

## **Abstract: The Time-Evolution of Climatically Significant Salinity Trends in the World Ocean**

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The global hydrological cycle is expected to amplify under a warming world which could lead to more frequent floods and droughts. With the ocean covering over 70% of the world, most of the changes in evaporation (E) and precipitation (P) will be over the ocean. However, monitoring these changes has been difficult due to either the lack of or uncertainty of the measurements of E and P over the ocean. In an attempt to resolve this issue, several recent studies have shown that long-term ( $\geq 50$  years) changes in near-surface salinity (NSS) patterns can be used as a proxy to estimate changes in E-P over the ocean. NSS patterns closely resemble patterns of E-P, and over the last 60 years salty regions of the ocean (dominated by evaporation) have become saltier and fresh regions (dominated by precipitation) fresher, indicating an amplifying NSS pattern and thus an amplifying hydrological cycle. However, it is imperative to learn whether NSS changes over smaller time periods (20 to 50 years) can unambiguously reveal climatic changes in the global hydrological cycle. We show that salinity changes over a minimum time period of 48 years should be used as a proxy to confidently estimate changes in the global hydrological cycle. Analyses of NSS trends over shorter time periods ( $< 48$  years) at least partially suffers from the influence of decadal and shorter-term variability and therefor inevitably skews any estimated changes of the global hydrological cycle.