Geophysical Research Abstracts
Vol. 16, EGU2014-6431-1, 2014
EGU General Assembly 2014

Neoproterozoic to Palaeozoic assembly, dismemberment and assembly of Peri-Gondwana -recorded in (East Avalonian) Anglesey (Ynys Môn), NW Wales, UK

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Late Neoproterozoic accretion at the outboard margin of East Avalonian Gondwana is recorded on Anglesey in ca. 650 Ma metamorphism in the Coedana Complex and the ca. 615 Ma supra-subduction zone Coedana Granite. Iapetan extension fragmented that assembly, crustal thinning is recorded in Anglesey by ca. 560 Ma exhumation of the Penmynydd Zone blueschists. Anglesey's present architecture is however largely a product of accretionary collisions that commenced in the Early Ordovician when coaxial to intensely non-coaxial deformation assembled those Late Neoproterozoic rocks with the Middle Cambrian (to earliest? Ordovician) Monian Supergroup greenschist facies metasediments.

In western Anglesey, the Monian Supergroup rocks record NW-facing coaxial D1 deformation sheared by SE-vergent, strongly non-coaxial, D2/D3 strain after an intervening episode of mafic magmatism. In northern Anglesey, Monian Supergroup rocks record only SE-facing deformation from the onset of collision. Deformed ocean floor and slices of garnetiferous basement gneiss are located between these structurally distinct regions and imply separation of these Monian tracts prior to earliest-Arenig? onset of Caledonian collision and accretion. This deformation is contemporaneous with Penobscottian accretion in the northern Appalachians and Newfoundland.

The Monian rocks were at surface (and deeply weathered?) before sub-aerial eruption of the (mid-Arenig?) Church Bay Tuff Formation. These acid to intermediate tuffs are overlain unconformably by an Upper Arenig to Llandovery marine transtensional foreland basin succession. Renewed convergence resulted in a SSE-vergent (late-Salinic?) fold and thrust imbricate stack; locally, thrusts override molasse deposits derived from an advancing thrust sheet. Active over-riding of tectonic molasse is continued in Anglesey until the Early Devonian at least. The axially sourced fluvial Old Red Sandstone of central eastern Anglesey is arranged in south-vergent folds and thrusts during Acadian deformation.

The geology of Ynys Môn showcases the geometrical complexity of the continental fragments that make up late-Neoproterozoic to Palaeozoic peri-Gondwana, and of the punctuated extensional and compressional deformations that affected the exterior of that continental assembly. This fragment of the UK Caledonides provides an important trans-Atlantic link to the Appalachian geology of North America.