



Rapid locking of tectonic magnetic fabrics in weakly deformed mudrocks

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The anisotropy of magnetic susceptibility (AMS) has provided important insights into early deformation conditions in compressive settings through characterization of tectonic fabrics in mudrocks that appear otherwise undeformed. The validity of these insights relies on the assumption that the tectonic fabrics are rapidly locked shortly after sediment deposition. However, the time lag between deposition and the tectonic overprint has yet to be quantified to verify this assumption. Here we present AMS data from Late Holocene sediments cored at Lake Issyk-Kul in the Kyrgyz Tien Shan fold-and-thrust belt. These sediments, in which magnetic fabrics reflect the preferred orientation of phyllosilicates, have typical tectonic magnetic fabrics. The mean orientation of the susceptibility maxima parallels neighbouring active thrust faults and is perpendicular to the geodetically-derived local shortening direction. Our age model for the studied core, which is based on 7 radiocarbon dates, indicates that sediments as young as 25 yr record this clear tectonic fabric, which is demonstrably locked within sediments older than 1180 cal. yr BP. Our demonstration of rapid locking of tectonic fabrics in weakly deformed mudrocks shortly after deposition provides the required validation of their reliability for tectonic studies, and opens new opportunities for providing quantitative insights into the relationship between magnetic ellipsoids, shortening rates, and stress directions in compressive settings.