Glaucophane-bearing eclogites in the Tso Morari dome
(eastern Ladakh, NW Himalaya)

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Abstract: Lenses of glaucophane-bearing eclogites have been discovered within the Cambro-Ordovician metagranitic basement and in the Permian metasedimentary cover of the Tso Morari dome (eastern Ladakh, India). Petrological and thermobarometrical evidence shows that these rocks underwent a high-pressure event (P > 16 kbar, probably near 20 ± 3 kbar) associated with relatively low-temperature conditions (T = 580 ± 60 °C). The beginning of decompression was isothermal down to 11 ± 2 kbar. Subsequently, temperature increased to 610 ± 70 °C under amphibolite-facies conditions. This record of high-pressure and relatively low-temperature metamorphism in the Himalayan belt implies that an early subduction of the whole NW part of the Indian continental margin to a minimum depth of 70 ± 10 km occurred during the India-Asia convergence. Two different units can be distinguished in the Higher Himalaya of Ladakh-Zanskar, recording two successive and distinct orogenic events: (i) the North Himalayan Massif related to the continental subduction and (ii) the High Himalayan Crystalline slab related to the intracontinental subduction.

Key-words: Himalaya, Ladakh, eclogites, glaucophane, continental subduction, thermobarometry.

Introduction

Most metamorphic studies on the Himalayan belt concern the intermediate-pressure intermediate-temperature metamorphism of the High Himalayan Crystalline slab (e.g. Pecher, 1989) (Fig. 1), attributed to the collision or intracontinental subduction between the Indian and Asian plates. Since the eighties, high-pressure low-temperature metamorphism has been described in the internal part of the NW Himalayan belt: Cretaceous blueschists (Honegger et al., 1989) and Eocene eclogites (Tonarini et al., 1993), attributed to the Indus Tsangpo suture zone and the Higher Himalaya, respectively. However, despite these significant recent discoveries, the Himalayan evolution is still interpreted as the result of intracontinental subduction processes (Chemenda et al., 1995).

More recently, eastwards, in the Tso Morari dome (NW Himalaya, Ladakh), classically related to the High Himalayan Crystalline slab (Fig. 1, 2), Guillot et al. (1995) have studied eclogites strongly retrogressed under amphibolitic conditions. These garnet-bearing metabasites were first mentioned by Berthelsen (1953). New field research has led to the discovery of glaucophane-bearing eclogites in the same unit, implying high-pressure low-temperature metamorphism, clearly related to subduction processes.

The aim of this paper is, first to describe the mineralogy and the petrological evolution of the glaucophane-bearing eclogites, and second to dis-