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Emmy-Noether-Campus, University of Siegen, 57076 Siegen, Germany. *Sparse Regularization of  
Geophysical Inverse Problems by a Greedy Algorithm.*

Localized methods for the processing of geophysical and geodetic signals including inverse problems have been developed for several decades. These spline and wavelet methods use “hat-like” basis functions which are centered around certain points of the sphere or the ball. However, the choice of the grid for the centers is not ideal, yet. Wavelet methods require the use of a quadrature grid, whereas the spline method uses a grid which corresponds to the data grid. Moreover, the calculation of the spline is connected to a system of linear equations, which limits the resolution due to the size of the associated dense matrix.

Due to the increasing size of data which is necessary to improve current models of the Earth’s interior, these approaches have to be further enhanced. It will be shown that a more flexible choice of the centers of the basis functions can be achieved by an iterative method, which is motivated by dictionary-based Euclidean methods called greedy algorithm and matching pursuit. The centers are now primarily chosen where locally a high content of detail information is hidden in the solution. Moreover, much more basis functions can be used than before, which yields a significantly increased resolution. (Received September 20, 2010)