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Nonlinear Processes in Geophysics
Discussions

Interactive comment on "Search for the 531 day-period wobble signal in the polar motion based on EEMD" *by* H. Ding and W. B. Shen

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Referee#1 ## This paper applies the EEMD method, a nonlinear and non-stationary time-series analysis method, to analyze superconducting gravimeter (SG) records to show a clear 531-day wobble in the polar motion (PM). It's an interesting result to readers, and it might be useful to study the polar motion and its geophysical excitation sources. Therefore, I recommend accepting it for publication after the following minor comments are considered.

Response: Dear Referee#1, Your recognition of our work is greatly appreciated. According to your valuable comments and suggestions, we revised the manuscript and added relevant explanations as you suggested. The responses point-to-point are described below.

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1. After the early 1980s, the geodetic technology is used to obtain the time series of PM, which has greatly improved the quality of the data. Authors should give more description about the quality of the used data, and the background noise level in section 3.1. Response: Thanks for you useful suggestions. We have added relevant expressions as you suggested in the revised manuscript. See Lines 158-162 in section 3.1.

2. In the introduction, the authors should explain why the Fourier analysis can't observe such a wobble and what is the advantage of the adopted EEMD method compared to others, such as the wavelet analysis.

Response: Thanks for you useful comments. We added a new reference in the 'Introduction' part for the readers who want to know some more differences between different spectrum methods (Tary et al. 2014: Spectral estimationâĂŤWhat is new? What is next?). In the 'Introduction' part, we discussed the reason why the 531dW cannot be found in the Fourier spectrum by the traditional Fourier analysis, and explained this in Section 3 in more details. Generally, the wavelet analysis can be considered as similar as the Fourier analysis (such as the short-time Fourier analysis). There are many literatures that show the differences between EEMD and Wavelet, and our results in Section 3 (the synthetic and observed results) also clearly show the advantage of EEMD over the Fourier or Wavelet analysis.

3. I suggest that authors give more discussions or interpretations of the 531-day wobble for the variable frequency and phase.

Response: Thanks for you useful suggestion. We added interpretations in Section 4 (See Line 411). Generally, those variable features might be caused by the excited process and the background noises in different time spanning. Taking the CW as an example, even we have known its period in good knowledge, namely about 430 days, but if we use different time series to estimate its period, we may obtain different results;

see Table 1 for example, the estimated min and max periods from the three sub-series are about 432.5 and 435.1 days. The background noise level can significantly affect the estimates.

Please also note the supplement to this comment:
http://www.nonlin-processes-geophys-discuss.net/2/C219/2015/npgd-2-C219-2015-supplement.pdf

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Interactive comment on Nonlin. Processes Geophys. Discuss., 2, 647, 2015.