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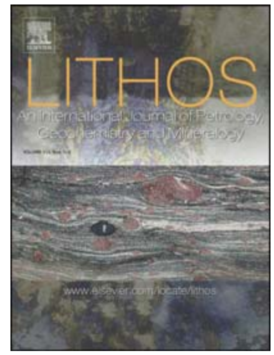

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On the geometric relationship between deformation microstructures in zircon and the kinematic framework of the shear zone

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Abstract

We present novel microstructural analyses of zircon from a variety of strained rocks. For the first time, multiple plastically-deformed zircon crystals were analyzed in a kinematic context of the respective host shear zones. Our aim was to derive how the orientation of zircon grains in a shear zone affects their deformation, based on careful *in situ* observations. For sampling, we selected zircon-bearing rocks that were deformed by simple shear. Samples covered a range of *P–T* conditions and lithologies, including various meta-igneous and meta-sedimentary gneisses.

Microstructural analyses of zircon crystals *in situ* with scanning electron backscatter diffraction mapping shows strong geometrical relationships between orientations of: (i) the long axes of plastically deformed zircon crystals, (ii) the crystallographic orientation of misorientation axes in plastically-deformed zircon crystals and (iii) the foliation and lineation directions of the respective samples. We assume that zircon crystals did not experience post-deformation rigid body rotation, and thus the true geometric link can be observed. The relationships are the following: (a) non-fractured plastically deformed zircon crystals usually have long axes parallel to the mylonitic foliation plane; (b) crystals with <c> axes oriented at an angle >15° to the foliation plane are undeformed or fractured.

Zircon crystals from the case (a) that have <c> axes aligned parallel or normal to the stretching lineation within the foliation plane develop misorientation and rotation axes parallel to the [001] crystallographic direction, with activation of the <100>{010} slip system. Zircon grains with the <c> axis aligned at 30–60° to the lineation within foliation plane often develop either two low-Miller indices misorientation axes or one high-Miller indices misorientation axis. Host phases have a significant influence