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Nonlinear Processes in Geophysics
Discussions

Interactive comment on "Compacting the Description of a Time-Dependent Multivariable System and Its Time-Dependent Multivariable Driver by Reducing the System and Driver State Vectors to Aggregate Scalars: The Earth's Solar-Wind-Driven Magnetosphere" *by* Joseph E. Borovsky and Adnane Osmane

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The authors analyze the solar-wind-driven magnetosphere-ionosphere-thermosphere system using a state-vector description of a time-dependent driven system. They develop a methodology based on the canonical correlation analysis to reduce the

time-dependent system and driver state vectors to time-dependent system and driver scalars. This allows them to find the scalars which describe the response in the system that is most-closely related to the driver, obtaining the following advantages: low noise, high prediction efficiency, linearity in the described system response to the driver, and compactness. The methodology also identifies independent modes of reaction of a system to its driver, and to assess the properties of the derived aggregate scalars using autocorrelation analysis, Jensen-Shannon complexity analysis, and permutation-entropy analysis.

In particular, it was shown that the aggregate variable S(1) can be used as a global activity index for the magnetospheric system, i.e. a next-generation magnetospheric index which would play a role similar to the Global Warming Index, and other global aggregate variables in the Earth system science.

Without doubts, this approach developed by Joseph Borovsky and co-authors during last few years is very novel and promising, and the paper reflects current advances in the improvement of the analysis of the dynamics of the magnetosphere represented as a state vector and should be published in the Nonlinear Processes in Geophysics after minor revision.

Minor points:

The title of the article is too long.

I would switch the second and the first paragraph of the introduction, starting with the description of the magnetosphere, and may be adding a few examples of the use of large data series for the prediction of the properties of the magnetosphere in the past and its limitations, justifying in this way the necessity to use a new methodology based on the state-vector approach and the canonical correlation analysis, described in the first paragraph.

With best wishes

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