THE RELATION OF RAUHWACKES (CARGNEULES) TO NAPPE-MOVEMENT IN THE NORTHERN APENNINES (ITALY)

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Abstract: A model is proposed of the synchronous metamorphism of the autochthon and its burial beneath the overthrusting Tuscan Nappe. Polymict rauhwackes between these two units resulted from posttectonic subrosion within a primary overthrust-breccia containing evaporitic material. In cavities caused by subrosion, particles of the surrounding polymict Rauhwackes formed new sedimentary bodies ("sedimentary rauhwacke").

Résumé: Un modèle, se basant sur la simultanéité de la métamorphose de l'autochtone et de la mise en place de la Nappe Toscane sur ce même, est proposé. Les cargneules polymictes entre ces deux unités sont considerées comme produits de la dissolution souterraine d'une brèche de friction contenant primairement des materiaux évaporitiques. La dissolution créa des cavités, qui furent ensuite remplies de particules origines des cargneules polymictes environentes.

In the Northern Apennines, between the metamorphic (greenshist-facies) autochthon and the overthrusted unmetamorphic Tuscan Nappe, unmetamorphic polymict rauhwackes are situated. These rauhwackes contain both of the unmetamorphic Tuscan Nappe and of the metamorphic autochthon in a calzitic matrix components. They are here considered to be the result of posttectonic subrosion processes within a primary, evaporitic material (gypsum or anhydrite) bearing, tectonic breccia that had been formed by the overthrusting.

Within the polymict rauhwackes occur finer- grained, smaller areas with the same petrographic composition but with clear sedimentary features. These sedimentary features together with the metamorphic components recently (1) gave rise to the hypothesis that the polymict breccias were sedimented upon the autochthon after its metamorphism during the period of its uplift and erosion but before the arrival of the Tuscan Nappe. It can be shown, however, that these sedimentary features are limited to small-

dimensioned, irregulary shaped but sharply delimited sediment-bodies ("sedimentary rauhwackes"). They seem to be young fillings of cavities that had been formed by the subrosion-processes within the surrounding polymict rauhwacke of primary tectonic origin.

The clastic components derived from the autochthon and contained in the polymict rauhwackes seem to indicate that the generation of the primary tectonic polymict breccia and thus the overthrusting occur later than the metamorphism of the autochthon. On the other hand the age of this metamorphism (14-11 MA acc. to (2)) is more or less the same as that of the main nappe-movements in the Northern Apennines. This apparent contradiction may be resolved by a geodynamic model with synchronism of overthrusting, metamorphism, and formation of a tectonic polymict breccia: Thè autochthon underwent a regional metamorphism during its burial beneath the Tuscan Nappe. The rising heat-flow that, together with a strong lateral compression, caused the thermodynamo-metamorphism of the autochthon could not metamorphose the Tuscan Nappe, because, in consequence of its synchronous gravitational gliding, new cold material continously came into contact with a probably only small area of actual metamorphism and did not remain long enough to become metamorphic. The metamorphic components of the polymict rauhwackes are fragments of those parts of the autochthon which had been metamorphosed beneath frontal parts of the foregliding Tuscan Nappe and had been fragmentated by following parts of the same nappe.

(1) DALLAN-NARDI,L. & NARDI,R.: Ipotesi sulla genesi e sul significato delle brecce stratigrafiche associate ai "calcari cavernosi" sulle Alpi Apuane e sul Monte Pisano in rapporto alla messa in posto della falda toscana.- Boll.Soc.Geol.It. 92, Roma 1973.

(2) GIGLIA,G. & RADICATI,F.: K/Ar age of metamorphism in the Apuane Alps (Northern Tuscany).- Boll.Soc.Geol.It. 89, Roma 1970.

Discussion

P.F. Burollet :

A la suite des présentations sur l'Appenin du Nord, je suis frappé par le contraste entre cette région fort active tectoniquement au Miocène, et le remplissage du sillon entre Corse et Elbe où les séries Miocènes sont très calmes. La même opposition apparaît entre Andalousie et Afrique du Nord, en cours de plissement, durant le Miocène et le Forage 372 du Leg (42 a) où l'on a une série pélagique continue à partir du Miocène inférieur. On a donc, en Méditerranée, souvent très proches les unes des autres, des régions où, pendant le Miocène, il n'y a que des mouvements verticaux et d'autres en compression, surrection et relaxation. Une certaine uniformisation n'apparaît qu'avec le Messinien.