
Cliperau RIGS Site

NRW RIGS no. 323 [SH 28348 84949]

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RIGS Statement of Interest:

Cliperau RIGS Site contains the best exposures of pillow lavas from the New harbour Group of Precambrian rocks in Anglesey. The rocks are thought to have erupted on the sea bed, probably at an oceanic ridge, prior to their translocation and descent into a deep sea trench. They are important for showing the effects of regional metamorphism on the lavas and sediments in which they are enclosed. Little of the original pillow structure remains to be seen, but traces of the pillow shape can be picked out in the otherwise flattened and distended layers of attractive purple and green rocks. Apart from the physical alteration, the mineralogy comprises assemblages of chlorite, calcite and epidote. The rocks originated as slices of ocean floor basalt which were scraped off a descending plate as it dropped down into an oceanic trench.

Geological setting/context: The Precambrian basement rocks of Anglesey and south-west Llŷn can be divided into several discrete groups, all of which were juxtaposed along a series of steep, brittle and/or ductile faults and shear zones (e.g. Dinorwic and Aber-Dinlle faults; Berw, Central Anglesey and Llŷn shear zones) collectively referred to as the Menai Strait Fault System (MSFS). First, the Monian Supergroup consists of a thick sequence of polydeformed metasediments and meta-igneous rocks, comprising the South Stack, New Harbour and Gwna groups, the latter representing the type example of a large-scale submarine debris flow or mélange said by some researchers to be of Lower Cambrian age. Ongoing research, however, may suggest a much older date for the Gwna Group with possible Cambrian ages being put forward for the South Stack metasediments. Second, the Coedana Complex of central Anglesey comprises high-grade metasediments, amphibolites and gneisses, and low-grade, thermally metamorphosed hornfelses adjacent to a granite (Coedana Granite), which has recently yielded a late Precambrian zircon age of 614 ± 4 Ma. Third, a belt of schists and metabasites displaying blueschist facies grade of metamorphism lies within the MSFS. The metabasites exhibit a strong mid-ocean ridge basalt signature and have yielded ages of 580–590 Ma. Fourth, the Sarn Complex in Llŷn comprises metagabbros and granite rocks which occur to the south-east of the Llŷn Shear Zone (LSZ), a continuation of the MSFS, which separates these igneous rocks from low-grade Monian mélange to the north-west. A late Precambrian zircon magmatic age of 615 ± 2 Ma has been obtained from a metagabbro of the LSZ. Fifth, on the mainland of north-west Wales, the Arfon Group comprises a thick sequence of tuffs and volcanoclastic rocks, dated at 614 ± 2 Ma, which are conformably overlain by late Lower Cambrian siltstones. Correlatives of the Arfon Group may occur as isolated outliers on Anglesey and, if proven, would provide an important potential lithostratigraphical link across the MSFS. The stratigraphical correlation between the various units has proved highly controversial. The recent recognition of mylonitic rocks, for example in the LSZ, emphasises the presence of tectonic contacts and indicates that each component may represent a so-called ‘suspect terrane’ which was transported laterally into position along the major faults and shear zones. Ongoing unpublished research suggests, that Anglesey’s Precambrian rocks accumulated in accretionary prisms, providing a tectonic sequence rather than a stratigraphic sequence which was formerly accepted. This new research would reverse the accepted stratigraphic order of the bedded succession, the South Stack Group, the New Harbour Group and the Gwna Group established for the island by Robert Shackleton. This Precambrian basement later formed the north-west margin of the Lower Palaeozoic Basin, the initiation of which was contemporaneous with Arfon basement terranes and was completed at least by early Ordovician times since an unconformable Arenig overstep sequence has been identified at several localities such as Wig Bach, Parwyd and Mountain Cottage Quarry. The Arenig sequence of Anglesey and Llŷn is considerably less deformed and metamorphosed than the underlying basement, although this distinction is not everywhere obvious.

Network context of the site: Cliperau is a critical component of a network of RIGS which represent stratigraphical key formations of Greenly’s Precambrian rocks in Anglesey. These belong to Precambrian Reference Sections which contain various sub-groups such as glaucophane schists and spilites (pillow lavas). Other sub-groups in this network include the various rock types encountered in the Gwna and South Stack Groups. select RIGS to demonstrate the Precambrian

evolution of Anglesey and Llŷn, three separate networks were devised. These are: 1. Precambrian stratigraphy and structures. This network includes two sub-sets: a) Precambrian sedimentary structures; and b) tectonic structures, such as folds and faults, which may have occurred during a tectonic event in Precambrian times or later, for example, during the Caledonian Orogeny; 2. Precambrian palaeontology which includes any life-form and trace fossil, such as stromatolites, sponge spicules, worm burrows and bioturbated metasediments. Some current research suggests that some of these fossils may be Cambrian or even Ordovician in age, although other geologists dispute this. As these life-forms were previously held to be Precambrian in age, they have been included in this category; and 3. Precambrian reference sections. These aim to represent all important Precambrian rock types found in Anglesey and Llŷn. They include the major mapped units of Greenly (1920). The aim is to provide the best and most accessible exposure of the rock type. These can be considered as RIGS 'type sections'. Where there is a relevant metamorphic, mineralogical, sedimentary, structural or other change across an outcrop, several representative sites have been chosen. In this study, Cliperau belongs to Network 3 (RIGS Precambrian reference sections; see above) and has been chosen to demonstrate important characteristics and variations of spilitic pillow lavas outside the Gwna Group. In particular, the effects of regional metamorphism in the New Harbour Group.

References:

- BLAKE, J.F. (1888) On the Monian system of rocks. *Quarterly Journal of the Geological Society of London*, 44, 271–290.
- CARNEY, J.N., HORÁK, J.M., PHARAOH, T.C., GIBBONS, W., WILSON, D., BARCLAY, W.J., BEVINS, R.E., COPE, J.C.W. & FORD, T.D. (2000) *Precambrian Rocks of England and Wales*. Geological Conservation Review Series No. 20. JNCC, Peterborough, 252pp.
- FITCH, F. J., MILLER, J. A., & MENEISY, M. Y. (1963). Geochronological investigations on rocks from North Wales. *Nature*, London, 199, 449–451.
- GIBBONS, W. (1983). Stratigraphy, subduction and strike-slip faulting in the Mona Complex of North Wales – a review. *Proceedings of the Geologists' Association*, 94, 147–163.
- GIBBONS, W. & BALL, M. J. 1991. A discussion on Monian Supergroup stratigraphy in northwest Wales. *Journal of the Geological Society of London*, 148, 5–8.
- GIBBONS, W. & HORÁK, J. (1990). Contrasting metamorphic terranes in northwest Wales. In : D'LEMONS, R. S., STRACHAN, R. A. & TOPLEY, C. G. (eds) *The Cadomian Orogeny*. Special Publication of the Geological Society of London, 51, 315–327.
- GIBBONS, W. & MANN, A. 1983. Pre-Mesozoic lawsonite in Anglesey, northern Wales; preservation of ancient blueschists. *Geology*, 11, 3–6.
- GREENLY, E. (1919). *The geology of Anglesey*. Memoirs of the Geological Survey of Great Britain. HMSO, London, 980pp. (2 vols) GREENLY, E. (1920). 1:50,000 (and 1 inch to 1 mile) Geological Map of Anglesey. Geological Survey of Great Britain, Special Sheet No. 92 and (93 with parts of 94, 105 and 106).
- MILLER, J. A. & FITCH, F. J. (1964). Potassium-argon methods with special reference to basic igneous rocks. *Quarterly Journal of the Geological Society of London*, 120S, 55–69.
- MOORBATH, S. & SHACKLETON, R. M. (1966) Isotopic ages from the Precambrian Mona Complex of Anglesey, North Wales (Great Britain). *Earth and Planetary Science Letters*, 1, 113–117. SHACKLETON, R. M. (1966). The Precambrian of North Wales. In WOOD, A. (ed.) *The Precambrian and Lower Palaeozoic rocks of Wales*. University of Wales Press, Cardiff, 1–22.
- SHACKLETON, R. M. (1975). Precambrian rocks of Wales. In: HARRIS, A. L., SHACKLETON, R. M., WATSON, J., DOWNIE, C., HARLAND, W. B. & MOORBATH, S. (eds) *Precambrian. A correlation of Precambrian rocks in the British Isles*. Geological Society Special Report 6, 76–82.

TUCKER, R.D. & PHARAOH, T.C. (1991). U-Pb zircon ages for Late Precambrian igneous rocks in southern Britain. *Journal of the Geological Society of London*, 148, 435–43.

WOOD, D. S. (1974). Ophiolites, melanges, blueschists and ignimbrites; early Caledonian subduction in Wales? In: DOTT, R. R. & SHAVER, R. H. (eds) *Modern and Ancient Geosynclinal Sedimentation*. Society of Economic Palaeontologists and Mineralogists, Special Publication, 19, 334–344.

Site geometry: Site boundary