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Ediacaran Magmatism in Jbel Hadid (Moroccan Meseta): New Geochronological, Geochemica lanalysis and Geodynamic Implications

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Within the Jbel Hadid sector of the Moroccan Meseta, Lower Cambrian marble formations (2) are stratigraphically superimposed upon rhyolites and pyroclastic breccias initially dated at 597 ± 3 Ma (1) and more recently reassessed to 604–543 Ma (3). This study aims to complement previous stratigraphic and geochronological investigations and to refine the age of Ediacaran magmatism in this key sector of the Meseta domain.

For the first time, basaltic-andesitic rocks are identified within the studied area. New U–Pb SHRIMP dating performed in this study on the Jbel Hadid rhyolites yields an Ediacaran age of 570 Ma, consistent with previously published data. The studied Ediacaran rocks are weakly deformed, suggesting emplacement prior to major Paleozoic tectonic events, likely associated with the subsequent Hercynian (Variscan) orogenic evolution.

Geochemically, the rhyolites display a calc-alkaline affinity comparable to magmatism generated in an active continental margin setting, whereas the andesites display transitional characteristics between calc-alkaline and tholeiitic series. These features indicate a progressive geodynamic shift during the Late Neoproterozoic. In addition, εNd (-0.3; 5) values show a mantle-derived source consistent with a depleted mantle (DM) signature and limited crustal contamination.

Collectively, these findings provide new constraints on the Ediacaran magmatic evolution of the Moroccan Meseta and contribute to a more refined understanding of Late Neoproterozoic tectono-magmatic processes within the Moroccan Central Hercynian Massif.

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