NEW RESULTS ON MINERAL ZONES AND ASSEMBLAGES IN THE CZECH PART OF THE KRÁLOVSKÝ HVOZD UNIT (KHU) (KÜNISCHES GEBIRGE)

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The Královský Hvozd Unit (KHU) comprises metapelites and –psammites with intercalated graphite schists, calc–silicate rocks, marbles and (epidote–) amphibolites in the NW edge of the unit. On the basis of the metamorphic zonation established by Vejnar (1962) and Blümel and Schreyer (1976) a phase petrological analysis of the KHV mainly in metapelites was initiated. First results are:
1) The metamorphic zonation of the eastern part differs from that of the western part; in the south–eastern part a kyanite zone was re–delimited (Vejnar 1962).
2) Calcite–dolomite marbles with accessory margarite and Mg–chlorite and associated with Paleozoic metapsammites (Reitz 1992) give temperature of 425–455 °C (thermometers of Powell et al. 1984, and Rice 1976), which are compatible with the assemblages in the associated metapelites.
3) In Vejnar's staurolite zone the assemblage chloritoid–garnet–biotite–phengitic muscovite is observed.
4) Within the staurolite zone, the delimitation of which is impeded by the scarcity of proper rock compositions, first pyroxene–bearing calc silicate rocks are observed.
5) At similar grain size garnet porphyroblasts show bell–shaped Mn–zonation profiles (starting with 55 mol% spessartine) at lowest grades, a two–stage pattern growth followed by retrograde zonation in the andalusite zone, and flat profiles with about 15 mol% pyrope in the kyanite (–muscovite) zone.
6) In the sillimanite zone garnet seems to disappear by the decompression reaction grt + mus = sil + bio + qtz and zincian staurolite by the reaction of the type: sta = spl + sil + qtz.
Re–investigation of the metamorphic zonation in the KHU may shed new light onto the relation between the SW–Bohemian and the Bavarian part of the Moldanubian.

PALAEOZOIC GEODYNAMIC EVOLUTION OF THE SOUTHERN CENTRAL ANDES (NW–ARGENTINA, N–CHILE), AND IT'S BEARING ON THE POSTULATED LAURENTIA CONNECTION

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The region of the southern Central Andes of NW–Argentina and N–Chile has formed part of the South American continental margin since at least the Late Precambrian. In analogy to geodynamic models of the Mesozoic–Cenozoic active Andean margin, continuous subduction since at least the Ordovician has long been assumed for the Palaeozoic Andes. However, the wealth of new studies of Palaeozoic rocks indicates a segmented development of the Palaeozoic margin of western South America. The development of the south central Andean segment of NW–Argentina and N–Chile is summarized here in order (i) to elucidate the main processes which formed the proto–Andean orogens, and (ii) to evaluate the recently postulated hypothesis of repeated plate–tectonic interaction between eastern Laurentia and western South America during the Palaeozoic.

Since the end of the Pampean Orogeny in the early Cambrian, the geodynamic evolution of this part of Palaeozoic South America is characterized by tectonic regimes alternating between phases without subduction and associated magmatism (late Cambrian?, and Silurian–early Late Carboniferous) and phases of active subduction accompanied by arc magmatism (Early Ordovician, and Late Carboniferous–Permotriassic).

The inferred Late Cambrian margin in the Argentinian Cordillera Oriental is marked by an at least 1000 m thick succession of quartz arenites intercalated by shales (Mesón Group). It was deposited under shallow marine, partly tidal conditions on a west–facing platform. There is no magmatic activity of similar age recorded. The tectonic setting of this siliciclastic platform is unclear but the depositional patterns, slow subsidence rates, the absence of magmatism and the lack of a western margin make a passive margin regime very likely. During the Tremadoc to Early Llanvirn, the Mesón

Group is overlain by the thick succession of fossiliferous shallow marine siliciclastic deposits of the Santa Victoria Group. It accumulated mostly under tectonically stable conditions on a platform extending east- and westward of the Cambrian exposures. However, deposition of this unit was accompanied to the W by coeval arc related magmatism and sedimentation. The position of the respective east-dipping subduction zone is inferred to have been located in N-Chile. Accordingly, the Santa Victoria Group was deposited at the distal margin of the back-arc basin.

Significantly increased rates of subsidence and turbidite accumulation mark the transformation of the back-arc basin into a foreland setting. Deposition lasted into the early Late Ordovician. The basin fill was folded in the Oclóyic Orogeny which is temporally restricted to the short period of the Caradoc-Ashgill transition. This orogeny affected large areas of NW-Argentina, eastern N-Chile and Bolivia. In view of the absence of a subsequent continuation of deformational events, the formation of the Oclóyic mountain belt as an Andean-type orogen is rather unlikely. Several lines of evidence suggest that the collision of either the allochthonous Arequipa Terrane or eastern Laurentia including the Arequipa Terrane caused the Oclóyic Orogeny. Subsequently, the highland of the Arco Puneño formed.

Westward of the Arco Puneño in N-Chile, the onset of transgression is recorded at the beginning of the Early Devonian and the shallow marine siliciclastic platform of the Zorritas Formation (c. 2700 m, Devonian-Early Carboniferous) developed. It consists of mature sandstones and shales deposited under intertidal and shallow subtidal conditions in an environment of slow, steady subsidence balanced by clastic input. Beds of Emsian and Middle Devonian age contain mixed brachiopod faunas of Malvinokaffric Realm colder water and Eastern Americas Realm warmer water affinities. These mixtures are also present in respective strata in southern Peru and are unique to the central Andean region. Above an erosional unconformity, the Zorritas Formation is overlain by the continental volcanic and sedimentary deposits of the arc-related Peine Group. During the Late Devonian and Carboniferous, this development is paralleled farther W in the Coastal Cordillera of N-Chile by the deposition of quartz-rich turbidite units (max. c. 3600 m) in tectonically controlled aggradational depositional systems. Like the Devonian deposits of Bolivia, the turbidites were partly derived from a suspect western source outboard of the Chilean margin. Continental intra-plate basalts are intercalated with Lower Carboniferous turbidites. They are the sole evidence of magmatic activity during the period encompassing the Late Silurian to Early Carboniferous (c. 90 Ma). Synsedimentary folding accompanied by melange formation affected the turbidite units during the Late Carboniferous Toco tectonic event. This led to a significant shallowing of the basin by the Early Permian when platform carbonates were deposited. The Toco event is accompanied by magmatism and metamorphism recorded in the Limón Verde metamorphic complex, several arc-derived plutons, and the volcanosedimentary successions of the Peine Group. The outlined evolution strongly indicates a passive margin setting at least during the Devonian and Early Carboniferous and is in keeping with a very Late Ordovician to Silurian rifting event. The Toco tectonic event and the associated beginning of arc magmatism during the Late Carboniferous most likely mark the transformation of the passive margin into a destructive one. Different lines of evidence indicating the presence of a sialic terrane outboard of the Chilean-Peruvian margin in the Devonian and Early Carboniferous, and the mixtures of Appalachian and Malvinokaffric brachiopod faunas in N-Chile and S-Peru, suggest that the terrane which rifted away after the Oclóyic Orogeny could in fact have been Laurentia.

In light of the hypothesis of Laurentia-South America interaction, the outlined evolution of the NW-Argentinian and N-Chilean segment of the South American continental margin may be summarized as follows: In the Late Cambrian, a potential passive margin developed in NW Argentina. The transition to an active margin had taken place by the beginning of the Ordovician when an arc - back-arc system developed. Processes connected to continental collision started in the Middle Ordovician with the inception of a foreland basin, leading to the finall docking of eastern Laurentia to South America (Oclóyic Orogeny) and the formation of the Famatinian-Taconic orogenic belt suturing both continents in the Late Ordovician. Separation of Laurentia from South America began subsequently and led to the formation of the marine basins in northern Chile by the beginning of the Devonian. In Middle Devonian time, Laurentia and South America were again close enough to permit the mixture of Appalachian and Malvinokaffric faunas in northern Chile and southern Peru. During its clockwise movement along the proto-Andean margin, onset of subduction of Pacific oceanic crust appears to have been diachronous along the Chilean margin. Subduction started in the early late Carboniferous first in southern Chile in the wake of Laurentia moving northward and "out of the way" towards it's Permian Pangaea position. By the latest Carboniferous, Laurentia had moved still farther north, and subduction of Pacific crust also started in northern Chile.

GRANITE BODIES IN DEEP SEISMIC PROFILES OF THE URALS AND THE MID-EUROPEAN VARISCIDES

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One of the advantages of deep seismic sounding profiles is the possibility to get information on the occurrence of magmatic bodies in the crust. In this regard seismic profiles especially in the eastern Urals and in Central Europe have improved the geological models on the role of granites for the Earth's crust development.

Variscides and Urals, mainly in the Saxothuringicum and the Moldanubicum in Central Europe and the Main Granite Belt of the East Urals, are characterized by numerous granite bodies, many of them of the same size, e.g. the Eibenstock massif of the Erzgebirge and the Dschabyk massif of the East Urals (40 x 40 km). But they differ from another in structure. Most of the Southern Urals granites are deformed, mainly by large shear zones of several km width. Within the Main Ural fault zone the intensity of deformation varies extremely (solid state deformation with elongation of xenoliths up to 1: 40).

The deep seismic expression of the bodies is similar:

* In many cases the diapiric granites are represented by seismic transparency.
* Even the large plutons are to verify in the upper crust only. Together with gravity data the material allows to draw the lower boundaries with approx. 2 km accuracy, which are mostly "diffuse" and are interpreted in Uralian granites as shear zones, in the Bohemian massif (including the Erzgebirge) as gneiss inlayers.
* Only a few are clearly contoured (Falkenberg granite). Many contain internal reflexion bands either of tectonic origin or of contrast in composition (Mursinski complex). This hints to a laccolithic shape of the granites near to their lower boundary. Nearly never the specific intrusion structures (cone-in-cone intrusions, repetition of chilled margins, brecciated exocontacts, metasomatic overprinting etc.) are detected in the seismic material.
* Some massifs (e.g. Chesmenskij massif) are highly reflective.
* The primary generation of the granitic melts is to suppose in the middle and lower crust. Orthogneisses are difficult to distinguish from weakly deformed granites and from gneisses with acid composition, the latter seems to be not rare in the Saxothuringian belt.

In general, the tectonic style of the Variscides and the Urals is of a significant different type. The deformation of the Urals is dominated by the influence of large deep reaching fault zones, marked by mafic intrusions and shear tectonics (cataclasites to blastomylonites) of several km width, whereas

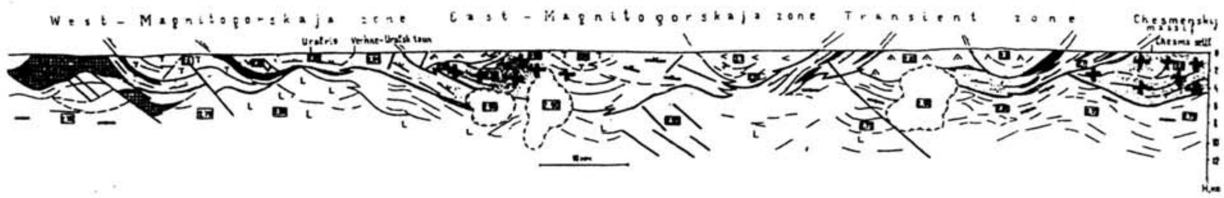

Fig.1. Reflection profile (E–W) through the South Urals, 50 km north of Magnitogorsk. Crosses: granitic massifs

in the Saxothuringian zone an inner deformation is dominating and in general the Hercynian granites are undeformed. This fact is reflected by the different structure of the granite bodies. That can be the cause for recognizable reflection bands in granites of Ural seismic profiles.