



## **Causal dependences between the coupled ocean-atmosphere dynamics over the Tropical Pacific, the North Pacific and the North Atlantic**

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The causal dependences between the dynamics of three different coupled ocean-atmosphere basins, The North Atlantic, the North Pacific and the Tropical Pacific region, NINO<sub>3.4</sub>, have been explored using data from three reanalyses datasets, namely the ORA-20C, the ORAS4 and the ERA-20C. The approach is based on the Convergent Cross Mapping (CCM) developed by Sugihara et al (2012) that allows for evaluating the dependences between observables beyond the classical teleconnection patterns based on correlations.

The use of CCM on these data mostly reveals that (i) the Tropical Pacific (NINO<sub>3.4</sub> region) only influences the dynamics of the North Atlantic region through its annual climatological cycle; (ii) the atmosphere over the North Pacific is dynamically forcing the North Atlantic on a monthly basis; (iii) on longer time scales (interannual), the dynamics of the North Pacific and the North Atlantic are influencing each other through the ocean dynamics, suggesting a connection through the thermohaline circulation.

These findings shed a new light on the coupling between these three different important regions of the globe. In particular they call for a deep reassessment of the way teleconnections are interpreted, and for a more rigorous way to evaluate dependences between the different components of the climate system.

### **Reference**

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