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Fault anatomy of the La Sarraz strike-slip fault system

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The understanding of the distance to failure (criticality) of the faults in the Alpine foreland is of strategic importance for the development the geothermal resources in Switzerland. Fault evolution involves highly coupled processes leading to a complex anatomy of fault zones. In turn, this complex anatomy will have a leading impact on current fault properties, behavior and stability. Our study is part of a larger joint venture between sisstopo, the Department of Geosciences of the University of Fribourg and the Center for Hydrogeology and Geothermics of the University of Neuchâtel. The project is dedicated to the Stress State, Fault Criticality and Fluids; Bearing on resource development in Switzerland. The main focus of the project is the investigation of an outstanding natural laboratory situated along the La Sarraz fault system in the Molasse basin at the edge of the Jura mountains. This NW-SE oriented right-lateral fault system shows spectacular outcrops in quarries in the Éclépens region (Fig. 1; Mormont quarry of LafargeHolcim). This fault is linked in a conjugate fault setup to the N-S trending sinistral Pontarlier strike-slip fault zone. In an initial phase, our project focusses on a detailed description of the fault anatomy, the overall fault characteristics and an analysis of the observed faults and associated striation.

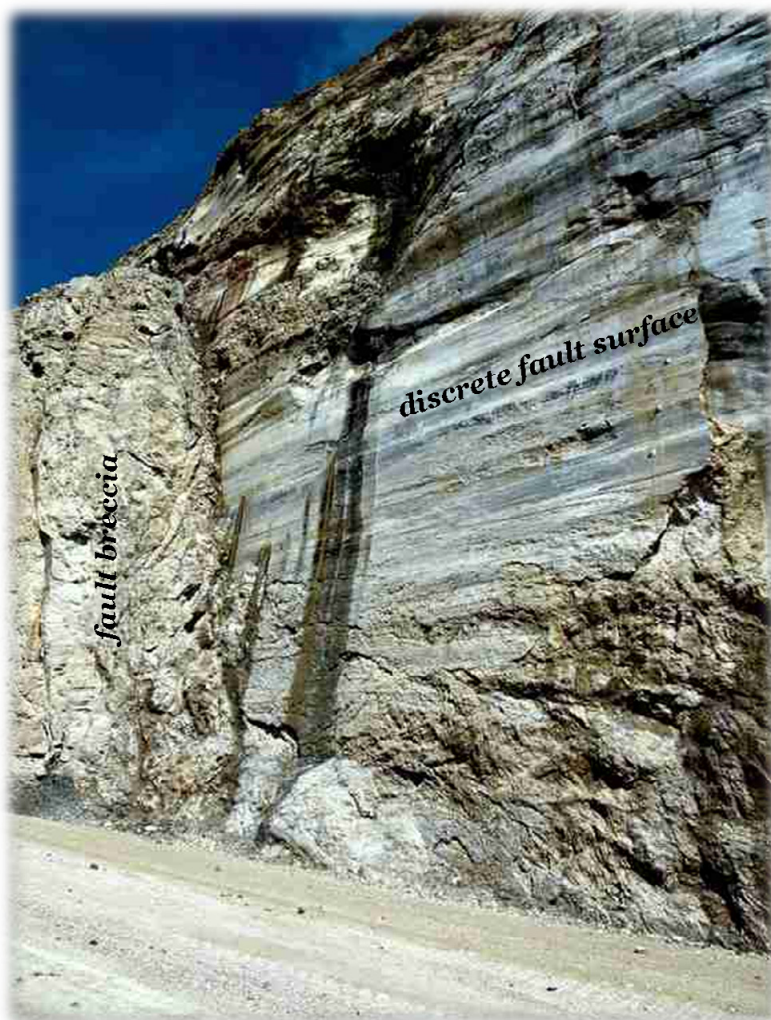


Figure 1. NW (left) – SE (right) oriented section of the La Sarraz fault system outcropping in the La Sarraz-Eclépens quarry. Ondulating distinct fault planes with strongly marked striations and fault damage zone are visible on this picture. Fault has dextral offset.

Our poster shows preliminary results from a fault/striation analysis and a detailed regional mapping of the NW-SE oriented La Sarraz Fault system. The fault is made of two branches isolating limestone series of Cretaceous age that form a topographically elongated ridge. Overall this fault system acts as a Riedel shear system. Towards the Mormont quarry to the E the northern branch evolves into a complex termination with multiple smaller faults, whereas the southern branch crosses the flat alluvial plain to the east of the quarry to cut into the Molasse series to the E (Cridec quarry). The Mormont quarry* itself is located between the two main branches and shows a major fault plane (Fig. 1) oriented almost W-E with a dextral movement. In addition to the large active Mormont quarry several abandoned quarries and good outcrops made it possible to sample abundant information on the faults and striation. This in turn made it possible to determine a local stress field and have insight into the geometrical complexity of the major discrete faults analysed. The major quarry fault show a set of several major decametric-scale discrete undulated fault planes separating zones with fault breccia. Associated are right-lateral faults with an angle of 15° left and right. In addition we can observe several associated fault sets with ENE-WSW; NW-SE and NNE-SSW orientations. The determined stress field in all investigated sites shows a strike-slip regime with a subhorizontal SE-NW compression, subhorizontal NE-SW extension and a vertical intermediate axis.

* The Eclépens site of LafargeHolcim is warmly thanked for giving access to their quarry.