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On the Computation of the Orthotide Constants

F. Panzetta (1) and S. Casotto (1,2)

(1) Centre for Space Studies (CISAS), University of Padua, Italy (francesca.panzetta@unipd.it, stefano.casotto@unipd.it), (2) Department of Physics and Astronomy, University of Padua, Italy (stefano.casotto@unipd.it)

Ocean tides can be represented according to different parameterizations, the most popular being the spherical harmonic representation, characterized by a sum of harmonic constituents spanning the entire tidal spectrum, followed by the response method representation, in which the transfer function between the tidal forcing and the ocean tide field is separately defined for each tidal species. Based on the response method, supplemented with orthonormality properties, the orthotide formalism can be used to represent ocean tide height as a linear combination of orthonomal functions of time—the orthotides—weighted by coefficients which are functions of the geographic location—the orthoweights. Orthotides were introduced by Groves and Reynolds in 1975, who provided a list of coefficients in tabular form, without any reference to an explicit computational algorithm. The present contribution fills this gap and provides a thorough analysis of the orthotide formalism and develops a computational algorithm based on recursion formulae valid up to any order. In particular, we provide a list of orthotide constants up to order 50 for both the diurnal and the semidiurnal bands, with overall orthonormality conditions satisfied to a precision better than 10 ppb for the diurnal band and better than 1 ppm for the semidiurnal band.