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An Empirical Model of the Earth's Horizontal Wind Fields: HWM07

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The Horizontal Wind Model synthesizes the information content of many diverse observations and past calculations into summary patterns for future use. By overhauling the model parameterization and adding a significant number of new data sets the HWM93 model has been transformed into the provisional HWM07. The new formulation represents the zonal mean, migrating tides, stationary planetary waves, and seasonal modulations thereof via Fourier modulated Vector Spherical Harmonics. The vertical variations are represented by cubic B-spline weighting kernels, with two specialized hybrid basis functions at the top of the model. There are 18,840 unknown model parameters that are estimated with a novel sequential estimation process from 60×10^6 available data points, from 35 different instruments that span a period of over 50 years. The ability of HWM07 to represent the available observational data sets, and thus the true behavior of the atmosphere, is dramatically improved over that of HWM93; in particular the low- to mid-latitude tidal oscillations between 80 to 150 km.