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## Tectonostratigraphy and depositional history of the Neoproterozoic volcano-sedimentary sequences in Kid area, southeastern Sinai, Egypt: Implications for intra-arc to foreland basin in the northern Arabian–Nubian Shield

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## ABSTRACT

This paper presents a stratigraphic and sedimentary study of Neoproterozoic successions of the South Sinai, at the northernmost segment of the Arabian–Nubian Shield (ANS), including the Kid complex. This complex is composed predominantly of thick volcano-sedimentary successions representing different depositional and tectonic environments, followed by four deformational phases including folding and brittle faults ( $D_1$ – $D_4$ ). The whole Kid area is divisible from north to south into the lower, middle, and upper rock sequences. The higher metamorphic grade and extensive deformational styles of the lower sequence distinguishes them from the middle and upper sequences. Principal lithofacies in the lower sequence include thrust-imbricated tectonic slice of metasediments and metavolcanics, whereas the middle and upper sequences are made up of clastic sediments, intermediate-felsic lavas, volcanoclastics, and dike swarms. Two distinct Paleo-depositional environments are observed: deep-marine and alluvial fan regime. The former occurred mainly during the lower sequence, whereas the latter developed during the other two sequences. These alternations of depositional conditions in the volcano-sedimentary deposits suggest that the Kid area may have formed under a transitional climate regime fluctuating gradually from warm and dry to warm and humid conditions.

Geochemical and petrographical data, in conjunction with field relationships, suggest that the investigated volcano-sedimentary rocks were built from detritus derived from a wide range of sources, ranging from Paleoproterozoic to Neoproterozoic continental crust. Deposition within the ancient Kid basin reflects a complete basin cycle from rifting and passive margin development, to intra-arc and foreland basin development and, finally, basin closure. The early phase of basin evolution is similar to various basins in the Taupo volcanics, whereas the later phases are similar to the Cordilleran-type foreland basin. The progressive change in lithofacies from marine intra-arc basin to continental molasses foreland basin and from compression to extension setting respectively, imply that the source area became peneplained, where the Kid basin became stabilized as sedimentation progressed following uplift. The scenario proposed of the study area supports the role of volcanic and tectonic events in architecting the facies and stratigraphic development.

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## 1. Introduction

The Arabian–Nubian Shield (ANS) forms one of the largest exposures of juvenile continental crust on Earth. The ANS evolved during the Neoproterozoic East African orogeny (870–550 Ma ago), and is generally viewed as a collage of juvenile volcanic arc terranes and ophiolite remnants amalgamated during the assembly of the

eastern part of Gondwana (Bentor, 1985; Stern, 2002; Stern et al., 2010; Cox et al., 2012). The ANS is bounded to the east and west by pre-Neoproterozoic crust (Abdelsalam et al., 2002; Hargrove et al., 2006) (Fig. 1A). The ANS is thus the result of diverse and poly-phase geodynamic events and its tectonic evolution can be divided into three main stages, namely: (1) subduction stage (~870–635 Ma) during which oceanic crust, island arc volcano-sedimentary sequences, and plutonic rocks formed; (2) continental collision (~630–580 Ma, Avigad and Gvirtzman, 2009; Be'eri-Shlevin et al., 2009) resulting from continuing convergence between East and West Gondwana to form the East African orogen (Stern, 1994),

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