

RES2DINVx64 - 2D RESISTIVITY & IP INVERSION software for Windows XP/Vista/7/8/10

Supports **on land**, **underwater**, **cross-borehole** and **time-lapse** surveys

Supports **smooth and sharp contrasts** inversions

Supports **multi-core CPUs** and **64-bit Windows**

Supports **up to 16000 electrodes** and **100000 data points** with almost any electrode arrangement

Fast seamless inversion of very long survey lines using sparse inversion techniques

Two-dimensional (2D) electrical imaging surveys are now widely used to map areas of moderately complex geology where 1D resistivity sounding surveys are inadequate. The RES2DINVx64 programs use the smoothness-constrained Gauss-Newton least-squares inversion technique (Sasaki 1992) to produce a 2D model of the subsurface from the apparent resistivity data. It is completely automatic and the user does not even have to supply a starting model. On a modern PC, the inversion of a single pseudosection is usually completed within seconds to minutes. It supports the Wenner, Schlumberger, pole-pole, pole-dipole, dipole-dipole, multiple gradient and non-conventional arrays.

The program will automatically choose the optimum inversion parameters for a data set. However, the inversion parameters can be modified by the user. The smoothing filter can be adjusted to emphasize resistivity variations in the vertical, horizontal or diagonal directions. It can also be optimized to produce models with smooth boundaries (for eg. chemical plumes), or with sharp boundaries (for eg. fracture zones). Resistivity information from borehole and other sources can also be included to constrain the inversion process. Known boundaries where an abrupt change in the resistivity occurs can also be incorporated in the inversion model. Three different techniques for topographic modeling (Loke 2000) are available. The complex resistivity method (Kenma et al. 2000) is used for IP data inversion.

Figure 1 shows an example from an electrical imaging survey in an area with fairly complex subsurface geology and significant surface topography.

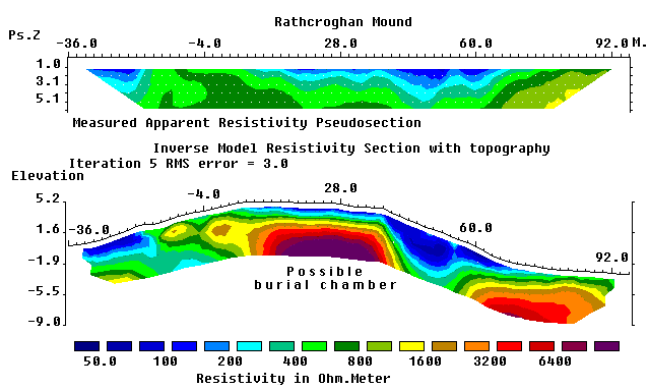


Figure 1 Rathcroghan mound survey (a) apparent resistivity pseudosection, (b) computer inversion model.

This survey was carried out across a circular mound that is thought to contain some important Irish archaeological burial chambers (Waddell and Barton 1995). The inversion of this data set with 67 electrode positions and 339 data points takes seconds on a modern PC. The second example is from a combined resistivity and IP survey over the Magusi River massive sulphide ore body

(Edwards 1977). This survey was conducted with 30.5, 61.0 and 91.4 meters dipoles. The resulting pseudosection has a complex distribution of data points with overlapping data levels measured with different dipole spacings. The apparent resistivity and IP pseudosections, together with the model sections are shown in Figure 2. The ore body shows up as a distinct low resistivity body with high IP values near the middle of the survey line in the model sections. Note the sharp boundaries between ore body and the surrounding rocks.

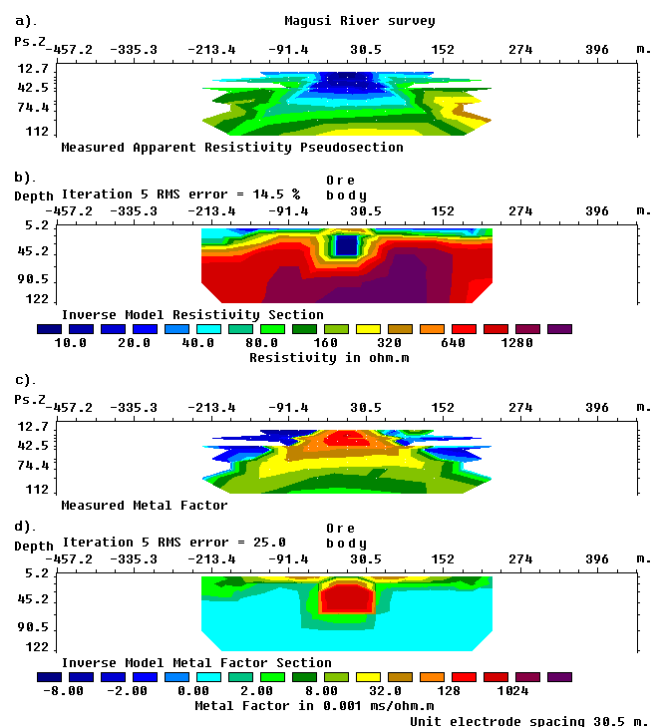


Figure 2. Magusi River ore body survey. (a) Apparent resistivity and (b) model sections. (c) Apparent metal factor and (d) model sections.

References

Edwards, L.S., 1977, A modified pseudosection for resistivity and induced-polarization. *Geophysics*, 42, 1020-1036.

Kenma, A., Binley, A., Ramirez, A. and Daily, W., 2000. Complex resistivity tomography for environmental applications. *Chemical Engineering Journal*, 77, 11-18.

Loke, M.H., 2000. Topographic modelling in resistivity imaging inversion. 62nd EAGE Conference & Technical Exhibition Extended Abstracts, D-2.

Waddell, J. and Barton, K, 1995, Seeing beneath Rathcroghan. *Archaeology Ireland*, Vol. 9, No. 1, 38-41.

Sasaki, Y. 1992. Resolution of resistivity tomography inferred from numerical simulation. *Geophysical Prospecting*, 40, 453-464.

Summary of RES2DINVx64 features

1. Support for conventional arrays such as Wenner, Wenner-Schlumberger, dipole-dipole, pole-dipole, pole-pole, multiple-gradient; and non-conventional arrays such as the offset pole-dipole array.
2. Handles data from surveys carried out on the ground surface, cross-boreholes, aquatic surveys with floating or bottom electrodes.
3. Inversion of IP data using the complex resistivity method.
4. Time-lapse resistivity data sets from monitoring surveys for up to 72 time-series on PCs with 32 GB RAM. Supports joint resistivity and I.P. time-lapse inversion.
5. Supports data sets with up to 85,000 readings and 9,500 electrode positions on PCs with 8 GB RAM. Supports up to 130,000 readings and 11,000 electrode positions with 32GB RAM.
6. Supports parallel processing for multi-core CPUs.
7. Many inversion techniques for different geological settings and survey configurations. This includes smooth (L2) and blocky (L1) inversion options, sparse inversion techniques for very long survey lines, topographic modeling using the finite-element method. Automatic determination of damping factor in smoothness-constrained least-squares inversion method using the L-curve method.
8. Calculation of model resolution to assess model reliability.
9. Option to combine data from different 2-D survey lines into a 3-D data set for the RES3DINV program to overcome limitations of 2-D inversion models.
10. Output of results in commonly used Geosoft XYZ and Golden Surfer formats.
11. Most resistivity-meter instruments have software conversion routine to convert field data sets into the data format used by this program.
12. Support for 64-bit Windows XP/Vista/7/8/10.
13. Users with only the Res2dinvx64 license can use the Res3dinvx64 program for 3-D data sets with up to 600 electrodes positions.