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Time constraints and fault kinematic evolution of the Periadriatic Fault System along the Meran-Mauls segment (N Italy)

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The Periadriatic Fault System (PFS) is one of the most important tectonic element in the Alps, separating the Europe-verging collisional wedge from the S-verging Southern Alps. The PFS developed in a dextral transpressional regime during the Cenozoic, following the Adria-Europe collision. The area between the Passeier and the Eisack rivers (Meran, NE Italy) is a key area for the understanding of the interactions among the PFS, the Giudicarie Fault and the fault network here active in the middle to late Cenozoic. Here the elsewhere E-W trending PFS rotates to a NE-SW trend, impliying significant changes in the fault kinematics and evolution.

The NE-SW strand of the PFS, known as the Meran-Mauls fault, is connected to the North Giudicarie Fault to the west and to the Pustertal segment of the PFS to the east. A general evolution from the ductile to brittle deformation regime has been recognized on the base of field-based structural analysis and microstructural analysis of fault rocks. Pseudotachylytes occur all along the fault zone, testifying to the seismic activity of the Meran-Mauls fault. ^{40}Ar-^{39}Ar dating of pseudotachylytes provided ages in the 32-22 Ma time interval, indicating that the PFS experienced a prolonged seismic activity during middle Cenozoic times. Several pseudotachylytes veins show a re-activation as cm-thick ductile shear zones, indicating that the plastic-brittle transition was not sharp in time.

Combining the structural analysis of the PFS with other adjacent faults connected in space and time (Passeier fault, Faltleis fault, Val Nova fault and other minor faults) we reconstructed a marked reverse dip-slip kinematics of the Meran-Mauls Fault during a progressive transition across the plastic-brittle regime, followed in time by a dextral transpression. Paleostress reconstructions performed on these faults populations indicate a progressive switch of the main direction of compression from NW-SE to N-S. This switch likely occurred when the Meran-Mauls segment of the PFS definitively passed to a brittle deformation regime.