

## ATLANTIC SEA SURFACE TEMPERATURE ANOMALIES DURING 1996

*Stretta, J.M.<sup>1</sup>, P. Travassos<sup>1</sup>*

### SUMMARY

This paper, written from information collected from the Internet, briefly presents Atlantic sea surface temperature anomalies during 1996. During this year, an important positive surface temperature anomaly was detected in the Atlantic tropical belt. It also presents several Internet sites where it is possible to find climatological, historical and actual SST information.

### RÉSUMÉ

Ce document, rédigé à partir d'informations obtenues par Internet, présente brièvement les anomalies de la température de la surface de l'eau de l'Atlantique en 1996. Au cours de cette année, on a détecté une importante anomalie positive de la température de surface dans la ceinture tropicale de l'Atlantique. Le document présente aussi plusieurs sites Internet où il est possible de trouver des informations SST climatologiques, historiques et actuelles.

### RESUMEN

Este documento se basa en información obtenida por Internet, y hace una breve presentación de las anomalías de la temperatura en superficie del Atlántico en 1996. Ese año se detectó una importante anomalía positiva de la temperatura en el cinturón tropical del Atlántico. Presenta también varias direcciones de Internet donde es posible encontrar información SST climatológica, histórica y actual.

### 1. INTRODUCTION

This paper was written from informations collected inside Internet world wide web. For several years it is possible to find and download informations, maps, short analysis about sea surface temperature (SST) for the whole ocean. It is quite impossible to build an exhaustive list of all servers delivering oceanographic environmental data and maps. But, one of the most important server presenting such kind of informations is shortly described below and the informations about oceanic environment founded inside are presented and discussed.

### 2. ORIGIN OF THE DATA

All the data and informations analysed here come from the Electronic version of the quarterly IGOSS<sup>2</sup> Products Bulletin (Address # 1) : they can be reached via the LDEO<sup>3</sup> Climate Data

For analysing oceanographical sea surface anomalies (SSTA), it is necessary to have two kind of data : the SST of the period you want to analyse and SST taken out from climatological atlas during the same time period. The LDEO uses the Reynolds and Smith (1994) climatology. This climatology (Address # 2) is constructed from a monthly 1-degree global SST climatology coming from two intermediate climatologies : the 2-degree SST climatology presently used at NMC (National Meteorological Center-USA) and a 1-degree SST climatology. The final climatology is a combination from these two products so that a 1-degree resolution was maintained and the base period was adjusted to the 1950-79 period wherever possible (approximately 40S and 60N).

<sup>1</sup> Centre ORSTOM, 911 avenue Agropolis, B.P. 5145, 34032 Montpellier cedex 1, France.

<sup>2</sup> IGOSS is a joint working committee between the Intergovernmental Oceanographic Commission (IOC) and the World Meteorological Organization (WMO)

<sup>3</sup> Lamont-Doherty Earth Observatory of Columbia University (USA)

From the "Integrated Global Ocean Services System Products " (Reynolds and Smith 1994 via the LDEO Climate Data), it is possible to found quarterly analyses of the SSTA in the whole ocean. From this server, we have taken out informations from the Atlantic ocean.

### 3. HYDROLOGICAL FEATURES DURING 1996

#### 3.1. Quarterly analysis

##### January, February and March 1996

During the first quarter, the entire tropical Atlantic and the subtropical southern Atlantic is warmer than normal and positive SSTA are also present at the southern tip of south Africa. (Figure of SSTA during february 1996)

##### April, May and June 1996

Unusual wet weather over Eastern Africa ( Ethiopia, Kenya and Tanzania ) and in the Gulf of Guinea. Maximum positive SSTA are found along the West African coastline (+1°C), in the equatorial Atlantic (+1.5°C) and southeast Indian ocean. This is a necessary condition for easterly wave amplification during summertime in the northern tropical Atlantic (Figure of SSTA during may 1996).

##### July, August and September 1996

The SSTA in the eastern Atlantic Ocean are above normal around 40°N (between +2° and +3°C). Negative values are located in the Gulf Stream and the Kuroshio areas (September). The SST in the southern Atlantic Ocean (south of 20°S) are below normal (Figure of SSTA during august 1996).

##### October, November and December 1996

The warmest parts of the Atlantic ocean in November and December are found at 40°N and 40°S at 40°W. The SSTA in the eastern Atlantic Ocean are above normal around 40° N (Figure of SSTA during november 1996). Subsurface temperature in the central and eastern equatorial Pacific Ocean are below normal. On the other hand, the thermocline is extremely deep in the western Pacific during December (deepest levels of the last ten years).

#### 3.2. Conclusions and SSTA during the first term of 1997

In conclusion, a warm event was present in the tropical belt of the Atlantic ocean during 1996 except during November and December. A first analysis of the SSTA during the first term of 1997 presents contrasted surface thermal structures. A cold event occurs in the south Atlantic (from -2° to -2.5°C) while a warm anomaly (from +1.5° to +2°C) is present off west Africa until 30°W. During the third quarter of 1997, the SSTA is moderately above the normal (Figure of SSTA during September 1997).

Actually a very strong "El Niño" event is coming and various forecasts present the El Niño for 1997-98 to be one of the biggest in the last 50 or 60 years (Address #3) and the warm anomaly forecast for winter 97-98 is over 3 standard deviations (Kirtman et al., 1997). These authors precise that after the boreal winter of 1997-98 the anomalies of El Niño analysed in all three kinds of forecasts will decay rapidly to near normal conditions by the boreal summer of 1998 with rather strong cold conditions by the winter of 1998-99.

#### 3.3. Addresses of some sites presenting thermal analysis <sup>4</sup>

- ▶ Bulletin (Integrated Global Ocean Services System Products Bulletin)  
<http://rainbow.ldgo.columbia.edu/igoss/productsbulletin/>

In this page, Y. M. TOURRE presents a quaterly analyses of the SST anomalies in the wole ocean from july-september 1993 to the last quarter. The highlights of the 1996 SST anomalies are presented in this paper.

- ▶ Anomalies :  
<http://ingrid.ldgo.columbia.edu/descriptions/reynoldsanom.html>  
<http://ingrid.ldgo.columbia.edu/descriptions/reynolds.html>

In these pages we found a presentation of the sea surface temperature anomalies processing : "The sea surface temperature (SST) analysis is produced weekly on a one-degree grid. The analysis uses in situ and satellite SST's. Before the analysis is computed, the satellite data is adjusted for biases using the method of Reynolds (1988) and Reynolds and Marsico (1993). A description of the analysis can be found in Reynolds and Smith (1994). Examples of the effect of recent corrections is given by Reynolds (1993)."

- ▶ Climatological Monthly Temperature January to December  
<http://ingrid.ldgo.columbia.edu/SOURCES/IGOSS/nmc/climatology/.sst/>

In this page, it is possible to obtain a SST map from the Reynolds climatology from january to december. For instance, to visualise a SST map of the whole Atlantic ocean and the western part of the Indian ocean, it is necessary to choose the domain of the map and the central point (Domain: 180.0 by 90.0 centered at 0.0, 0.0). The figures presented in this paper show this domain.

- ▶ Climatological Monthly Temperature January to December (from 0.0 to 400.0m)  
<http://ingrid.ldgo.columbia.edu/SOURCES/IGOSS/sio/climatology/.temp/>

Like the previous page, it is possible to obtain at this address temperature informations from the climatology and from surface to 400.0 meters deep.

- ▶ Monthly SST since november 1981  
<http://ingrid.ldgo.columbia.edu/SOURCES/IGOSS/nmc/.monthly/.sst/>

In this page, it is possible to obtain a monthly SST map since november 1981. Like the other maps, to visualise a monthly SST map of the whole Atlantic ocean and the western part of the Indian ocean, it is necessary to choose the domain of the map and the central point (Domain: 180.0 by 90.0 centered at 0.0, 0.0).

- ▶ Monthly SST anomaly  
<http://ingrid.ldgo.columbia.edu/SOURCES/IGOSS/nmc/.monthly/.ssta/>

In this page it is possible to found, for the whole ocean, the monthly SST anomalies as it is explain upper.

- ▶ Weekly Mean Sea Surface Temperature (since november 4th 1981)  
<http://ingrid.ldgo.columbia.edu/SOURCES/IGOSS/nmc/.weekly/.sst/>

This page presents the last weekly mean SST from november 1981 to present.

It is also possible to find this kind of information inside several sites :

<sup>4</sup> All the Internet addresses presented below were tested on october 4, 1997.

[http://www.ssec.wisc.edu/data/sst/latest\\_sst.gif](http://www.ssec.wisc.edu/data/sst/latest_sst.gif)

<http://www.funceme.br/>

This Brazilian site will present weekly SST (from NOAA satellites) of the Atlantic ocean from 10°N to 20°S and from 50°W to 20°W. Actually this site is under tests and the SST information currently available are monthly mean SST.

► Daily Mean Sea Surface Temperature

<http://www.fnoc.navy.mil/>

In the site of the US Navy, it is possible to find twice a day the current SST map. This map is built from a model called "Optimum Thermal Interpolation System (OTIS)". This model is a based objective analysis scheme designed to produce analyses or "nowcasts" of ocean temperatures. This site also presents a daily SST anomalies.

#### 4. CONCLUSION

It is possible to find several Internet sites presenting SST informations. In front of a very wide variety of thermal informations accessible via the web, this paper is not exhaustive. At the present time, a very important activity on this topic is detected on the web due to the very strong El Niño event rising in the equatorial Pacific.

#### 5. REFERENCES

Address # 1 : <http://rainbow.ldgo.columbia.edu/igoss/productsbulletin/introduction.html>

Address # 2 : <http://ingrid.ldgo.columbia.edu/descriptions/reynoldsclimo.html>

Address # 3 : [http://iri.ucsd.edu/hot\\_nino/](http://iri.ucsd.edu/hot_nino/)

Kirtman B.P., J. Shukla and Z. Zhu (1997).- Forecasts from September 1997.  
<http://grads.iges.org/nino/fcst0997.html>

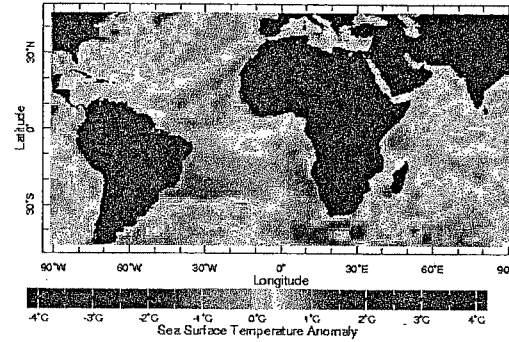
Reynolds, R. W., 1988: A real-time global sea surface temperature analysis. *J. Climate*, 1, 75-86.

Reynolds, R. W., 1993: Impact of Mount Pinatubo aerosols on satellite-derived Sea Surface Temperatures. *J. Climate*, 6, 768-774.

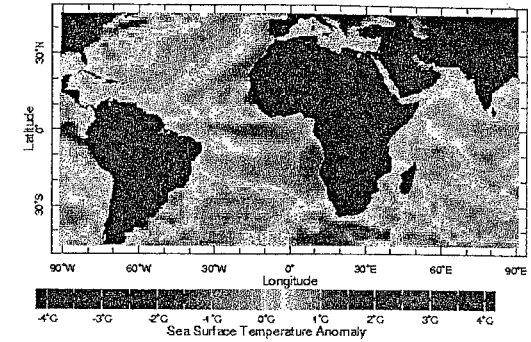
Reynolds, R. W. and D. C. Marsico, 1993: An improved real-time global sea surface temperature analysis. *J. Climate*, 6, 114-119.

Reynolds, R. W. and T. M. Smith, 1994: Improved global sea surface temperature analyses. *J. Climate*, 7, 929-948.

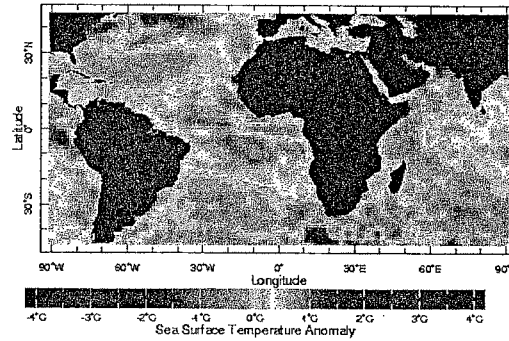
February 96



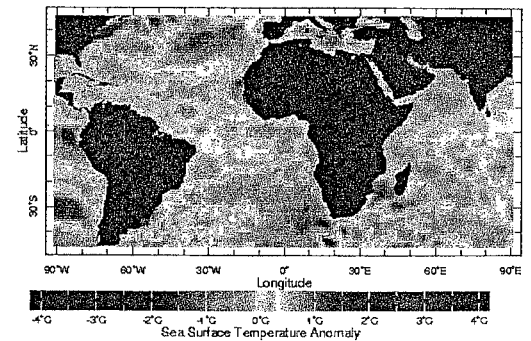
May 96



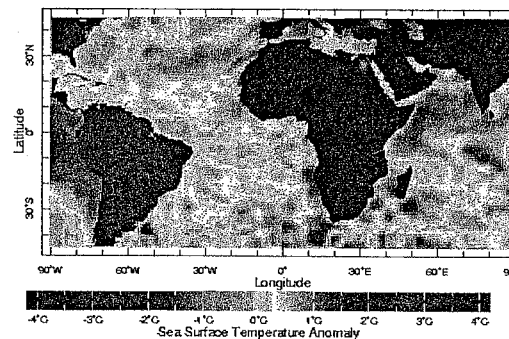
August 96



November 96



September 97



Sea surface temperature anomalies