

## **Volcanology and Geochemistry of the Central Atlantic Magmatic Province (CAMP) volcanic sequences of Berrechid and Doukkala basins (Western Meseta, Morocco)**

Mohamed Khalil Bensalah<sup>1,2</sup>, Nasrddine Youbi<sup>1,2,3</sup>, Abdelkader Mahmoudi<sup>4</sup>, Hervé Bertrand<sup>5</sup>, João Mata<sup>2,6</sup>, Hind El Hachimi<sup>1</sup>, José Madeira<sup>6,7</sup>, Lúcia Martins<sup>2,6</sup>, Andrea Marzoli<sup>8</sup>, Hervé Bellon<sup>9</sup>, Fida Medina<sup>10</sup>, Morad Karroum<sup>1</sup>, Lalla Aïcha Karroum<sup>1</sup>, and Mohamed Ben Abbou<sup>11</sup>

<sup>1</sup> Geology Dept., Fac. of Sciences-Semlalia, Cadi Ayyad Univ., Prince Moulay Abdellah Boulevard, P.O. Box 2390, Marrakech, Morocco. E-mail: youbi@ucam.ac.ma

<sup>2</sup> Centro de Geologia da Universidade de Lisboa (CeGUL), Portugal

<sup>3</sup> National Centre for Scientific and Technical Research, Angle avenues des FAR et Allal El Fassi, Madinat Al Irfane, P.O. Box 8027, Nations Unies, 10102 Rabat, Morocco

<sup>4</sup> Geology Dept., Fac. Sciences de Meknès, Moulay Ismail Univ., Meknès, Morocco

<sup>5</sup> Laboratoire de Géologie de Lyon, UMR-CNRS 5276, Ecole Normale Supérieure et Université Claude Bernard de Lyon, 46, Allée d'Italie, 69364 Lyon, France

<sup>6</sup> Universidade de Lisboa, Faculdade de Ciências, Departamento de Geologia (GeoFCUL), Portugal

<sup>7</sup> LATTEX/Instituto Dom Luiz - Laboratório Associado (IDL – LA), Lisboa, Portugal

<sup>8</sup> Dipt. di Geoscienze, Univ. Padova, I-35137, Italy.

<sup>9</sup> Université Européenne de Bretagne, UMR 6538 Domaines océaniques, IUEM, Université de Bretagne Occidentale, place Nicolas Copernic, 29280 Plouzané, France.

<sup>10</sup> Laboratory Geotel (URAC 46), Scientific Institute, University Mohammed V-Agdal, Rabat, Morocco

<sup>11</sup> Geology Dept., Fac. Sciences Dhar Al Mahraz, Sidi Mohammed Ben Abdellah Univ., Fès, Morocco.

We present the volcanological and geochemical data from the extrusive sequence of Berrechid and Doukkala basins in order to contribute to the knowledge of the CAMP volcanology and geochemistry in the Moroccan Meseta, and to compare it with the Atlas domains. The CAMP volcanic pile of Berrechid and Doukkala basins was formed during one (Doukkala) to two pulses (Berrechid) of volcanic activity, represented by one or two formations. The Sidi Mohamed Larbi-Sidi Saïd Mâachou Formation (Doukkala and Berrechid basins) was produced by 1 to 5 eruptions, and usually comprise flow fields composed of up to 5 flow units. The Aïn Bouhachad Formation, which is lacking in Doukkala basin, is the result of up to 2 eruptions. Lavas are mainly compound pahoehoe flows showing evidence of endogenous growth by inflation, suggesting slow emplacement during sustained eruptive episodes. The textures vary vertically in each lobe (fine- to medium-grained intergranular, sub-ophitic to ophitic in the lava core, and aphanitic to glomeroporphyritic in the lava crust). The mineralogy is typical of continental tholeiites: plagioclase, clinopyroxene (augite and pigeonite), and minor amounts of olivine and ferro-titanium oxides. The major and trace element concentration and ratios of the Sidi Mohamed Larbi-Sidi Saïd Mâachou Formation and the the Aïn Bouhachad Formation match respectively the composition of the Lower and Intermediate formations from the Central High Atlas basin. In the Berrechid basin, we recognized the chemical fingerprint the Lower and Intermediate Formations while only the Lower Formation occurs in the Doukkala basin. The studied CAMP basalts are low-Ti continental tholeiites, moderately enriched in LILE and LREE relative to HREE and HFSE, also displaying small negative Nb and P anomalies. Their compositional range is similar to that of other low-Ti CAMP tholeiites, in particular those of the neighbouring CAMP outcrops of West Africa.