Duration of metamorphism in the eclogite type locality

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The eclogite type locality is located in the Kor- and Saualpe region of the Eastern European Alps. The region also hosts one of the largest shear zones of the orogen: The Plattengneiss shear zone. Peak metamorphism occurred around 15 kbar and 700°C and the duration of its metamorphic cycle is loosely constrained by peak ages around 80 Ma and fission track ages around 50 Ma.

Despite the high temperatures of peak metamorphism, equilibration of both, major elements and radiogenic isotopes is extremely heterogeneous so that metamorphic conditions and the absolute timing thereof are not very well constrained. The lack of pervasive equilibration suggests that the highest grade metamorphic conditions were only achieved for a very short time and/or at very dry conditions.

In a series of projects over the last 10 years we have attempted to constrain both, the water content of the rocks and the time scales of metamorphism using petrological rather than geochronological methods. Although we generally obtain very short time scales and dry conditions, our studies are plagued by the inherent problems of petrological methods.

Nevertheless, on the largest scale, we have determined a metamorphic field gradient from north to south across the Koralpe range that shows that metamorphic conditions increase by less than 20°C per kilobar. We suggest that this shallow field gradient may be interpreted in terms of a non-lithostatic pressure gradient. This in turn implies that these conditions prvailed only very briefly.

Fractional crystallization of monosulfide solid solution from sulfide liquids lead to the PGE enrichment in the Jinchuan Ni-Cu sulfide deposit, western China

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Discordant lenses of Pt-Pd enriched zones (ores bearing up to 1.0 ppm of Pt or Pd) have recently been identified in the sulfide-bearing peridotite of the Jinchuan Cu-Ni-PGE (Platinum group element) sulfide deposit, China. Chalcopyrite, pyrrhotite, and pentlandite occur in both Pt-Pd enriched zones and normal ores, but Cu-bearing minerals such as cubanite and Bi-, Te-, and As-bearing minerals are more abundant in the Pt-Pd enriched zones. Sperrylite is the major Pt-host minerals in the Pt-Pd enriched zones interstinally and occurs mainly as euhedral grains within base-metal sulfides which occur among the cumulates of olivine. PGE-enrichment is found only in sulfide-bearing samples. In orebody # 1 and orebody 24, Rh, Ru, and Ir are positively correlated, but a negative Ir-Pd and Ir-Pt correlation. However in orebody 2 Rh, Ru, Pt, Pd and Ir are positively correlated.

Taken together, the elemental correlations and mineralogical data support a model for the origin of Pt-Pd rich ores in Orebody 1 and Orebody 24 of the Jinchuan deposit are consistent with fractional crystallization of monosulfide solid solution from sulfide liquids on cooling; The origin of Orebody 2 involves variable magma/sulfide liquid mass ratios (R-factors).