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# Nothing to fear from ellipsoidal harmonics

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Almost any geoscientist uses spherical harmonics apparatus routinely. Nevertheless, step by step the resolution increases, the need for an approach closer to an ellipsoid of revolution (or any other 'Earth-shape-like' domain) becomes natural. The article discusses the well-known apparatus of ellipsoidal harmonics from a numerical point of view. For this purpose an innovative numerical approach to the evaluation of associated Legendre functions of the first as well as the second kind is demonstrated. Its great numerical efficiency, stability over the full range of coordinates and high numerical precision are shown. Employing ISO/IEC 60559 double precision floating-point numbers one is able to evaluate ellipsoidal harmonic functions up to the degree and order 432 000 (or even higher) at almost any point in space with the relative accuracy better than $10^{-10}$ and with no considerable performance or precision penalty in contrast to spherical harmonic functions.

Simply, why do not use ellipsoidal harmonics sooner than spherical ones?