The Late Neoproterozoic Dahanib mafic-ultramafic intrusion, South Eastern Desert, Egypt: is it an Alaskan-type or a layered intrusion?

Mokhles K. Azer[1], Hisham A. Gahlan[2,3], Paul D. Asimow[4], Khaled S. Al-Kahtan[2]

[1]*Geological Sciences Department, National Research Centre, 12622-Dokki, Cairo, Egypt*

[2]*Department of Geology and Geophysics, King Saud University, Riyadh 11451, Saudi Arabia*

[3]*Geology Department, Assiut University, Assiut 71516, Egypt*

[4]*Division of Geological & Planetary Sciences, California Institute of Technology, USA*

We present new field work, geochemical data, mineral chemistry and interpretations for the late Neoproterozoic Dahanib mafic-ultramafic intrusion in the South Eastern Desert of Egypt (northernmost Arabian–Nubian Shield, ANS). The Dahanib intrusion shows no evidence of metamorphism or deformation, with excellent preservation of intrusive contacts, well-preserved textures and primary mineralogy. Field relations indicate that it is younger than the surrounding metamorphic rocks and syn-tectonic granitoids. The intrusion is composed of a basal suite of ultramafic rocks (dunite, lherzolite, wehrlite and pyroxenite) and an overlying suite of mafic rocks (olivine gabbronorite, gabbronorite and anorthosite). It displays evident layering of modal abundance, visible directly in outcrop, as well as cryptic layering discernible through changes in mineral compositions. The western and eastern lobes of the Dahanib intrusion occur in the form of a lopolith with readily correlated layers, especially in the upper mafic unit. The present-day dip of the layering decreases from the ultramafic units into the mafic sequence. Structural and compositional relations show that the ultramafic units are cumulates from a high-Mg tholeiitic parent magma emplaced at deep crustal levels and evolved via fractional crystallization rather than any kind of residual mantle sequence. Fo content of olivine and Mg# of pyroxenes display a systematic decrease from ultramafic to mafic rocks, well-correlated with whole-rock Mg#. Spinels in ultramafic samples vary from Cr-rich to Al-rich and have Mg# and Fe^{3+}# similar to spinels from typical stratiform complexes and clearly different from those found in ophiolitic and Alaskan-type complexes. The mafic and ultramafic units are clearly related and represent different pulses of magma. The Dahanib mafic–ultramafic intrusion does not display any features that convincingly identify it as a typical Alaskan-type body. Our results confirm that it is more akin to a layered mafic-ultramafic intrusion with a multistage evolution. It was emplaced into a stable post-orogenic cratonic setting.