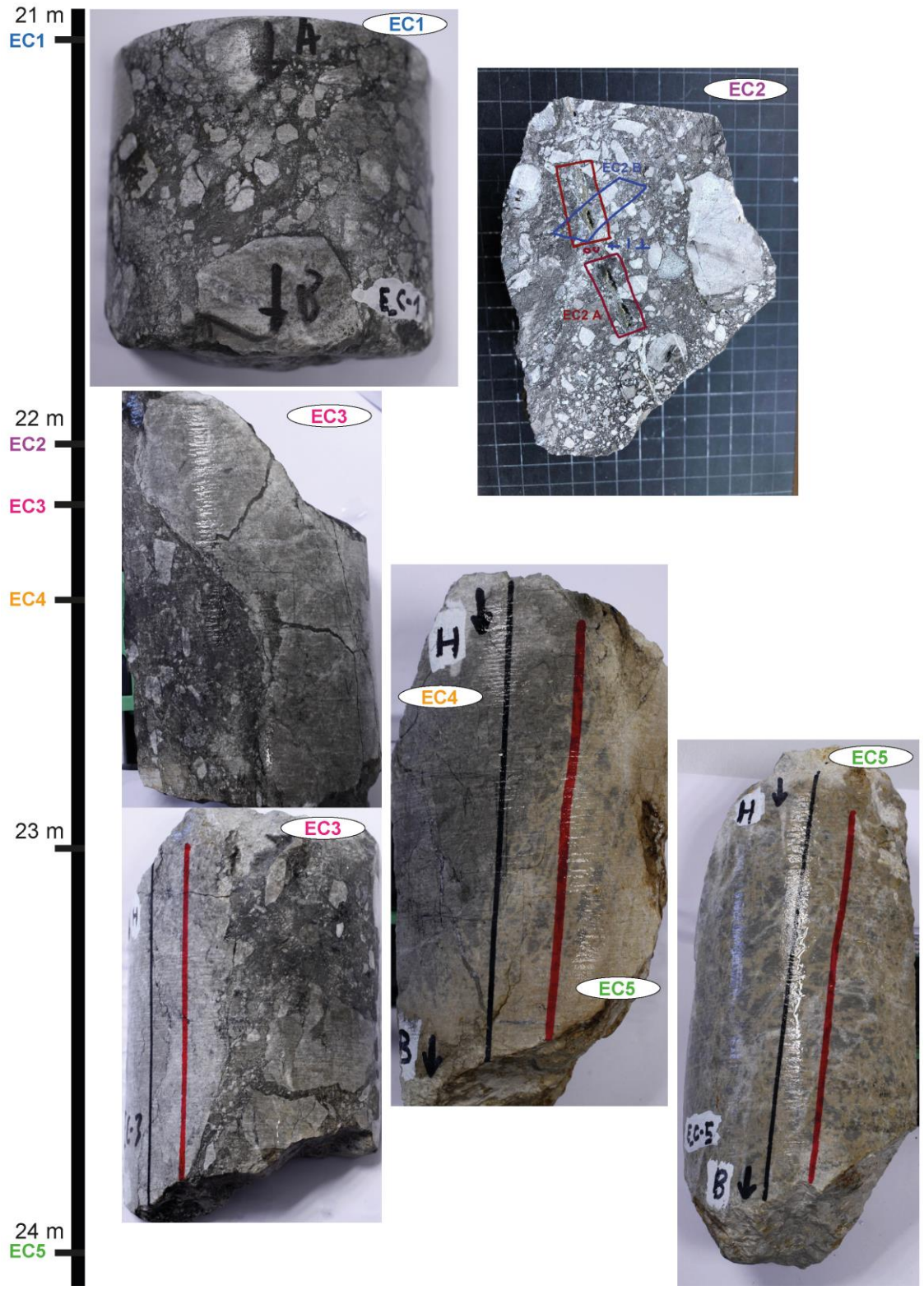
SMTable 2: Analytical setting of quantitative analyses and results from 20 to 28 (see location on SMFigure 3C and associated compositional profiles in SMFigure 3D) and from 1 to 13 (see location in SMFigure 5A).



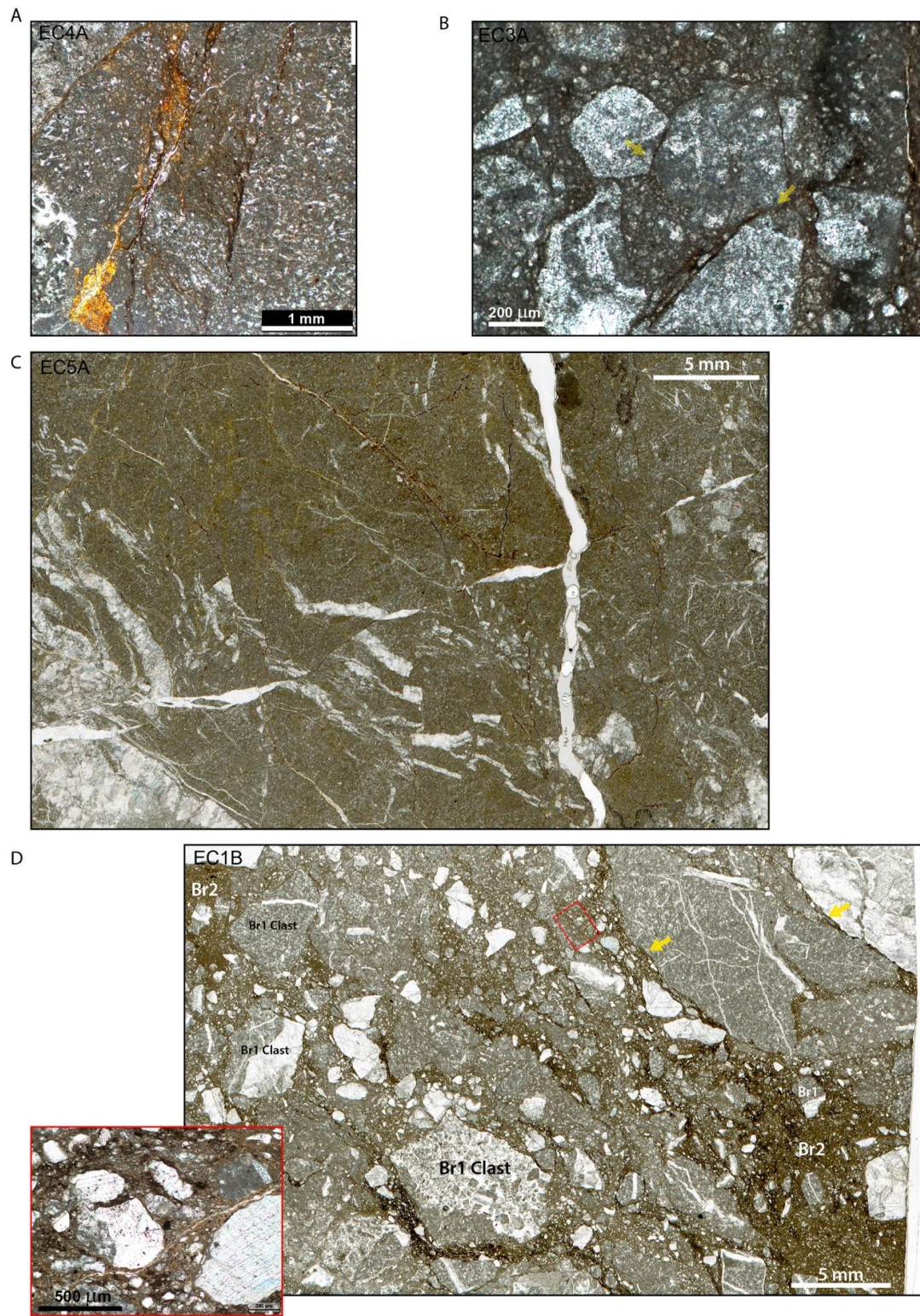
4°40'05"E 4°40'09"E 4°40'12"E 4°40'16"E



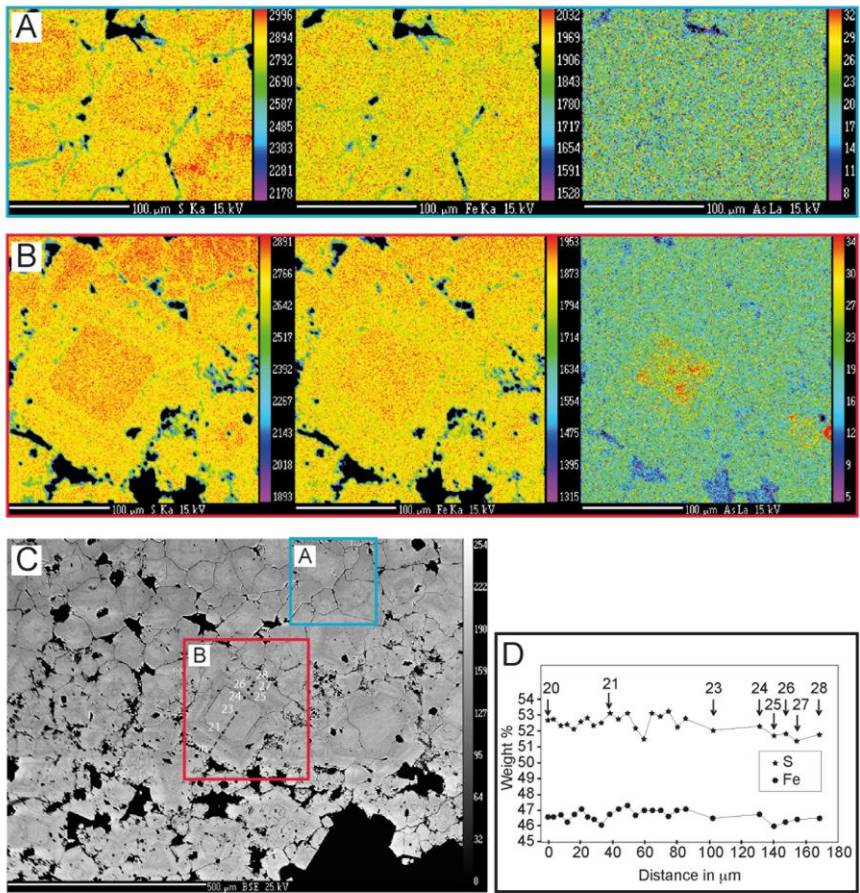
SM fig1



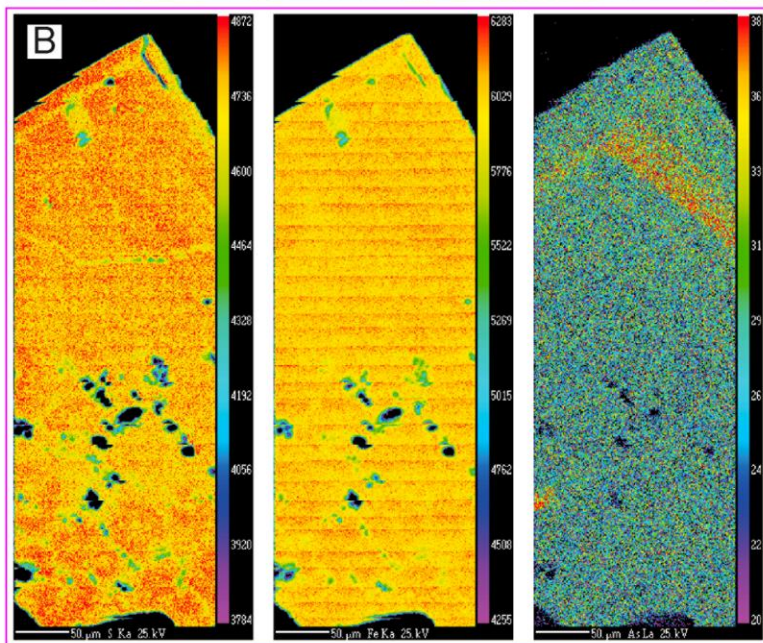
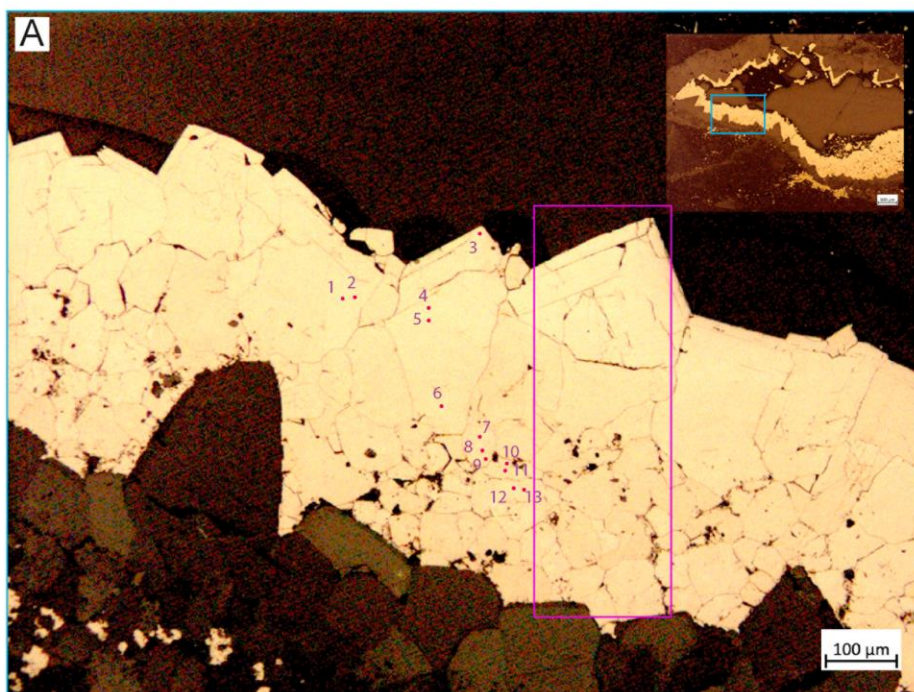
SM Fig2



SM Fig3



SM Fig 4



SM Fig 5