Polished slickensides preserved in the Obir Caves (Austria) close to the Periadriatic Fault System

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We studied polished slickensides, which are perfectly preserved in the Obir Caves (Northern Karavanke Mountains, Austria) situated in the Middle Triassic Wetterstein limestone of the Hochobir massif. The investigated area is located close to the seismogenic ESE-trending Periadriatic Fault System, which is the border between the Eastern and Southern Alps. The polished slickensides observed on a block between two major left-lateral NE-SW trending slickensides record a range of polishing from none to highly-reflective fault surfaces. A classification of the different polishing grades of the fault surfaces inside the cave compared with their spatial orientation shows that there is no relationship between the degree of polishing and fault orientation. Associated cataclastically deformed brittle fault zones and partly polished slickensides at the cave entrance and on the Eastern slope of the Hochobir massif where the fault zone localizes in shattered dolomitic rocks, show similar kinematics and spatial orientation to the faults inside the Obir Caves.

Thin section analysis identified the smooth fault mirror surfaces as principal slip surfaces. Cataclastic grains are truncated along the principal slip surfaces and along secondary Riedel faults. Five different stages of cataclastic deformation can be distinguished: I) Undeformed carbonate host rock. II) Isolated fractures in the host rock with injected ultracataclastic material. III) Dilation cataclasites containing jigsaw breccia. IV) Ultracataclasite with angular-to-rounded host rock fragments and jigsaw breccia. V) Ultracataclasite with isolated clasts and truncated grains close to the mirror surfaces.

The microstructures including polished slickensides, injected cataclasites and truncated grains along principal slip surfaces as well as the geological position close to the seismogenic Periadriatic Fault System suggest that the investigated fault surfaces in the Obir Caves formed during seismic slip.