

GEOPHYSICAL PROSPECTION IN SOUTH ABUSIR, EGYPT, 2002

R. Křivánek¹ *, M. Bárta²

¹ Institute of Archaeology of Academy of Sciences of Czech Republic, Letenská 4, CZ-118 00 Praha 1, Czech Republic, tel.: +420-2-575 33 782, fax: +420-2-575 32 288, email: krivanek@arup.cas.cz

² Czech National Centre of Egyptology + Czech Institute of Egyptology, Charles University, Celetná 20, 110 00 Praha 1, Czech Republic, tel.: +420-2-24491394, fax: +420-2-24491628, email: miroslav.barta@ff.cuni.cz (or Czech Institute of Egyptology, 4 Dokki Street, Giza-Cairo, Arab Republic of Egypt, tel.: +202-3315257, 3315297, fax: +202-7485892, email: mbarta@yahoo.com)

Task Group TG3

KEY WORD: archaeology, geophysics, surveying, measurements, mapping, identification, egyptology, cemetery

ABSTRACT:

Enclosed paper demonstrates on example of south Abusir area in Egypt possibilities of application of present geophysical survey methods in desert region. Non-destructive geophysical prospection of large areas choosen by egyptologists outside of previous and present archaeological excavations brought a new view on extent and quantity of archaeological remains (cemetery) beneath the sand and also practical experience (limits and possibilities of applied geophysical methods) in various terrain desert conditions. Subsequently planned archaeological verification of geophysical results in 2003 field-season then could help for better interpretation of geophysical data. Comparison of results of non-destructive and destructive archaeological techniques then could coordinate another planned geophysical surveys in territory of the new Czech archaeological concession.

1. INTRODUCTION

Wide desert area western of Abusir village is a field working place of czech egyptologists for more than 40 years. The large territory of the new Czech archaeological concession in Abusir (aprox. 2 km²) includes very various and sloped desert terrains including some important archaeological monument from the time of Old Kingdom or Late Period. Northern part of territory of Czech archaeological concession includes flat or slightly sloped desert terrain with the pyramid field of Abusir, mortual complexes and mastabas from the 5th Dynasty (25th-24th century BC).

This part is the most surevied and also archaeologically excavated area of the whole territory with more visible modern landscape changes. Geophysical surveys of choosen parts of this area have been realised in late 70's and early 80's by dr. Hašek (Hašek-Obr-Prichystal-Verner 1986; Hašek-Obr-Verner 1988; Verner-Hašek 1981). Middle part of territory of Czech archaeological concession is covered by more flat desert without many visible and significant terrain changes or indications of archaeological situations. Archaeological activities (and smaller geophysical surveys) were here up to now concentrated only on smaller parts of terrain in place of Sate-Persian shaft tombs of admiral Wedjahorresnet or majordomus Iufaa (6th-5th century BC). Southern part of territory of Czech archaeological concession (Bárta-Krejčí 2000; Bárta 2001) includes different more various hilly or sloped desert terrains northern of North Sakkara with more areas of limited archaeological excavations on places of private tombs (and shaft tombs) of Hetepi, Ity, Kaaper, Fetekti, Inti or Qar family complex from the 3rd-6th Dynasty (28th-22nd century BC). This large perspective terrain of cemeteries has not been surveyed by any non-destructive method up to 2001 when started a new field surface survey of areas including geodetical 3D-modelling (Brůna 2002) and fotogrammetry (Čech 2002).

2. EXAMPLES OF GEOPHYSICAL RESULTS

The new possibility of cooperation between new founded Czech National Centre of Egyptology and the Institute of Archaeology in Prague could start by new geophysical field surveys of choosen parts of Abusir territories in autumn 2002 (Křivánek-Bárta 2003). During 23 days of geophysical measurements in the field there were used (or also tested in different scale of work) 3 types of geophysical equipment. Caesium magnetometers Smartmag, SM-4g (Scintrex, Canada) seemed to be the most efficient method for preliminary surveying (and mapping) of large unknown terrains especially in case of expected or supposed mud bricks components of subsurface features. Approx. 17,5 ha were surveyed (common grid-net 1x0,25 m, details in grid-net 0,5x0,2 m) by Cs-magnetometers during 18 days (in total approx. 746 000 measured points). Kappameter for detailed measuremets of apparent surface magnetic susceptibility in situ KT-5c (Geofyzika Brno, Czech republic) showed interesting results for survey of particular features (tombs) and smaller open archaeological situations (different levels of magn. susceptibilty of mud brick walls from different tombs). Electromagnetic measurements by EM-38b (Geonics, Canada) tested also possibilities of identification of non-magnetic materials (limestone, tafla or clay destruction) of shallow subsurface features.

All of areas for geophysical surveys (4 in southern part and 1 in middle part of territory) were selected in cooperation

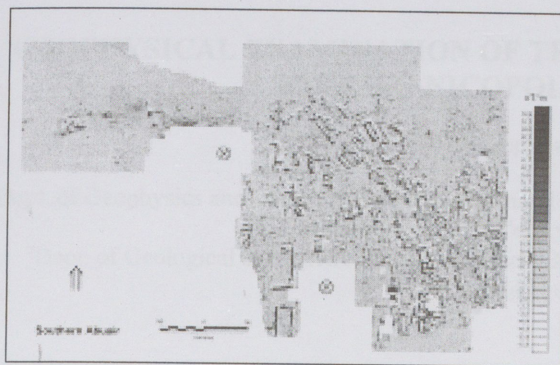


Figure 1. Large area magnetometric survey in southern Abusir with identification of magnetic rectangular features of cemetery area (11,5 ha).

with Egyptologist and respecting some previous results of field surface survey and fotogrammetry realised in 2001. For geophysical surveys (and all types of possible future surveys connected together by GIS) has been established for the whole area of Czech territory unique geodetical grid-net 50x50m with N-S orientation. The large area magnetometric survey of hilly and sloped landscape around excavated tomb-complex of vizier Qar and official Inti (approx. 11,5 ha) was the main focus of geophysical measurements in 2002 in southern Abusir. The example of preliminary results of magnetometric survey of this area documents very intensive and also extensive use of probable cemetery area approx. 7-8 ha (fig. 1). The main concentrations of various rectangular, subrectangular or linear probable mud brick structures cover the whole upper hilly plateau and sloped terrain south-eastern from present excavated area of shaft tombs in Qar family complex. Various dimensions, shapes, orientations and also amplitudes of identified linear magnetic anomalies could contribute to separation of more different types of funeral or another features (tombs, shaft tombs, chapels, walls,...?) very probably from more different periods of Old Kingdom or later activities on site (fig. 2). The use of magnetometers in complicated field conditions helped to identification of low or high magnetic components of more complicated features where was very common to combine more building materials (magnetic mud bricks, non-magnetic limestone blocks, very low or non-magnetic clay and sandy materials, only sometimes also magnetic granites or high magnetic volcanic materials).

The big concentration of remains of various features on magnetometric results represents very probably only a part of features present on surveyed area beneath the sand.

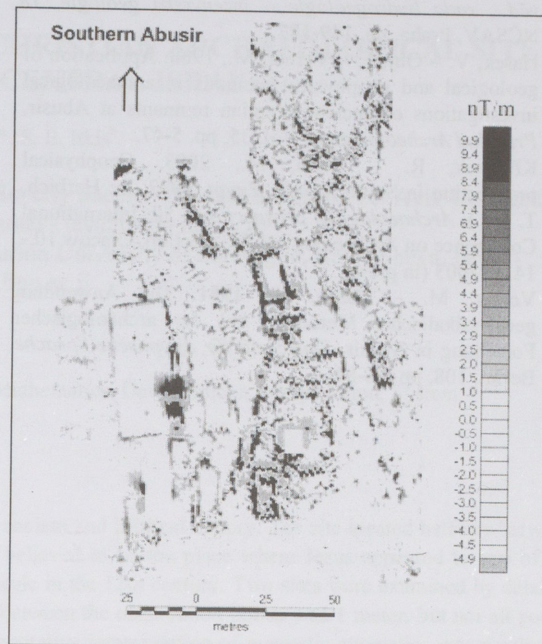


Figure 2. Separation of different types and shapes of linear features from detail of magnetometric survey (approx. 2 ha).

3. CONCLUSION

The new geophysical survey in territory of the new Czech archaeological concession after more than 20 years brought to Egyptologists a lot of quantitatively and also qualitatively new results. The new experience of application and testing of more geophysical techniques provides more real ideas about possibilities and also limitations of geophysical work in desert conditions. Anyway for the future choice of geophysical work (and possibility of better interpretation of identified anomalies) in area of south Abusir it will be good to have any archaeological data and at first to verify more discovered places by quick archaeological excavations (trenches). For the future work in southern Abusir region western from dry Abusir lake it would be also useful to coordinate, compare and complete area magnetometric results with similar area geophysical surveys on territory of National Museum of Scotland concession in northern Sakkara. The first systematic archaeological verifications of geophysical results from 2002 field-season should be realised in autumn 2003.

References:

- Bárta, M. - Krejčí, J., eds. 2000. Abusir and Saqqara in the Year 2000, Prague.
- Bárta, M., 2001. Abusir V. The Cemeteries at Abusir South I, Prague.
- Brůna, V., 2002. Úloha geoinformatiky při archeologickém výzkumu v Abúsíru, In: PES - *Pražské egyptologické studie*, 1/2002, pp. 43-47, Praha.
- Čech, P., 2002. Nová metoda ve starém kabátě, In: PES - *Pražské egyptologické studie*, 1/2002, pp. 48-50, Praha.
- Hašek, V. – Obr, F. – Přichystal, A. – Verner, M., 1986. Application of Geological and Geophysical Methods in Archaeological Research at Abusir. *Sborník geologických*

věd, rada hydrogeologie – inženýrská geologie, 18, NČSAV, Praha, pp. 149-187.

Hašek, V. – Obr, F. – Verner, M., 1988. Application of geological and geophysical methods in archaeological investigations of ancient egyptian remnants at Abusir, *Przegląd Archeologiczny*, Vol. 35, pp. 5-47.

Křivánek, R. – Bárta, M., 2003. Geophysical prospection in South Abusir, Egypt, 2002. In: Herbich, T. (ed.): *Archaeological prospection - 5th International Conference on Archaeological Prospection*, Cracow 10.-14. 9. 2003 (in press).

Verner, M. – Hašek, V., 1981. Die Anwendung geophysikalischer Methoden bei der archäologischen Forschung in Abusir. *Zeitschrift für Ägyptische Sprache*, Berlin, 108, pp. 68-84.

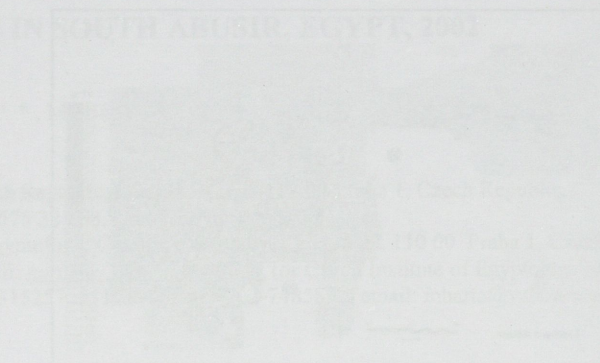


Fig. 1. Map of the area of archaeological investigations in South Abusir, Egypt, 2002.

The area of archaeological investigations in South Abusir, Egypt, 2002, is shown in the map. The map is a plan view of the area, showing the location of the archaeological site and the surrounding area. The map is a plan view of the area, showing the location of the archaeological site and the surrounding area.

The area of archaeological investigations in South Abusir, Egypt, 2002, is shown in the map. The map is a plan view of the area, showing the location of the archaeological site and the surrounding area. The map is a plan view of the area, showing the location of the archaeological site and the surrounding area.

The area of archaeological investigations in South Abusir, Egypt, 2002, is shown in the map. The map is a plan view of the area, showing the location of the archaeological site and the surrounding area. The map is a plan view of the area, showing the location of the archaeological site and the surrounding area.

The area of archaeological investigations in South Abusir, Egypt, 2002, is shown in the map. The map is a plan view of the area, showing the location of the archaeological site and the surrounding area. The map is a plan view of the area, showing the location of the archaeological site and the surrounding area.

The area of archaeological investigations in South Abusir, Egypt, 2002, is shown in the map. The map is a plan view of the area, showing the location of the archaeological site and the surrounding area. The map is a plan view of the area, showing the location of the archaeological site and the surrounding area.

The area of archaeological investigations in South Abusir, Egypt, 2002, is shown in the map. The map is a plan view of the area, showing the location of the archaeological site and the surrounding area. The map is a plan view of the area, showing the location of the archaeological site and the surrounding area.

The area of archaeological investigations in South Abusir, Egypt, 2002, is shown in the map. The map is a plan view of the area, showing the location of the archaeological site and the surrounding area. The map is a plan view of the area, showing the location of the archaeological site and the surrounding area.

The area of archaeological investigations in South Abusir, Egypt, 2002, is shown in the map. The map is a plan view of the area, showing the location of the archaeological site and the surrounding area. The map is a plan view of the area, showing the location of the archaeological site and the surrounding area.

The area of archaeological investigations in South Abusir, Egypt, 2002, is shown in the map. The map is a plan view of the area, showing the location of the archaeological site and the surrounding area. The map is a plan view of the area, showing the location of the archaeological site and the surrounding area.

The area of archaeological investigations in South Abusir, Egypt, 2002, is shown in the map. The map is a plan view of the area, showing the location of the archaeological site and the surrounding area. The map is a plan view of the area, showing the location of the archaeological site and the surrounding area.