MobileMT
porphyry forward modeling

from innovations to discoveries

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Definition: in the case of MobileMT technology, forward modeling is the mathematical simulation of a geoelectrical model which is used to compute natural EM field data in the range of 26-20,000 Hz that would be observed given that model.

Objective of the forward modeling, based on a geologic model and petrophysical parameters of the model, is investigation a target detectability or the model recovering capabilities of MobileMT technology in different geoelectrical conditions and scenarios.

The next steps are implemented into the forward modeling procedure:

- Development a simplified or fully identical geoelectrical model-section.

- Calculation of MobileMT response (apparent conductivity or apparent resistivities values) for different frequencies along a model.

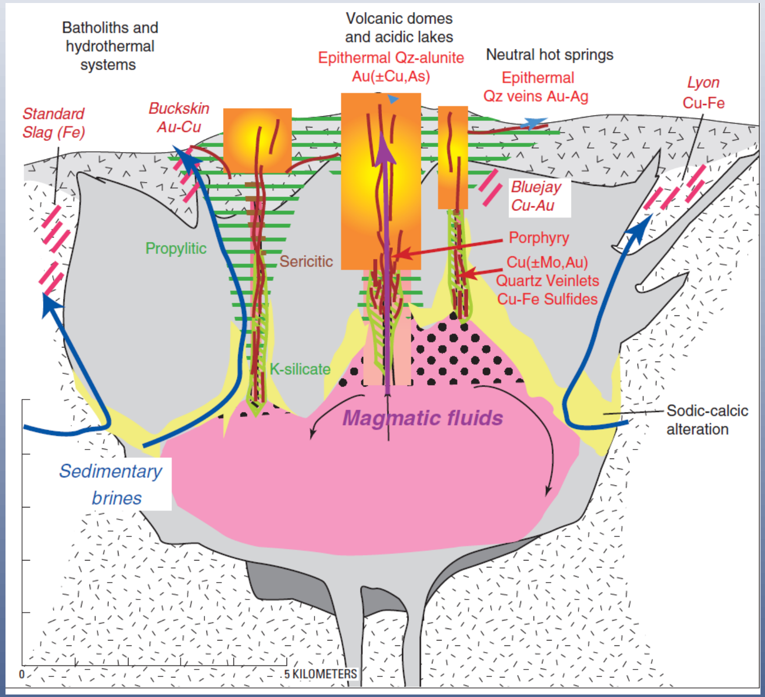
- Adding gaussian noise into the calculated data (~3%).

- Non-constraint inversion of the calculated+noise field based on the half-space initial model.

- The MobileMT technology is recognized as potentially effective if the inverted data is recovering the initial model or detect a given target.

Porphyry Copper Deposit Style

"Porphyry copper deposits, the world's largest source (about 60 percent) and resource (about 65 percent) of copper and a major source of molybdenum, gold and silver. " (David A. John, 2010)



Sources:

David A. John, 2010, Porphyry Copper Deposit Model, Scientific Investigations Report 2010–5070–B, USGS.

Emond, A.M., Zhdanov, M.S., and Petersen, E.U.,2006, Electromagnetic modeling based on the rock physics description of the true complexity of rocks: applications to study of the IP effect in porphyry copper deposits. SEG/New Orleans Annual Meeting. Expanded Abstracts, p.p. 1313-1317.

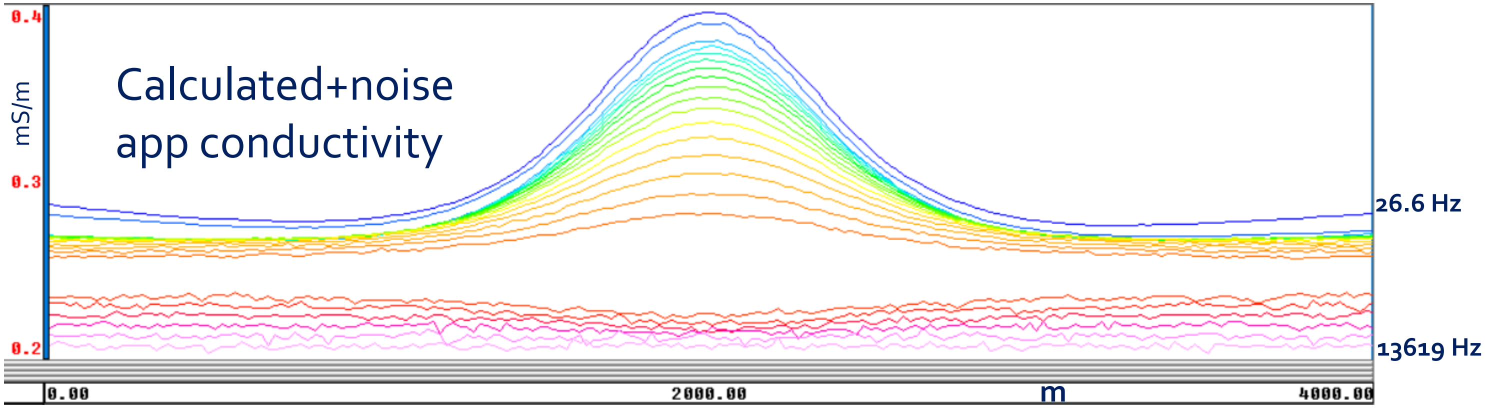
Hope, M., Andersson S., 2016, The discovery and geophysical response of the Atlántida Cu–Au porphyry deposit, Chile. Exploration Geophysics, 47, 237–247

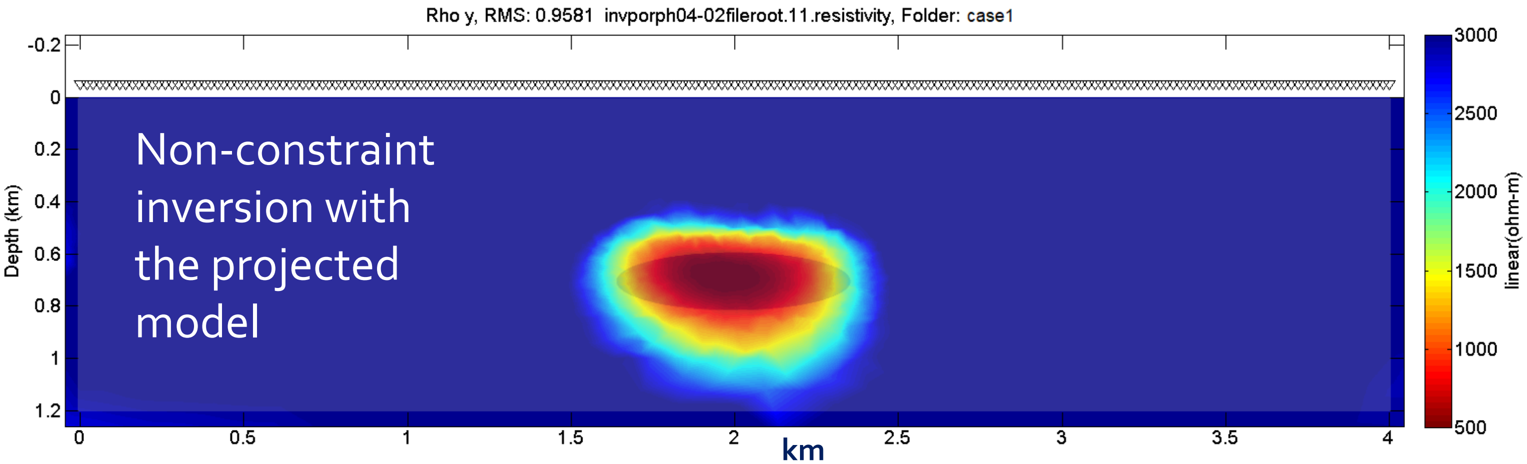
Presented models

- Case 1 - Coastal Cordillera simplified porphyry. 200 Ohm-m target in resistive environment, 600 m depth.
- Case 2&2a - Atlántida deposit style (Chile). Under conductive overburden, 0.5-1 km depth.
- Case 3 - American Eagle Porphyry style (Arizona). 1-2 km depth.
- Case 4 - Dark Canyon Arizona style.
- Case 5&5a - a typical porphyry copper system in the southwestern U. S. under very conductive overburden.

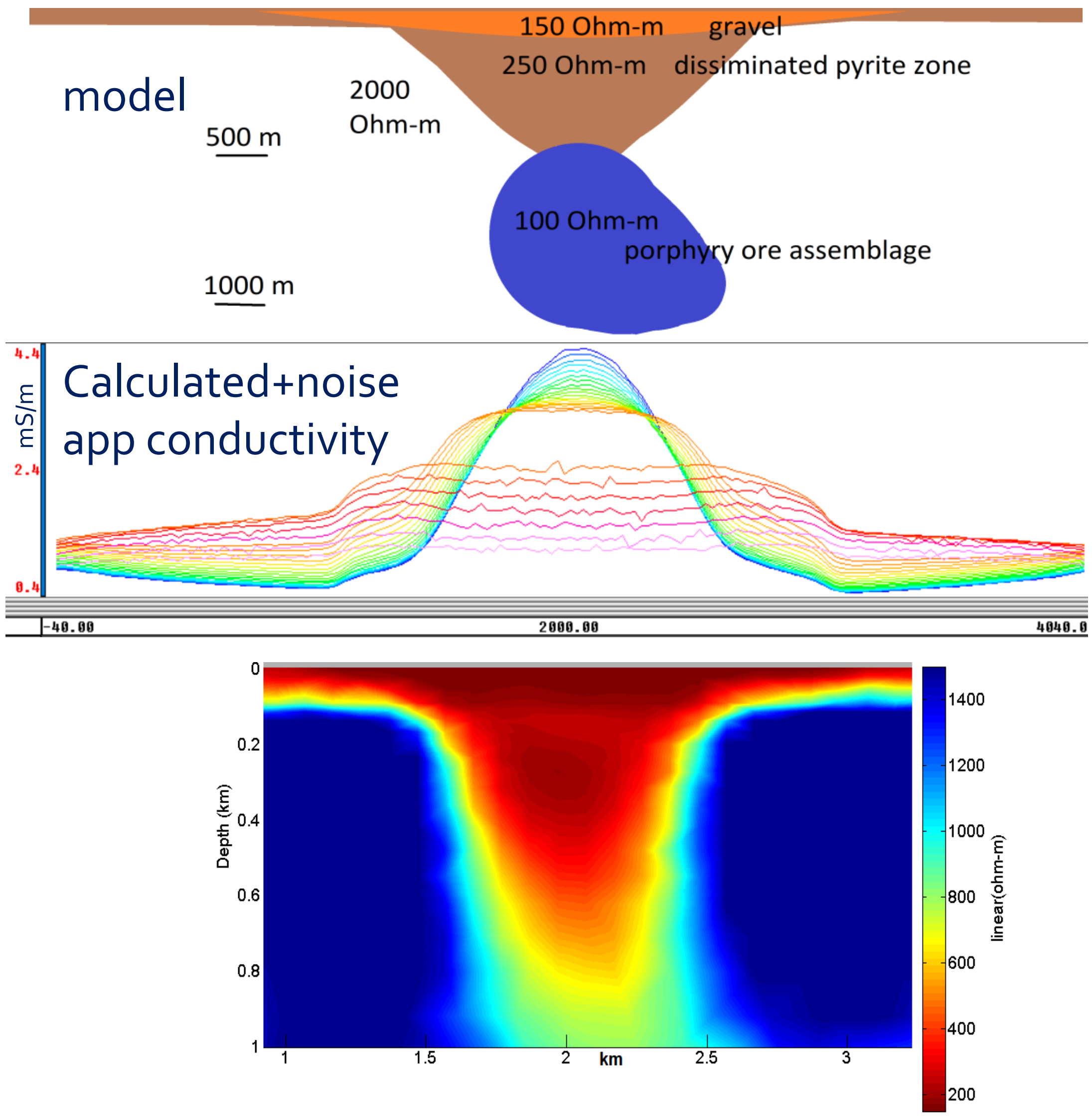
Case 1 Coastal Cordillera simplified porphyry

model

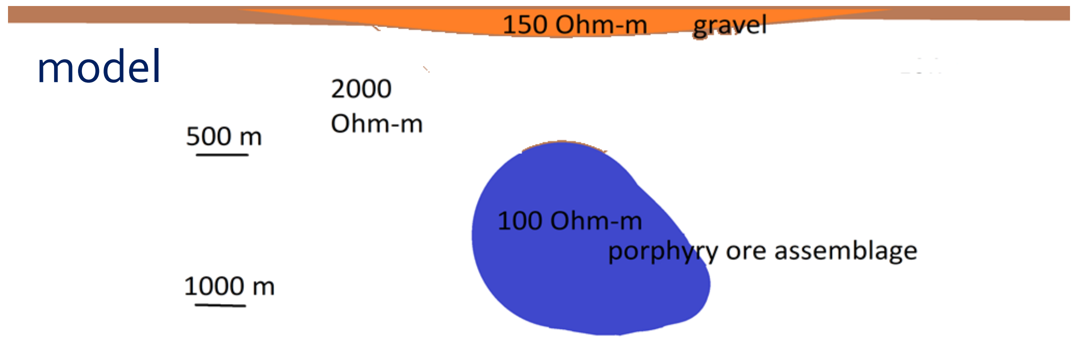


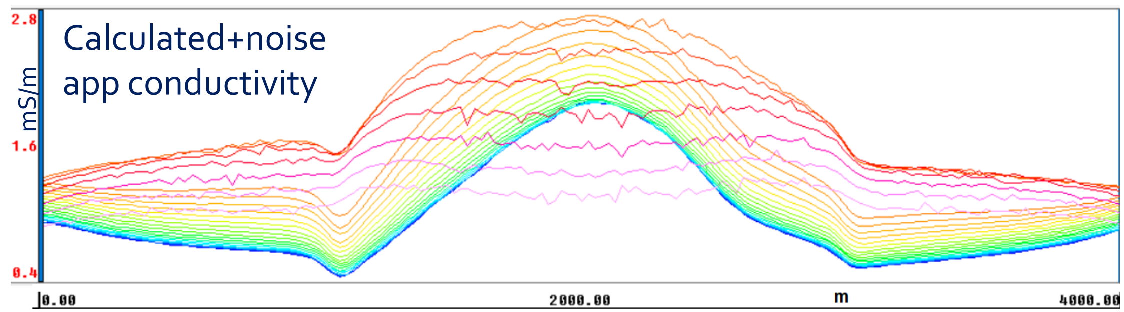


Case 2 Atlántida deposit style (Chile) (Hope, M., Andersson, S. 2016)

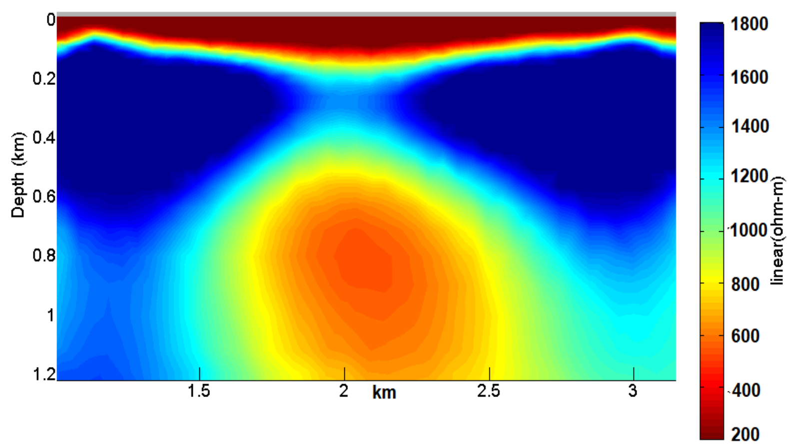


Case 2a Atlántida deposit style (Chile) modified

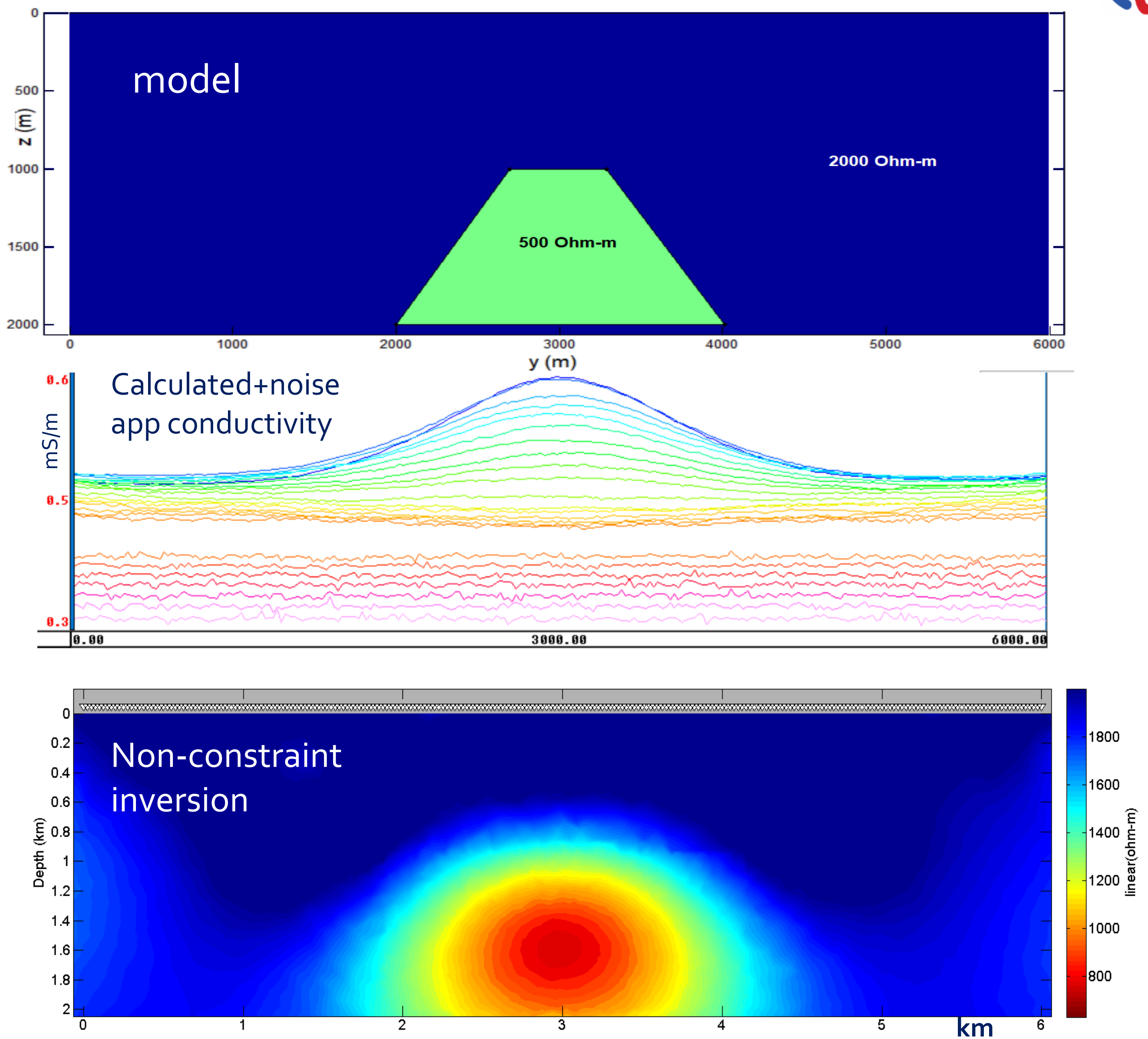




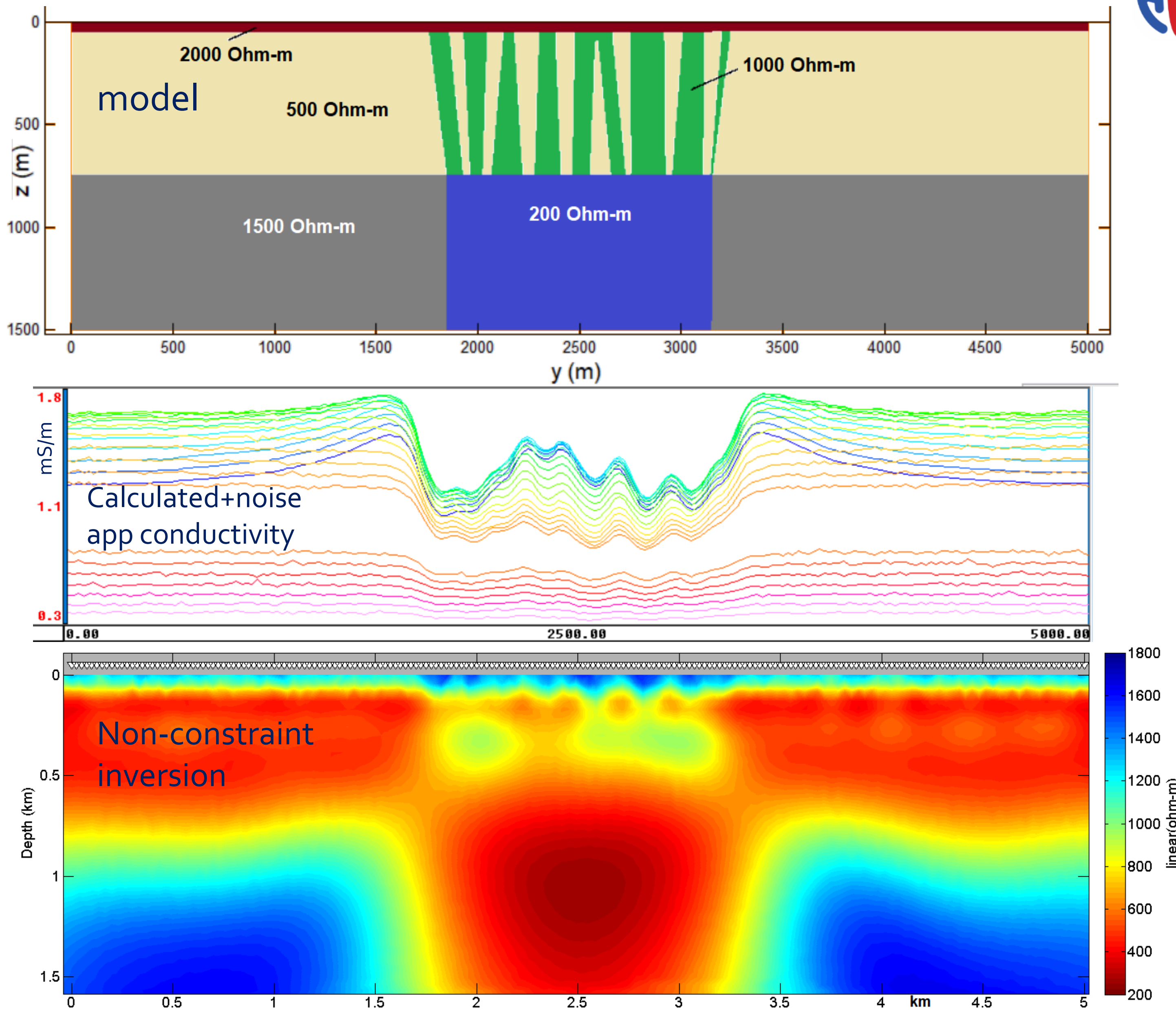
Non-constraint inversion



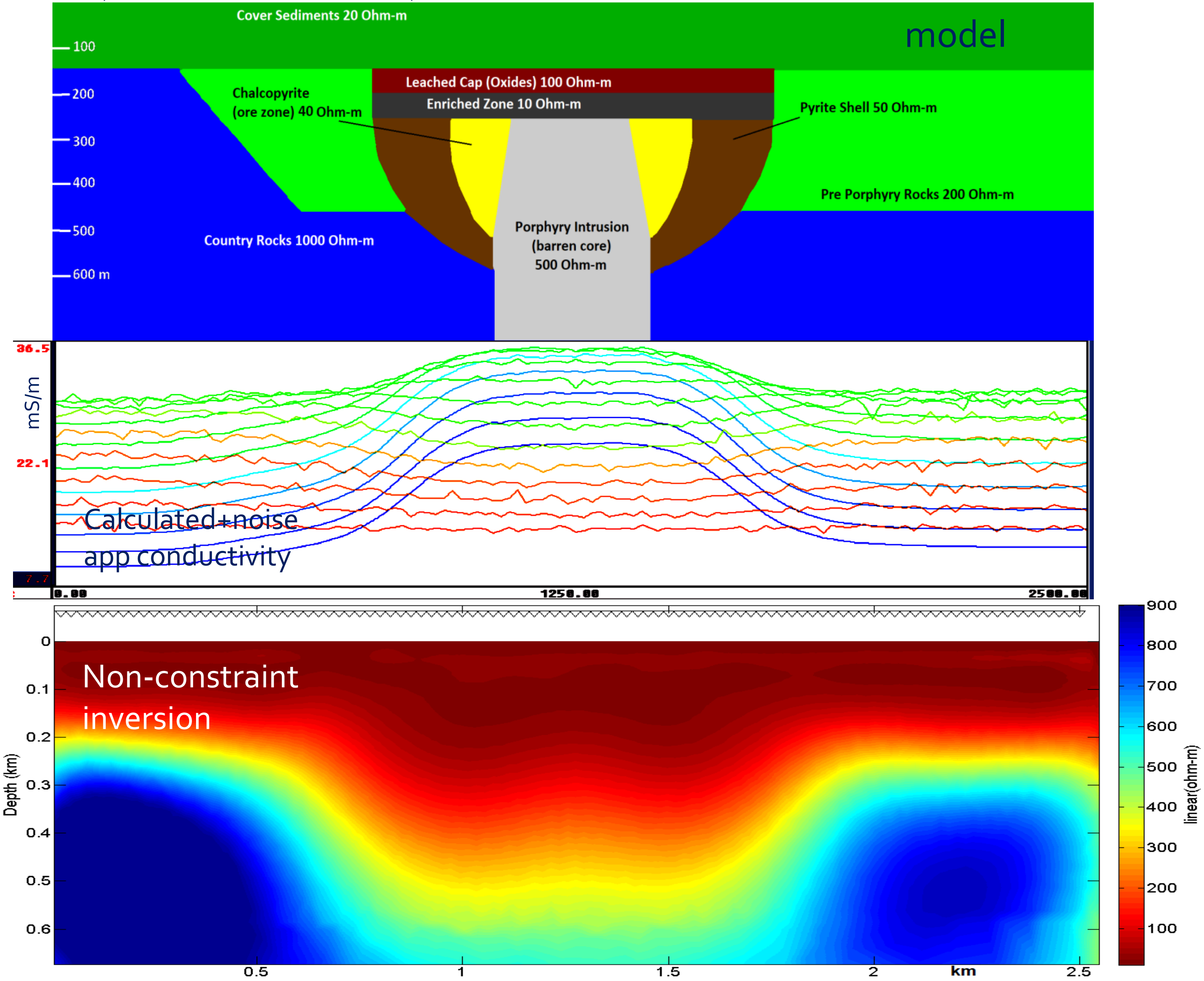
Case 3 American Eagle Porphyry style (Arizona)



Case 4 Dark Canyon Arizona style

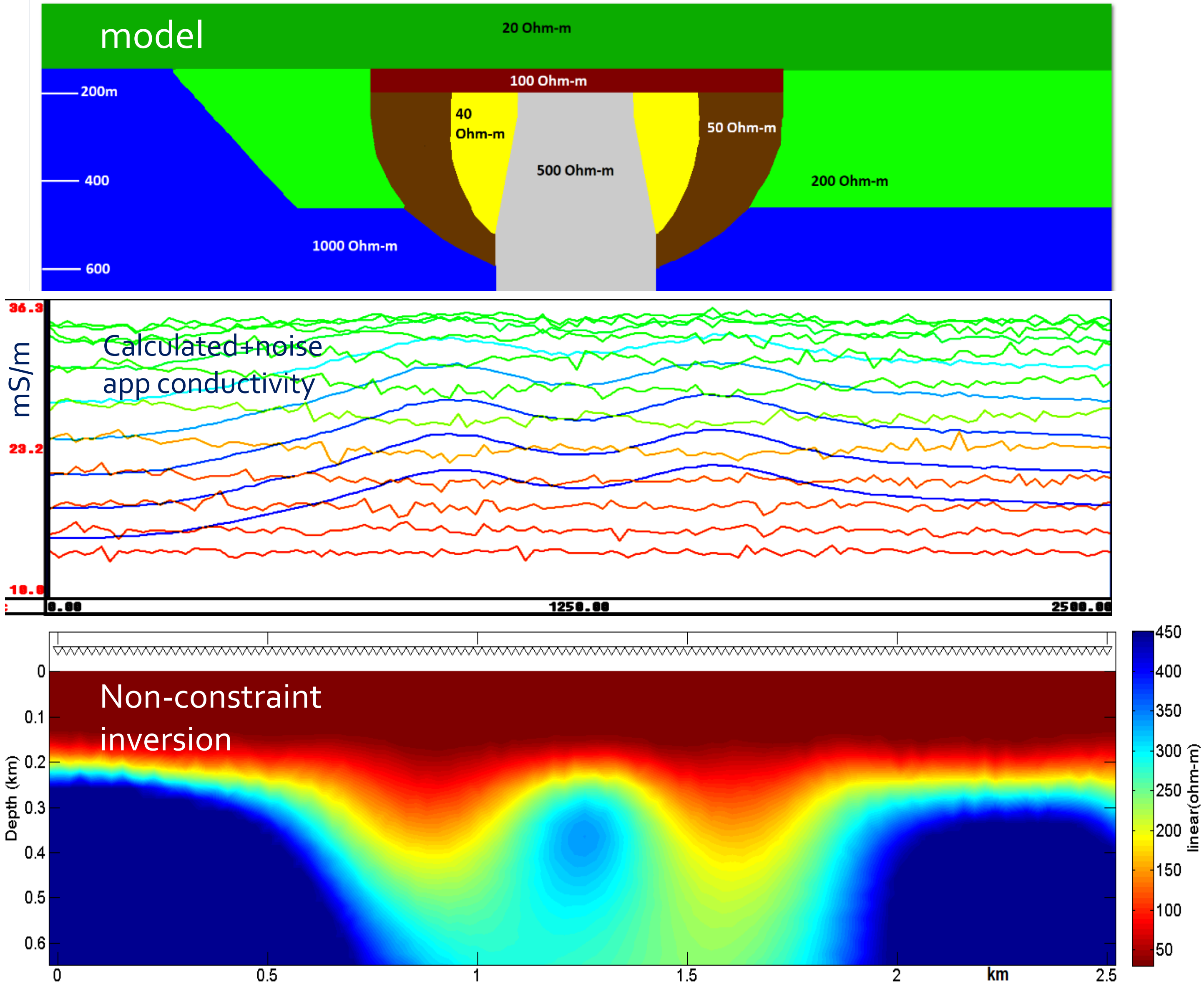


Case 5 a typical porphyry copper system in the southwestern U. S. (Emond et. al. 2006).



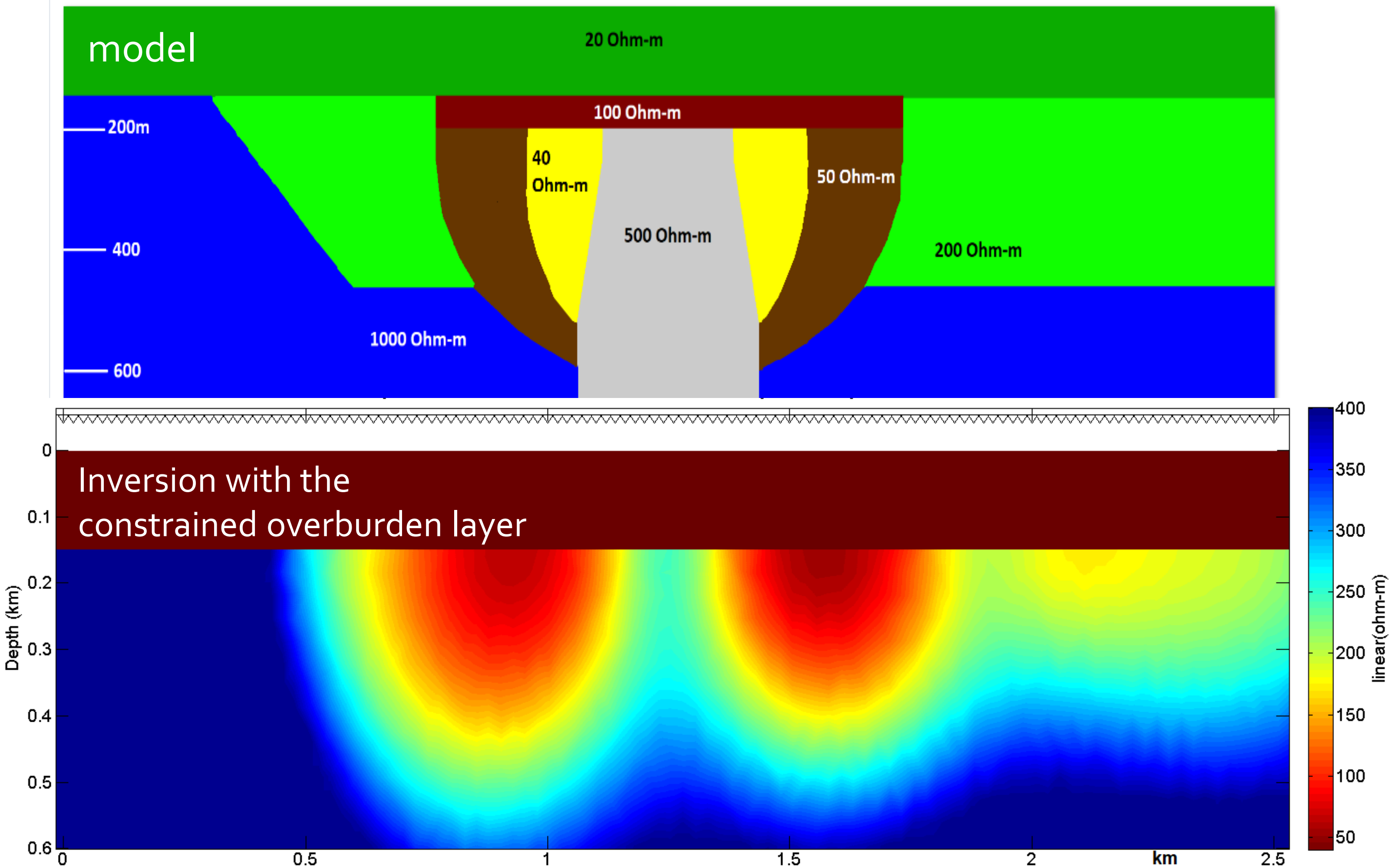
porphyry copper system in the southwestern U. S.

Case 5a a typical porphyry copper system in the southwestern U. S. modified



Case 5a a typical porphyry copper system in the southwestern U. S. modified

EXPERT GEOPHYSICS



Even small a-priory constraints combined with data inversions improve models recovery.

Conclusion

Numerical methods have been used to simulate porphyry ore-systems models and their reflection in the MobileMT data. The current forward modeling covers 5+ typical and generalized porphyry systems models in a broad spectrum of geoelectrical conditions, from resistive to conductive.

As the theoretical results and practice show, MobileMT airborne EM system is able to recover subsurface geology effectively in the broad range of resistivities and depths from near surface to >1 km.

Mobile-MT technology is highly potential in porphyry mineral exploration, including those porphyry ore-systems that are deeply located or masked by challenging post-mineral cover.

Please send us your models or sections and we will check MobileMT capabilities in solving your exploration problems.

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