Geophysical Research Abstracts
Vol. 18, EGU2016-14727, 2016
EGU General Assembly 2016

Removing the effects of metamorphism from the Neoproterozoic carbon isotope record: a case study on Islay, western Scotland

Alasdair Skelton
Stockholm University, Geology and Geochemistry, Stockholm, Sweden (alasdair.skelton@geo.su.se)

The Port Askaig Formation on Islay, western Scotland is the first discovered tillite (glacial sediment) of Neoproterozoic age. This formation is sandwiched between carbonate rocks which preserve an extreme negative carbon isotope excursion. This so called "Islay anomaly" has been correlated with other such anomalies worldwide and together with the tillites has been cited as evidence of major (worldwide) glaciation events. During subsequent mountain building, this carbonate-tillite- carbonate sequence has been folded, producing a major en-echelon anticlinal fold system. Folding was accompanied by metamorphism at greenschist facies conditions which was, in turn, accompanied by metamorphic fluid flow. Mapping of the δ^{18}O and δ^{13}C values of these carbonate rocks reveals that metamorphic fluids were channelled through the axial region of the anticlinal fold. The metamorphic fluid was found to have a highly negative δ^{13}C value, which was found to be in equilibrium with metamorphosed graphitic mudstones beneath the carbonate-tillite-carbonate sequence. Devolatilisation of these mudstones is therefore a likely source of this metamorphic fluid. Removal of the effects of metamorphic fluid flow on δ^{13}C values recorded by metamorphosed carbonate rocks on Islay allows us to re-evaluate the isotopic evidence used to reconstruct Neoproterozoic climate. We are able to show that extreme negative δ^{13}C values can partly be attributed to metamorphic fluid flow.