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I. Berrada, A. Fekkak, M. El Houicha, H. Ouanaimi, A. Jouhari, et al.. First evidence of early Cambrian felsic-intermediate plutonism in the Western High Atlas (Moroccan Atlas-Meseta Domain): SHRIMP U-Pb zircon geochronology study. Magmatisme, Métamorphisme et Minéralisations Associées 3MA-11ème coll, Apr 2019, El Jadida, Morocco. hal-02417291

HAL Id: hal-02417291

<https://hal.archives-ouvertes.fr/hal-02417291>

Submitted on 18 Dec 2019

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First evidence of early Cambrian felsic-intermediate plutonism in the Western High Atlas (Moroccan Atlas-Meseta Domain): SHRIMP U-Pb zircon geochronology study

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The Cambrian rifting is well documented through the Moroccan Meseta-Atlas variscan domain, comprising the western Meseta graben and its prolongation to south in the Western High Atlas Paleozoic massif (Bernandin et al., 1988; Cornée, 1989; Piqué et al., 1995; El Attari et al., 1997; Álvaro et al., 2014). The Cambrian magmatism associated with this rifting event is mostly represented by mafic- intermediate pyroclastic rocks, lava flows and few sills and dikes (Jouhari et al., 2001, El Archi et al., 2004, El Hadi et al., 2006; Álvaro et al., 2008 ; Pouclet et al., 2008, 2018, Berrada et al., 2018 and references therein).

This work presents the first evidence of early Cambrian intermediate-felsic plutonic activity in the Western High Atlas Paleozoic massif. New U-Pb zircon geochronology results

(SHRIMP) carried out during the National Program of Geological Cartography (PNCG) (Jouhari et al., 2018, Fekkak et al., 2018, Ouanaimi et al., 2018; Ettachfini et al.; 2018, have revealed that the Tiniskt hypovolcanic microgranite intrusive in Ediacaran volcanosedimentary rocks of the Tighardine-Takoucht massif (Wirgane area, Eddif, 2002) yielded a crystallization age of 521 ± 5 Ma. Further to the West (Azegour area), the Medinet quartz-diorite crystallization age is 514 ± 3 Ma. These findings show that there is a time relationship between these felsic-intermediate intrusive rocks and the mafic-intermediate volcanic rocks of the Western High Atlas massif. Geochemical data show that these two early Cambrian intrusions are peraluminous ($ANK > 1$ and $ACNK > 1$) and calc-alkaline. The REE patterns do suggest cogenetic nature of both intrusive rocks. The LILE enrichment and negative Nb anomaly are indicative that the magmas were derived from partial melting of continental crust during Cambrian rifting.

The early Cambrian felsic plutonism highlighted for the first time in the Western High Atlas in this study is lacking in the remaining Moroccan Meseta-Atlas domain. Further to south of the South Meseta Fault, (SMF), the only early Cambrian plutonic activity found in the Anti-Atlas – Saharan domain is the Derraman granite from “Ouled Dlim” located close to the NW border of the West African Craton, which yielded a crystallization age of 525 ± 3 Ma (SHRIMP zircon U–Pb age; Bea et al., 2015). With regard to other peri-Gondwanan terranes which are distributed by Western-Central Europe, many early Cambrian peraluminous and calc-alkaline plutons are found in the Ossa-Morena Zone of SW Iberia (Pereira et al., 2011; Sanchez Garcia et al., 2014), in the Armorican Massif (Thiéblemont et al., 2001; Diot et al., 2015) and in the Saxo Thuringia Zone (Bialek et al., 2014; Zieger et al., 2018).

We stress that our new U-Pb geochronology results allow us to admit a paleogeographic link between the West African Craton - Anti-Atlas domain and the Moroccan Meseta–Atlas domain, and the Western-Central European peri-Gondwanan terranes; this affinity has the expression in the age, geochemical signature and geodynamic setting of the early Cambrian magmatism that characterizes North-Gondwana. In addition, the Western High Atlas massif where several mineralization have been described (Alansari et al., 2009; Ilmen, 2016; Boukarrou et al., 2018) may be viewed with more certainty as a target of mining prospecting campaigns as is the case with other peri-Gondwanan terranes where early Cambrian magmatism has been found associated with important economic ore deposits.

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