



0.0.1 Wavelet coherence analysis of Length-Of-Day variations and El Niño-Southern Oscillation

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Wavelet coherence analysis is defined and used to analyze the relationships between Length-Of-Day (LOD) variations and El Niño-Southern Oscillation (ENSO) on interannual scales. Using the newest observation data, this study quantitatively shows time-scale-dependent correlations and phase shifts between LOD variations and the ENSO. Good no-lag correlations (larger than 0.8) can be found on 3.0-4.9-year scales, while either obvious phase-shifts or low correlations are found on the other interannual scales. Around 2.5-year (biennial), 3.5-year and 5.0-year scales (i.e. around the time scales of ENSO's significant modes), the LOD variations with respect to the ENSO **lag** in phase by 4-5 months, **lead** by 3 months and **lag** by 3-5 months, respectively. Thus, there are obvious time-scale-dependent correlations and phase-shifts between the Earth rotation rate variations and the ENSO even within interannual scales.