

Inversion Based Processing of Time Domain Induced polarization data

Anders K. Kühl¹, Thue Bording¹, Gianluca Fiandaca²

(1) *HydroGeophysics Group, Department of Geoscience, Aarhus University, Aarhus, Denmark*

(2) *Department of Earth Sciences “Ardito Desio”, University of Milano, Milan, Italy*

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With modern large scale or long time monitoring surveys, large amounts of IP data can be acquired and the data processing is often highly time intensive and requires a deal of experience. Here we present a novel approach to automatically process decay curves from time domain IP data.

This is done by iteratively inverting the data using the Generalized Minimum Support (GMS) norm and the L2 Norm. Each decay is inverted for individually, using a fixed geometry 3-Layer buried electrodes model, which can generate any physical decay shape. Constraints are added between 3-Layer models of quadrupoles that were measured spatially adjacent, in order to better remove outliers.

The GMS Norm puts a cap on the weight of non-fitting data points, allowing for the model to focus on the data points that can be fitted. After a GMS inversion cycle, the L2-error of the gates is calculated and those with an error above a chosen threshold are removed.

This approach effectively removes both random and systematic noise, as well as EM effects, which are not modelled in the forward response. The constraints help in removing outlying decays, that otherwise might be fittable with the three layer models.

Comparison with manually processed data and final inversion models show that this automatic processing scheme removes less datapoints than a manual processor while having similar misfits.

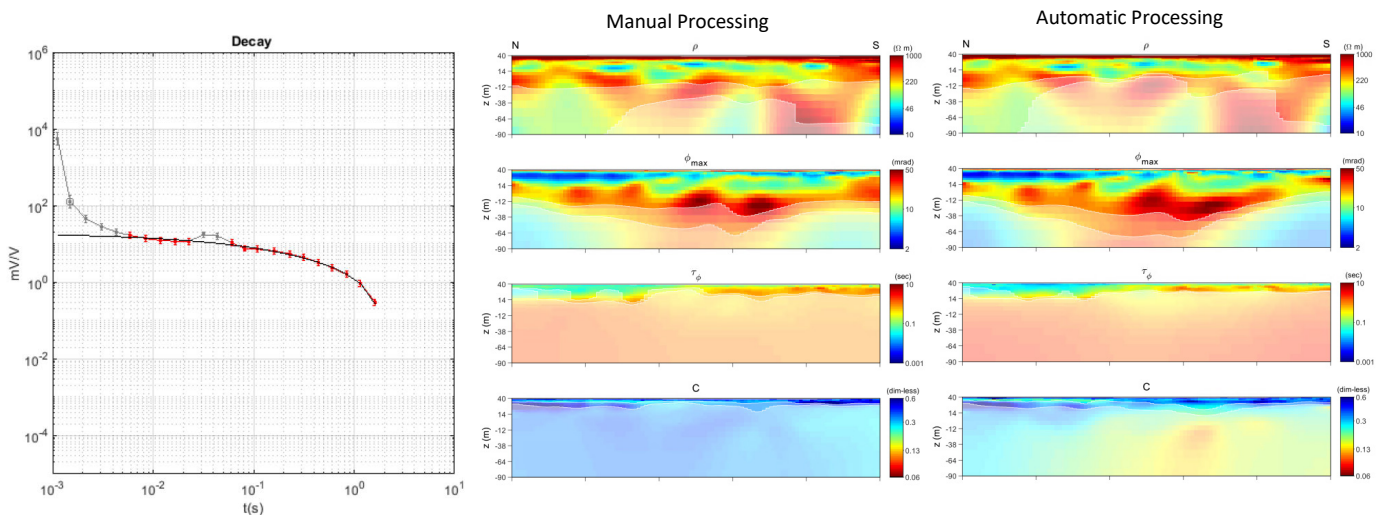


Figure caption: Left: A decay after processing. Removed gates in grey, kept gates in red, circles for negative data, black model used to fit. Center: A Maximum Phase Angle inversion using Manual processing. Right: Same as Center but using the Automatic Processing scheme