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Low frequency variability in the Length of the day (LOD) time series (1630-2005). Comparative analysis through different spectral methods.

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Variation in Length of the day (LOD), through conservation of solid earth- fluid envelope angular momentum, is imprinted by core-mantle processes, ocean-atmospheric dynamics, the hydrologic cycle, etc. Therefore, variations in LOD present oscillations going from sub daily to secular time scales, with a well known separation between those time scales (decadal) imprinted preferentially by mantle-core processes and those at higher frequencies (sub daily to interannual time scales) associated with the ocean-atmosphere coupled dynamics.

Over the recent decades, since roughly the 1970 with the appearance of the modern space techniques the quality of the measurements of earth rotation parameters has improved so drastically that it allows now investigation of geophysical processes which occur at the sub daily time scales. In addition, thanks to different world wide efforts which took into account different old astrometry measurements, variations in LOD can be now traced back regularly to XVII century (1630). However even though down to 1880-1920, “precision” of the LOD time series still allows some interannual time scales to emerge, before these times only decadal time scales can be investigated with a certain success.

The present work intend through different and complementary spectral methods (continuous and discrete wavelets, principal components, empirical modal decomposition, maximum entropy, polynomials, etc) to give an insight on the different oscillations

present in LOD over the last three centuries, with a particular insight on decadal time scales, which may give constraint on the different geophysical phenomena participating. In addition, in order to give a short indication on the time scales present within the geophysical phenomena pertaining to LOD excitation, a model (CAM) of mantle-core angular momentum exchange will be analyzed as well as few climate indexes over the last three centuries. A discussion on the quality of LOD data for constraining long term geophysical phenomena will follow.