toPeak: A GUI Client Software for Three-dimensional Magnetotelluric Inversion

Liu Zhongyin, Chen Xiaobin, Cai Juntao, Zhao Guoze, Tang Ji
State Key Laboratory of Earthquake Dynamics,
Institute of Geology, China Earthquake Administration, Beijing, China, cxb@ies.ac.cn

**SUMMARY**

toPeak is a graphical user interface (GUI) client for three-dimensional (3D) inversion of magnetotelluric (MT) data. It is written in Delphi. toPeak contains two parts: one is the inversion programs distributed on Linux calculation clusters, including ModEM and WSINV; the other one is Windows client managing data, building topographic model and executing inversion command via SSH to clusters. This client runs without installation and registry, it is a green software. By integrating the normal workflow of 3D inversion, the client has made the 3D inversion easier to most users.

**Keywords:** Geophysics, Magnetotellurics, Inversion, Graphical user interface, Object-oriented programming.
Figure 3d and Figure 3e shows the data curve and residual fitting, which displays all the sites’ fitting situation. It would help choosing data for the next inversion operation.

Figure 3f shows the cluster nodes selection situation. Before the user start his inversion mission, he should setup the number of cluster nodes and CPUs he is willing to use. Two ways of setup are available now: set the number of nodes and CPUs directly (selected nodes have the same number of CPU) or set the specified nodes and setup their CPU count (selected nodes may have different number of CPU).

Figure 3g shows the situation displaying any project’s specified inversion status in specified cluster. By clicking the inversion name on the left listbox, the user can select the inversion status he wants to view, which includes the basic inversion parameters, the RMS curve, the Lambda curve and inversion log.

Figure 3h shows the situation displaying current project’s inversion status in specified cluster. By clicking the combobox, the user can get the specific inversion status he wants to view, and by clicking the download button, the inversion results can be downloaded to the local computer.

Figure 4 shows the result model. Figure 4a shows the whole model, while Figure 4b shows the slice along survey lines. Based on the results, relative geological data etc., the user can do the later explanations.

CONCLUSIONS

Firstly, data project as the core, GUI operation as the packaging, toPeak realizes all the 3D inversion workflow basically, which reduces the learning costs of 3D inversion and promote its practical use.

Secondly, as a client coded in modularity, toPeak has the potential becoming a platform containing various inversion programs and connecting different clusters by changing some codes. It has important impact on the future cloud calculation.

Thirdly, despite the fact that all the software’s functions has realized narrowly, toPeak still remains some shortcomings and bugs due to the insufficient understanding of MT, the rapid development of MT and poor programing coding skill. Having the will of making toPeak a useful tool of MT, the later updates and bug fixes will last long.

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REFERENCES


Figure 1: toPeaks's functions

Figure 2: toPeaks's workflow
Figure 3 part of toPeak's functions
(a) Sites distribution in Geographic coordinate system; (b) Sites distribution in relative Cartesian coordinate system; (c) Model building part; (d) Curve fitting display; (e) Residual fitting display; (f) Calculation Cluster nodes selection; (g) Any project's specified inversion status in specified cluster; (h) Current project's inversion status in specified cluster.

Figure 4 result model display
(a) Model display (include sites, faults); (b) Model slice display along survey lines