

Cataclastic fragmentation: A prelude to retrograde metamorphism during continental collision

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Plagioclase feldspars in the basement granulites of the Bergen Arcs record a history of seismically-induced fragmentation and subsequent fluid infiltration, rock weakening and shear zone formation associated with the Caledonian orogeny. The evolution of the microstructure has been studied by SEM, EBSD and TEM methods and documents the formation of a “jigsaw-puzzle” texture where individual grains are only minimally misoriented relative to the parent large crystals by a mechanism related to a seismic shock event rather than deformation. Infiltration of calcic solutions along the newly-formed interfaces results in precipitation of zoisite and partial replacement of the plagioclase by a more calcic composition. Subsequent healing of the crystal captures the zoisite needles as inclusions. Within the shear zone the fragmentation allows ductile flow in the feldspars by dissolution-precipitation creep, a deformation mechanism that is strongly grain-size dependent. The microstructures confirm the importance of seismic activity in initiating retrograde metamorphism [1].

1. Austrheim H., Dunkel K.G., Plümper O., Ildefonse B., Liu Y. and Jamtveit B. Fragmentation of wall rock garnets during deep crustal earthquakes. *Science Advances* 2017; 3: e1602067