

***Interactive comment on* “Shallow Geophysical Techniques to Investigate the Groundwater Table at the Giza Pyramids Area, Giza, Egypt” by Sharafeldin M. Sharafeldin et al.**

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Please also note the supplement to this comment:

<https://www.geosci-instrum-method-data-syst-discuss.net/gi-2017-48/gi-2017-48-AC2-supplement.pdf>

Interactive comment on Geosci. Instrum. Method. Data Syst. Discuss.,
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1 **Shallow Geophysical Techniques to Investigate the Groundwater Table**
2 **at the Giza Pyramids Area, Giza, Egypt**

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9 **ABSTRACT**

10 The near surface groundwater aquifer that threatened the Great Giza Pyramids of Egypt,
11 investigated using integrated geophysical surveys. Ten Electrical Resistivity Imaging, 26
12 Shallow Seismic Refraction and 19 Ground Penetrating Radar surveys conducted in the Giza
13 Pyramids Plateau. Acquired data of each method subjected to state- of- the art processing and
14 modeling techniques. A three-layer model depicts the subsurface layers and better delineates the
15 groundwater aquifer and water table elevation. The aquifer layer resistivity ranges between 40-
16 80 Ω m and seismic velocity of 1500-1800 m/s. The average water table elevation is about +15
17 meters which is safe for Sphinx Statue, and still subjected to potential hazards from Nazlet
18 Elsamman Suburban. Shallower water table in Valley Temple and Tomb of Queen Khentkawes
19 detected to be between 14.5-15m represent a sever hazards. Perched ground water table detected
20 in elevated topography to the west and southwest might be due to runoff and capillary seepage.

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22 *Keywords: Groundwater, Electrical Resistivity, Seismic refraction, GPR.*

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24 **I. INDRDUCTION**

25 In recent years, the 4500 years old Giza Great Pyramids (GGP) of Egypt; Cheops
26 (Khufu), Chephren (Khafre), Menkaure and Sphinx statue; threatened from the rising
27 groundwater table resulted from the water leakage of the suburban, irrigation canals and mass
28 urbanization surrounding the GGP. This problem promoted the need to use non-destructive near
29 surface geophysical techniques integrated with available borehole hydrogeological data to
30 investigate and characterize the groundwater occurrences in the GGP. The GGP located in the
31 southwestern part of the Greater Cairo Region (Fig. 1). Geologically, the Giza Pyramids Plateau
32 composes mainly of white limestone, cream and yellow argillaceous limestone and dark grey
33 dolomitic limestone of Middle-Upper Eocene age. The plateau rocks are commonly interbedded
34 with thin marl layers in their upper part, which dips with about 5-10° to the SE direction. Steep
35 escarpments border the plateau to the north and east directions as shown in Fig. 2 (Yehia, 1985;
36 Mahmoud and Hamdan, 2002). Two regional groundwater aquifers underlie the sphinx (Fig. 3),
37 the Quaternary aquifer of the Nile alluvium, consists of graded sand and gravel with

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Fig. 1. final revised version include figures and replies