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Archaeological prospection results in the surroundings of the Serapeion at Ephesus, Turkey

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For more than 15 years, the ZAMG (Central Institute for Meteorology and Geodynamics in Vienna), in cooperation with the Austrian Archaeological Institute (ÖAI), has been carrying out archaeological prospection using magnetics, georadar (GPR), resistivity and seismic methods in Ephesos, Turkey (Scherrer 2005).

In 2005, 2011 and 2014, an area of roughly 50,000 m^2 surrounding the Serapeion, one of the best preserved archaeological structures in Ephesos, was surveyed, partly in very difficult field conditions.

The Serapeion was built in the 2nd century AD on the northern slope of the Bülbüldag (*http://www.ephesus-foundation.org*). It takes up an area of approximately 100 m by 75 m. From the viewpoint of architectural history, this building is very significant, for one thing because it is so very well preserved (Heberdey 1915). Building blocks can still be found where they collapsed after the destruction of the temple, enabling archaeologist to reconstruct the temple with considerable accuracy (*http://www.ephesus-foundation.org*).

Refraction seismics were used along two lines running from north to south and positioned right and left of the ruined temple. The objective was to detect the rock surface and the thick-

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Fig. 1. Refraction seismic fieldwork (left) and GPR fieldwork (right) in Ephesos

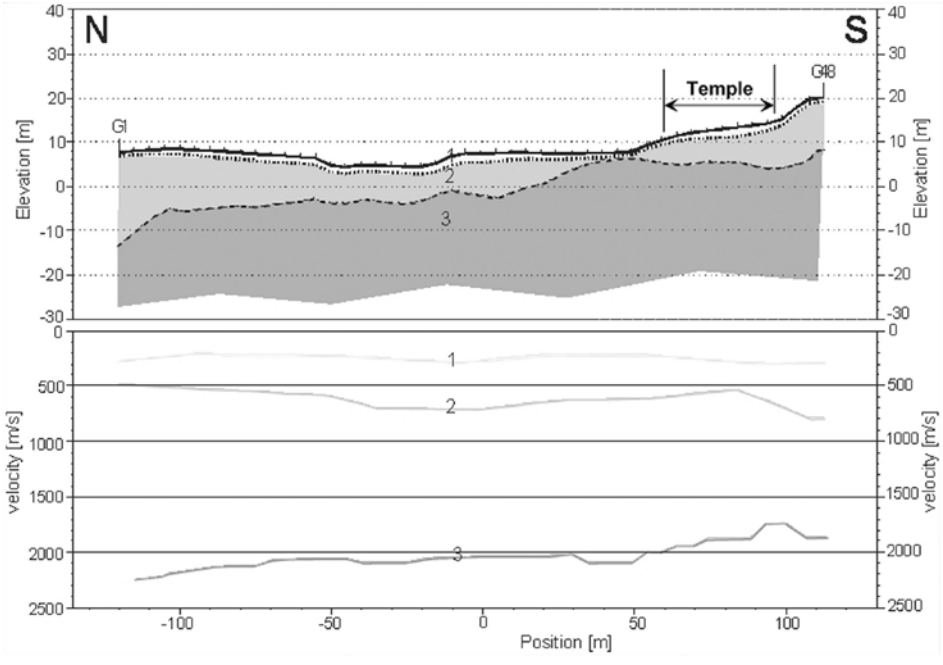

Fig. 2. Result of refraction seismics: upper plot – depth section; lower plot – layer velocities

Fig. 3. The results of GPR prospection in the area of the Serapeion in Ephesos above (black: high amplitudes – reflective, white: low amplitudes – absorbent) and the archaeological interpretation below

ness of slope materials covering it (Fig. 2). At every 6th geophone, a seismic wave was generated by using a sledge hammer. The geophone distance was set at 5 m.

The results of the refraction seismics are shown in Figure 2 with seismic layers (upper plot) and seismic velocities (lower plot). Three layers were determined, namely, the surface topsoil (1), debris/loose rock (2) and solid rock (3). The thickness of debris varies from 1 m in the close vicinity of the temple to 20 m at the start of the profile in the north. In general, the solid rock (3) shows a lower velocity (1750 to 2250 m/s), which indicates a large fault zone in this area. This can be seen especially in the last part of the profile.

For the GPR a Noggin (Sensors and Software) and for magnetics a 4-sensors Fluxgate magnetometer (Förster) was used. The survey grid was 50 cm by 16 cm for the magnetics and 50 x 5 or 25 x 5 cm for the GPR (Fig. 3).

The magnetics and GPR data were evaluated with the software APMAG and APRadar developed by the ZAMG (Seren *et al.* 2007). The images produced by APMAG and APRadar are imported and interpreted archaeologically in a GIS together with all the other information available. These are mainly structures already known through excavation, topographical lines, digital city maps and historical photographs.

The geophysical prospection, especially the GPR prospection, shows a densely built up area east and west of the Serapeion. In the north and northwest of the Serapeion, it is possible to distinguish the Weststraße, a colonnaded street approximately 160 m long and 24 m wide, running from the Tetragonos Agora to the Medusentor. On the southern side of this street, it is possible to see the remains of single colonnades in the GPR data. Lined up along this street one can identify numerous structures possibly resembling small shops, so called tabernae. Apart from these structures, it is possible to see large areas of debris west of the temple. This debris probably derives in part from loose rock coming down from the Bülbüldag, possibly covering archaeological structures in this area. In the prospected area south of the temple one can see the remains of terrace houses situated on the northern slope of the Bülbüldag. In all of the measured areas it is possible to identify streets, helping the archaeologists build up a more accurate plan of the street system running through the Roman town.

Due to the good preservation of the temple, it was possible to use GPR and magnetics on top of the Serapeion only in its part, so this exploration must be done through archaeological digs. Nevertheless, these two methods give us a good understanding of the areas surrounding this important archaeological structure.

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