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# Evolution of Western Mediterranean Sea Surface Temperature between 1985 and 2005: a complementary study in situ, satellite and modelling approaches

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In order to evaluate the variability of the sea surface temperature (SST) in the Western Mediterranean Sea between 1985 and 2005, an integrated approach combining geostatistical tools and modelling techniques has been set up. The objectives are:

1. underline the capability of each tool to capture characteristic phenomena,
2. compare and assess the quality of their outputs,
3. infer an interannual trend from the results.

Diva (Data Interpolating Variationnal Analysis, Brasseur et al. (1996) Deep-Sea Res.) was applied on a collection of *in situ* data gathered from various sources (World Ocean Database 2005, Hydrobase2, Coriolis and MedAtlas2), from which duplicates and suspect values were removed. This provided monthly gridded fields in the region of interest. Heterogeneous time data coverage was taken into account by computing and removing the annual trend, provided by Diva *detrending* tool. Heterogeneous correlation length was applied through an advection constraint.

Statistical technique DINEOF (Data Interpolation with Empirical Orthogonal Functions, Alvera-Azcárate et al. (2005) Ocean Modell.) was applied on a Pathfinder_v5 SST archive covering the region and period of interest. DINEOF synthesised the 21 year variability of the SST signal as a series of spatial and temporal modes and also provides filled images for any satellite image used, as well as time-averaged fields at any temporal resolution required for sound comparison with *in situ* gridded fields and numerical model outputs.

Several runs of the k-epsilon GHER 3D model [Beckers (1991) J. Mar. Syst.] were performed. Atmospheric parameters from NCEP/NCAR reanalysis fields were used to force the model and a no-gradient condition was applied at the Gibraltar Strait. The high spatial and temporal resolutions outputs (respectively 4-km and 6-hour steps) were averaged on both weekly and monthly basis.

Results were contrasted, as some of the months show similar features, while others have large discrepancy in some part of the studied region. These differences were attributed to:

1. irregular data distribution, both in time and space,
2. unequal repartition of cloud coverage,
3. surface effects (difference between skin and *in situ* temperature),
4. the forcing accuracy and the small-scale process parameterization for the numerical model.

Validation of the three methods was carried out through cross-validation by setting apart a fraction of *in situ* observations.