First evidence of high-pressure, low-temperature metamorphism in the Alpujárride nappes, Betic Cordilleras (S.E. Spain)

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Abstract: HP-LT assemblages and minerals are described for the first time in the Alpujárride nappes of the Central and Eastern Betic Cordilleras. These assemblages occur in Permo-Triassic metapelites and include ferro- and magnesio-carpholite, aragonite, kyanite and Mg-rich chloritoid. The estimated P-T conditions range from 4-5 kbar at 280-300 °C to 7-9 kbar at 450-500 °C. Hence, these nappes underwent HP-LT metamorphism (thermal gradient of 12-16 °C/km), just as did the underlying Nevado-Filabride units, prior to their low- to intermediate pressure evolution.

Key-words: Betic Cordilleras, high-pressure metamorphism, carpholite, aragonite, Mg-rich chloritoid.

High-pressure, low-temperature (HP-LT) terrains are widespread in the Alpine Belt. More particularly, the Western Alps and Corsica are characterized by the superposition of low-grade HP-LT units (blueschists and carpholite-bearing schists) upon high-grade eclogitic units (Saliot et al., 1980; Goffé and Chopin, 1986; Caron and Péquignot, 1986; Gibbons et al., 1986). In the Betic Cordilleras, HP-LT metamorphism has until now only been recognized in the deepest zones (Nevado-Filabride Complex) through the occurrence of high-grade assemblages in the eclogite facies (Nijhuis, 1964; Kampschuur, 1975; Puga, 1977; Martinez-Martinez, 1986; Gomez-Pugnaire and Fernandez-Soler, 1987). Low-grade HP-LT rocks, on the other hand, were unknown in the belt.

The higher Betic units (Alpujárride nappes) were thought to have only suffered low- to intermediate-pressure metamorphism of various grades from lower greenschist to granulite facies (Westra, 1969; Torres-Roldan, 1979; Aldaya et al., 1979; Akkerman et al., 1980; Platt, 1986), while the still higher nappes (Malaguides, Sub-Betic) are virtually unmetamorphosed. We report here new petrographical observations from the Alpujárride nappes which decisively change this previous conception.

Geological setting of HP-LT facies rocks

HP-LT assemblages and associated relics can be identified in the Alpujárride nappes of