Criticisms GC and CCM

FB & CP

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If we wanted to do things well, we should also look at all the papers (at least the ones in our already cited literature) that do use GC after 2012, especially on models that are not supposed to work (maybe, at least in the letter to the Editor, cite some of the reviews that do no totally exclude GC such as Michailidis 2013, Eichler ?, Papana ?)

References

Cobey, S. & Baskerville, E.B. (2016). Limits to causal inference with state-space reconstruction for infectious disease. *PloS one*, 11, e0169050.

Deyle, E.R., Maher, M.C., Hernandez, R.D., Basu, S. & Sugihara, G. (2016). Global environmental drivers of influenza. *Proceedings of the National Academy of Sciences*, 113, 13081–13086.

McCracken, J.M. & Weigel, R.S. (2014). Convergent cross-mapping and pairwise asymmetric inference. *Physical Review E*, 90.

Mønster, D., Fusaroli, R., Tylén, K., Roepstorff, A. & Sherson, J.F. (2017). Causal inference from noisy time-series data—testing the convergent cross-mapping algorithm in the presence of noise and external influence. *Future Generation Computer Systems*, 73, 52–62.

Sugihara, G., May, R., Ye, H., Hsieh, C.h., Deyle, E., Fogarty, M. & Munch, S. (2012). Detecting causality in complex ecosystems. *Science*, 338, 496–500.

Tsonis, A.A., Deyle, E.R., Ye, H. & Sugihara, G. (2018). Convergent cross mapping: theory and an example. In: *Advances in Nonlinear Geosciences*. Springer, pp. 587–600.

Ye, H., Deyle, E.R., Gilarranz, L.J. & Sugihara, G. (2015). Distinguishing time-delayed causal interactions using convergent cross mapping. *Scientific reports*, 5.

Ye, H. & Sugihara, G. (2016). Information leverage in interconnected ecosystems: Overcoming the curse of dimensionality. *Science*, 353, 922–925.

Reference	Use GC	Use CCM	"GC does not perform well for some model types"
Sugihara *et al.* (2012)	Yes	Yes	"Granger's condition of separability [...] is generically unattainable in general dynamic systems" (Appendices)
McCracken & Weigel (2014)	No	Yes	"CCM is described as a technique that can be used to identify 'causality' between time series and is intended to be useful in situations where Granger causality is known to be invalid (i.e., in dynamic systems that are 'nonseparable"'
Ye *et al.* (2015)	No	Yes	"in dynamic systems with behaviors that are at least somewhat deterministic, [...] Granger's test is invalid (except in certain cases; see Discussion)
Cobey & Baskerville (2016)	No	Yes	"Many of these methods, including Granger causal0ity [...] infer interactions in terms of information flow in a probabilistic framework and cannot detect bidirectional causality."
Deyle *et al.* (2016)	No	Yes	"It is well known that correlative approaches can fail to provide an accurate picture of cause and effect in a dynamic system, and this is especially true in nonlinear systems where interdependence between variables is complex. Such systems are known to produce mirage correlations that appear, disappear, and even reverse sign over time" (citing Sugihara et al. 2012)
Ye & Sugihara (2016)	No	Yes	"Thus, many statistical frameworks (e.g., principal components analysis, generalized linear models, multi-variate autoregressive models) assume that causal factors do not interact with each other and have independent or additive effects on a responsevariable. This simplification can lead to problems in identifying associations (5,6) or pre-dicting out-of-sample behavior (7)."
Mønster *et al.* (2017)	No	Yes	"While Granger causality performs well for certain types of coupled systems, it rests on the assumption of easily separable variables with little or no feedback. As a consequence, it fails to correctly detect the direction of causality in a range of naturally occurring biological, ecological, and social systems that are rather characterized by weak to moderately coupled dynamics"
Tsonis *et al.* (2018)	No	Yes	"Specifically, CCM addresses cases not covered by Granger involving interdependent (nonlinear) dynamic systems–i.e., cases where Granger's assumption of separable piece-wise independence is explicitly violated."