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Estimating Inter-Sensor Sea Surface Temperature Biases using DINEOF analysis

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Climate studies need long-term data sets of homogeneous quality, in order to discern trends from other physical signals present in the data and to minimise the contamination of these trends by errors in the source data. Sea surface temperature (SST), defined as one of essential climatology variables, has been increasingly used in both oceanographical and meteorological operational context where there is a constant need for more accurate measurements. Satellite-derived SST provides an indispensable dataset, with both spatially and temporally high resolutions. However, these data have errors of $\sim$0.5 K on a global scale and present inter-sensor and inter-regional differences due to their technical characteristics, algorithm limitations and the changing physical properties of the measured environments. These inter-sensor differences should be taken into account in any research involving more than one sensor (SST analysis, long term climate research ...).

The error correction for each SST sensor is usually calculated as a difference between the SST data derived from referent sensor (e.g. ENVISAT/AATSR) and from the other sensors (SEVIRI, AVHRR, MODIS). However, these empirical difference (bias) fields show gaps due to the satellite characteristics (e.g. narrow swath in case of AATSR) and to the presence of clouds or other atmospheric contaminations. We present a methodology based on DINEOF (Data INterpolation Empirical Orthogonal Functions) to reconstruct and analyse SST biases with the aim of studying temporal and spatial variability of the SST bias fields both at a large scale (European seas) and at a regional scale (Mediterranean Sea) and to perform the necessary corrections to the original SST fields. Two different approaches were taken: by analysing SST biases based on reconstructed SST differences and based on differences of reconstructed SST fields. Corrected SST fields based on both approaches were validated against independent in situ buoy SST data or with ENVISAT/AATSR SST data for areas without in situ data (e.g. eastern Mediterranean).