Models of the crustal magnetic field are typically represented using spherical harmonic coefficients. Rather than spherical harmonics, spherical Slepian functions can be employed to produce a locally and also globally orthogonal basis in which to optimally represent the available data in a region at a given degree. The region can have any arbitrary shape and size. The Slepian functions can be tailored to be either band- or space-limited, allowing a trade-off between spectral and spatial concentration in the region and leakage beyond. Another advantage is that only N Slepian coefficients are required to be solved for to optimally concentrate the energy of the Slepian functions into the region of interest (\(N = (L+1)^2R/4\pi\); where N is the Shannon Number and R is the size of the region as a fraction of the full sphere).

We use N Slepian functions to optimally separate a crustal field model into its oceanic and continental regions in order to investigate the spectral content of each. Spherical harmonic coefficients are transformed into Slepian coefficients, separated into the appropriate regions and transformed back to spherical harmonic coefficients representing the space-limited extent of the oceans and continents. The spectral power of each region is examined over degrees \(L = 16-72\). We show that both regions display different power levels at discrete bandwidths. For example, the oceanic signal dominates at degrees 16-30, while the continental signal is stronger at degrees 45-65. We compare different crustal models to illustrate that the derived signals are robust.