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Distinguishing slow aseismic creep from rapid strike-slip fault movement and palaeostress orientations using the e-twinned calcite crystal fibre lineation

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The Sabz-Pushan active strike-slip fault zone extended from northwest of the Shiraz city to the southeast of Ghir city. This fault zone with length of 220 km along the Zagros Thrust System consists of distorted en echelon pattern of Dehdary fault, Mouk fault, Meymand fault and Nora fault along the Zagros Thrust System. The offset of these segmented faults varies from 5km to 30 km. The main target of detailed structural and microstructural studies are selected along the northwest of the Sabz-Pushan anticline which mainly are composed of dolomite-limestone of Jahrom- Asmari formation farcies. The calcite mineral coatings on the fault plane are forming slip-fibre lineation. The morphology of slip-fibre lineation shows that two movements can be recognized. The earlier L1 slip fibre lineation show plunge and trend of 30˚, N10˚W.The later superposed lineation is normal to the strike of the Sabz-Pushan fault with plunge and trend 30˚, N32˚E. Microscopic examinations of crystal fibres of the fault plane indicate that they are elongated twinned syntaxial fibres which record two phases of deformation. The early phase of deformation is due to slow transport of the mineral constituents to the end of fibres either by diffusion or more probably, through fluid phase in which constituents are dissolved. The growth of slip fibres implies aseismic creep rather than large and rapid displacement earthquake. Later deformation shows typical characteristics of high simple-shear relative to pure shear components. In this stage, e-twins of the calcite fibres were rotated relative to the micro shear zone walls forming S/C fabrics, inclined e-twins and e-twin fish during rapid fault movement.

Measurements of e-twin and c-axis of the fault slip fibres were used to calculate principal maximum (σ_1) and minimum (σ_3) principal stress orientations. Mean of maximum principal stress (σ_1) is N32°E$\pm$12°. This maximum principal stress orientation represents latest main force which activated Sabz-Pushan strike-slip fault. This data is comparable with data from the inversion of focal mechanisms of Sabz-Pushan earthquake.