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Thermally driven accelerated creep of shallow faults

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Within the frame of the European projects DGLab Corinth and 3F-Corinth, fault zone cores from the active Aegion Fault in the Gulf of Corinth in Greece have been collected continuously from depths between 708 to 782 m. At depth 760 m the Aegion Fault was intercepted, dipping at an angle of about 60^o. The heart of the fault is a zone of clay-rich material on a length of about 1 m [2]. This zone is surrounded by a damage zone of highly fractured rock (breccia) and constitutes a natural boundary between a highly pressurized aquifer beneath the fault from a hydrostatic aquifer above it [1]. In this work we analyze the creep movement of a fault zone accounting for the thermo-poro-mechanical behaviour and the boundary conditions of the aforementioned intercepted Aegion fault.

Bernard et al. [1] recently reported that the seismic activity in Aigion fault is usually preceded by creep, accompanied by a fast continuous slip on the deepest part of the detachment zone. On a recent work Veveakis et al. [3] proposed a constitutive model for the thermally driven accelerated creep motion of clay-rich faults prior to the catastrophic thermal pressurization phase [2], where the strength of the fault is reduced significantly. This model is adapted to the Aegion fault, trying to estimate when the creep process will enter the pressurization regime, leading to a) a fast slip on a frictionless surface at the base of the fault, and b) the abrupt increase of the permeability of the highly fractured zone and thus to a pore pressure release from the highly pressurized area to the normally pressurized one.

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