Geophysical Research Abstracts
Vol. 18, EGU2016-9203-1, 2016
EGU General Assembly 2016

The inverse microconglomerate test: Definition and application to the preservation of Paleoarchean to Hadean magnetizations in metasediments of the Jack Hills, Western Australia

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We introduce a new paleomagnetic field test, the inverse microconglomerate test. In contrast with traditional conglomerate tests, which target specimens that might preserve primary magnetizations, the inverse microconglomerate test focuses on magnetic carriers having unblocking temperatures less than peak metamorphic temperatures. These mineral carriers are expected to carry a consistent direction of remagnetization. Hence, the inverse microconglomerate test evaluates whether coherent magnetizations are retained on a grain/mineral scale in a given sedimentary rock sample. By defining the remagnetization direction, it also serves as a benchmark for comparison of magnetizations from other grains/minerals having unblocking temperatures higher than peak metamorphic conditions (i.e., potential primary magnetizations). We apply this new test to sediments of the Jack Hills (JH), Yilgarn craton, Western Australia. For the JH sediments we focus on fuchsite, a secondary Cr-mica that contains relict Cr-Fe spinels capable of recording remanent magnetizations. We find that JH fuchsite grains retain consistent magnetic directions at unblocking temperatures between ~270 and 340 ^{o}C, which defines a positive test. This direction does not reproduce a nominal 1078-1070 Ma remagnetization reported by Weiss et al. (*EPSL*, 2015) that we interpret as an artifact of inappropriate use of averaging and statistics. The thermochemical remanent magnetization recorded by the fuchsite was most likely imparted during peak JH metamorphic conditions at ~2650 Ma. Our inverse microconglomerate test complements a positive microconglomerate test and large scale positive conglomerate test conducted on JH cobbles (Tarduno and Cottrell, *EPSL*, 2013), further supporting evidence that JH zircons record Paleoarchean to Hadean primary magnetizations at high (greater than 550 ^{o}C) unblocking temperatures (Tarduno et al., *Science*, 2015). More generally, the new inverse microconglomerate test may aid in understanding the timing of peak metamorphism and deformation in complex terrains that have undergone multiple episodes of folding.