The South Atlantic Meridional Overturning Circulation: A driver of climate variability and extremes.

Using couple ocean-atmosphere general circulation models, recent studies have demonstrated the dominant role of the South Atlantic Meridional Overturning Circulation (SAMOC) and associated meridional heat transport in modulating decadal variability of global precipitation and the monsoons. The limited length of SAMOC observational records prevents us from verifying if such mechanism is in play in nature. Given this, we reconstruct a century-long SAMOC index and explore potential factors influencing its variability and how SAMOC could modulate climate and high-impact extreme weather events. The SAMOC reconstruction is possible due to its covariability with sea surface temperature (SST). A singular value decomposition (SVD) method is applied on the joint correlation matrix of SSH or SST and SAMOC. The SVD is performed on the trained period of 1993-2017 for which satellite altimetry observations are available. The joint modes obtained are used in the reconstruction of a monthly mean SAMOC timeseries from 1870 to 2017. The reconstructed index is highly correlated to the observed SAMOC timeseries during the trained period and provides a long historical estimate. Using this SAMOC reconstruction as well as model experiments, we show that the South Atlantic is a major driver of global precipitation variability and a modulator of extreme weather events.