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Tectonic-metamorphic evolution of the Jebilet massif (Morocco) in the context of the Variscan orogeny

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The Jebilet massif belongs to the western Moroccan Meseta characterized by nearly complete Paleozoic sedimentary sequence folded and metamorphosed under low-grade greenschist- to amphibolite-facies during the Variscan orogeny, and intruded by widespread syn- to late-orogenic Carboniferous granitoids (Michard et al., 2008, 2010 and references therein). It has been previously proposed that Jebilet massif first underwent a regional, greenschist facies metamorphic event (D1 phase), followed by a high-T regional and contact metamorphism that reached the hornfels/amphibolite facies conditions (D2 and D2/D3 phases). However our recent observations of staurolite likely belonging to D1 assemblage obscure the previously proposed metamorphic conditions. In order to refine the metamorphic model we propose to revise the entire metamorphic conditions of the Jebilet massif.

To address this issue, detailed structural, mineralogical, thermobarometric and Raman Spectroscopy on Carbonaceous Material (RSCM) methods have been employed to study the tectono-metamorphic evolution of the Jebilet. The results obtained for the metapelitic rocks that underwent D2/D3 higher metamorphism grades (hornfels/amphibolite facies), show four dominant mineral assemblages: (1) Chlorite–Biotite, (2) Cordierite–Biotite, (3) Andalusite–Garnet–Biotite, and (4) Andalusite–Cordierite–Biotite. The corresponding RSCM temperatures vary between 474 ± 50 °C and 628 ± 50 °C. The computed pseudo-sections for samples from the hornfels/amphibolite facies confirm the peak temperatures measured by the RSCM method. Our structural and mineralogical results support the occurrence of the Garnet–Staurolite assemblage during the D1 regional metamorphism event. These results bring new constrains on the evolution of the Jebilet massif during the Variscan orogeny of the western Moroccan Meseta and strongly suggest that the D1 phase reached higher conditions than those initially proposed, refining the metamorphic history of the Jebilet massif. As the Jebilet massif contains many ore deposit, this work will contribute to determine the main thermal event responsible of concentration the mineralization.