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Michel Volker* (michel@mathematik.uni-siegen.de), Geomathematics Group, Department of Mathematics, University of Siegen, 57068 Siegen, Germany. *Spherical Harmonics, Splines and Wavelets — What Comes Next?*

For a long time, spherical harmonics have been the only remarkable mathematical tool for the analysis of spherical functions. Although there is still a series of applications, their use becomes less and less important in numerical implementations. Several more sophisticated mathematical tools for spherical functions (such as spherical splines and wavelets) have superseded orthogonal polynomials as the first choice method during the last decades. This talk discusses what could be the next step in developing new methods for the analysis of spherical functions. One answer could be "let's become non-linear". This means that non-linear methods are possible improvements. On the Euclidean domain, dictionary-based methods recently became popular. The principle ideas can be transferred to the sphere, as it is shown in the talk. Moreover, "non-linear" refers not only to the methods but also to the problems since there is also a need for good approximation methods to solve non-linear problems in geomathematics. One example occurs in the joint inversion of seismic and gravity data for the modelling of the Earth's interior. (Received September 21, 2009)