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Spatial and temporal variations of seismicity during the Maurienne swarm (French Alps): short- and long-term migrations and b-value dependence with depth

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We analyse the spatio-temporal variations of the seismicity recorded during the Maurienne swarm. The Maurienne swarm occurred between 2017 and 2018 in the French Alps in the central part of the external crystalline massif of Belledonne. This massif extends for more than 120km in N30 direction, it is bounded to the west by the wide topographic depression of the Isère valley and the Combe de Savoie, and it is crosscut by the Maurienne valley. The location and the 3D shape of the seismic swarm are consistent with an outcropping N80 vertical fault zone. The seismic activity is interpreted as a result of the reactivation of this inherited vertical fault system. The largest event had a magnitude of 3.5.

We used a catalog of 58000 events that were detected using template-matching and relocated with a double-difference method.

We show that the swarm is characterised by short-term (days) and long-term (months) migrations that may be related to the presence of fluids.

We also observe that the b-value decreases with depth and we discuss how this variation may due to shallow fault systems whose geometry differs from the one of the main fault system.

Part of the events occurred when only one station was active. This study shows that, by grouping earthquakes into groups of similar events (clusters), it is possible to study spatio-temporal variations in such conditions.