



Petrophysical characterization of Nubian Sandstone reservoirs and their potential for geothermal applications; central Gulf of Suez, Egypt

Mahmoud Hefny^{a‡}, Mohamed Hamed^b, Anozie Ebigbo^a, Martin O. Saar^a

^a Geothermal Energy and Geofluids Group, Department of Earth Sciences, ETH Zurich, Switzerland

^b Geology Department, Cairo University, Egypt

[‡] Corresponding author: mhefny@ethz.ch

Keywords: Geothermal, Nubian Sandstone, Petrophysics, Gulf of Suez.

ABSTRACT

The hot springs with various surface temperatures along the coastal margins of the central Gulf of Suez (cGOS) are promising clues for geothermal potentialities and development. The present work digitizes the most promising geothermal sites and provides a new dataset to evaluate the potential of Nubian Sandstone as a geothermal reservoir in the cGOS basin.

The dataset comprises: a) Laboratory physical characteristics, including quantitative mineralogical maps using QEMscan analysis, grain density, effective porosity, capillarity, and fluid permeability of surface samples using routine experimental techniques; b) Petrophysical characteristics of the Nubian Sandstone from Bakr and Ras-Budran offshore oil-fields on, respectively, the western and eastern sides of the cGOS; and c) The geothermal-gradient map constructed based on the Bottom-Hole Temperature log of 178 offshore boreholes across the cGOS.

The constructed geothermal gradient and heat-flow maps reveal high anomalies on the eastern margin of the cGOS. The high geothermal potential may be attributed to a clear conjunction between the present-day surface thermal manifestations and the locations of Oligo-Miocene volcanic activity (basaltic bodies, sills, and dykes) along major rift-related faults. These observations, along with other geochemical and geophysical studies, suggest that the Nubian Sandstone in this region could be a geothermal resource.