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Combining surface weathering analyses and cosmogenic ^{36}Cl dating on the Pisia fault plane (Eastern Gulf of Corinth) to reveal the Holocene earthquake history

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The deformation of the Corinth rift (Greece) is distributed along several E-W trending active normal faults like the 25-km-long Pisia fault, which experienced up to 110 cm of coseismic displacement during the 1981 Alkyonides earthquake sequence (Mw 6.7). Ages of paleoearthquakes and slip rate estimates of the Pisia fault are not known so far, despite the faults recent strong shaking and its significant destruction that reached until Athens. We mapped the continuous bedrock fault scarp of the central Pisia fault and revealed at least six different weathering stripes, which are interpreted as coseismic slip that stepwise exhumed the Pisia fault plane. The stripes were detected by color changes, lichen colonization, karst features (pitting and solution flute termination), and by the laser backscatter intensity. Their width and thus the amount of coseismic displacement ranges from 50-110 cm suggesting that six to seven paleoearthquakes of Mw 6.5-6.7 have exhumed the lower 5.15 m of the free-face. Forward modeling of 32 ^{36}Cl concentrations indicates that the Pisia fault moved at an average slip rate of 0.7 mm/yr during the Holocene. Modeled ages of individual earthquake events reveal recurrence intervals ranging between 0.2 and 3.1 kyr and a declined tectonic activity from this fault during the past 4.5 kyr. The exposure time in between most events was too narrow to be able to differentiate consecutive events based on cusps in the cosmogenic ^{36}Cl concentrations as there is a rather low local ^{36}Cl production rate (38°N, 625 m a.s.l.). Since such recurrence intervals and earthquake clustering phenomena appear to be quite common on active faults, mapping of independent offset features are often necessary to accurately restore the earthquake history on similarly located bedrock fault planes.