Case Study

GEOSOFT®

Institute of Mediterranean Studies – F.O.R.T.H.

1

A New Interactive FFT-Based Grid Suturing Technique Applied to Ground Geophysical Surveys in Greece.

A. C. Johnson[1], A. Sarris[2] and M. E. Amza-Prein[3]

Introduction

The utility of compiling potential field surveys is well documented and varies in scale from continental-scale projects to assess global tectonics, to local surveys of a few metres in size to evaluate environmentally or archaeologically important sites. A single survey covering the whole of an area of interest with uniform data quality, station spacing and data reduction parameters is a luxury that is rarely available. What is more often the case is that areas of particular interest in any given survey lie at the margins of the data set, necessitating either further acquisition, or the stitching together of adjacent existing surveys to give the best possible coverage. This merging of surveys is a vital step in the processing and analysis of survey results which is too often both timeconsuming and inaccurate. This paper will present an example of merging a number of small-scale survey blocks using a newly developed automatic grid suturing process.

Data acquisition

During 1997 and 1998, a series of vertical magnetic gradient and EM31 surveys were carried out over the archaeological site of Dimini-Volos in Greece. EM31 data were acquired at 1m station intervals and the magnetic gradient data at 0.5 m intervals. We will present the magnetic gradient data here. The survey area was divided into 8 blocks, each of which was surveyed separately with a single line of overlap between surveys. The data were processed individually and a grid with cell size 0.25 m created for each block. When these grids are displayed on a single map (Figure 1) it is clear that the grids do not match, and a number of offsets and possible trends occur in the original data.

[1]Geosoft Europe Limited
[2]Institute of Mediterranean Studies – F.O.R.T.H.
[3]Geosoft Europe, Germany

Submitted to: 2nd Balkan Geophysical Congress, Istanbul, 5-9 July, 1999.

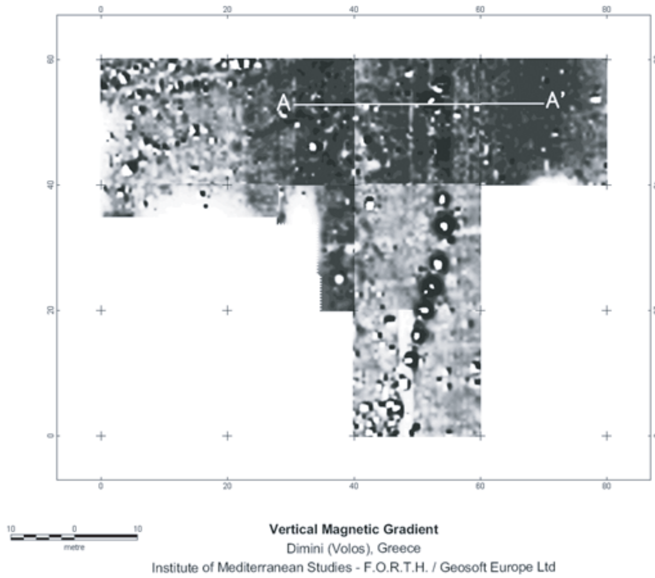

Figure 1. Magnetic grids over the Dimini (Volos) site prior to grid merging. AA' marks the position of the profile shown in Figure 3.

Grid Suturing

Grid Suturing is one of the techniques available in the GridKnit™ program, which is part of Geosoft's OASIS montaj™ Data Processing and Analysis system. The first step in this newly-developed FFT-based method is to automatically remove a trend from either or both of the grids. The second step is to define the suture path, which is the line along which the two grids will be joined. This line can be chosen automatically or interactively. The system then extracts a curve of the differences between the two grids along the suture path. This difference curve is split using a Fourier transform function into many curves, each representing a unique frequency. A grid is then created for each frequency with the grid extent either side the suture line proportional to the frequency of the particular curve. This proportional correction means that short-wavelength features on a grid are given a shortwavelength correction and longer wavelength features are given a longer wavelength correction. The correction surface for each frequency is added to create an overall correction grid. This correction grid is then applied to each grid according to a user-defined weighting. The advantages of the suturing method over conventional blending or averaging methods is that no wavelengths are introduced into the data set that do not exist in the original grids.

Results

Each of the 8 vertical gradient grids were sutured in series according to the above method. The suture path was chosen automatically in each case, and the correction was weighted evenly between the two grids. The resulting grid is shown in Figure 2. A profile (position shown in Figure 1) was extracted from each grid illustrating the corrections that have been applied to the data (Figure 3).

Case Study

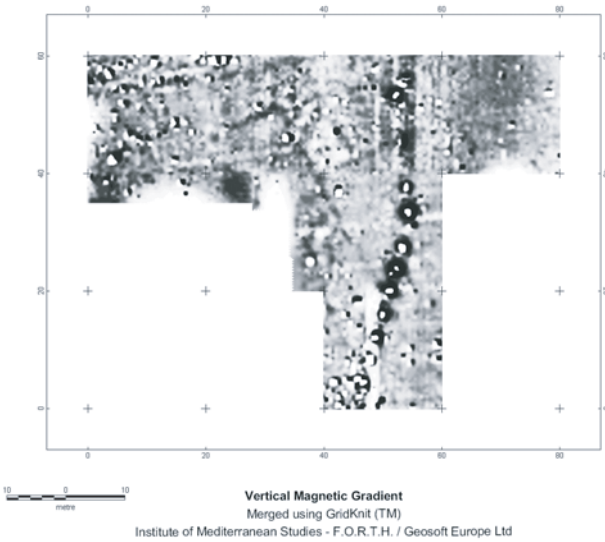

Figure 2. Vertical magnetic gradient grids merged using the GridKnit™ Suturing technique.

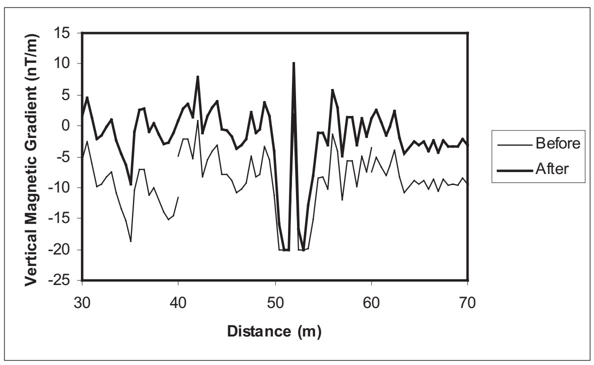

Figure 3. Profile AA' (position shown in Figure 1) before and after merging. Amplitudes have been clipped to 20nT/km