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# Paleomagnetism of the Cryogenian Mirbat dikes, Oman: New paleogeographic constraints for the northeastern edge of the East African Orogen (EAO)

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## Résumé

The Mirbat dikes (around 100 km E of Salalah, Sultanate of Oman) dated at  $757 \pm 61$  Ma (Sm/Nd) and  $655 \pm 89$  Ma (Rb/Sr on whole rock) (Worthing, 2005) can provide important paleogeographic constraints on the Neoproterozoic history of the northeastern border of the East African Orogen (EAO). The basaltic-to-rhyolitic dikes intruded a juvenile crust, composed of a HT metamorphic and migmatitic gneisses with late to post-kinematic basic to felsic intrusions (815 to 780 Ma, Mercolli et al, 2006) in a general context of Andean-type active margin (Denèle et al, 2012).

At the end of the Gondwana amalgamation (i.e. around 550 Ma), Oman is accreted to the Arabian Nubian Shield (ANS) (i.e. Fritz et al, 2013 and Johnson et al, 2011) and paleomagnetic poles measured in glacio-marine formations of this age exhibit paleo-latitudes of  $13^\circ$  and  $9.4^\circ$  (Kilner et al, 2005 and Kempf et al, 2000, respectively), relatively close to the Equator. However, the older geodynamic history of the northeastern part of the EAO notably during the accretion of Gondwana remains almost unknown. The Mirbat dykes provide a unique chance to provide constraints on: (i) the paleolatitude of Mirbat basement around 700 Ma and (ii) the geodynamic implications that can be deduced for the Late Precambrian earth.

A total of 22 sites (202 cores) distributed between Mirbat and Sadh cities were sampled in March 2013. AF and thermal demagnetizations were realized in the GET laboratory (Toulouse, France), the IAG laboratory (Sao Paulo, Brazil) and the IPG laboratory (Paris, France). New datations are currently ongoing at the NGU (Trondheim, Norway). A high temperature component carried by low ti-magnetite was isolated in all the sites and a new paleomagnetic pole, constrained by field tests, could be retrieved for the basement of Oman. A new geodynamic scenario for the northeastern border of the EAO will be proposed.

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\*Intervenant

References:

- Denèle, Y., Leroy, S., Pelleter, E., Pik, R., Talbot, J-Y., Khanbari, K., 2012, The Cryogenian arc formation and successive high-K calc-alkaline plutons of Socotra Island (Yemen), *Arab. J. Geosci.*, 5, 903-924.
- Fritz, H., Abdelsalam, M., Ali, K. A., Bingen, B., Collins, A. S., Fowler, A. R., Ghebreab, W., Hauzenberger, C. A., Johnson, P. R., Kusky, T. M., Macey, P., Muhongo, S., Stern, R. J., Viola, G., 2013, Orogen styles in the East African Orogen: A review of the Neoproterozoic to Cambrian tectonic evolution, *J. Afr. Earth Sci.*, 86, 65-106.
- Johnson, P.R., Andresen, A., Collins, A.S., Fowler, A.R., Fritz, H., Ghebreab, W., Kusky, T., Stern, R.J., 2011, Late Cryogenian-Ediacaran history of the Arabian-Nubian Shield: A review of depositional, plutonic, structural, and tectonic events in the closing stages of the northern East African Orogen, *J. Afr. Earth Sci.*, 61(3), 167-232.
- Kempf, O., Kellerhals, P., Lowrie, W., Matter, A., 2000, Paleomagnetic directions in Late Precambrian glaciomarine sediments of the Mirbat Sandstone Formation, Oman, *Earth. Planet.Sci.Lett.*, 175, 181-190.
- Kilner, B., Mac Niocaill, C., Brasier, M., 2005, Low-Latitude glaciation in the Neoproterozoic of Oman, *Geology*, 33, 413-416.
- Mercolli, I., Briner, A.P., Frei, R., Schonberg, R., N'agler, T.F., Kramers, J., Peters, T., 2006, Lithostratigraphy and geochronology of the Neoproterozoic crystalline basement of Salalah, Dhofar, Sultanate of Oman, *Precambrian Res.*, 145, 182-185.
- Worthing, M.A., 2005, Petrology and geochronology of a Neoproterozoic dyke swarm from Marbat, south Oman, *Journal of African Earth Sciences*, 41, 248-265.