THE PALAEOZOIC ASSEMBLY OF THE CALEDONIDES

J.F. DEWEY

Department of Earth Sciences, Oxford University, Parks Road, Oxford, OX1 3PR, England, U.K.

The terrane 'concept' has been useful only in drawing attention to the likelihood of major strike–slip motions in the history of orogens and the consequent braiding of orogen/continental margin parallel transform faults that excise or repeat earlier formed assemblages and collages to continuously generate new assemblies and collages. It has been useful, thus, in de–emphasising earlier cross–sectional approaches to orogenic evolution. The Caledonides of the British Isles, Scandinavia and Greenland have been intensively studied over a century or more and are a prime orogen for serious in–depth tectonic studies. However, there is yet an enormous amount of critical work needed in the orogen before reasonably definitive solutions can be offered. The Caledonides of the British Isles and of Scandinavia have quite different histories, structures and kinematics resulting from the interposition of the North Sea 'triple junction' and the Polish Caledonides.

The Scandinavian Caledonides evolved mainly from the roughly orthogonal convergence of Laurentia and Baltica resulting in early Silurian ophiolite obduction, midSilurian intense continental collision, convergence, and the development of a very thick crust followed by late Silurian/Devonian extensional collapse that drove frontal thrusting. Scandinavia is dominated by nappe followed by extensional detachment tectonics roughly orthogonal to the belt with no evidence of substantial orogen parallel strike–slip motion,

The British Caledonides are polyphase. The early Palaeozoic Grampian orogeny involved continental margin deformation and metamorphism with an uncertain relationship to early Ordovician ophiolite obduction and arc collision. Sinistral oblique subduction during the Ordovician and Silurian led to subduction–accretion and the beginning of sinistral terrane excision, arc–parallel motion and 'docking' (e.g. the Connemara Dalradian terrane). The oblique sinistral closure of lapetus during the late Silurian led to major sinistral strike–slip motion and the motion of terranes for up to 1000 km. Terrane excision (e.g. along the Highland Boundary and Southern Uplands Faults) and terrane repetition (e.g. Connemara) is judged principally by comparing and contrasting cross sections with the basic 'template' of the Newfoundland Appalachians where 'pre–terraning' relationships are clearest. Major terrane boundaries are linear/arcuate fundamental lineaments across which palaeogeographic/palaeotectonic continuity did not exist for a particular time period in question and along which an eclectic assemblage of exotic slivers can be seen.

Palaeotectonic plan–view reconstructions are challenging and fraught with diffiiculties because plate–slip vectors are difficult to deduce except in the most general sense; dykes and fracture zones in large ophiolites (e.g. in Newfoundland) and transpressional structure (e.g. in western Ireland) offer the best data.

Lastly, it is critical to be aware of the pitfalls and dangers in the blind acceptance of geochronological and palaeomagnetic data and their consequent direct application to make major palaeotectonic statements. Such data is only as good as the fundamental mapping and observational framework in which it is collected. This will be illustrated by reference to zircon ages from the Ben Vuirich Granite and palaeomagnetic data from western Ireland.

PALAEOGEOGRAPHIC AND GEODYNAMIC EVOLUTION OF THE SOUTFHWESTERN RHENISH MASSIF, MID–EUROPEAN VARISCIDES

U. DITTMAR

Institute for Geology, University of Würzburg, Pleicherwall 1, D–97070 Würzburg, FRG

Across the southwestern Rhenish Masssif (Mosel Syncline, Hunsrück) a balanced cross section was constructed. Its strain–corrected palinspastic restoration yields the synsedimentary basin–configuration and enables a more detailed reconstruction of the palaeogeographic and geodynamic evolution of this part of the Rhenohercynian Zone:

In the southern Hunsrück, N of the town Kirn, Gedinnian conglomerates and adjacent Cadomian gneisses exhibit a sedimentary contact. This proves that the development of the southwestern Rhenohercynian basin started relatively late, at the beginning of the Devonian. Since the Siegenian within this basin thick shallow–marine successions were deposited. At the beginning of the sedimentation the southern shoreline of this epicontinental sea area lay slightly S of the present–day South–Hunsrück borderfault. Already in the Siegenian the formation of synsedimentary fractures further indicates a prograding extension of the Rhenohercynian crust. During the Lower Emsian this splitting of the southwestern Rhenohercynian basin into horsts and graben reached its maximum. Thus the very thick sequences within the "Mosel–Graben" and central Hunsrück area contrast with extremely condensed sediments on the narrow ridges (e.g. on the "Taunuskamm–Soonwald–Horst"). Further S on the southern margin of the Rhenohercynian basin a very strong crustal thinning during the Ulmen–Substage (Lower Emsian) probably led to the formation of a narrow ocean ("Lizard–Giessen–Ostharz–Ocean"). With the opening of this ocean the area of the present–day South–Hunsrück Phyllite Zone became part of the continental rise of the Rhenohercynian passive margin and also comprises the transition zone to the oceanic crust (occurrence of MOR–type metabasalts within the southernmost imbricate of the Phyllite Zone).

The Lizard–Giessen–Ostharz–Ocean probably reached its maximum width in the Givetian (>200km?). On the other hand, in the southern Hunsrück, lower Upper Devonian flysch sediments seem to indicate that plate convergence had already begun at this time. So at the southern margin of the ocean basin south–dipping subduction and the evolution of the MidGerman Crystalline Rise presumably started at the beginning of the Upper Devonian.

The oceanic closure and subduction proceeded until the accretionary wedge of the Mid–German Crystalline Rise collided with the southern margin of the Rhenohercynian Basin in the upper Lower Carboniferous. At the beginning of the collisional stage the area of the present–day Vordertaunus and South–Hunsrück Phyllite Zone was partly subducted, received a first cleavage and suffered a pressure–accentuated metamorphic event. Then after its accretion the Phyllite Zone. was welded to the northerly adjoining units and shared a common deformation history with them. During the Upper Viséan and Namurian the accretionary wedge of the Mid–German Crystalline Rise thrusted extensively over the Rhenohercynian lower crust and detached the Rhenohercynian basin–filling from its basement. The thick sequences of the southwestern Rhenohercynian Zone simultaneously formed a large–scale duplex structure consisting of the imbricate stack of the footwall "Hunsrück Nappe" (including the Hunsrück– and Taunuskamm–Soonwald–unit) and the overlying "Giessen Nappe". Farther similarities in the sequence and facial development of the Giessen Nappe and the South–Hunsrück Phyllite Zone as well as the occurrence of MOR–type metabasalts in both units suggest that the Phyllite Zone of the Hunsrück is part of the root zone of the Giessen Nappe.

Altogether the orogenic processes shortened the southwestern Rhenohercynian Zone to 38% of the former basin width and also induced a considerable crustal thickening. Finally, collision–related isostatic uplift and lateral crustal extension set in and caused the formation of the Permo–Carboniferous intramontane graben and half graben (cf. the Saar–Nahe–basin).

HOSTROCK ALTERATION IN THE RUBIALES ZN–PB DEPOSIT, NW–SPAIN – A MASS BALANCE STUDY

M. DOPPLER, L. FONTBOTÉ

Département de minéralogie, Université de Genéve, rue des Maraîchers 13, 1211 Genéve 4, Switzerland

The Rubiales Zn–Pb mine (Lugo, NW Spain) is situated in Lower Cambrian sediments of the Transition Beds of the West Asturian–Leonense Zone which have undergone several phases of deformation and low grade metamorphism during the Hercynian orogeny (Arias, 1988, Arias et al.,1991, Tornos & Arias 1993). Mineralization is interpreted as the result of replacement of mainly carbonate rocks by migration of low temperature hydrothermal fluids along a NNW–trending shear zone. Reserves and accumulated production until 1992 when the mine closed amounted 18.3 Mt with an ore grade of 7.3% Zn and 1.3% Pb.

The Transition Beds are divided into the Lower, Middle and Upper Transition Members (Arias et al.,1991). The Lower Transition Member consists mainly of shales with intercalated carbonate layers, the Middle Transition Member of limestones with several shaly and sandy intercalations, the Upper Transition Member consists of dolostones and limestones with intercalated shales. The Transition Beds are underlain by feldspathic sandstone of the Cándana Group and overlain by dolomitized shallow–water carbonate rocks of the Vegadeo Formation which host stratabound Zn–Pb occurrences (Ribera et al., 1992, Tornos et al, 1992). The Rubiales orebody is essentially located in Middle Tran–