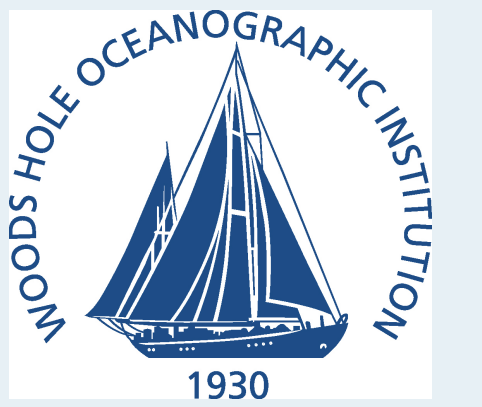




Regional Forcing Mechanisms for Cool-Season Precipitation Variability in New England



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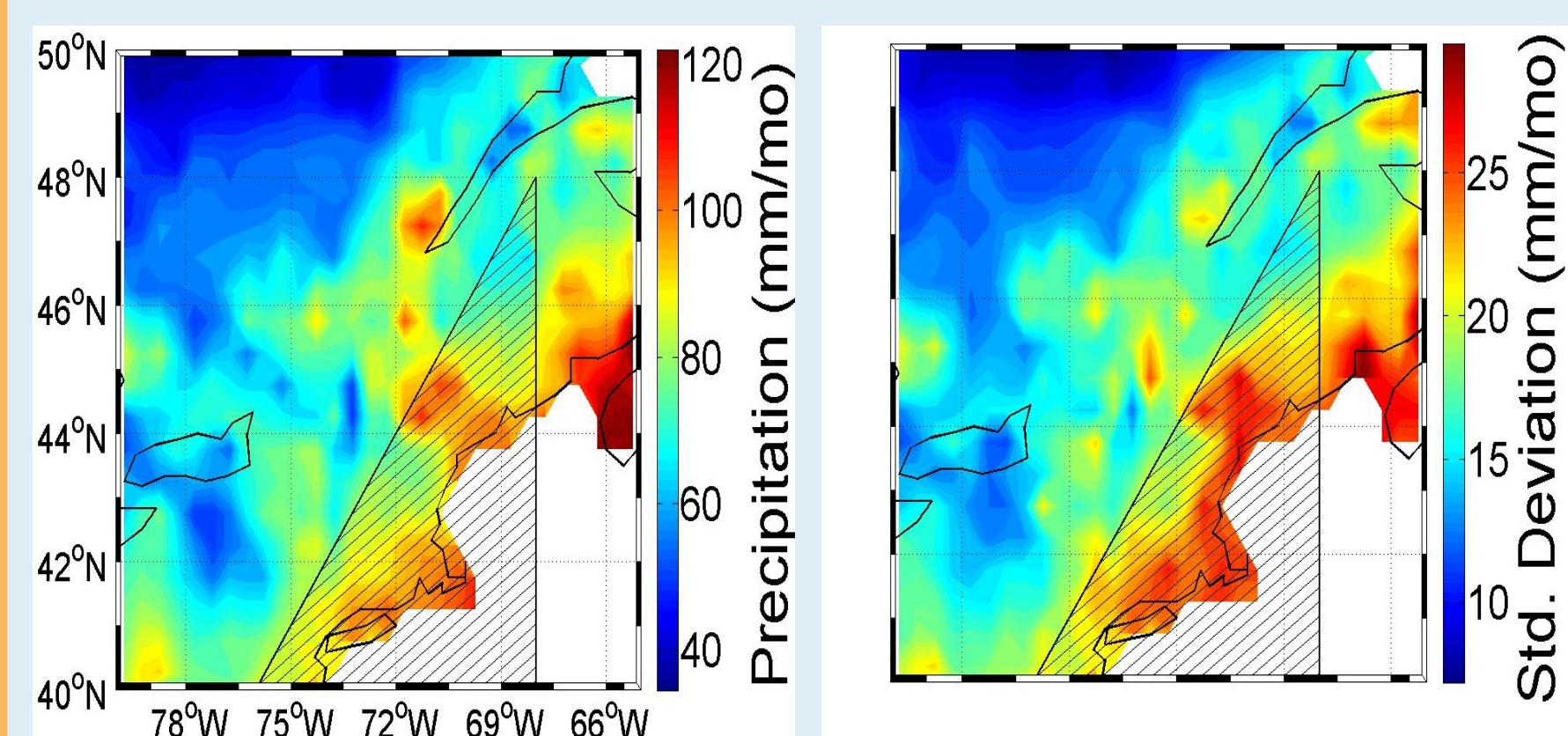
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Abstract

Attempts to link winter (JFM) precipitation variability in New England to large-scale climate variability, such as the North Atlantic Oscillation (NAO), have been largely unsuccessful (Archambault et al., 2008). Nevertheless, our analysis suggests that extreme winter precipitation in coastal New England is dynamically linked to localized blocking patterns in the Northwest Atlantic associated with anomalously warm Sea Surface Temperatures (SST) near Newfoundland, which results in an increased onshore moisture flux.

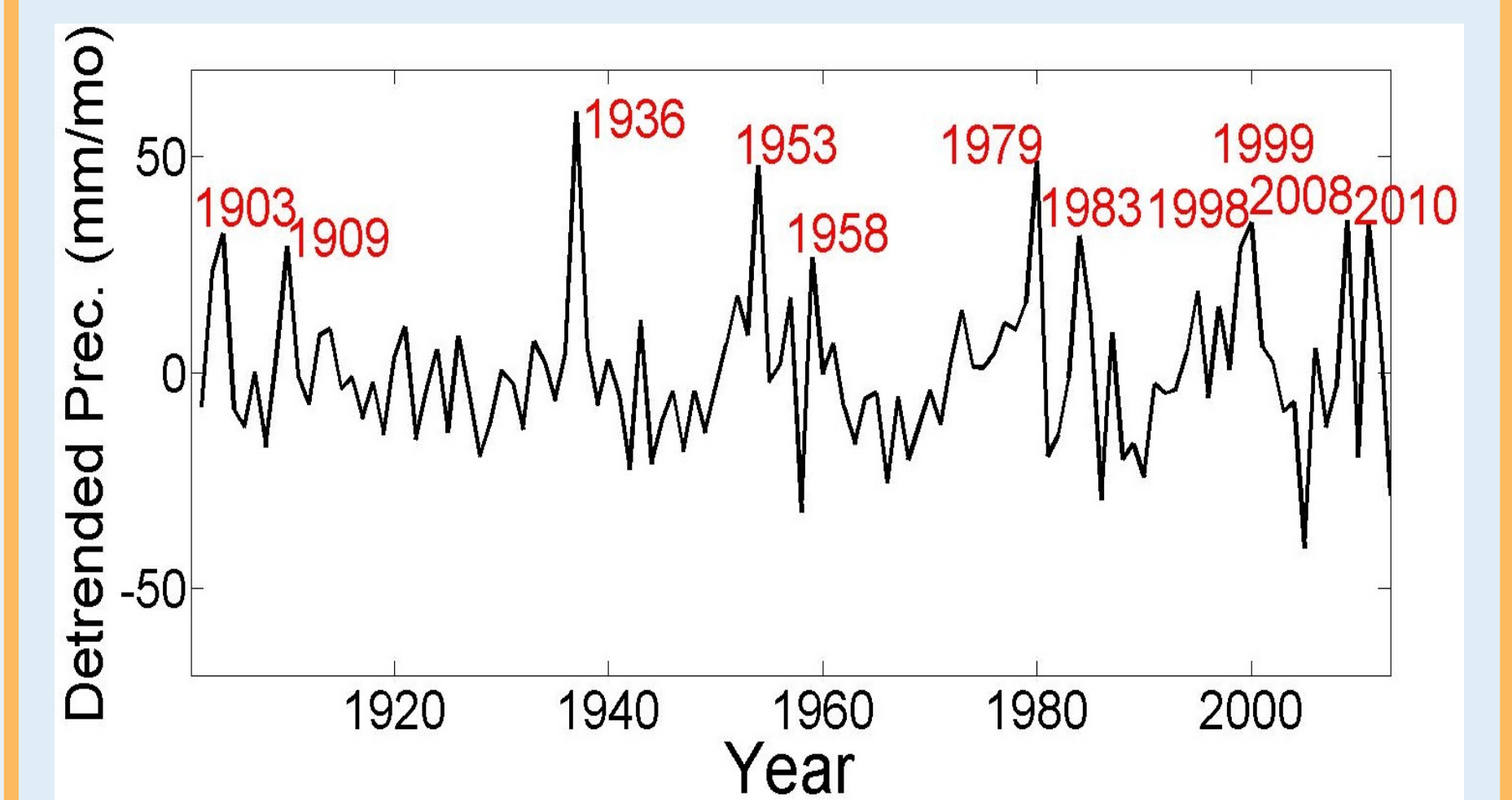
Climatology



Left: Climatological mean JFM precipitation from PRISM (1901-2013: <http://prism.oregonstate.edu>)

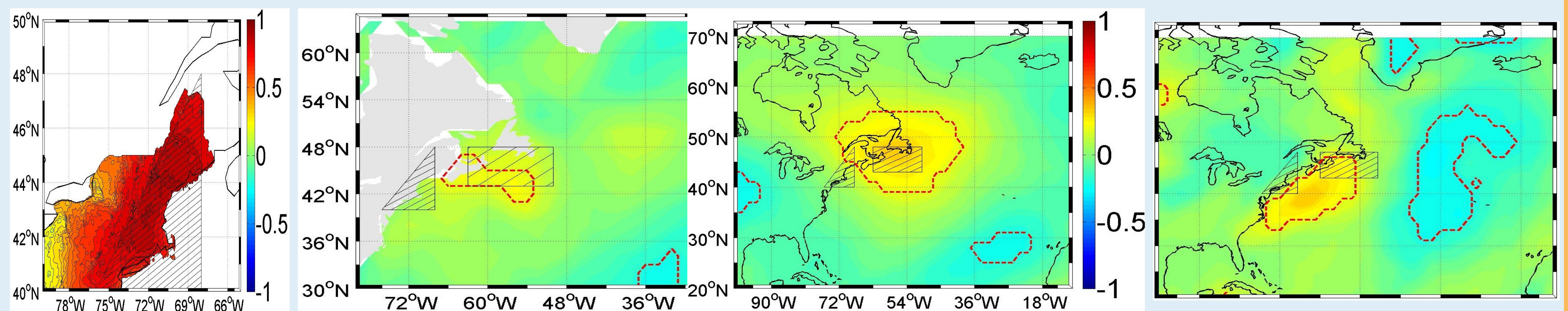
Right: Interannual standard deviation of JFM precipitation.

Coastal N.E. Precip Index



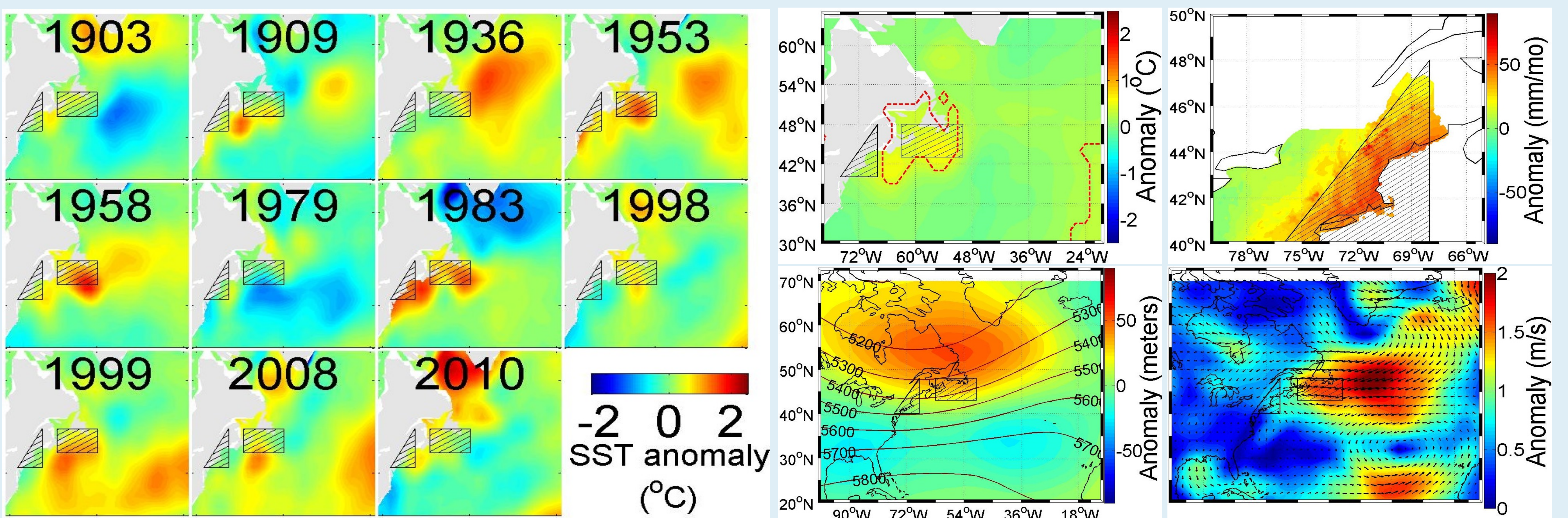
JFM precipitation averaged over coastal New England (triangle in the maps) from PRISM. Years with precipitation in the upper decile are noted.

Spearman's Rank Correlation Analysis Using a Coastal N.E. Precipitation Index



Spearman rank correlation between the coastal New England precipitation index and (from left to right) simultaneous **a:** precipitation, **b:** SST (HadISST), **c:** 500 hPa geopotential height (20CR), and **d:** Meridional wind (20CR).

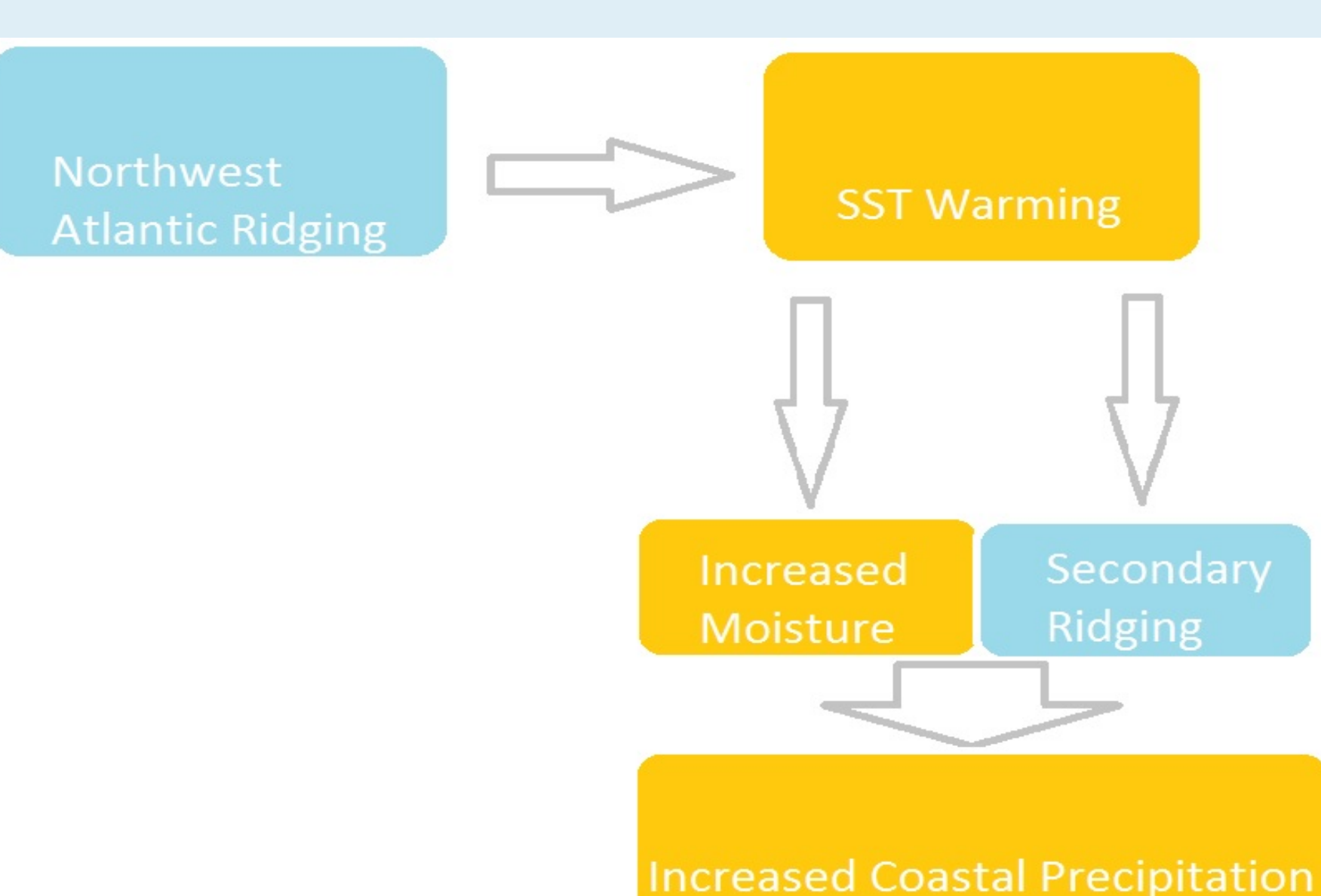
Extreme Precipitation Winters: A Composite Analysis



SST anomalies in the Northwest Atlantic for each JFM period falling within the upper decile of coastal New England precipitation. Areas within the red contours are locally significant at the 95% confidence level.

Clockwise from top left. Composite averages for the upper decile years of coastal New England precipitation index. **a:** SST, **b:** precipitation, **c:** surface wind and wind speed, and **d:** Z500.

Possible Mechanisms



1. Ridging reduces Westerlies over the Northwest Atlantic.
2. Weakened Westerlies warm SST off New England through reduced evaporational cooling and Ekman Transport of warm water northwards.
3. Warmer SST increase moisture flux into New England
4. Warmer SST contributes to a secondary blocking pattern (not shown) that further increases precipitation

References

Archambault et al., 2008, *Mon. Wea. Rev.*, **136**, 2945-2963.
 PRISM, 2013, <http://prism.oregonstate.edu>
 Smith, T. M., and R. W. Reynolds, 2013, NOAA ERSST (<http://www.esrl.noaa.gov/psd/>)
 University of East Anglia Climatic Research Unit, 2014, <http://dx.doi.org/10.5285/D0E1585D-3417-485F-87AE-4FCECF10A992>

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