Dinantian of Northern England & North Wales (DIN-N-E-WL)

Block Description

Visit https://jncc.gov.uk/gcr-site-list, for more information on GCR blocks and sites
For Palaeozoic Stratigraphy GCR block descriptions and GCR site lists,
visit https://jncc.gov.uk/gcr-blocks-palaeozoic-stratigraphy

Introduction

The GCR sites selected for this GCR Block represent the British geological record of Earth history from about 354 to 327 million years ago (Ma) as represented by rocks in Northern England and North Wales. This interval is the first part of the Carboniferous Period, which spans from about 354 to 292 Ma. Rocks that formed during the during Dinantian time constitute the Dinantian Subsystem, which comprises the Tournaisian and Visean series, in turn made up from the Courceyan, Chadian, Arundian, Holkerian, Asbian and Brigantian stages. In the GCR, the Dinantian Subsystem plus Pendleian and Arnsbergian stages (the lowest two stages of the overlying Silesian Subsystem) are equated with Lower Carboniferous (or Mississipian) Subsystem.

The majority of the stages are defined at stratotype sections, either in northern England, South Wales or southern Ireland, but a stratotype section for the Arnsbergian Stage has yet to be established.

Palaeoenvironment and palaeogeography

The major features controlling deposition in Britain during Early Carboniferous times owe much to structures inherited from the Caledonian Orogeny. (**See Caledonian Structures of the Lake District (CAL-STR-LD); Caledonian Structures of the Southern Uplands (CAL-STR-SU) and Caledonian Structures of Wales (CAL-STR-WL)**). Closure of the Iapetus Ocean had led to the development of a suture running ENE–WSW across northern England, with differing Lower Palaeozoic geological histories on either side.The Caledonian structure of England and Wales was strongly influenced by a 'Midlands Microcraton' in central England.To the east of this, Caledonian structures trend north-west–south-east, but to the west and north the trend is north-east–south-west.A major feature of the palaeogeography of Britain during Early Carboniferous times is the land area of the Wales–Brabant Massif, formerly known as St George's Land, which is, at least in part, a remnant of this Midlands Microcraton.

Major collision was taking place through Central Europe during the Early Carboniferous Subperiod as a result of closure of the Rheic Ocean, but to the north of this, in Britain, extensional tectonics prevailed.An overall north–south stretching is envisaged, although east–west tension has also been suggested.In England and Wales north of the Wales–Brabant Massif, the combination of (probable) north–south extension combined with the inherited Caledonian structures led to the development of asymmetric grabens with relative subsidence partly controlled by the position of low-density granite plutons.Rifting was pulsed, with particularly active episodes in Chadian–early Arundian and in mid–late Asbian times.Significant rifting also took place during Courceyan times.

Areas undergoing slow subsidence and thus accommodating a relatively thin Lower Carboniferous succession have been variously called 'blocks', 'highs', 'horsts', 'shelves' or 'platforms', and the areas undergoing more rapid subsidence as 'basins', 'troughs', 'gulfs' or 'lows'.

South of the Wales–Brabant Massif, the Culm Trough and the shelf area bordering it are remnants of a back-arc basin relating to northwards subduction and closure of the Rheic Ocean.In Scotland, between the Grampian Mountains to the north and the Southern Uplands to the south, a major rift, the Midland Valley, formed, controlled by movements on inherited Caledonian faults.

In late Dinantian times, uplift of source areas led to southwards progradation of a giant clastic delta complex which rapidly filled the basinal areas.At this time, active rifting largely ceased and subsidence in Namurian and Westphalian times was regional and thermally driven.

The final closure of the Rheic Ocean led to the 'Variscan' or 'Hercynian Orogeny' (**see Variscan Structures of South-West England (VAR-STR-SW) and Variscan**

Structures of South Wales and the Mendips (VAR-STR-WM)) during late Westphalian and Permian times.South of the Wales–Brabant Massif, compression resulted in thrust faulting and nappe emplacement.In northern Britain, inversion of Lower Carboniferous half-graben and subsequent erosion led to the development of a Permian–Carboniferous angular unconformity.

GCR site selection

For the Dinantian stratigraphy of Britain sites were selected according to palaeogeographically defined GCR Blocks.

• Dinantian of Scotland – Midland Valley Basin

• Dinantian of northern England and North Wales – Northumberland Trough; Lake District and Alston Blocks; Stainmore Basin and Askrigg Block; Craven Basin; Derbyshire Platform, North Staffordshire Basin and the Hathern Shelf; and North Wales Shelf;

• Dinantian of southern England and South Wales – South Wales–Mendip Shelf

• Dinantian of Devon and Cornwall

Although the relatively common invertebrate fossils do not have a separate selection category in the GCR in their own right, the scientific importance of many stratigraphy sites lies in their fossil content. Therefore, some of the GCR sites are selected specifically for their fossil fauna, which facilitates stratal correlation and enables the interpretation of the environments in which the animals lived. Moreover, some sites have international significance because they have yielded fossils that are the ‘type’ material for a taxonomic group.

Palaeontology, fauna and flora

In the early 20th century the first coral–brachiopod zonation schemes for the British Lower Carboniferous sequence were established; subsequently a proliferation of biostratigraphical schemes for the Lower Carboniferous successions of north-west Europe has evolved based principally on the distribution of miospores, conodonts, foraminifera and ammonoids.