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Constraining the Neoproterozoic East African orogen in the Eastern Desert, Egypt: combining U-Pb ID-TIMS ages, in situ LA-ICPMS Hf data and field observations

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The Eastern Desert, Egypt, is an assemblage of Neoproterozoic island arcs and ophiolites formed within and at the margins of the Precambrian Mozambique Ocean, and accreted to the East Sahara metacraton during the East African orogeny. Post-accretional (<650 Ma) sedimentary (Hammamat Sequence) and volcanic (Dokhan Volcanics) basins are also present. A characteristic feature of the Eastern desert are a series of gneiss cored domes (Meatiq, Hafafit, El Shalul) separated from structurally overlying island arc sequences of lower metamorphic grade by a high strain zone (Eastern Desert Shear Zone). The gneisses, low-grade island-arc sequences and the basin deposits are intruded by a large number of plutons of variable compositions and degrees of deformation. New ID-TIMS U-Pb age data from selected plutons challenge the generally accepted subdivision into “Younger” and “Older” granites based on geochemical character and degree of deformation. The data furthermore indicate that magmatic activity in the Eastern Desert occurred in distinct pulses. Six pulses are identified in the time interval 700-540 Ma. No dated rocks in the gneiss domes are pre-Neoproterozoic, and in situ zircon LA-ICPMS Hf data from variably deformed to undeformed granitoids in the Meatiq and Hafafit areas testify to a Neoproterozoic juvenile character of their source regions. The deeper parts of the Eastern Desert are thus not substantially older than the island arc sequences and ophiolites occuring above the Eastern Desert shear zone. Our robust geochronological data also questions the timing of various tectonic models proposed for the Eastern Desert.