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The structuration of the External Rif (Rif belt: Northern Morocco). An insights from paleo-thermal and structural analyses

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Belonging to the Maghrebides system, the Rif belt (Northern Morocco) suffered an important Cenozoic Alpine compressional deformation as a consequence of the closure of the Maghrebian Tethys and the westward translation and docking of the Alboran Domain onto the African margin during the Late Burdigalian. The Mesozoic North African Margin is still partially preserved in the Eastern Rif (e.g., Senhadja Jurassic-Cretaceous unit) and inverted in its Central portion (North of the Nekor Fault Zone) due to the high shortening in this area. It is in agreement with sub-surface data suggesting that the thickest crust along the chain is located in the central Rif (Izzaren Area, External Rif), and can be interpreted as a deep-rooted crustal imbrication.

This contribution aims to characterize the role of the structural inheritance of the rifted North African margin in the development and the propagation of the Rif belt by the combination of paleothermal and structural data collected along a NE-SW regional transect (between Chefchaouen and Ouezzane provinces), focusing mainly on the external zones (namely, Intrarif, Mesorif and Prerif) sampling the deformed domains originally developed along the North African paleo-passive margin. A new paleo-thermal dataset of vitrinite reflectance (Ro%), micro-Raman spectroscopy on organic matter and XRD on clayey fraction of sediments displays levels of thermal maturity between early and deep diagenetic conditions (Ro% from 0.49% to 1.15%). The highest thermal maturity values along the section are concentrated in the Lower to middle Cretaceous Loukkos Intrarifain sub-unit that is structurally squeezed between Tangier Intrarif Upper Cretaceous sub-unit and the Mesorif “Izzaren Duplex”. It attests for an important amount of shortening leading to the development of an imbricate fan of thrusts.

The geometry of the “Izzaren Duplex”, limited at surface by two first-order thrust faults, is controlled by pre-existing tectonic structures, probably inherited by the former architecture of the North African paleomargin. Moreover, the Chattian-Middle Miocene siliciclastic succession filling the Zoumi basin is in a stratigraphic continuity with the Izzaren Upper Jurassic-Upper Cretaceous substratum, sheding new light on its geodynamic meaning. This observation is supported by the

homogeneity of deformation and the absence of thermal jump between the Mesozoic and Cenozoic successions, attesting for an active compressive deformation in the area between the Late Serravalian and Late Tortonian.

In conclusion, the combination of paleo-thermal and structural analysis allowed to reconstruct robust tectono-thermal model in order to propose an accurate reconstruction of the structural evolution and a new geological restoration of the Rif belt with respect to the geometry of the rifted paleo-margin.