

1096-65-2297

**Martin Gutting\*** ([gutting@mathematik.uni-siegen.de](mailto:gutting@mathematik.uni-siegen.de)), University of Siegen,  
Emmy-Noether-Campus, Walter-Flex-Str. 3, 57068 Siegen, Germany. *Fast Multipole Accelerated  
Multiscale Analysis on the Sphere.*

Spherical wavelets allow a space-frequency decomposition of many geophysical quantities on the sphere allowing regional modeling or the improvement of a global model. Certain types of spherical wavelets allow the acceleration of the spherical convolution by the fast multipole method. The main idea of the fast multipole algorithm consists of a hierarchical decomposition of the computational domain into cubes and a kernel approximation for the more distant points. The direct kernel evaluation is performed only for points in neighboring cubes on the finest level. The contributions of the other points are taken into account by the kernel approximation.

Wavelet methods on the sphere come along with a tree algorithm that allows the computation of the lower frequency scales from a starting scale that contains the highest frequency parts of the signal. The application of the fast multipole method can accelerate the computation of this starting point as well as the tree algorithm itself.

Applications to gravitational field modeling and spherical denoising are presented and finally, the extension to boundary value problems is considered where the boundary is the known surface of the Earth itself. (Received September 17, 2013)