Abstract
Surface layer variability is investigated in the tropical Atlantic using altimetry between 1992 and 2010. This study focuses on the low frequency interannual variations. Empirical orthogonal functions and singular value decompositions are made on altimetry and other oceanic and atmospheric parameters in order to characterize this low frequency variability. Diagnosis of these decompositions are presented in this poster.

1. DATA SETS
Absolute dynamic topography (ADT) were downloaded from the AVISO data center. They were used to calculate the ADT deviation from the ICGEM mean (www.aviso.oceanobs.com) for more information. One can use the "reference" version from October 1992 to January 2011.

The NCEP Reynolds Optimally Interpolated (0.5° resolution, SST) product used here from October 1982 to January 2011 consists of meridional SSTs on a 1 degree grid. The analysis uses both oceanic and land SSTs and is available from the NOAA Advanced Very High Resolution Radiometer (AVHRR).


developed for this study is also based on the ECMWF ERA-Interim 0.75° model results for wind stress and pressure fields (http://www.ecmwf.int/research/era/get/era-interim) from October 1992 to January 2011 for these products.

All series have been low pass filtered to remove temporal scales < 13 months.

2. EOF ANALYSIS

The first 3 Empirical Orthogonal Functions (EOFs) of the ADT low-pass filtered series represent 88% of the total variance. They show interannual variability superimposed to lower modes (~ 5 to 10 years). Their spatial patterns general reveal meridional contrast between alternating positive and negative structures.

The spatial structure associated with EOF1 (15.7%) is maximum between 5 and 15°N. Globality it corresponds to an opposition in terms of variability between the 15°N-15°S area and the poleward latitudes. The principal components and wavelet analysis indicates that this signal was prevailing during the first part of the series, from 1992-2004.

The second EOF (10.7%) is linked with a variability in the Gulf of Guinea.

The signal associated with the 3rd EOF (9.4%) clearly depicts variability in the Gulf of Guinea. This signal peaks in 1997 then 2002 and corresponds to an intensification of the usual upwelling signal which occurs every year during boreal summer in that region.

3. SVD ANALYSIS

The Singular Value Decomposition (SVD) technique is used to investigate the relationship between the altimetry and the other fields. The SVD results are presented using interference maps. The square covariance function (scf) gives the amount of cross-covariance extracted by the SVD and the correlation coefficients (r) gives the coupling between the expansion coefficients of both variables.

The first SVD (SST vs altimetry) shows a strong positive coupling of the variables between 0°N in 20°N and a weak negative coupling elsewhere.

The second SVD shows a positive coupling in the northern hemisphere while the 3rd SVD exhibits positive coupling in the Gulf of Guinea.

The wind stress curl and altimetry fields in SVD 1 are generally anti-correlated with the strongest correlation observation from 5° to 20°N.

In SVD 2, no clear relationship can be observed while in SVD 3 an inverse relationship is seen around 15°N and 55°W.

4. CORRELATIONS

For information the gridded correlation between the altimetry field and the other fields are displayed.

CONCLUSION

Low frequency variabilities of different variables: altimetry, Sea Surface Temperatures and wind stresses, have been investigated in the tropical Atlantic ocean.

Empirical Orthogonal Function analysis performed on the different fields generally evidence interannual variability with sometimes lower frequencies superimposed.

The relationship between altimetry and the other fields through Singular Value Decomposition will help to investigate how the altimetry can be linked to other climate fields or indexes as the El Nino Southern Oscillation, the North Atlantic Oscillation...

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