

## A NOTE ON LOWER PRESSURE AND HIGHER PRESSURE METAMORPHIC BELTS IN NORTH PORTUGAL

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### ABSTRACT

In north Portugal a lower pressure metamorphism occurring in belts associated with Older Hercynian Granites includes low and intermediate pressure facies types. A higher pressure metamorphism occurring in belts outside the main granite area includes intermediate to high pressure facies types.

### INTRODUCTION

The Oporto-Viseu belt in North Portugal has been described (Oen 1958, 1970) as a Hercynian lower pressure metamorphic belt characterized by the occurrence of andalusite and staurolite and the absence of almandine and kyanite. The first find of kyanite in this belt by Atherton, Atkin and Naggar (1974) is an important contribution. The latter authors have properly discussed some of the implications of this find. The present note contains the present author's reflections on the problem.

1. The Oporto-Viseu belt is one of three parallel plutonometamorphic belts, which occur associated with the Older Hercynian Granites in North Portugal (Oen 1970). These belts show differences in metamorphism. The northeasternmost Vila Real-Moncorvo belt shows a low pressure metamorphism with andalusite and cordierite, whereas the southwesternmost Oporto-Viseu belt shows a low to intermediate pressure metamorphism with andalusite and staurolite. This difference is presumably not due to chemical composition of the Beira Schists along these belts. Thus, the lower pressure plutonometamorphic belts include low pressure and intermediate pressure facies types. Kyanite and garnet are not to be expected as common minerals in these belts, but conceivably the low to intermediate pressure facies in the Oporto-Viseu belt may show local gradations to a higher pressure facies and kyanite and garnet may be found locally in some abundance, as is the case near Cavernais.

2. Hall (1973) has demonstrated a relationship between composition of the granites in a granite belt and the

associated metamorphic facies series. Granites high in quartz and low in albite occur in areas of low pressure or Buchan type metamorphism and granites with low quartz and high albite occur in areas of higher pressure or Barrovian type metamorphism. Noting the difference between the low pressure Vila Real-Moncorvo belt and the low to intermediate pressure Oporto-Viseu belt, it would be interesting to investigate whether a similar relationship between granite composition in these belts and the associated metamorphic facies can be established. The find of kyanite near the peculiar gneiss-granite of Cavernais (Oen 1958) poses the question whether there is a relationship between this type of granites and the occurrence of kyanite.

3. The main area of Older Hercynian Granites and lower pressure metamorphic belts is flanked in the SW by the Oporto-Albergaria and in the NE by the Bragança-Vinhais-Morais zones of higher pressure metamorphism with garnet and kyanite (Oen 1970). Kyanite in the Oporto-Albergaria zone is not impressive by quantity; this suggests that this higher pressure zone is in fact represented by intermediate to high pressure facies types. The possibility that in North Portugal the higher pressure metamorphism outside the main area of Hercynian granites may be pre-Hercynian in age has been hinted at (Oen 1970), but elsewhere in the same Hercynian Massif, e.g. in Galicia and in the Sierra de Guadarrama, there is evidence for an intermediate to high pressure Hercynian metamorphism. Not much is known about the relations between the higher pressure and lower pressure metamorphic belts in North Portugal. Here is a fascinating field of research where much work needs still to be done!

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