

1106-65-664

Roger Telschow* (telschow@mathematik.uni.siegen.de), Geomathematics Group,
Walter-Flex-Str. 3, 57068 Siegen, Germany. *A Regularized Orthogonal Matching Pursuit for
Geoscientific Inverse Problems.*

We propose an algorithm for the stable solution of inverse problems as they appear in geosciences. Based on an orthogonal matching pursuit, the unknown signal is expanded in terms of trial functions which are iteratively picked from a large redundant set of spherical functions. As a big advantage, the method is able to combine arbitrary spherical basis functions. In particular, we combine spherical harmonics of low degrees with wavelets of different scales and/or scaling functions for the reconstruction of global trends and regional details, respectively. In order to stabilize the solution, we use a Tikhonov regularization with a particular spherical Sobolev norm. Since there is no need to solve any system of equations or any integration problem, the method also provides the ability to handle very large amounts of data or extremely scattered data sets. The outcome is a smooth and sparse approximation of the signal which is locally adapted to the detail structure of the signal as well as to the density of the data. Moreover, in the case that wavelets are contained in the dictionary, we additionally obtain a multiresolution of the signal. Several numerical experiments are presented, e.g., the problem of downward continuation of the gravitational field. (Received September 04, 2014)