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# Low-frequency variability of global sea surface temperature

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Sea surface temperature (SST) is a fundamental parameter in the analysis of the Earth's climate. Retrieval of SST from space allowed for a dramatic increase in the spatial coverage of SST data for the analysis of climate variability at the global and regional scales. A common analysis approach includes the use of dimensionality reduction methods such as EOF analysis and its variants. However, these methods are not designed for the extraction of low-frequency patterns, taking the form of a smooth function with a systematic variation, which are of particular interest in the analysis of the climate system. A method to overcome this limitation has been proposed recently, which uses inverse ranks as a measure of monotonicity for the extraction of trend patterns from a gridded dataset. In this study, the NOAA Optimum Interpolation SST dataset is considered for the analysis of low-frequency SST variability at the global scale. Data includes monthly SST values on a 2 degree regular grid over 24 years, since January 1982. The non-linear rank-based extension to traditional EOF analysis is applied for the extraction of low-frequency modes from the global SST grid. The first trend mode reflects a systematic decrease of SST during the 24-years period in the equatorial Pacific and an increase in most of the global ocean, particularly in the Japan Sea and North Pacific, in the western south Pacific, in the Labrador Sea and in the North-East Atlantic. The second mode reflects ENSO variability in the Pacific Ocean. We show that the rank-based approach is able to separate systematic non-ENSO from ENSO variability from the global SST record. Furthermore, examining the contribution of each mode to the fluctuation of global mean SST, we find that the two derived low-frequency modes are able, alone, to account for the variability observed in global mean SST.