

EGU21-5681

<https://doi.org/10.5194/egusphere-egu21-5681>

EGU General Assembly 2021

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



Sedimentary breccias formed during extensional tectonics: facies organization and processes

Tarik Kernif, Thierry Nalpas, Sylvie Bourquin, Pierre Gautier, and Marc Poujol

Univ Rennes, CNRS, Géosciences Rennes, UMR 6118, 35000 Rennes, France (tarik.kernif@univ-rennes1.fr)

Sedimentary breccias formed during extensional tectonics are spatially associated with large-throw normal faults. They result from the creation of a steep topography that becomes unstable, producing major rockfalls. The studied breccias, in Crete and in the Pyrenees, are up to 300 meters thick and are characterized by poorly sorted polygenic deposits of pebbles to boulders composed of highly angular plurimillimetric to plurimetric carbonate clasts. A lateral evolution is observed, with pebble-size clasts found near the normal fault and boulder-size clasts away from the fault. This evolution is related to the rockfall process as the total kinetic energy acquired by the small clasts during the fall is lower than that acquired by the bigger ones; as a result, the latter are able to travel farther. Interestingly, the fact that the smallest clasts are proximal while the bigger ones are more distal is contrary to the distribution found in alluvial fan systems, making it possible to differentiate from one another. The studied breccias commonly show disorganized layers and/or no noticeable layering across large distances. We interpret this feature as related to the movement on the normal fault, which progressively tilts the breccia layers and favours their gliding along the slope. Gliding is an important internal process to take into account in rockfall systems because it may disorganize the layering, create specific geometries like onlap around olistoliths, and produce deformation inside the breccia layers; the latter feature could be mistakenly interpreted as resulting from post-deposition regional deformation.

According to our observations, active normal faults with large throws provide the conditions for the formation and preservation of great volumes of sedimentary breccias through the following processes: i) footwall uplift, creating a pronounced topography with steep slopes, giving rise to major rockfalls, ii) hangingwall rapid subsidence, which allows the accumulation and preservation of the breccias without clast reworking by drainage systems. The latter is reinforced by the fact that, during the early stages of extension, the main watersheds point in a direction opposite to the fault slope whereas only small, discontinuously distributed watersheds flow in the direction of the fault slope. Upon ongoing extension, the size of these small watersheds increase. At one point, the sedimentary flow coming from these watersheds becomes more important than rockfall processes. Part of the breccia body is then eroded, reworked, and replaced by conglomerates of an alluvial fan deposited unconformably above the breccias.

Summing up, sedimentary breccias are readily formed as thick syn-tectonic deposits during early stages of extensional basin development. Thus, they may be considered as a typical lithology, and

a marker, of continental extension.