TIME AND PLACE
OF PROGRESSIVE REGIONAL METAMORPHISM:
A DISCUSSION

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Zusammenfassung

Studien in den verschiedensten Gebieten mit Regionalmetamorphose zeigen immer wieder, daß die metamorphe Kristallisation mit den Durchbewegungen beginnt und sie meist überdauert. NAll (in diesem Heft) beschreibt aus einem polymetamorphen Komplex einen Fall von — bezogen auf die Faltung — syn- bis posttektonischer Metamorphose, welcher eine regionale Überschiebung folgt. Damit ist aber noch nicht bewiesen, daß alle diese Vorgänge ein und demselben orogenen Zyklus angehören. Eine solche Beweisführung ist unerläßlich, um eine Metamorphose, die vor der Hauptphase der Tektonik stattfindet, glaubhaft erscheinen zu lassen.

Abstract

That in areas of regional metamorphism thermal fronts surging from the depths invade the geosynclinal prism in the waning stage of its deformation and bring about re- and neocrystallization often than not outdating the penetrative movements, have been demonstrated time and again from metamorphic terrains of all ages and continents. In the present issue of this journal Dr. K. NAll describes a case from a polymetamorphic complex of Eastern Indian Precambrians, where the metamorphism is pictured to have taken place syn- to posttectonically with reference to the folding movements, regional thrusting following subsequently. It is pointed out that compelling evidence, leading to the conclusion that folding and metamorphism on the one hand and thrusting on the other belong to one and the same cycle of orogeny in his area, is yet to be presented. Such a proof, the onus of which lies with NAll, is indispensable before this unique sequence of regional metamorphism prior to diastrophic paroxysm may be claimed to have been established.

Résumé

Des recherches dans les schistes lustrés de la région du Simplon indiquent que de grandes déformations ont suivi la formation des nappes penniques. En même temps que ces déformations, apparaît une métamorphose (recristallisation et néocristallisation) qui dure plus longtemps que les processus tectoniques. Ceci confirme les observations faites dans d’autres régions alpines.

Remarques critiques sur le travail de NAll (paru dans ce tome).

Краткое содержание

Исследования сланцев в районе Симплон доказали, что их деформация следовала за образованием Пенинских покровов. Наряду с этими преобразованиями они подверглись метаморфизму (крystalлизации, пере-крystalлизации), продолжавшимся и после завершения тектонических процессов.

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From structural-petrological observations on the Bündnerschiefer of Simplon area, the author arrived at the following conclusions: i) The penetrative movements giving birth to the secondary planar and linear fabric elements chased the Pennine thrusts on the heels, and 2) the metamorphic re- and neocrystallization set in synchronously with these post-thrusting penetrative movements, but outdated them by far (Chatterjee, 1961, pp. 47—48 and Plate 1).

Further, metamorphic facies mapping exhibited how the facies boundary surfaces transgress the large scale structures in three dimensions in space, providing unequivocal evidence for concluding that the Alpine metamorphism is younger than the thrusting.

As far as the Tessin theatre of metamorphism is concerned — of which Simplon area is but a part — this sequence of events appear to be fairly well established (cf. Wenk, 1955; Plessmann, 1957; Wunderlich, 1957, 1958; Beartn, 1958) 1). That metamorphism, ultrametamorphism and granitization here are causally linked processes, has been magnificently demonstrated by the painstaking detailed works of Wenk (1955).

Very similar is the history of metamorphic events in the Tauern area of the Austrian Alps. Even in the western Alps, where the Alpine metamorphism is essentially weaker and no Alpine granitization is visible, the metamorphic crystallization outdates the penetrative movements (Ellenberger, 1952, 1958; Michel, 1953). In this sector of the Alps, detailed fabric study has shown that the regional E—W trending linear fabric has been uniformly imprinted practically throughout the whole stratigraphic column, regardless of the autochthonous, parautochthonous or allochthonous nature of the various units, evincing their relative younger age (Ellenberger, 1955; Plessmann and Wunderlich, 1961). The Mesozoic metamorphites here exhibit syn- to postkinematic crystallization with reference to this post-thrusting lineation (Chatterjee, 1962). A set of N—S trending postcrystalline linear element has been occasionally observed here. They are very feebly developed and are of only local importance. Obviously, they are to be assigned to such posthumous movements as are known from many other folded belts. Needless to say, they donot undermine our conclusion that the Alpine metamorphism is syn- to posttectonic with reference to the penetrative movements.

Practically in all other well-studied metamorphic terrains of all ages and continents, essentially similar sequence of events has been recognised and in many of them the isograd surfaces have been found set athwart the structural planes (cf. Bederke, 1935; Billings, 1937; Hietanen, 1941; Misch, 1949; Wenk and Haller, 1953; James, 1955; Schüller, Chang and Ying, 1960; Zen, 1960). Metamorphism and diastrophism have, therefore, been regarded as independent variables, the former process being genetically connected with other phenomena like ultrametamorphism and

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1) The writer’s conclusions have since been accepted by Prof. E. Wenk (personal communication, Bâle, 19.4.62) and Prof. P. Beartn (personal communication, Bâle, 26.6.62), the two most prominent connoisseurs of the Tessin-Valais area.