Revisiting the Global Patterns of Seasonal Cycle in Sea Surface Salinity

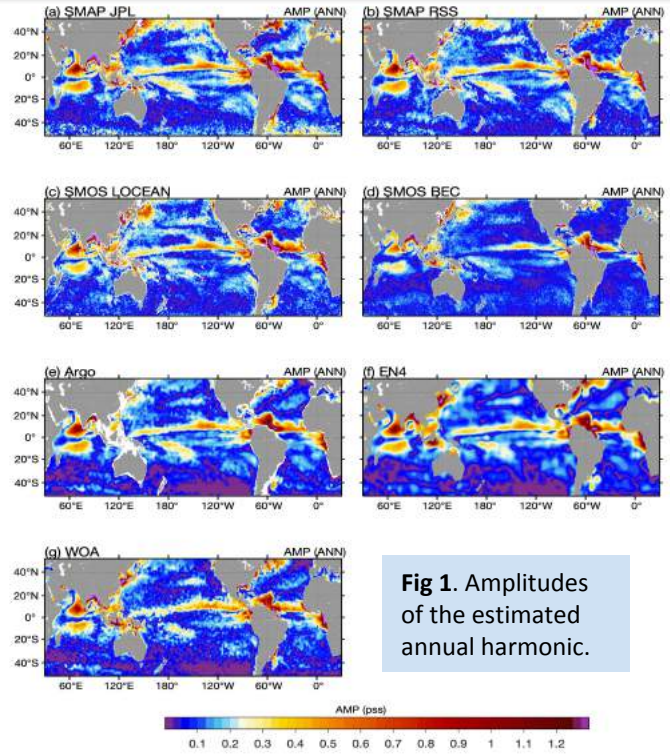

Fig 1. Amplitudes of the estimated annual harmonic.

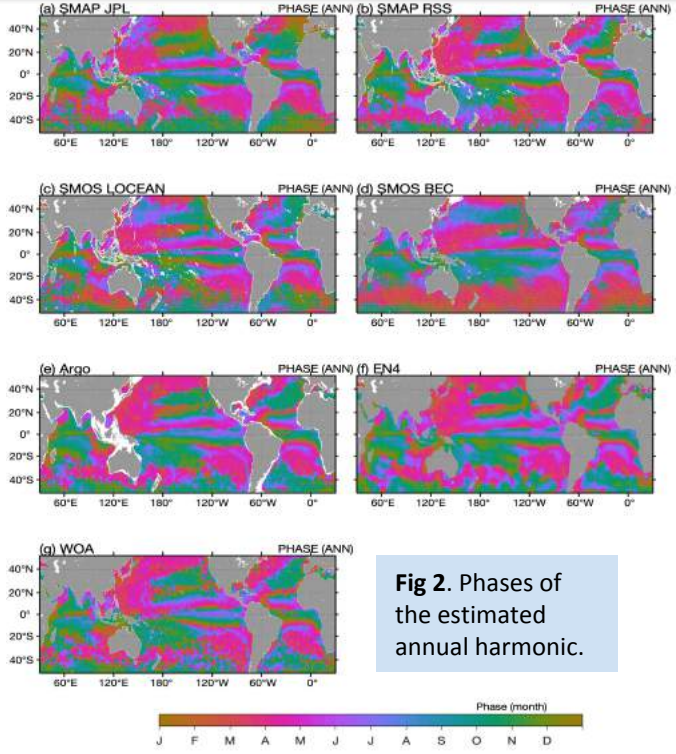

Fig 2. Phases of the estimated annual harmonic.

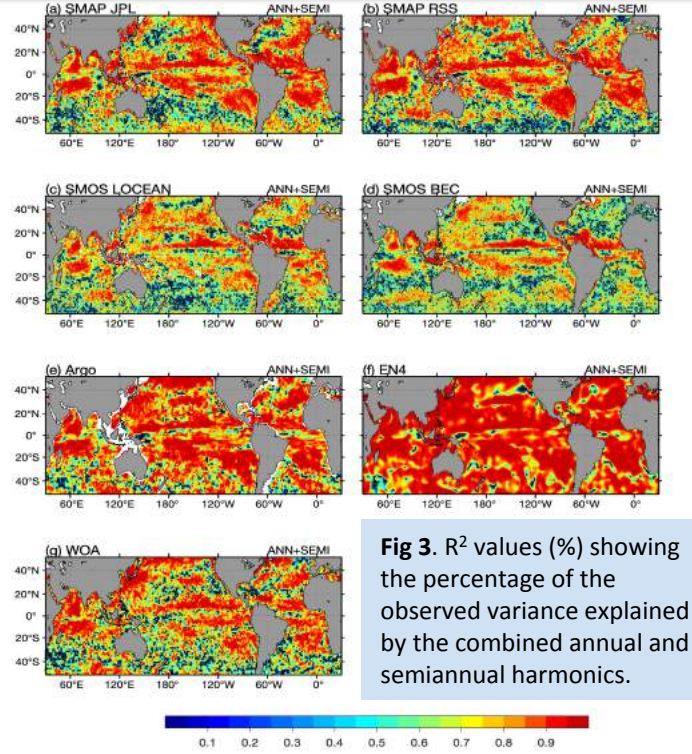

Fig 3. R^2 values (%) showing the percentage of the observed variance explained by the combined annual and semiannual harmonics.

Problem: Seasonal cycle is the dominant signal of sea surface salinity (SSS) variability. Previous analyses of seasonal SSS were based on the World Ocean Atlas (WOA) 1998 constructed from inhomogeneous sampling. This study is to revisit the seasonal harmonic patterns using four 0.25° satellite (SMAP and SMOS) and two 1° in situ (Argo and EN4) products and compare with the latest 0.25° WOA 2018.

Finding: The six recent products averaged over 2016-2018 are capable of producing the essential climatological features of the annual amplitude (Fig.1) and phase (Fig.2) in the WOA. The R^2 values (Fig.3) were computed to determine the percentage of the SSS observed variance that can be explained by the combined annual and semiannual harmonic modes. The R^2 values in the SMAP JPL and RSS products have a better agreement with those in the WOA than with those in the SMOS LOCEAN and BEC products. The two coarser-resolution in situ products are smooth due to the lack of the representation of high-frequency small scale SSS variability and hence, the combined annual and semiannual harmonics account for more than 90% of the observed variance over most of the global ocean.

Significance: Satellite SSS products are superior in representing the full-range of SSS variability. However, the accuracy of satellite products is algorithm dependent and may also be influenced by radiometric noises in near-coastal regions .

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