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THE METAMORHPIC FIELD GRADIENT OF THE KORALPE

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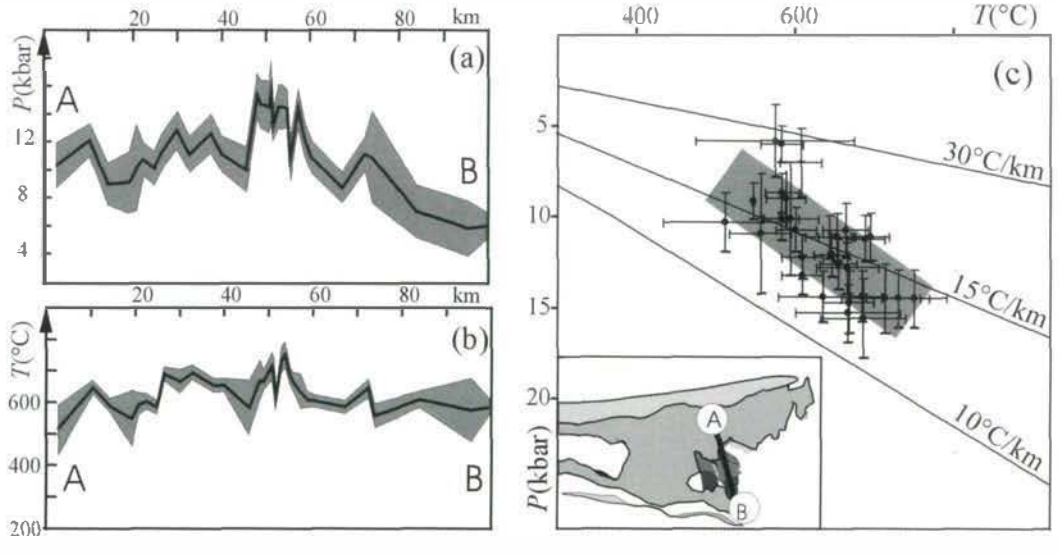
The Koralpe, which contains the eclogite type locality, is the largest region of the Alps preserving high grade metamorphic rocks from the early part of the Alpine orogenic cycle: the Eoalpine event in the Cretaceous. Here we present a detailed documentation of the metamorphic field gradient of the Koralpe along a transsect from north to south (shown in the inset in fig. c)

The principal characteristics of the region are: (1) The gradient of Eoalpine metamorphism in the Koralpe is inverted. It increases from North (A in fig. c) to South (B in fig. c)over a distance of 50 km from greenschist to amphibolite and eclogite facies conditions along a structurally south-dipping sequence. This sequence consists of predominately metapelitic rocks containing metre to kilometre sized mafic bodies that are amphibolites in the north and eclogites in the south. (2) South of the highest grade rocks, the gradient drops symmetrically to the north, back down to lower grade conditions. (3) The structure is controlled by the flat-lying Plattengneiss shear zone, which is the largest shear zone in the Eastern Alps and covers the central part of the transsect, where the metamorphic grade is the highest. (4) Eoalpine deformation occurred synchronous with the metamorphic peak and age of metamorphism decreases with increasing grade. (5) Despite the high grade, Eoalpine parageneses show relics of previous metamorphic events, indicating very heterogeneous equilibration and possibly short duration of the event.

We show that, in the northern half of the profile, both pressure (fig. a, bold line; grey shaded area indicates the error estimates) and temperature (fig. b) increase constantly from north to south across all boundaries that have been assigned tectonic significance by previous authors over a length of about 60 km. However, while pressure increases from 9 kbar to at least



15 kbar, temperatures increase only from 550°C to 700°C over the same distance. A comparable continuous decrease of the PT conditions can be seen in the southern part of the profile where pressure decreases from 15 kbar to 6 kbar over about 40 km. The results raise the question whether the metamorphic field gradient (indicated by the grey shading in fig. c) of the Koralpe follows a metamorphic geotherm (three possible linear geotherms are outlined in fig. c as straight lines) with considerably high perturbation of the lower grade rocks, or a piezotherm during Eoalpine times that does not follow traditional piezotherms of regional metamorphic terrains. Both interpretations are not completely consistent with traditional interpretations of the region. Finally, we discuss the tectonic settings that allow the formation of this significant metamorphic field gradient by rapid exhumation of deep seated rocks.

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