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Active synchronous counterclockwise rotation and northwards translation of Africa toward Eurasia during the Late Cretaceous: A paleomagnetic study on the Alkaline volcanic field of Wadi Natash (ca. 100-86Ma), South Eastern Desert, Egypt

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In order to shed light on the paleo-tectonic movement of Africa during the Late Cretaceous, the two end members of the alkaline volcanic field of Wadi Natash (ca. 100-86Ma) in the South Eastern Desert of Egypt were studied paleomagnetically. The Wadi Natash volcanic field (24.5ºN-34.25ºE) is made up of a succession of differentiated flows grading from alkali olivine basalt [AOB] to trachyte-phonolite [Tr/Ph]. The oldest flows of the AOB (104±7 Ma) and the youngest Tr/Ph plugs and ring dykes (86Ma) as well as the interflows sandstones [previously know as Nubian sandstone were sampled allover the field > 400km2.

The isothermal remanent magnetization [IRM] study revealed that the remanence in Wadi Natash volcanics reside mainly in magnetite with some subsidiary goethite/hematite sites. On the other hand, goethite/hematite are the sole remanence carriers in the Nubian-type interflow sandstone. After the progressive stepwise thermal demagnetization of all samples, the visual isolation and subsequent calculation of the best-fit line of the characteristic remanence [ChRM] direction of each sample, followed by the calculation of the site and rock-unit means revealed that:

1- In the tilt-corrected coordinates, the mean ChRM of the oldest AOB flows [N=12 sites]] was Dec./Inc.= 341º/-10º [K=54, 95=6º] yielding a north pole at 55ºN/249ºE. while the ChRM of the youngest Tr/Ph ring dykes [N=9sites] was Dec./Inc.= 352º/1º [K=64, 95=6.5º] yielding a north pole at 65ºN/234ºE.

2- On the other hand, the mean ChRMs of the interflow sandstone are swinging around the present-day geomagnetic field in the area with Dec./Inc.= 3º/33º [K=31, 95=10º] yielding a north pole at 86ºN/218ºE.

The two paleomagnetic poles of the AOB and the Tr/Ph rock units reasonably fit with coeval poles of rotated from the main Cratons around the Atlantic Ocean such as Stable Europe and the North American Craton using the published Paleomagnetic Euler Pole [PEP] rotation parameters as well as the recently obtained African poles from Madagascar volcanics. The obtained poles of Wadi Natash volcanics place the African Plate at two different azimuths and paleolatitudes pointing to active northwards translation associated with CCW rotational convergence of Africa towards Eurasia during the Late Cretaceous. Between the eruption on AOB [104±7 Ma] and the intrusion of the TR/Ph [86Ma] the African plate apparently rotated CCW about 11º and simultaneously moved northwards towards Eurasia about 5.5º of latitudes.