# 22

## Minimum gradient support and geostatistics regularization approaches for inverting time-lapse data

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Inversion of time-lapse resistivity data allows obtaining 'snapshots' of changes occurring in monitored systems for applications such as aquifer storage, site remediation or tracer tests. Based on these snapshots, one can infer qualitative information on the location and morphology of changes occurring in the subsurface but also quantitative estimates on the degree of changes in certain property such as temperature or total dissolved solid content. Analysis of these changes can provide direct insight into flow and transport processes and controlling parameters. However, the reliability of the analysis is dependent on survey geometry, measurement schemes, data error, or regularization. Except regularization, survey design parameters may be optimized prior to the monitoring survey. Regularization, on the other hand, may be chosen depending on available information collected during the monitoring. Common approaches consider smoothing model changes both in space and/or time. We here propose to use two alternative regularization approaches which may be better suited to invert time-lapse data. The first approach is the minimum gradient support (MGS) regularization, which focus the changes in tomograms snapshots. MGS will limit the occurrences of changes in electrical resistivity but will also restrict the variations of these changes inside the different zones. The second approach is based on geostatistics and requires first to derive variogram parameters for the model changes. In this contribution, we demonstrate the benefits and limitations of these regularization approaches to time-lapse data on numerical benchmarks and three case studies.