Meeting: 1003, Atlanta, Georgia, SS 17A, AMS-SIAM Special Session on Nonsmooth Analysis in Variational and Imaging Problems, I

1003-45-1370   **Carsten Mayer*** (`cmayer@mathematik.uni-kl.de`), University of Kaiserslautern, Departement of Mathematics, Geomathematics Group, 67663 Kaiserslautern, Germany. *Mathematical Modeling of the Inverse Source Problem in Geomagnetism.*

The presentation will show the development of the mathematical modelling procedure for the geomagnetic inverse source problem. It is concerned with the reconstruction of ionospheric currents from magnetic field measured by satellites orbiting the Earth. In order to start, the problem has to be formulated in mathematical equations and has to be classified. In our case, we have to discuss an inversion of the pre-Maxwell equations which turns out to be an exponentially ill-posed problem. After this, the problem is embedded in the class of vectorial inverse problems. To solve these problems a new technique is developed. Scaling functions and wavelets are used to realize a multiscale analysis of the function spaces under consideration and to establish a multiscale regularization procedure for the inversion of the considered vectorial operator equation. Based on the knowledge of the singular system a regularization technique in terms of certain product kernels and corresponding convolutions can be formed. At the end, the multiscale regularization techniques are used to reconstruct ionospheric currents from geomagnetic satellite data. The method is tested on real magnetic field data of the satellite CHAMP and the proposed satellite mission SWARM. (Received October 05, 2004)