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Earth System Dynamics
Discussions

Interactive comment on "On the interconnections among major climate modes and their common driving factors" *by* Xinnong Pan et al.

Anonymous Referee #2

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Title: On the interconnections amongmajor climate modes and their common driving factors

Author(s): Xinnong Pan, Geli Wang, Peicai Yang, Jun Wang, and Anastasios A. Tsonis

The authors apply the Slow Feature Analysis (SFA) on climate indices representing the variations in major climate modes in order to extract driving forces and, applying the wavelet analysis, they estimate the main oscillatory components characterizing the variability of the analyzed climate modes. About 26 different periods are interpreted as harmonics of only four main periods rooted in QBO, ENSO and the solar activity. This seems as a very interesting and important result, however, I am afraid that

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Discussion paper

such a bold conclusion requires more than just estimating the periods. Moreover, as already the first referee pointed out, the authors should present the mean estimates of the periods and their errors in order to see how well particular periods fit into the harmonic relationships. It would be also interesting which physical mechanisms would lead to occurrences of 16- or 32fold multiples of the basic periods. The authors write about synchronous behavior or harmonic relationships, however, no relationships between the identified modes are tested. The simple list of estimated periods is not sufficient for such conclusions. The wavelet analysis gives the possibility to extract the oscillatory components themselves, so relations of them should be investigated. For instance, if a mode contains an oscillatory component which is a harmonic of a basic period of another mode, than one would expect some coherence, or phase synchrony of these components obtained from different climate modes. There are also tools for identification of higher harmonics in experimental data, see, e.g. Sheppard, L. W., A. Stefanovska, and P. V. E. McClintock. "Detecting the harmonics of oscillations with time-variable frequencies." Physical Review E 83.1 (2011): 016206.

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