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Fold age determination in the northeastern United Arab Emirates (U.A.E.) using K-Ar illite age analysis

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Recent advances in direct age-dating methods of deformation structures make it possible to provide formation/reactivation ages of faulting and folding that can help to understand the overlapped polyphase and diachronous orogenies. In this study, we propose a K-Ar illite age analysis method that can be used to date the folding event in the northeastern U.A.E.

During folding by flexural slip, gouges (clays) can be formed along the bedding plane. The most common radiogenic potassium bearing mineral growing at this relatively low temperature "brittle" condition is illite. Thus, we have adopted a recently developed K-Ar illite-age-analysis (IAA) to determine the absolute age of folding. It can be determined by a combined approach of the optimized illite-polytype quantification using full-pattern fitting with WILDFIRE[U+24D2] simulated pattern and the conventional K-Ar dating of arbitrarily determined illite fractions separated from the clays. K-Ar age dating was conducted by measuring the total K and radiogenic 40Ar at the Okayama University of Science.

To unravel the evolution of foreland anticline in the Jebel Hafeet area, northeastern U.A.E., four size fractions (<0.1, 0.1-0.4, 0.4-1.0 and 1.0-2.0 μm) were separated for optimized illite quantification and K-Ar dating. A linear regression analysis of these results reveals the Neogene age of the authigenic 1Md illite that are comparable with Miocene to Pliocene deformation event reported from relative timings based on cross-cutting relationships between sedimentary strata and structure developments. This results clearly suggests the possibility of obtaining the age of folding event through a K-Ar illite-age-analysis utilized in this study, and will further indicate that the direct age-dating of deformation structures will advance our understanding on the evolution of the northeastern U.A.E. as well as worldwide fold-thrust belt in general.