rentially partitioned into amphibole relative to biotite. All these rocks have suffered varied degrees of retrogression, which resulted in removal of halogen, CO_2 and S, and were infiltrated by dilute fluids. Fluid-bearing minerals formed during retrogression and metasomatism were fluorapatite, sodalite, amphibole, clinohumite, hauyne, pyrite, and lazurite, which either form veins or replace earlier formed phases.

Textural relations indicated the presence of several varieties of scapolite in the Sare Sang rocks. Compositional variation in this high-grade scapolite from various samples is related to certain rock type. This can be explained by relatively large marialite content in scapolite from garnet-free calc-silicates, where the coexisting phases such as apatite, amphibole and biotite are rich in Cl. The calculated equilibrium reactions of the Sare Sang rocks indicate that scapolite coexists with pyroxene and/or garnet, hence belongs to the earlier formed phases in the rocks, and it was partly affected by later metamorphic events. The presence of NaCl-scapolite in metamorphosed rocks generally implies an evaporitic source with NaCl provided from salt-rich layers, either locally or distally. Sedimentary origin of NaCl in the Sare Sang rocks is assumed by the stratigraphic control of the occurrence of carbonate and Na- or Al-Mg-rich minerals that were distributed parallel to bedding. The scapolite crystallized during regional metamorphism in rock layers that originally contained halite, calcite and dolomite. Additionally, the occurrence of phlogopite or Mg- and Al-rich biotite with only minor K-feldspar may indicate metamorphism of evaporitic argillites. There is no significant compositional variation between textural varieties of scapolite in one sample. This suggests mostly a closed system for recrystallization or formation of scapolite during later metamorphic history.

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Metamorphism Along a South-North Cross-section in the Middle Austroalpine Units East of Tauern Windows (Easter Alps, Austria)

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The Austroalpine tectonic units display a complex internal structure that formed mostly during Cretaceous tectonic processes. Basement rocks with Pre-Alpine amphibolite to eclogite facies conditions were affected by Alpine penetrative deformation and greenschist to amphibolite/eclogite facies metamorphism (Neubauer et al., 1999). The Middle Austroalpine units east of the Tauern Windows indicate a southwards grading Alpine metamorphism. To distinguish Alpine and Pre-Alpine assemblages and to constraint variation in P-T conditions existing during Alpine metamorphism, metapelites and metabasites along a south- northwards profile, from northern sector of the Saualpe and Koralpe Complex, trough Wölzer Tauern (Micaschist-Marble Complex) to the Hochgrößen massif in the Rottamann Tauern (Speik Complex and Permian Rannach Formation) were investigated.

The most common minerals in metapelites from the Seetaler Alps are garnet, white mica, quartz, kyanite and rare staurolite and kyanite. Garnet contains inclusions of quartz, micas, rutile, ilmenite, plagioclase, staurolite and kyanite. The metabasites consist of garnet, amphibole, plagioclase, quartz and symplectites of pyroxene + plagioclase + amphibole. Minor and accessory phases are relict omphacite, epidote-zoisite, rutile, ilmenite, titanite and calcite. Some samples may additionally contain white mica and biotite. Similar mineral assemblages as that in the Seetaler Alps are present in metapelites from the Wölzer Tauern. However, garnet is formed by two zones, which originated during different metamorphic events. Metabasites from the Wölzer Tauern consist of garnet, plagioclase and amphibole, and contain no symplectites or omphacite. The Speik Complex rocks at Hochgrößen massif are represented by serpentinites and retrograde eclogites. Fresh eclogites are rare and contain omphacite with a maximum of 39 mol% jadeite content, garnet and amphibole. Retrograde eclogites consist of amphibole and symplectites of Na-poor clinopyroxene (5–8 mol% Jd) + albite ± amphibole of edenite composition. The Permian Rannach Formation rocks, which are tectonically imbricated in serpentinites, contain quartz, white mica, chlorite and chloritoid.

An early Variscan high-pressure metamorphism of the Speik Complex rocks is assumed by $^{40}Ar/^{39}Ar$ radiometric dating (397.3 ± 7.8 Ma) from edenitic amphibole in eclogite at Hochgrößen massif (Faryad et al. 2001). Garnet-pyroxene thermometry yielded an average temperature of 700 °C for eclogite facies metamorphism. A minimum pressure of 15 kbar is indicated by the maximum jadeite content in omphacite. Peak P-T conditions of 700 °C/18 kbar for eclogite facies metamorphism were followed by a near isothermal retrogression at 590–640 °C/ /6–8 kbar. Based on different compositions of core garnet (garnet I) in metapelites in the Wölzer Tauern, two metamorphic events of amphibolite facies conditions can be distinguished. The older (Variscan?), medium-pressure metamorphism in the upper Rappold Complex and a Permian (Schuster and Thöni 1996), low-pressure metamorphism in the underlain Wölzer Complex are assumed.

Because of strong retrogression, evidences of Alpine eclogite facies metamorphism are locally preserved in some metabasites in northern parts of the Koralpe and Saualpe Complex. The peak high-pressure minerals are garnet, omphacite, rutile and phengite. Metamorphic conditions estimated using garnet and omphacite indicate ca 690 °C and minimum pressure of 13 kbar, based on jadeite content (Jd = 27 mol%). Mineral assemblages in metapelites yielded temperature of 700 ° at 15 kbar. Retrograde history in metabasites is documented by several stages of mineral growing and extensive retrogression which led to subsequent low-pressure eclogite – amphibolite/greenschist facies assemblages after the high-pressure assemblage.

Both the Wölzer and Rappold Complexes experienced Alpine metamorphism of similar P-T conditions (550–650 °C at 10–11 kbar). Based on mineral assemblages in the Permian Rannach Formation, a temperature of 500–540 °C at 8 kbar was estimated for Alpine metamorphism in the northern part of the Austroalpine basement units, east of Tauern Windows.

The presented data from the Eastern Alps indicate different metamorphic history in terms of timing, degree and nature of metamorphic evolution. Three metamorphic events with different P-T conditions are distinguished in the Austroalpine basement units: Early Variscan eclogite facies, Variscan medium-pressure amphibolite facies and late Variscan low-pressure amphibolite facies metamorphism. This metamorphic evolution suggests subduction of continental and oceanic elements during Silurian-Devonian and continent-continent collision between Gondwana-derived continental elements and northern portion of Central European Variscan Belt. P-T conditions of Alpine metamorphism estimated for Austroalpine units indicate a subduction type geotherm of Ca 12–14 °C/km. The Koralpe and Saualpe Complex represent the deeper portions of subducted slab.

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West Bohemian Seismic Swarm 2000: First results

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The swarm of August-November 2000 represented the most pronounced swarm-like seismic activity since the $M_L = 4.6$ swarm 1985/86 in the area of West Bohemia / Vogtland. Weaker in the maximum magnitude of the strongest quakes, but longer in the total duration of the activity, the swarm 2000 with more than 10,000 events will provide a lot of observational data for further studies.

The swarm was typical of the occurrence of a number of swarm phases – micro swarms starting with a rapid and sudden increase in seismic event magnitude and frequency of event occurrence.

The first results of relative hypocentre locations of hundreds of stronger events obtained by the master-event technique show the swarm hypocentres occupied almost vertical, N-S oriented, planar area of a radius of about 3 km, while the hypocentres migrated between particular swarm phases. The temporal dependence of the magnitude-frequency distribution of the events and the classification of the swarm waveforms following the P-wave onset polarities and S-wave amplitude ratios between pairs of the WEBNET stations revealed the common and different features of particular swarm phases. This, together with estimating the fault plane solutions for a set of stronger events enabled us to get a closer view of the fault area of the 2000 swarm and to better understand the role of swarm phases in the development of the faulting process.

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