Nonlinear Sea Level Trends in the Atlantic Ocean

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Since the sea surface changes in response to many forcings occurring at different time scales, analysis of the interactions between the different scales of variation is important to understanding how sea level has varied in the past and how it will vary in the future. Geographically uneven sea level trends in the North Atlantic were analyzed using the monthly mean altimetry sea surface height anomaly (SSHA) from January 1993 to December 2011. In order to understand the different time scales in SSHA variability, the data were decomposed into seasonal, annual, interannual, decadal and residual signals using Ensemble Empirical Mode Decomposition (EEMD). Using the EEMD residual the nonlinear sea level trend was determined, which shows the turning point of the sea level trend during either the rising or falling trend. While a downswinging inflection was the dominant pattern in the regions of sea level rise occurring after 2007 in the Subpolar Gyre, the Subtropical Gyre, and the Equatorial Current, a pattern of upswinging inflection was dominated in the regions where sea level was significantly decreasing after about 2000 close to the North Atlantic Current and Northern Recirculation Gyre. Similarly, the turning points in the South Atlantic will be compared those in the North Atlantic. We may therefore understand whether sea level changes related with Atlantic Meridional Overturning Circulation (AMOC) in different regions are in phase or out of phase, and with how much lag.