

## **The 348-340 Ma Jebilet-Rehamna-Fourhal Large Igneous Province of the Meseta domain (Variscan Belt, Morocco): U-Pb geochronology, geochemistry, and links with coeval magmatism on other crustal blocks**

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The Variscides or Hercynides of the Meseta domain include all the Paleozoic massifs north of the South Atlas Fault, except the Ouzellarh Block of the Marrakech High Atlas which belongs to the Anti-Atlas Paleozoic domain. During Early Carboniferous, the mesetian basins of Jebilets, Rehamna and Fourhal (Central Hercynian Massif of Morocco) of western Meseta show great tectono-sedimentary evolution similarities. Their deposits record large instabilities and disorganization with huge thickness and lithological variations, related to a synsedimentary tectonic context. At the same time, tilted block tectonics affect the basement of these basins, controlled by bordering transfer faults. Abundant traces of magmatic activity during the Carboniferous period are recognized in Morocco, particularly in the Jebilets, Rehamna and Fourhal igneous areas. These rocks constitute a magmatic province consisting of basaltic lavas, mafic sills and dykes, and gabbroic intrusions together with subordinate layered ultramafic intrusions and silicic volcanic/intrusive rocks exposed in the Meseta Domain, part of the Moroccan Variscan belt. We report 6 new U-Pb zircon ages obtained by sensitive high-resolution ion microprobe (SHRIMP) and laser ablation–inductively coupled plasma-mass spectrometry (LA-ICP-MS). Available zircon U-Pb ages obtained (both from the literature and new data herein) from various rocks in this province, which has an areal extent of ~400,000 km<sup>2</sup> (~850 km × 470 km), indicate that magmatism occurring between 349 and 340 Ma ago, coeval with the Eastern Meseta volcanism in northeastern Morocco. Such a striking similarity in emplacement age, in combination with the tectonic reconstruction of northwestern Gondwana ca. 350 Ma ago, allows us to propose that the extensive Jebilets-Rehamna-Fourhal igneous rocks in western Meseta, the Tazekka-Debdou-Mekkam igneous rocks in eastern Meseta in Morocco, the likely 353-346 Ma St. Jean du Doigt bimodal layered intrusion (Brittany, France) and other equivalents such as the 345-340 Ma Southern Vosges magmatism may represent the erosional and/or deformational remnants of a large igneous province, which we call the Jebilets-Rehamna-Fourhal LIP. Their intraplate tholeiitic and alkaline chemical character are consistent with

rifting during this period. We argue that this newly identified LIP was likely caused by a mantle plume, which started in the Early Carboniferous and may have played a role in the breakup of northwestern Gondwana and the development of the local alpine glaciation. The plume was likely centred on the thick lithosphere of the West African Craton. The highly thinned western Meseta realm with widespread rift-type basins (pull apart basins) is interpreted here as a large thin-spot-type domain. The northeast-directed large-scale sublithospheric plume channeling from the plume site (WAC) to the western Meseta large thin-spot, lead to the development of widespread tholeiitic/alkaline magmatism in the western Meseta and calc-alkaline magmatism in the overthickened eastern Meseta.