

Abstract for CLIVAR CDP Annual Workshop (Sep 2022)

Session 1: “How to isolate the relative contributions of external and internal variability to observed decadal and longer variability?”

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**Title: “Spurious Pacific Connections to Internal Atlantic Multidecadal Variability Introduced by the Global Residual Method”**

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Separating external and internal contributions to observed decadal and longer timescale variability is challenging due to the short duration of the observational record and imperfect empirical techniques. In this talk, I will illustrate this challenge with the example of the Atlantic Multidecadal Variability (AMV) phenomenon. There is ongoing debate regarding the relative role of external influences and internal mechanisms that combine to produce the spatial and temporal characteristics of observed AMV. One simple and often used approach to isolating the internal component of AMV (iAMV) is to remove sea surface temperature (SST) variability associated with global-mean temperature (G) via linear regression, and then regress the residual SST variability onto the North Atlantic area-average residual timeseries. I will show that this method introduces spurious connections to the Indo-Pacific basin that resemble the pattern of Pacific Decadal Variability (PDV) in 7 different model Large Ensembles, for which the true iAMV pattern is known *a priori*. This spurious connection arises from the fact that the timeseries of G includes not only an externally-forced component, but also an internal component that is associated with PDV influences. This shortcoming of the residual method can be overcome by using only the forced component of G ( $fG$ ) to compute the SST residuals. Finally, I will show that a similar spurious Pacific connection to iAMV is found in the observations, which can be mitigated through the use of model Large Ensemble estimates of  $fG$  in the residual method.