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On the time-varying characteristic of the 6-year oscillation signal in length-of-day

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A significant 6-year oscillation (SYO) signal existing in the length-of-day (LOD) variations may reflect the fast dynamics of the Earth cores. The time-varying characteristic (TVC) of this signal may reveal the relevant details on the geophysical excitation process. However, it is still debate about the TVC of the SYO. Our previous works indicated that the SYO signal was showing an obviously decaying trend during 1962~2012 based on the normal Morlet wavelet transform (NMWT) method, while other works did not show the similar decaying result based on the other methods (e.g., the least square fitting- LSF). Here, in order to solve this controversial issue, we revisit the SYO and its TVC. Through a lot of numerical simulation tests, NMWT method is further confirmed to be a good approach to quantitatively recover the target damped harmonic signals from the complex background noises, but the classical LSF method can destroy the original harmonic signal. This work indicates that the unattenuated SYO result obtained by the LSF method is not reliable. In addition, this work further analyzes the LOD data during a longer span (i.e., 1840~2018) and extracts the SYO result in the time domain, the result of which shows: 1) the amplitude modulation phenomenon of the SYO itself on the longer time span, revealing the relevant excitation information within the Earth system; 2) a decreasing trend of the SYO signal in its amplitude after 1960s, which further supports the current SYO decaying result during 1962~2019. This recovered SYO result during a longer time-span obtained by this work is significant to understand the nature of the SYO change and its excitation process.