lower Paleozoic cover, and the Avalon–Carolina exotic terrane. The history along the Laurentian margin was consistent throughout the orogen to Early Silurian time, with formation of a Late Proterozoic rifted margin, an early Paleozoic passive margin, and then destruction during the Penobscottian and Taconian (Ordovician) events with ophiolite obduction, arc accretion, emplacement of thrust and fold nappes, metamorphism, and plutonism. The Taconian event was diachronous – older (or a different event) to the south and north; younger in the central. Taconic allochthons derived from the outer margin are confined to the northern half of the orogen. Tectonic history of the internides is remarkably dissimilar along the length of the Appalachians throughout the remainder of the Paleozoic. Accretion of the Avalon/Carolina volcanic arc terrane probably occurred during the Taconian. In the northern Appalachians, one or more seaways remained open receiving turbidites until the Middle Devonian, and deformation of the internides was Acadian producing early fold–thrusts, metamorphism, possible underthrusts, backfolding, and gneiss domes; no known parallels exist in the southern or central Appalachians. Devonian plutons dominate in NE; fewer occur in the south where Ordovician and Carboniferous–Permian plutons dominate. Devonian metamorphism dominates throughout the north; its extent in the south is not clear, but may prove equally important because the internides may be dominated by a crustal-scale Acadian shear zone that decoupled the Blue Ridge from the Piedmont. The tectonic style in the south is dominated by Alleghanian (Permian) cratonward-directed thrusts in both the internides and foreland, and early Alleghanian dextral faults in the internides. Ordovician and Carboniferous–Permian plutons dominate in the south; Devonian plutons to the north. Foreland clastic wedges indicate the extend of uplift during all three events: Taconian wedges are diachronous and extend along the entire orogen; a single Acadian wedge extends from New York to northern Virginia, and diachronous Alleghanian wedges extend from Pennsylvania to Alabama, and westward into the Ouachitas. Alleghanian collision with Africa was probably rotational-oblique -zippered- involving promontories along an irregular continental margin. Oblique collision in the north produced only early Alleghanian (Carboniferous) dextral faulting and internal pull-apart basins, but in the south produced both early (Carboniferous) dextral faults and later (Permian) megathrusts by head-on collision. Basements generated during earlier orogenies served to consolidate the orogen, but were transported westward in the south aboard the megathrust sheet.Several buried terranes are present beneath the Coastal Plain in Florida, Alabama, and Georgia that, together with geophysical data, reveal a major suture that truncates Appalachian structure, south of which is African cratonic basement and Paleozoic cover. Alleghanian foreland deformation was driven ahead of the megathrust sheet and overlaps Ouachita deformation beneath the Gulf Coastal Plain. The orogen was extended during the Triassic and Jurassic during opening of the Atlantic.

The Appalachian orogen is similar to the Scandinavian Caledonides and Urals, although several important differences also exist, and is markedly dissimilar to the British Caledonides and the Variscan orogen. The Scandinavian Caledonides formed by collision during the Silurian and underwent extensional collapse during the Devonian. Compressional events affected the Urals at times similar to the Appalachians, but did not undergo extensional collapse precursor to another spreading event.

## THERMAL MODELING OF LATE–OROGENIC EXHUMATION AT A VARISCAN SUTURE ZONE (SOUTHERN RHENOHERCYNIAN ZONE AND WESTERN MID–GERMAN CRYSTALLINE RISE)

A. HENK

*Institut für Geologie, Pleicherwall 1, 97070 Würzburg, FRG*

Thermal modeling techniques constrained by published petrologic and thermochronometric data were applied to examine the late–orogenic exhumation of southern Rhenohercynian zone and western Mid-German Crystalline Rise. These crustal units are separated by a prominent suture zone which traces the site of a small oceanic basin. Closure of this basin during Variscan subduction and subsequent collision of continental units were responsible for the different tectonometamorphic histories in the southern Rhenohercynian and northern Saxothuringian zones. Thermal modeling suggests that initial exhumation of the western Mid–German Crystalline Rise was characterized by a brief stage with rapid uplift at rates of more than three mm/a. Comparison with data from other orogenes suggests that such high uplift velocities were largely the result of extensional strain rather than erosion. Similarly rapid uplift of the southern Rhenohercynian zone immediately after thrusting was followed by a

phase of strongly reduced exhumation. Uplift accelerated again during Westphalian to Lower Permian times. Exhumation of the southern Rhenohercynian at average rates of 0.65 mm/a contrasted with decompression velocities of 0.2 mm/a in the adjacent Saxothuringian zone. This difference was probably related to reactivation of the suture as a major normal fault zone. Thermal modeling results help to constrain the tectonometamorphic history of the study area and allow evaluating the contributions of extensional strain and erosion to uplift. Additionally, they provide an estimate on the thermal state of the crust during late-orogenic exhumation.

## THE EASTERN MARGIN OF THE BOHEMIAN MASSIF IN AUSTRIA

V. HÖCK

*Institute of Geology, University of Salzburg, 5020 Salzburg, Hellbrunnerstr. 34, Austria*

The eastern margin of the Variscan orogen called Moravian zone by F.E. SUESS 1903 is divided into two major domes (windows), the Svratka dome in the N and the Thaya dome in the S, the latter being largely situated on Austrian territory. At the E the Thaya dome is bordered by Tertiary sediments of the Molasse zone, which covers crystalline rocks of still disputed origin.

The core of the Thaya window is formed by a composite granitic batholite of Cadomian age (550 mA according to SCHARBERT and BATIK, 1980). It consists of granites, granodiorites and tonalites bordered in the W by the Therasburg formation, which consists of micaschists, quartzites, para- and orthogneisses as well as rare intermediate metavolcanics. Despite a common tectonic contact the intrusion relationships are locally preserved with migmatic textures and traces of a Cadomian metamorphism (old Moravian phase). The Stengel-gneiss of Weitersfeld separates the Therasburg formation from the overlying Pernegg formation which, in turn is built up by micaschists and marbles. The calcsilicate rocks of Fugnitz form the western horizon towards the Bittesch gneiss, a spectacular augen-gneiss body, which can be traced from the very southern end of the Moravian zone towards N of the Svratka dome. The age of the Bittesch gneiss is still debated with age figures ranging from Upper Proterozoic to Ordovician.

The Variscan orogeny formed an inverse metamorphism with a mineral zonation from the greenschist to the amphibolite facies oblique to the regional strike (middle Moravian phase). Temperatures calculated from coexisting garnet-biotite pairs revealed 590 °C to 620 °C for the high grade areas (garnet-biotite-staurolite zone). The overall pressure can be estimated based on the garnet-muscovite-plagioclase-biotite-geobarometer in the micaschists and on phengite-barometry in adjacent gneisses between 6 to 8 kbars.

The geometry of the mineral zones indicates that the zonation is compatible with an NNE directed movement of the Moldanubian over the Moravian unit, but the internal Moravian nappes should have formed prior to the maximum stage of the metamorphic evolution. The thickness of the overriding Moldanubian plate must have thinned considerably towards the south, the east and the north as suggested by the lower temperatures and pressures in the same direction.

## BASIN DEVELOPMENT AND SEDIMENTATION IN THE UPPER CARBONIFEROUS CULM BASIN, SW-ENGLAND

CH.-CH. HOFMANN

*Geologisch-Paläontologisches Institut der Ruprecht-Karls-Universität, Im Neuenheimer Feld 234, 69 Heidelberg*

Extension of the lithosphere in SW-England during the Upper Devonian and Dinantian strongly influenced the sedimentary processes and the subsequent thermal and tectonical behaviour of the crust during Variscan compression. Consequently, the Culm Basin geometry does not reflect the typical geometry of a foreland basin: The sediments were not derived from the Variscan Orogen to the south. Therefore the facies-symmetry from deep marine to litoral, to deltaic and thence fluviatile facies are reversed, so that the prograding onlap of the younging strata propagates southward and not onto the foreland plate to the north.

A comparison of differently constructed subsidence paths (1. decompacted sediment versus time, 2. tectonic subsidence) demonstrates a high sediment accumulation at the northern basin margin, but the gradient of the tectonic subsidence is a magnitude smaller than the gradient of decompacted