Detecting Causality in Complex Ecosystems

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Fig. 1 Mirage correlations.

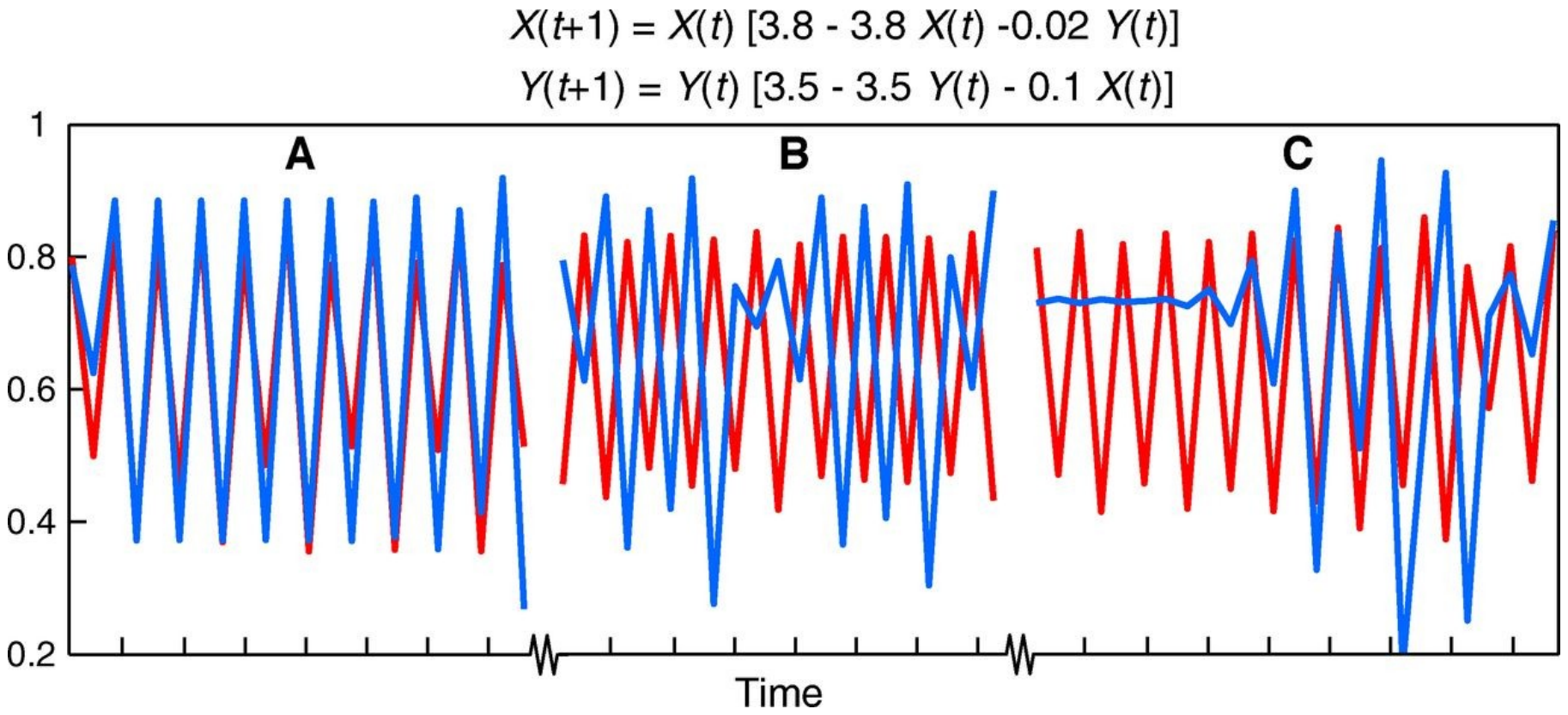

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Fig. 2 Convergent cross mapping (CCM) tests for correspondence between shadow manifolds.

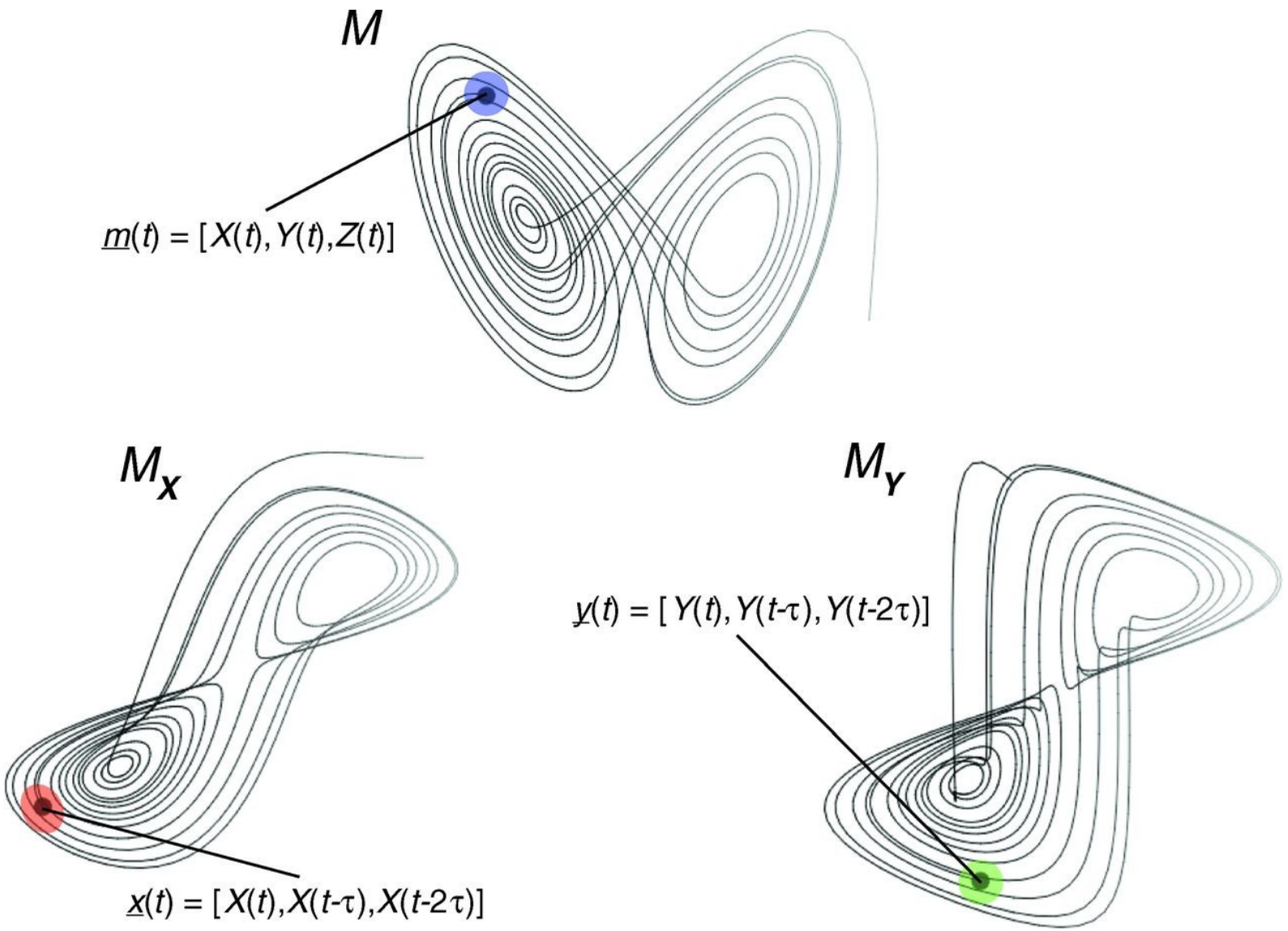

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Fig. 3 Detecting causation with CCM. With convergence, the skill of cross-map estimates, indicated by the correlation coefficient (ρ), increases with time-series (library) length L. (A) CCM for Eq. 1, Fig. 1, where the effect of X on Y is stronger than in the reverse: βy,x > βx,y.

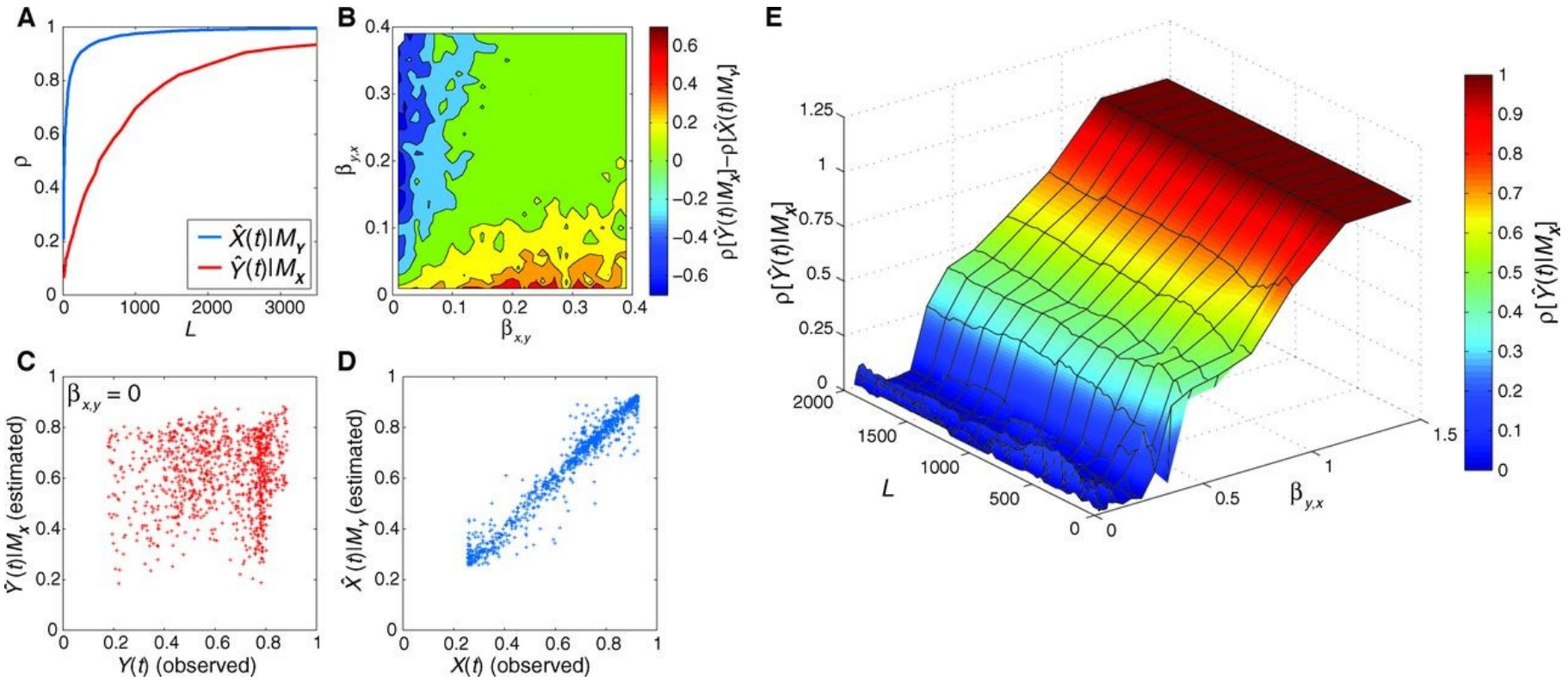

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Fig. 4 Model causal networks.

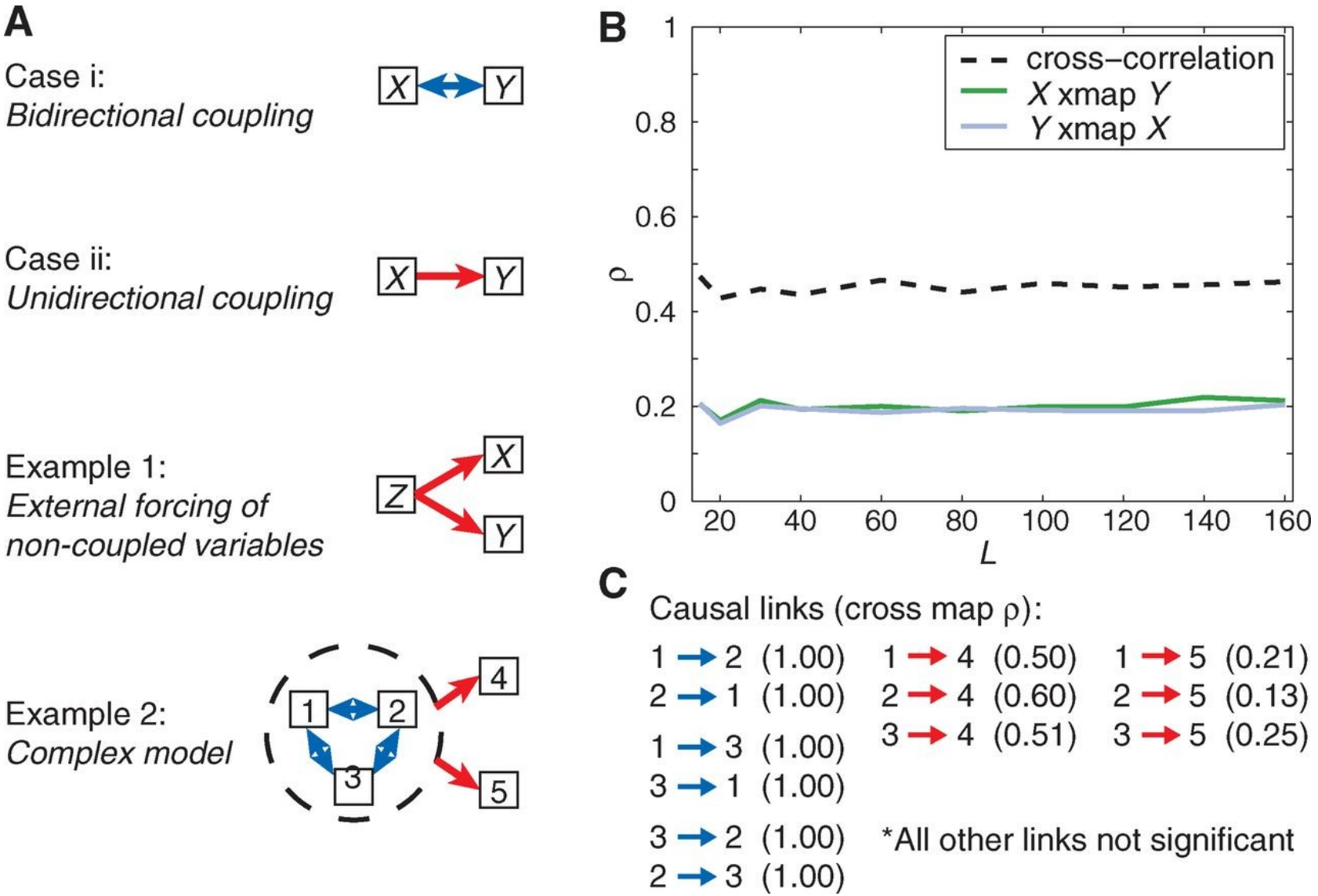

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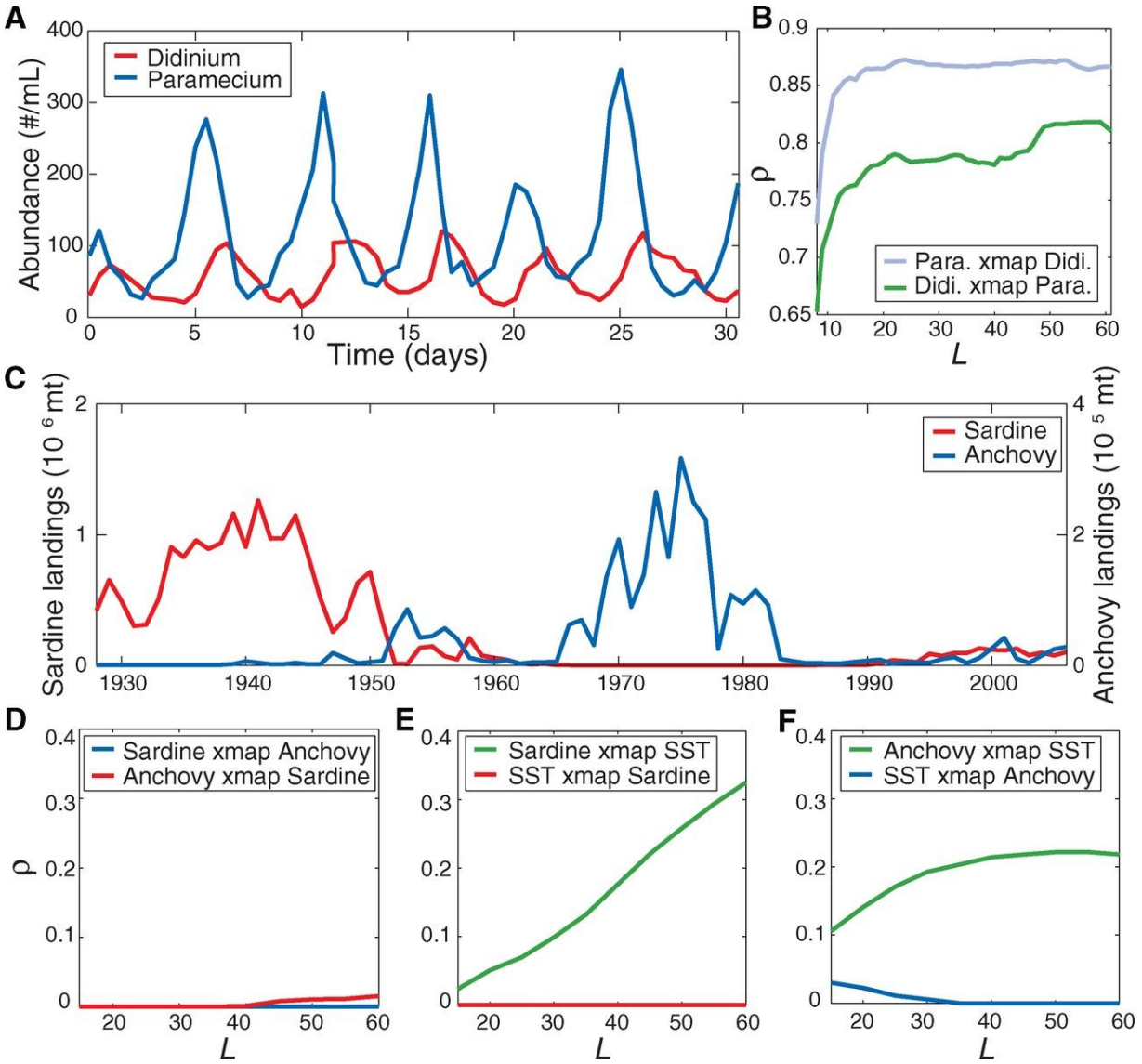
Fig. 5 Detecting causation in real time series.



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