



Spherical tensor Slepian functions for satellite gravity gradiometry

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For data on the sphere in scalar and vectorial form spatially concentrated and spectrally limited, or spatially limited and spectrally concentrated functions have proven to be a viable and versatile tool. These so-called Slepian functions have been applied in a variety of fields including geodesy, planetary magnetism, cosmology, and biomedical imaging. Their focus on a chosen region on the planet allows for local inversions, when only regional data are available or are of desired quality, or they enable us to extract regional information. For tensorial data, as for example provided by the gravity satellite mission GOCE, no such Slepian functions are available. We present a method for an efficient construction of tensor Slepian functions for symmetric regions such as spherical caps. These functions arise from the solution of an optimization problem involving tensor spherical harmonics (by Freedon and Schreiner) and primarily, spin-weighted spherical harmonics (by Newman and Penrose). Our work also implies the improvement of the theory of the spin-weighted spherical harmonics as a main aspect.