



## **GALS - Gradient analysis by least squares**

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The current as well as many other important quantities can be estimated from the space and time gradients of physical fields. Here we present a general method (GALS — Gradient Analysis by Least Squares) for reconstructing the field and its gradients at an arbitrary point in space-time by using multi-spacecraft observations. GALS treats space and time symmetrically by using a least square method with weights depending on the distance, both in space and time, to the observation point. Applying GALS both to simulated data and to the magnetic fields observed by the Cluster satellites, the full current vector is derived. We analyze the result, describe the properties of our method and compare it with the alternative Curlometer method. Preliminary results are promising, indicating that GALS is fairly robust and in many cases superior to the Curlometer. Moreover, reasonable measures of quality (describing properties such as the resolution, sensitivity, and stability of the GALS method) can often be obtained.