

GLOSS Training Course

Valparaiso, Chile, April 2003

Altimetria Satelital

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**Introduccion y conceptos basicos de
altimetria y dinamica marina: Mar PM**

Circulacion de gran y meso-escala: Mie AM

Aplicaciones, hands on training: Mie AM

Colaboracion: Victor Zlotnicki y Joaquin Trinanés

Material de NOAA, NASA/JPL, CNES

NOAA/AOML, Miami, Florida, USA

The screenshot shows a Netscape 6 browser window displaying the NOAA/AOML website. The browser's address bar shows the URL <http://www.aoml.noaa.gov/>. The website header features the title "Atlantic Oceanographic and Meteorological Laboratory" and a navigation menu with links for "Ocean & Climate", "Coastal & Regional", "Hurricanes", "Site Map", "Staff", "Data Sets", "Contact Information", and "Research Divisions". A search bar and "Options" button are located on the left side. Below the navigation menu, there is a "Popular Links" section with a list of links: Library, Keynotes, Outreach and Public Relations, In the Spotlight, Admin, Check E-mail, Publications, and Data Sets. The main content area contains a large photograph of the AOML building and a text block describing the laboratory's mission and research focus. At the bottom of the page, there are logos for NOAA Research, AOML, and NOAA, along with contact information and a footer containing a disclaimer, privacy notice, and the email address aoml.webmaster@noaa.gov. The footer also indicates the last update date as 7/22/2002.

DOC/NOAA/OAR/AOML: Atlantic Oceanographic and Meteorological Laboratory - Netscape 6

File Edit View Search Go Bookmarks Tasks Help

Back Forward Reload Stop <http://www.aoml.noaa.gov/> Go Print

Home Netscape Search Bookmarks

Atlantic Oceanographic and Meteorological Laboratory

Search Options

Popular Links

- Library
- Keynotes
- Outreach and Public Relations
- In the Spotlight
- Admin
- Check E-mail
- Publications
- Data Sets

[Ocean & Climate](#) [Coastal & Regional](#) [Hurricanes](#)

[Site Map](#) [Staff](#) [Data Sets](#) [Contact Information](#) [Research Divisions](#)

The Atlantic Oceanographic and Meteorological Laboratory (AOML) is one of the Oceanic and Atmospheric Research (OAR) Facilities of the National Oceanic and Atmospheric Administration (NOAA). NOAA/AOML is a part of the US Department of Commerce in Miami, Florida. AOML's mission and applied research in oceanography, meteorology, atmospheric and acoustics. The research seeks to understand the physical characteristics and processes of the ocean and the atmosphere, both separately and as a coupled system.

[More about AOML...](#)

United States Department of Commerce
National Oceanic and Atmospheric Administration
Office of Oceanic and Atmospheric Research
Atlantic Oceanographic and Meteorological Laboratories

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DOC/NOAA/AOML

aoml.webmaster@noaa.gov
Last updated: 7/22/2002

Document: Done (11.226 secs)

NOAA/AOML/PHOD, Miami, Florida, USA

The screenshot shows the NOAA Physical Oceanography Division website. The header includes the NOAA logo and the text "Physical Oceanography Division". Below the header, there are two images: a research vessel and a satellite. The main content area features a list of "Recent Advances" and "Research Projects". A central section titled "The primary mission of the Physical Oceanography Division (PHOD) of the Atlantic Oceanographic and Meteorological Laboratory (AOML) is to provide and interpret oceanographic data by conducting research relevant to the following NOAA Strategic Goals:" lists three goals: 1. Predict and Assess Decadal to Centennial Climate Change, 2. Implement Seasonal to Interannual Climate Forecasts, and 3. Sustain Healthy Coastal Ecosystems. Below this, a paragraph describes the division's research activities, including "blue water" research cruises and satellite observations. A "Staff" section mentions approximately 35 research scientists and technicians, with Dr. Sylvia L. Garzoli as the Physical Oceanography Division Director. The website footer includes the NOAA logo and contact information for the division in Miami, FL.

The screenshot shows a NOAA news article titled "NOAA SAYS EL NIÑO'S DEPARTURE LEAVES SOME WESTERN DROUGHT THIS SPRING, AND FLOODING IN THE SOUTH AND EAST POSSIBLE". The article includes a map of the United States showing drought and flooding patterns. The text states that NOAA forecasters are increasingly confident that drought will linger in areas of the West and floods could possibly threaten portions of the South and East during the spring of 2003. It also mentions a "U.S. Seasonal Drought Outlook" and a "Winter 2003-2003" section. The article concludes with a quote from NOAA Vice Adm. Conrad C. Lautenbacher, Ph.D., regarding the impact of El Niño's departure on weather patterns.

The screenshot shows the NOAA website home page. The header includes the NOAA logo and the text "NOAA". Below the header, there are several sections: "Weather", "Ocean", "Satellites", "Fisheries", "Climate", "Research", "Coasts", and "Charting & Navigation". Each section has a small image and a brief description of the topic. The "Check This Out..." section lists several links, including "NOAA Satellite Images of Iraq", "Economic Statistics for NOAA (PDF)", "NOAA 2004 Budget Request", "Coastal Zone Management Act Consistency Appeals", "NOAA Maps World Trade Center Site", and "NOAA Magazine". The footer includes the NOAA logo and contact information.

The screenshot shows the NOAA website home page with a news article titled "NOAA Looks Back at Great Flood of '93". The article includes a photo of a flooded area and text describing the event. The text states that the Great Flood of 1993 inundated 20 million acres in nine states, taking 50 lives and costing about \$20 billion. Approximately 54,000 people were evacuated from flooded areas, and approximately 50,000 homes were destroyed or damaged and 75 towns had been completely inundated. The article also mentions that some riverside communities were abandoned or relocated to higher ground. The website footer includes the NOAA logo and contact information.

<http://www.aoml.noaa.gov/phod>

Pregunta:

Que parametros oceanicos conoce usted que estan siendo actualmente medidos por satelites ?

Temperatura de superficie, nivel del mar, color, turbidez, vientos.....

OBJETIVOS DEL CURSO

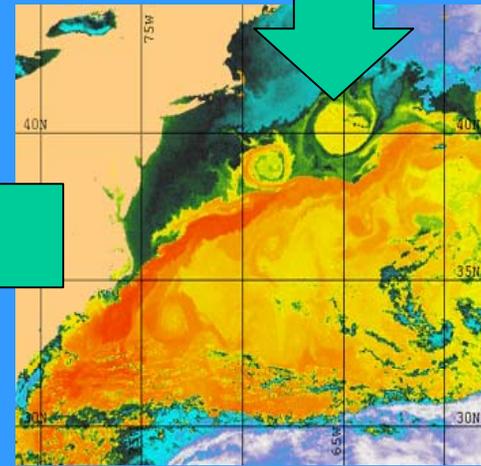
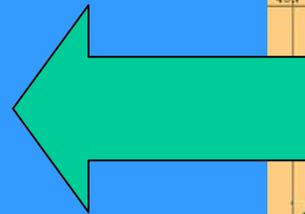
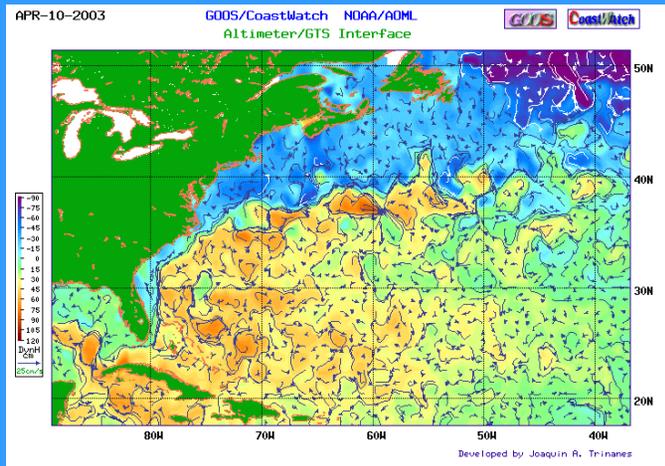
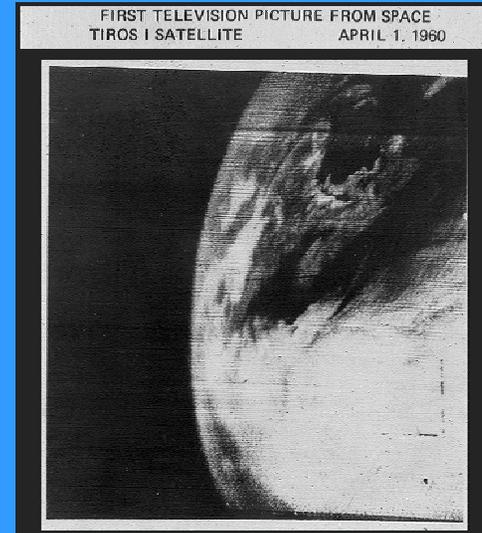
Maximizar el tiempo disponible en el curso para tener una idea *minima* y *decente* de:

1. Que es la altimetria
2. Aplicaciones, Que mide
3. Que limitaciones tienen los datos
4. Usos operacionales
5. Donde se pueden obtener datos altimetricos
6. Futuro de la altimetria

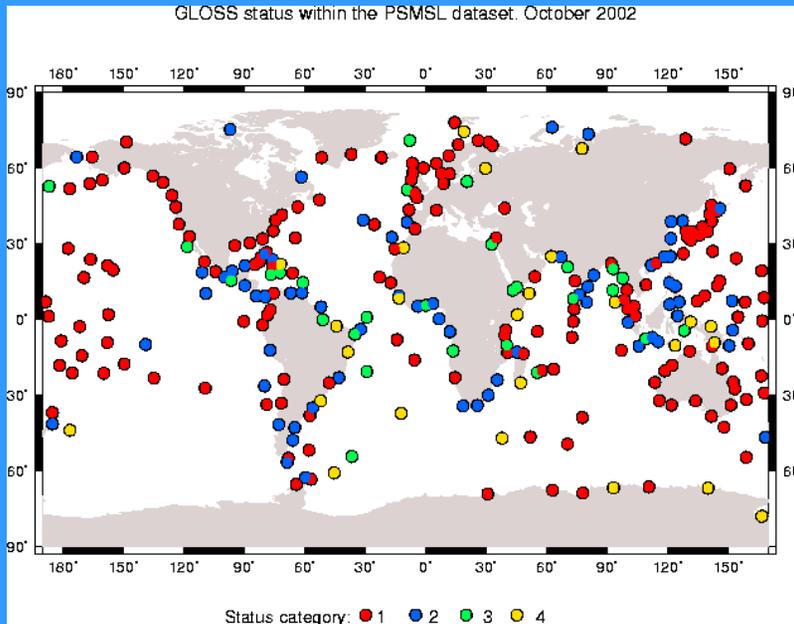


Launched: Aug 10, 1992
Ariane rocket
USA-French mission

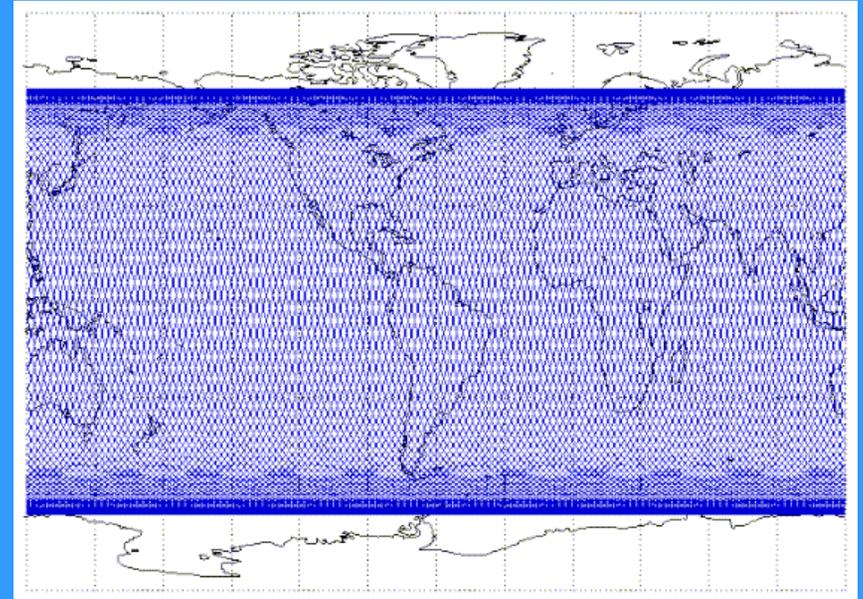
Avances en el estudio de corrientes oceanicas



Por que altimetria ?



Source: GLOSS

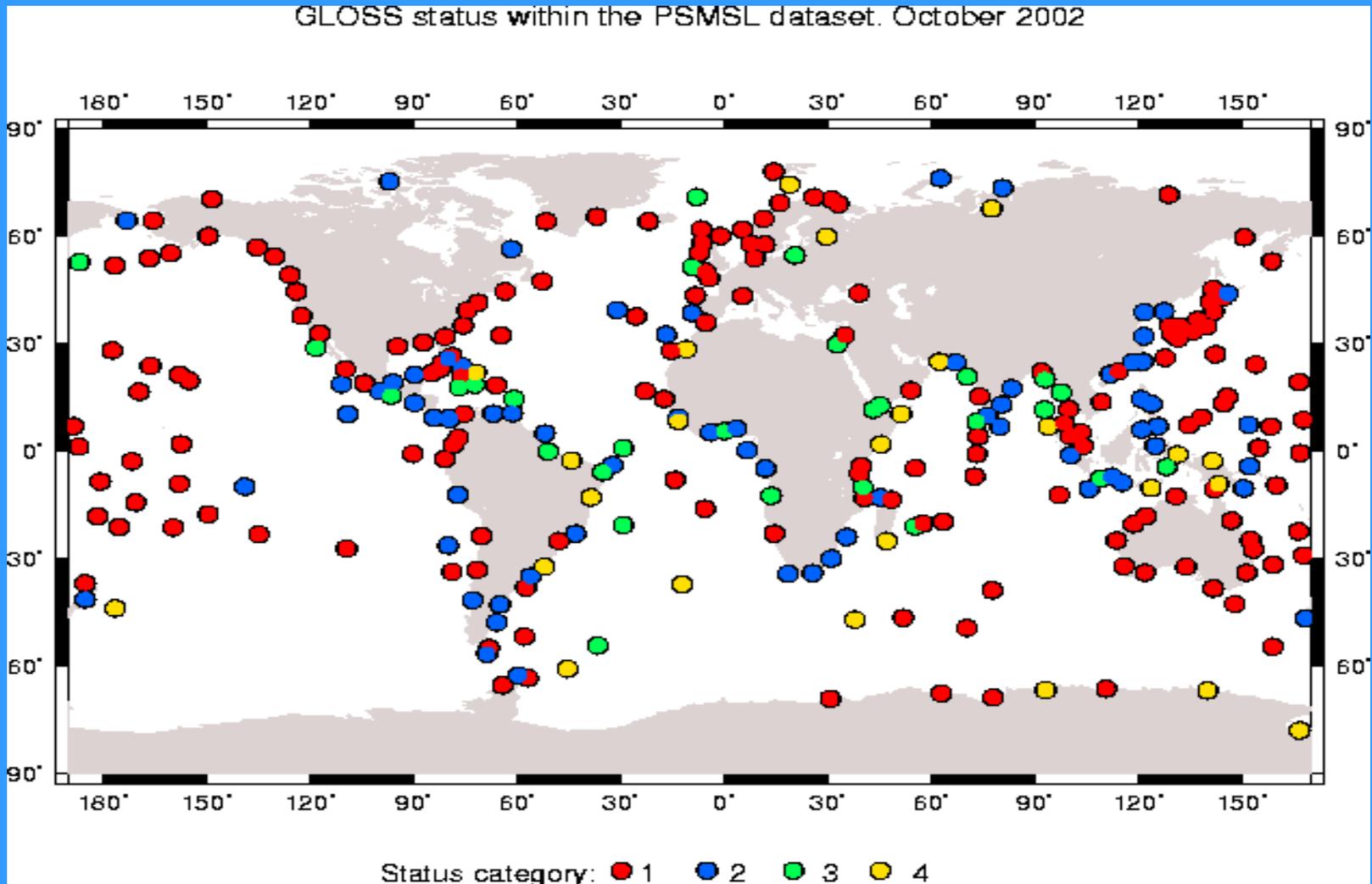


Source: NASA/JPL

Medición del nivel del mar en tiempo casi real con *gran* precisión y *excelente* cobertura en tiempo y espacio

Pregunta:

Cual de estas estaciones puede usted identificar ?



Source: GLOSS

Pregunta:

**Hay alguna relacion entre la varicion del nivel del mar
NO relacionada con las mareas, presion atmosferica,
olas, y el transporte del agua en el oceano ?**

SI

EN TERMINOS MUY GENERALES 1 cm de diferencia de nivel del mar en una distancia de 500 km significa un transporte de agua de aproximadamente 1 millon de metros cubicos por segundo !!

Pregunta:

Cuales son las corrientes marinas mas importante que uds conocen ?

Que sucede en los oceanos que justifique tanto gasto de tiempo, esfuerzo y dinero para tener altímetros ?

Circulacion Oceanica: la cinta transportadora y la circulacion meridional (global conveyor belt, meridional overturning circulation MOC)



CNES

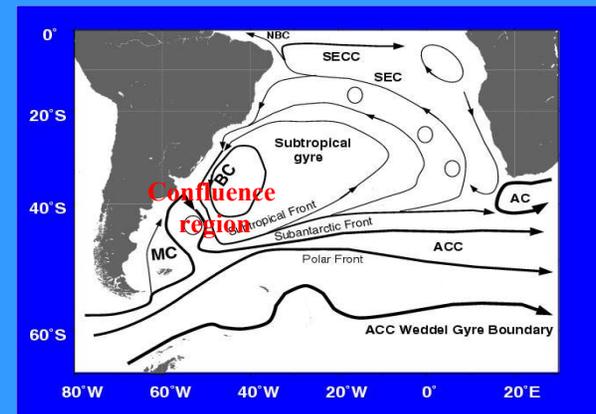
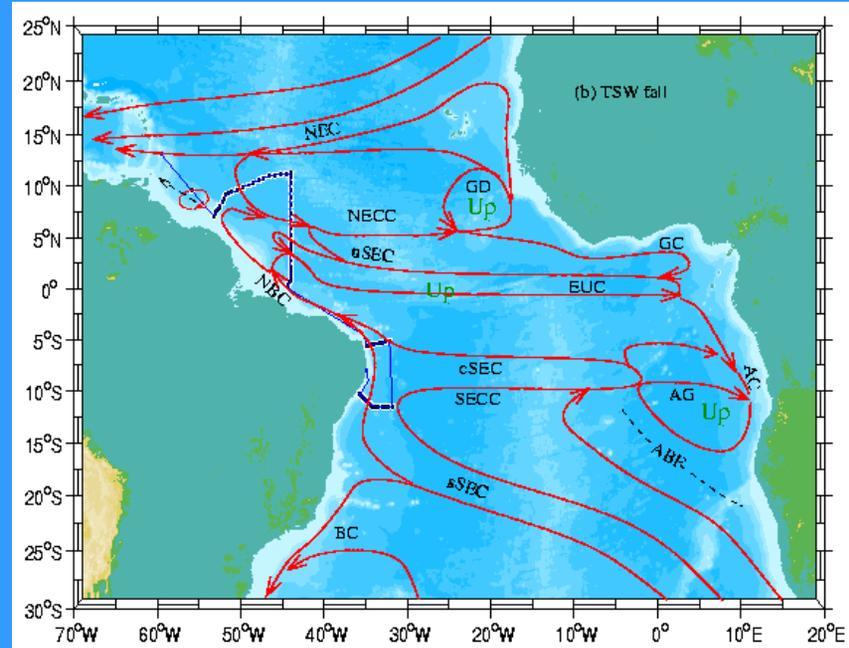
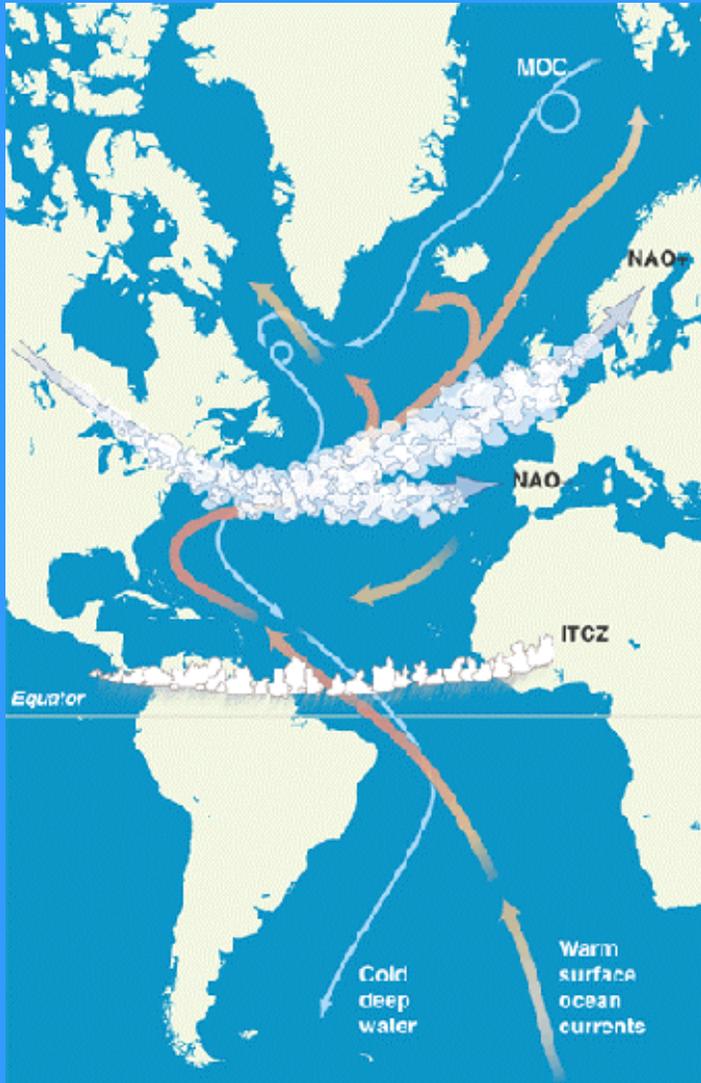
- Aguas calidas en superficie
- Aguas frias en profundidad

Pregunta:

Cuanto tiempo Uds creen que tarda en completarse un ciclo de la cinta transportadora ?

APROX MIL ANIOS

Que sucede en los oceanos que hace que uno gaste tanto tiempo, esfuerzo y dinero para tener altímetros ?

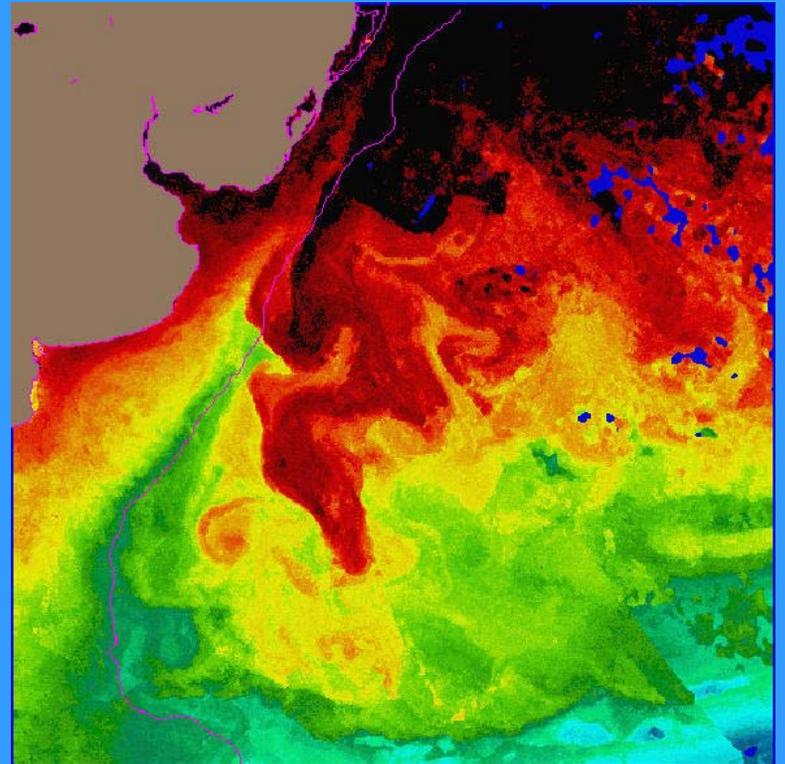


Adapted from Peterson and Stramma, 1991

Pregunta:

**Que corrientes oceanicas superficiales
conoce usted que sean calidas.....frias ?**

Identifica Ud a esta region ?



Pregunta:

Que es la termoclina ?

Como es un perfil tipico de temperatura en areas frias y en areas tropicales ?

Conceptos Oceanográficos

- Circulación Oceánica
Patrón General de corrientes
EBC y WBC

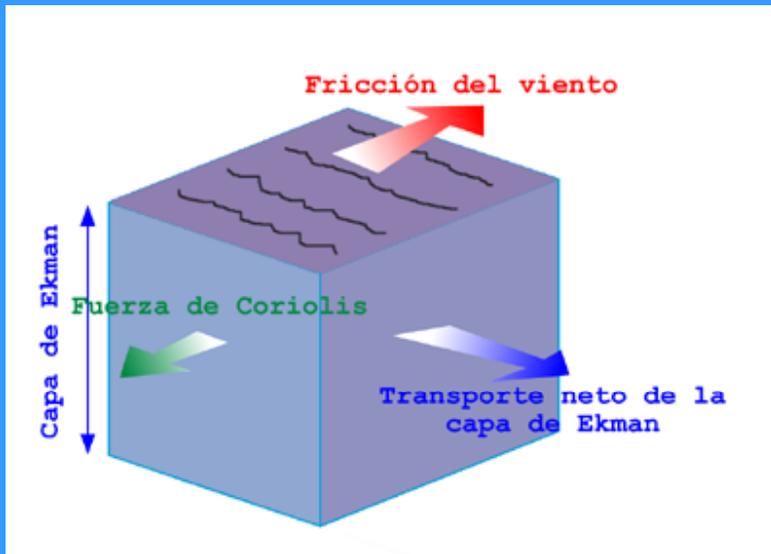


- Giros Mesoescalares
Fríos ciclónicos
Calientes anticiclónicos
- Teoría de Ekman

Modelo del efecto de los vientos sobre la masa oceánica

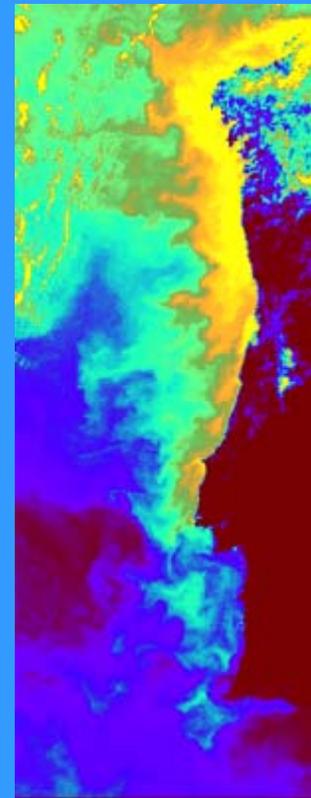
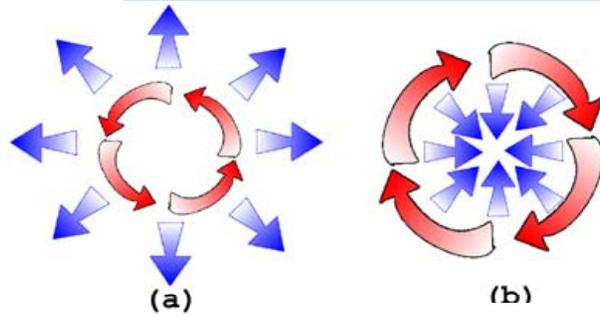
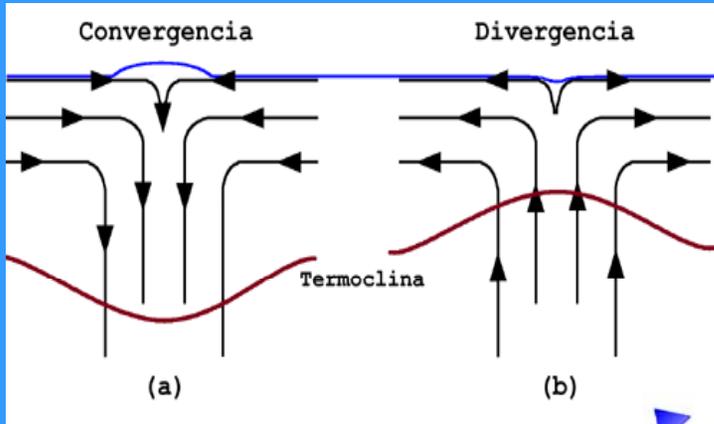
Espiral de Ekman

Capa de Ekman

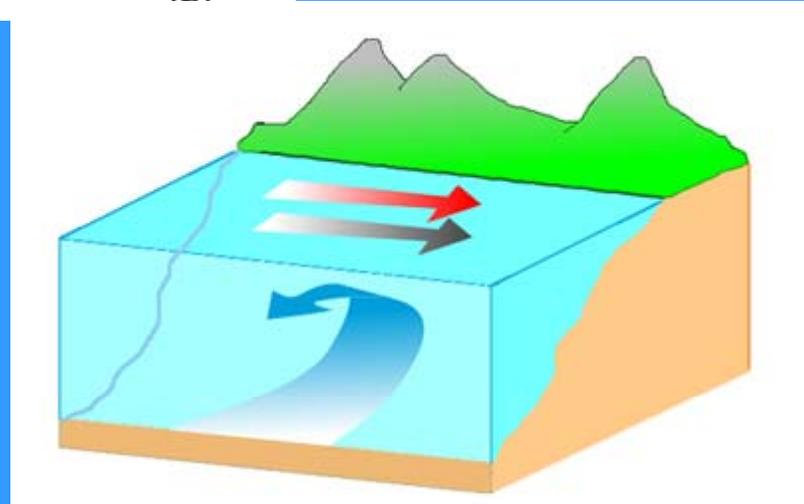


Cortesía J. Trinanés

- **Convergencia y Divergencia**



- **Ekman Pumping**
- **Afloramiento**



Cortesía J. Trinanes

- Frentes

Gradientes térmicos y/o salinos horizontales

Tipos: Shallow front, afloramiento, plataforma,

Asociados a convergencias

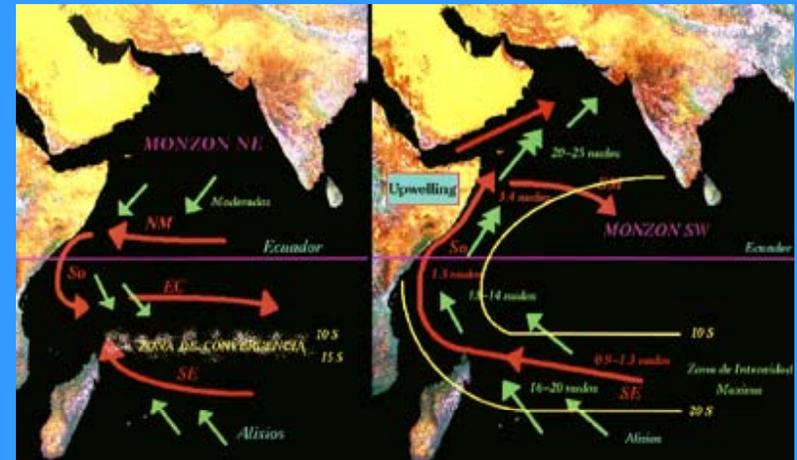
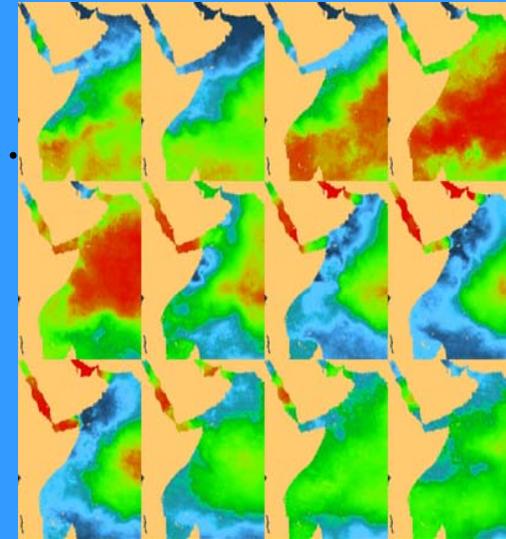
Gran importancia pesquera

- Caso particular: Índico Oeste

Régimen monzónico

Afloramiento de Somalia

Pesca sobre CL y OF



Cortesía J. Trinanes

Pregunta:

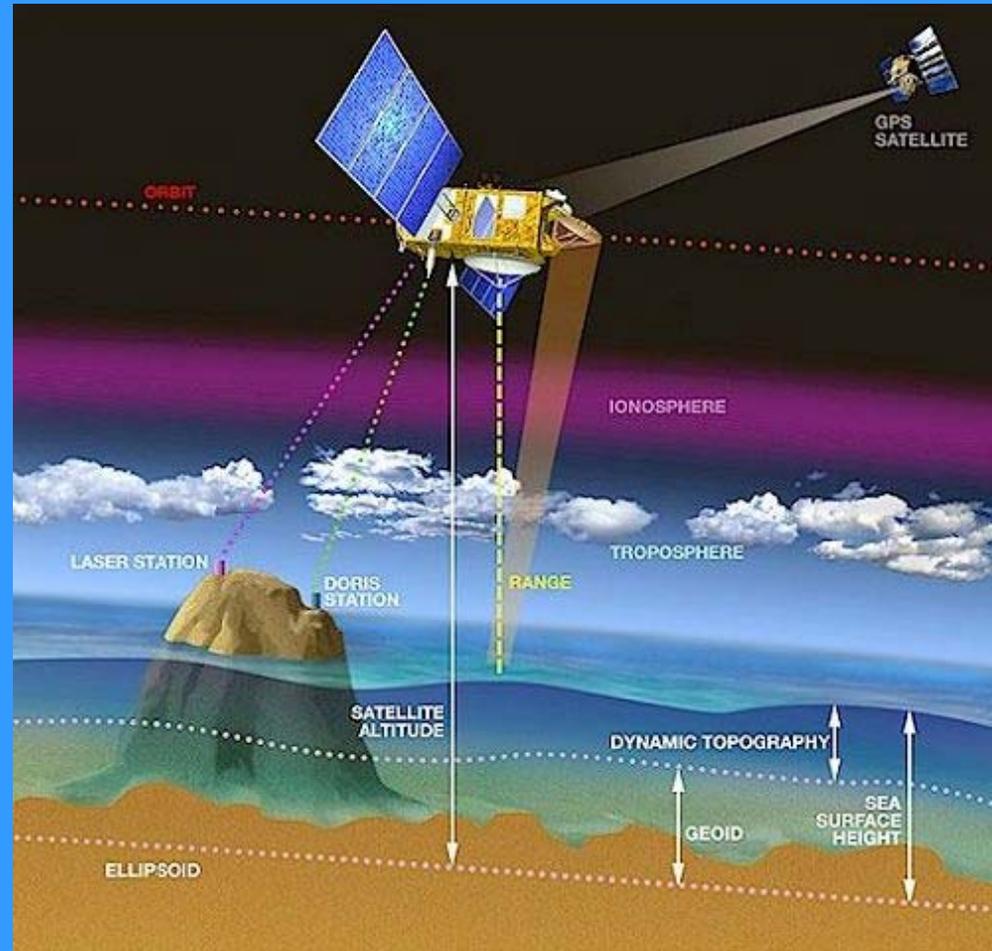
**Que areas Uds conocen que sean de
convergencia o divergencia ?**

Cómo se deriva la altura del mar ?

Se mide la distancia entre la antena del satélite y la superficie del mar.

Se computa la posición y altura del satélite

La altura de la superficie del mar se computa referida a un elipsoide.



Correcciones

Dry tropospheric: -2000 to -3000 mm

Ocean tides: -15000 to 15000 mm

Electromagnetic bias: -1200 to 0 mm

Inverse barometric: -1300 to 3105 mm

Ionospheric: -500 to 40 mm

Mean sea surface: -300000 to 300000 mm

Significant wave height: 0 to 25.5 m

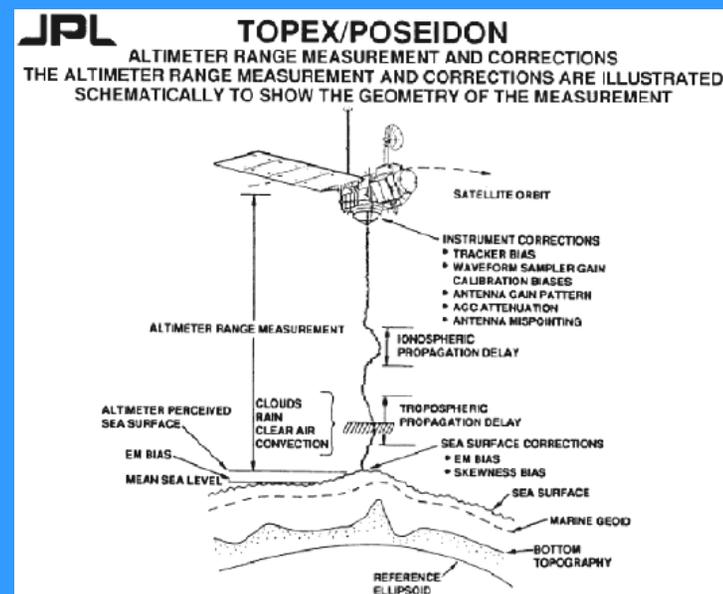
Solid Earth tide: -1000 to 1000 mm

Wet tropospheric: -1000 to 0 mm

Wind speed: 0.7 to 21.4 m

71 algoritmos para pasar de data crudo a data usable.

Precision = 2 cm



NASA/JPL

Punto sobresaliente:

Un altímetro 'mide' una altura de nivel del mar ~ cm desde 1500 km con un error máximo de 5 cm

La señal y el SWH:

El pulso:

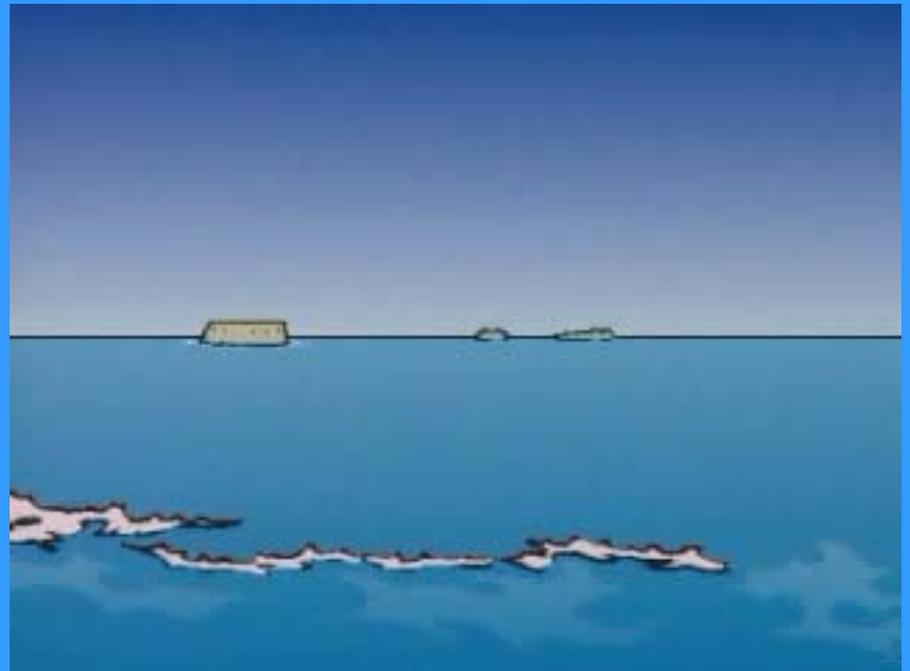
El pulso es generado por un oscilador de $\sim 15\text{GHz}$, transmitiendo a 1000 Hz and promediados en 1 seg.

El pulso de retorno depende de:

Distancia

Rugosidad de superficie

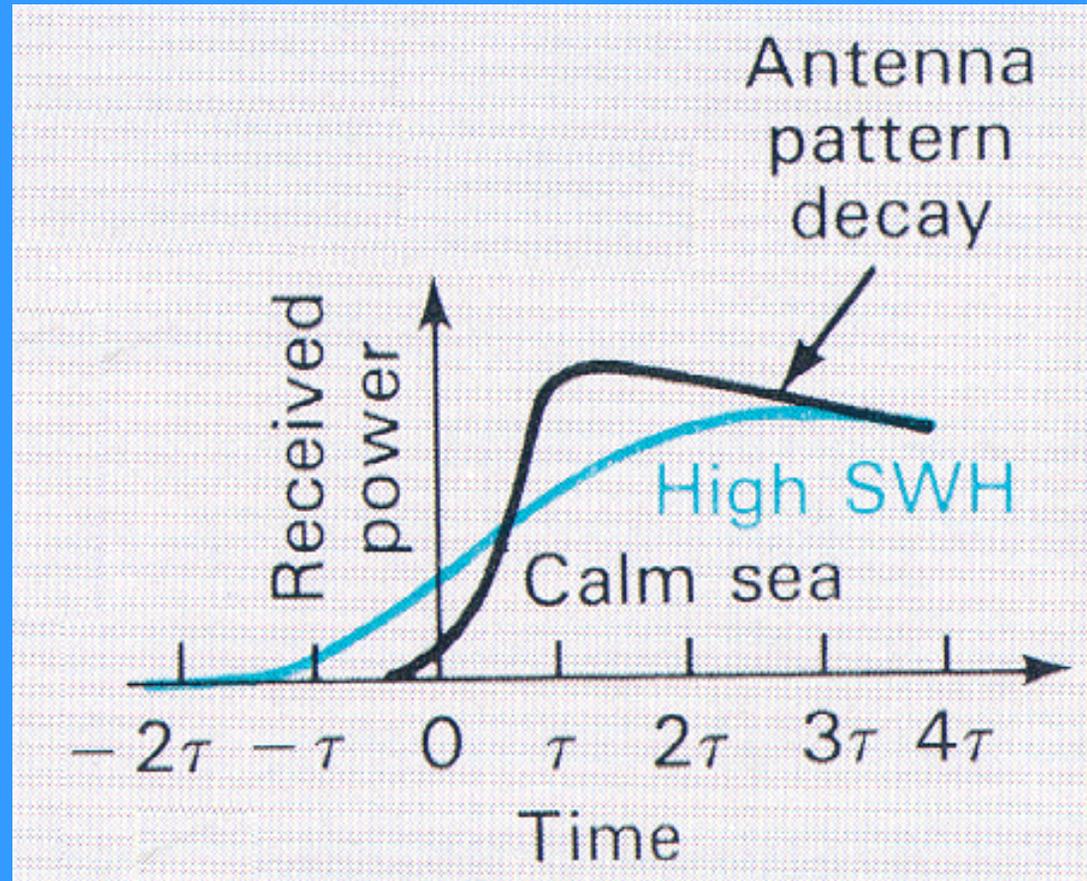
Altura de ola significativa



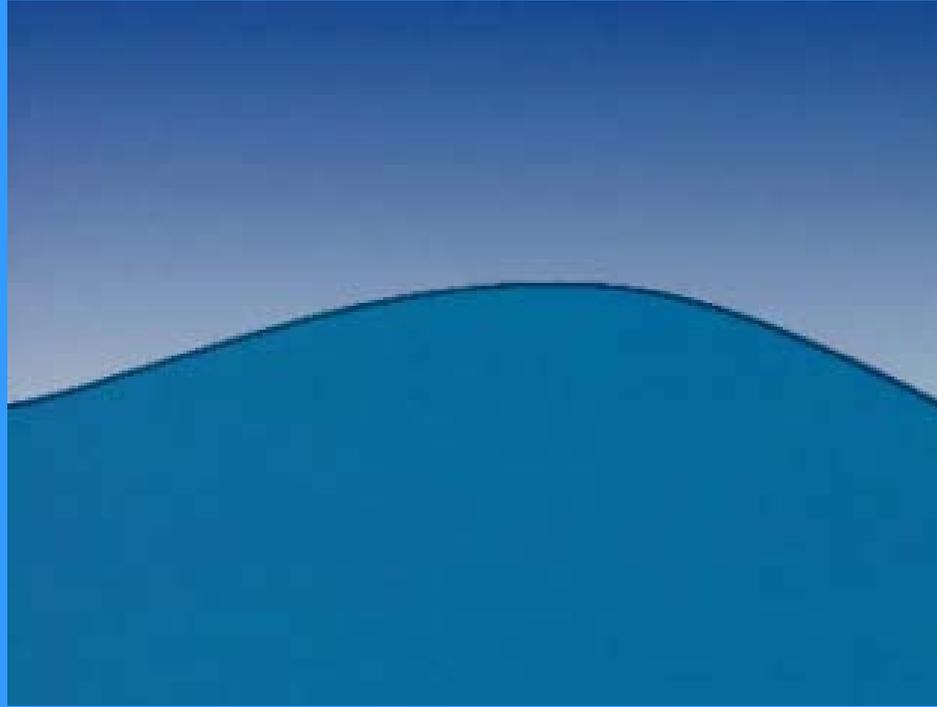
La señal:

La forma de onda:

- Tiempo de viaje:
distancia/altura
- Rugosidad de
superficie
- Pendiente



MEDICIONES DEL SATELITE - GEOIDE



Si se conoce la media (no variante) de la superficie del mar y la posición del satélite, entonces se puede estimar las corrientes oceánicas de la pendiente de la superficie del mar.

La media del nivel del mar en ausencia de corrientes marinas da la forma del ***GEOIDE***. Este geoide ***GEOIDE*** con sus cimas y valles representa al campo gravitacional de la tierra debido a su densidad y forma.

Altimetros

Satelite	Lanzamiento	Alt (km)/Incl	Status
Skylab	1973		1974
GEOS 3	1974	840/115	1978
SeaSat	1978	800/108	1978
GEOSAT	1984	800/108	1989
ERS-1	1991	780/98.5	1996 stand-by
TOPEX/POSEIDON	1992	1115/66.04	cont
ERS-2	1995	780/98.5	cont
GEOSAT - GFO	1998	800/108	cont
JASON-1	2002	1116/66.05	cont
ENVISAT	2001		
JASON-2	2004 ?	1116/66.05	n/a

85

90

95

00

Geosat

ERS-1 ERS-2

TOPEX/Poseidon

Geosat Follow-On

JASON-1

Envisat



TOPEX/POSEIDON



ERS



Envisat



Jason



Geosat



GFO



Spot

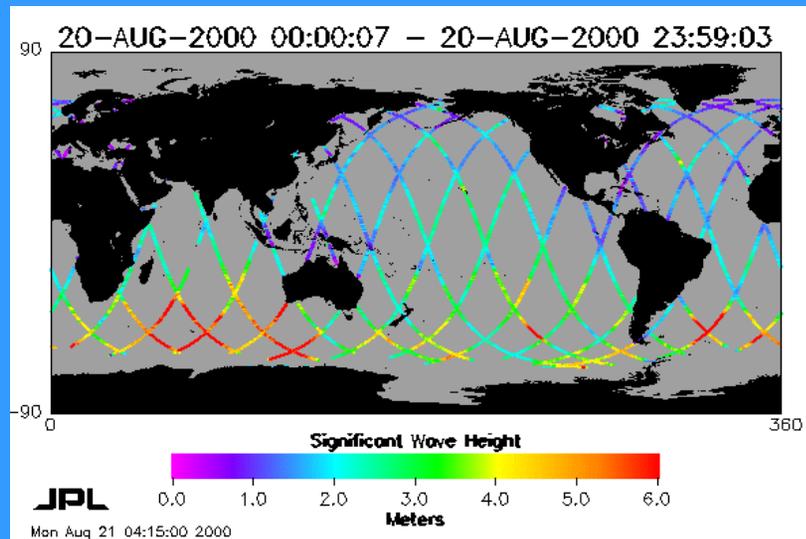


Parámetros de órbita

La cobertura real de la superficie depende de los parámetros de orbita, tal como la inclinacion de la orbita y el periodo de repeticion.

Satelite	Periodo	Espacia miento	Inclinacion
GFO	17 days	163 km	108°
ERS	35 days	80 km	98°
TOPEX/P	10 days	315 km	66.5°

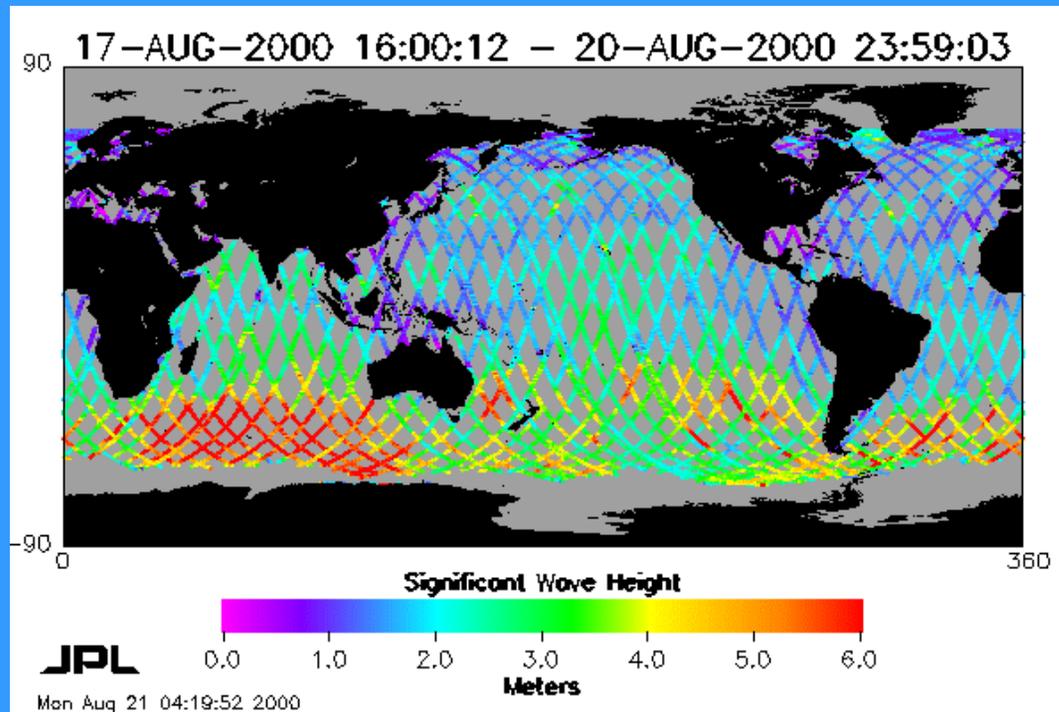
Muestreo de la superficie del mar cada 7-9 km a lo largo de la traza, hace promedios de 1 segundo de mediciones. Cada traza se repite dentro de 1km de la traza anterior.



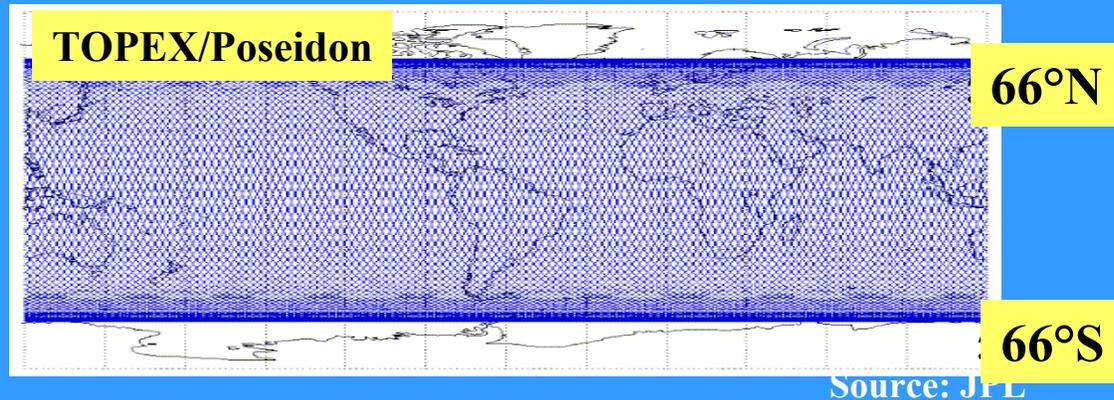
Muestreo – TOPEX/Poseidon

El numero de trazas depende del periodo de repeticion (T/P=10 dias).

La cobertura depende de la inclinacion del plano de orbita.



Trazas de TOPEX/Poseidon



Flying at 1300 km height

**Spacing: 315 km between parallel tracks at the equator
(3.5 days)**

Groundtrack velocity: 5.8 m/s

Acute (slope) angle at the equator is 39.5 deg

Alongtrack measurements

Repeat groundtracks every 9.9156 days after 127 rev

Begin: September 23, 1992

Data: Near-real time

Que es lo que mide en realidad un altimetro ?

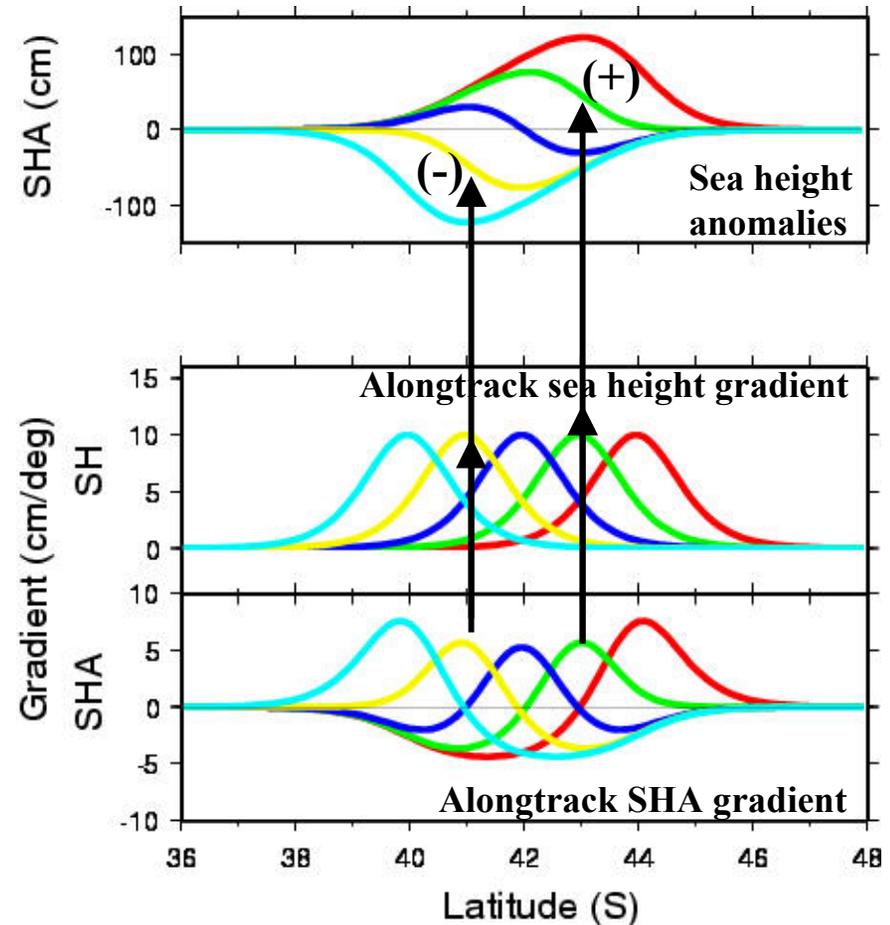
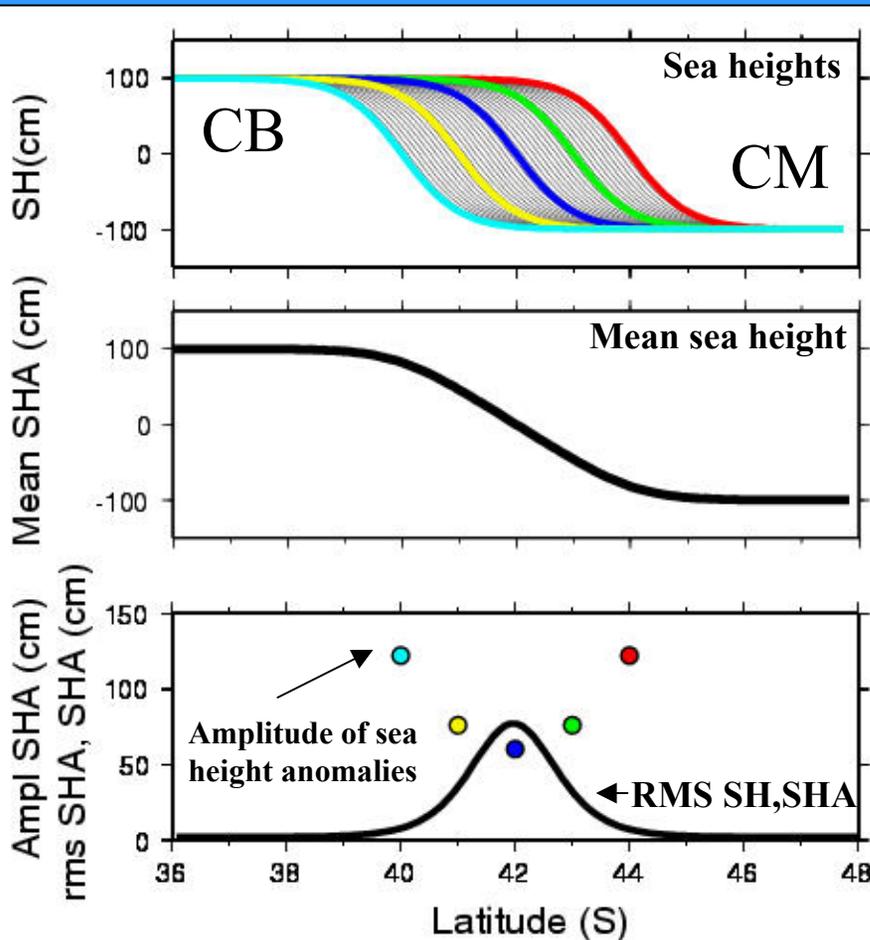
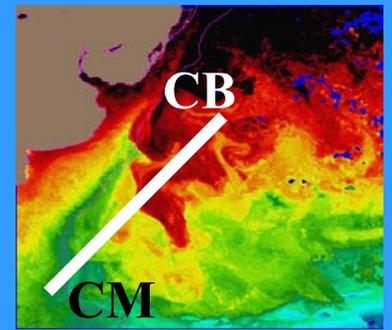
..... Mide tiempos.

Los tiempos son convertidos en distancias

Las distancias son convertidas en alturas del nivel del mar

Las alturas del nivel del mar son convertidas en anomalías.

ALTIMETRIA Y ANOMALIAS DE ALTURA DEL MAR



POR QUE MEDICIONES EN GROUNDTRACKS COLINEALES ?

**Para repetir las mediciones en los
mismos puntos geograficos**

POR QUE ANOMALIAS ?

**Para anular los errores provenientes de no
conocer exactamente el geoide**

DE ALTURAS A LO LARGO DE LAS TRAZAS A MAPAS DIARIOS DE ALTURAS DE SUPERFICIE DEL MAR....

... ES UN PROBLEMA...

1. Se pueden usar los datos de un periodo de N dias.
Efectuar una interpolacion (lineal, gaussiana,)
2. Analisis objetivo, Analisis Optimo.....

Pregunta:

Aproximadamente cuanto tarde el altímetro en completar un ciclo (dar una vuelta alrededor del mundo) ?

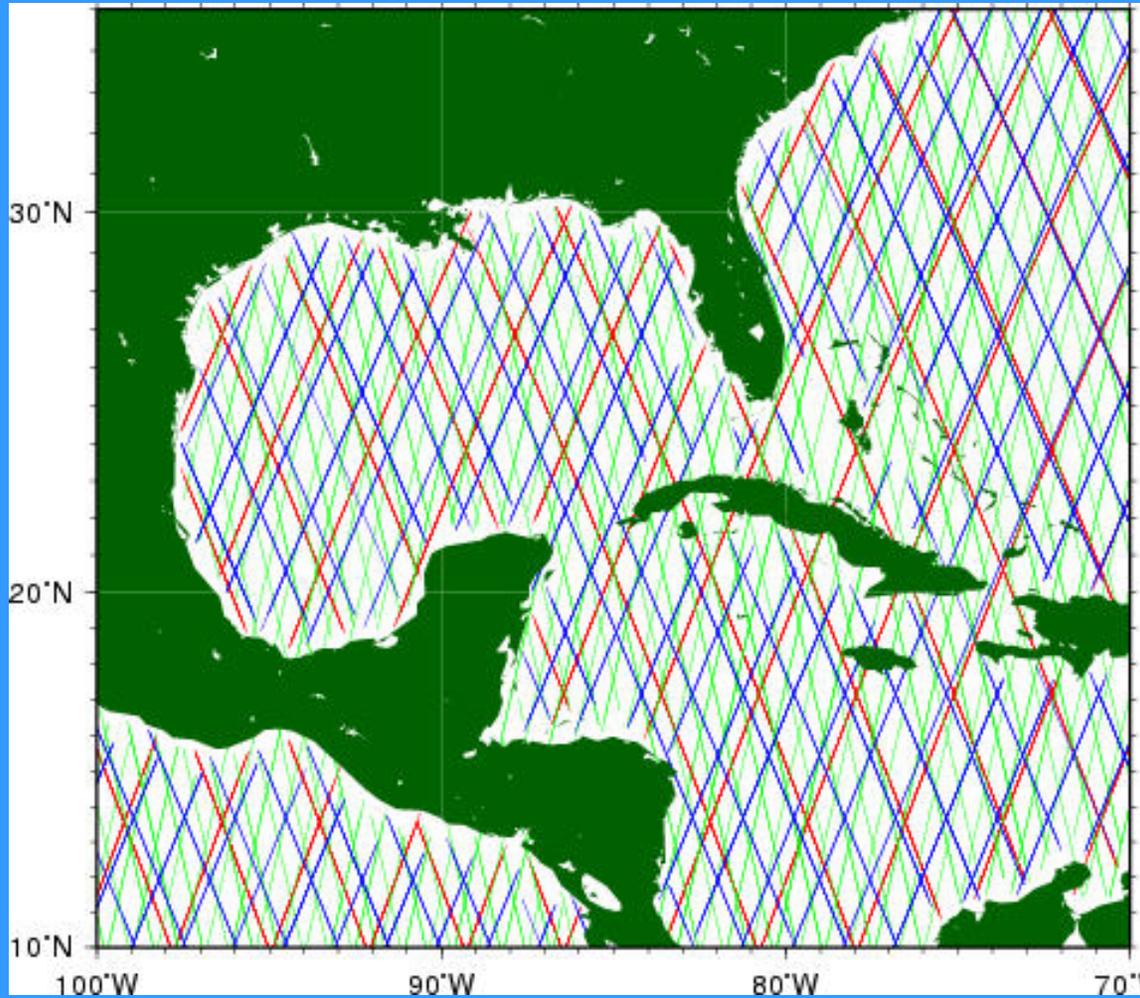
Para mañana: estimar la velocidad a lo largo de una traza. Ayuda: R_{Tierra} approx 6300 km

Muestreo

Una revolucion del altimetro lleva aproximadamente de 100 a 115 minutos, dependiendo de la altura del satelite (800-1350 km).

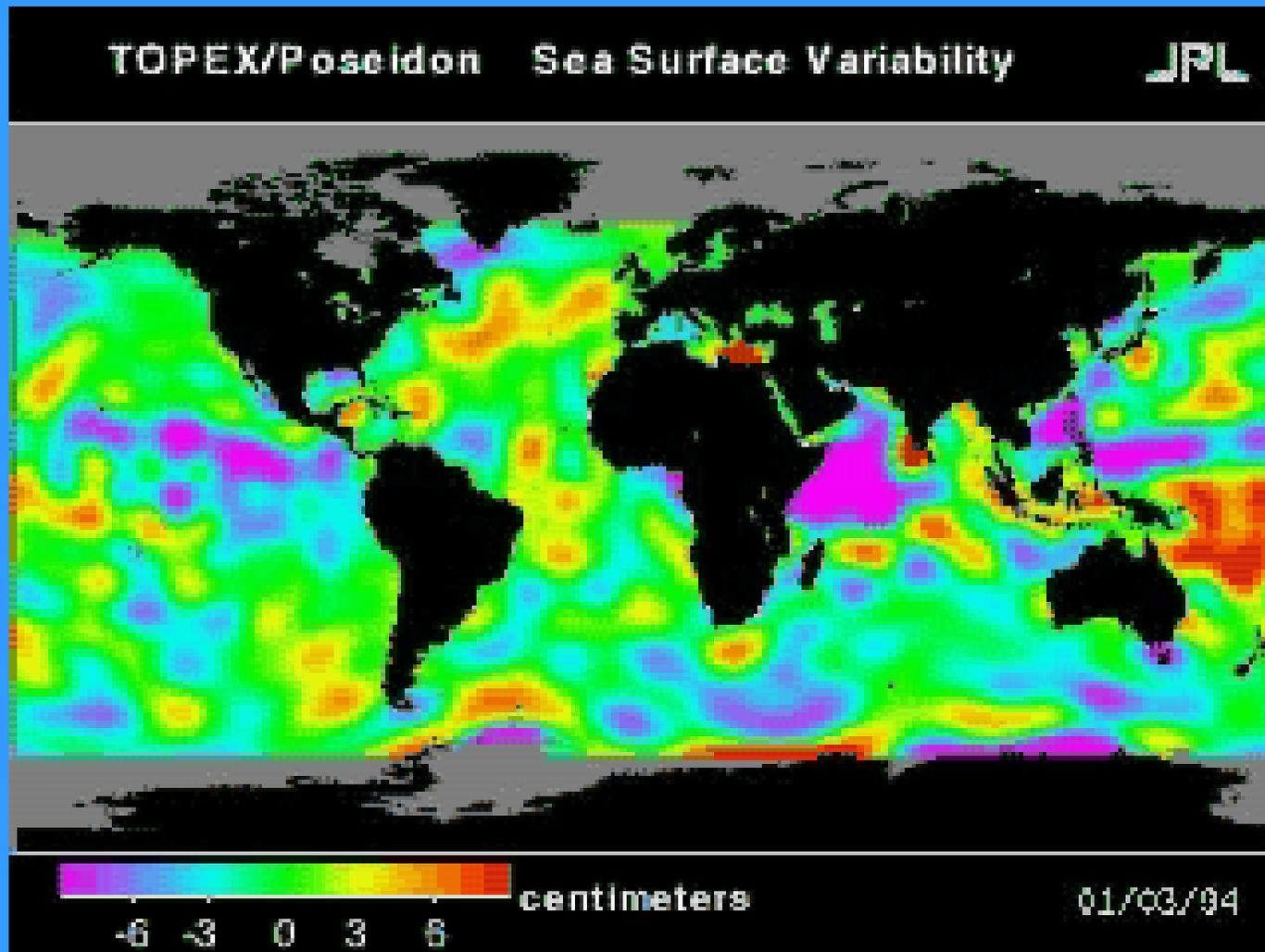
Un altimetro completa 13-14 revoluciones por dia.

Trazas (groundtracks) de 3 altímetros



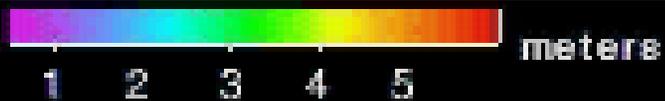
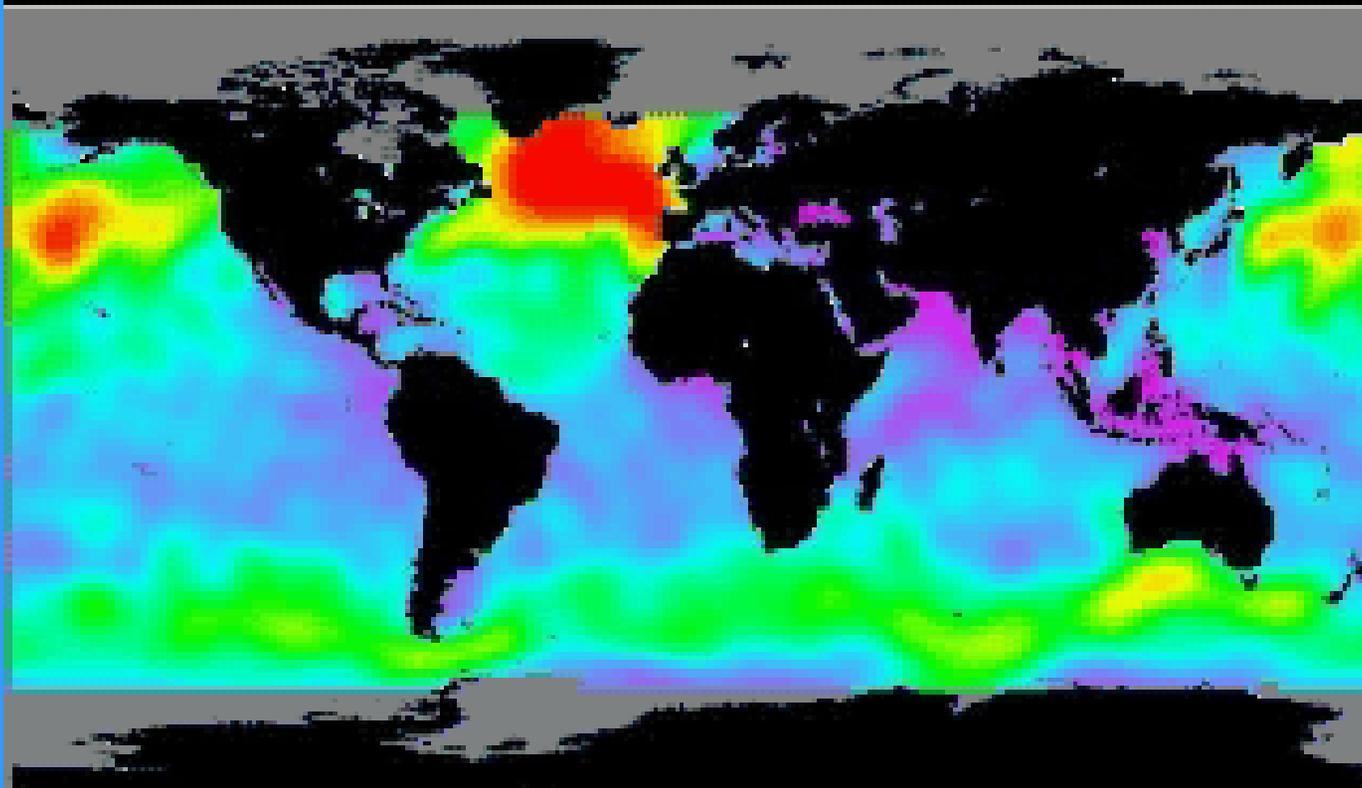
— TOPEX/Poseidon — ERS2 — GFO

SHA, Olas, Vientos durante 1994



TOPEX/Poseidon Significant Wave Height

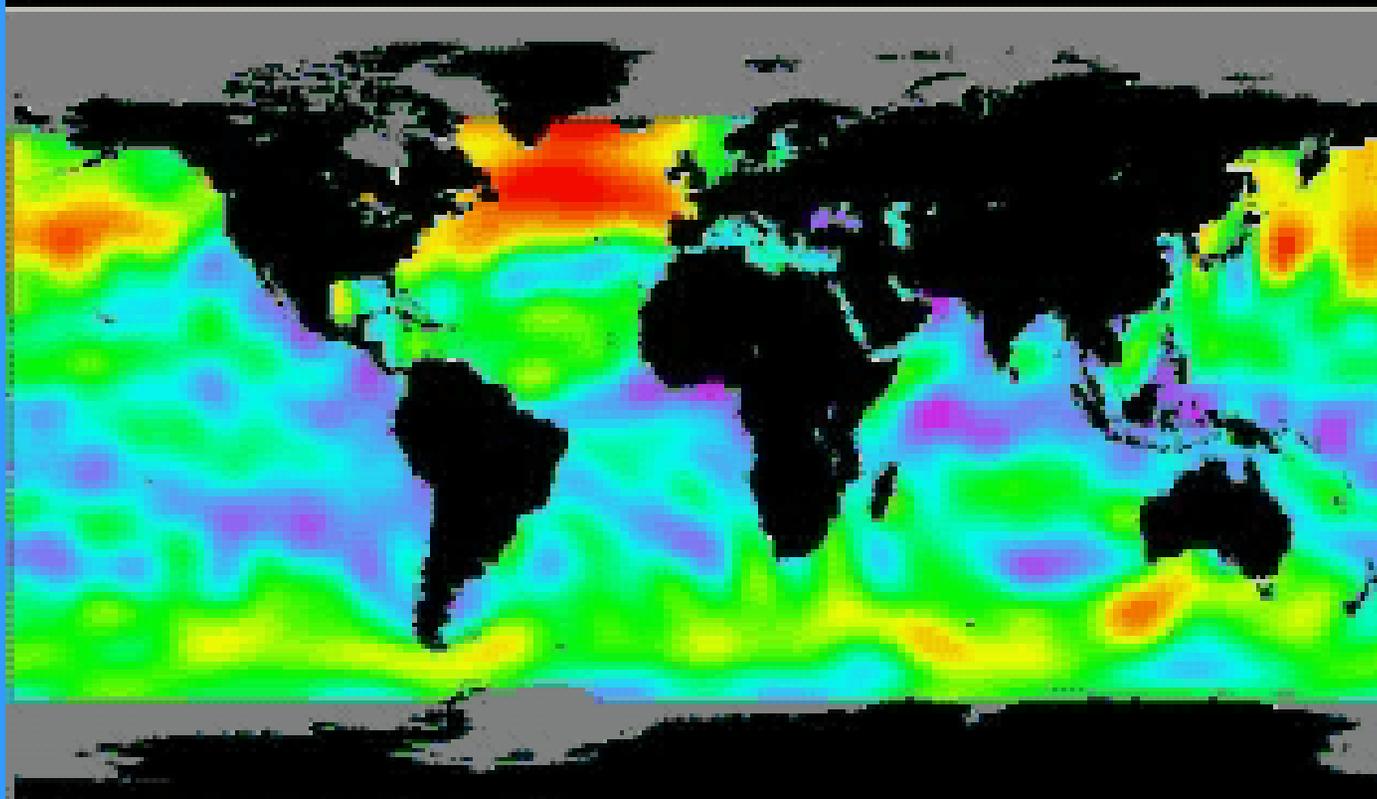
JPL



01/03/94

TOPEX/Poseidon Wind Speed

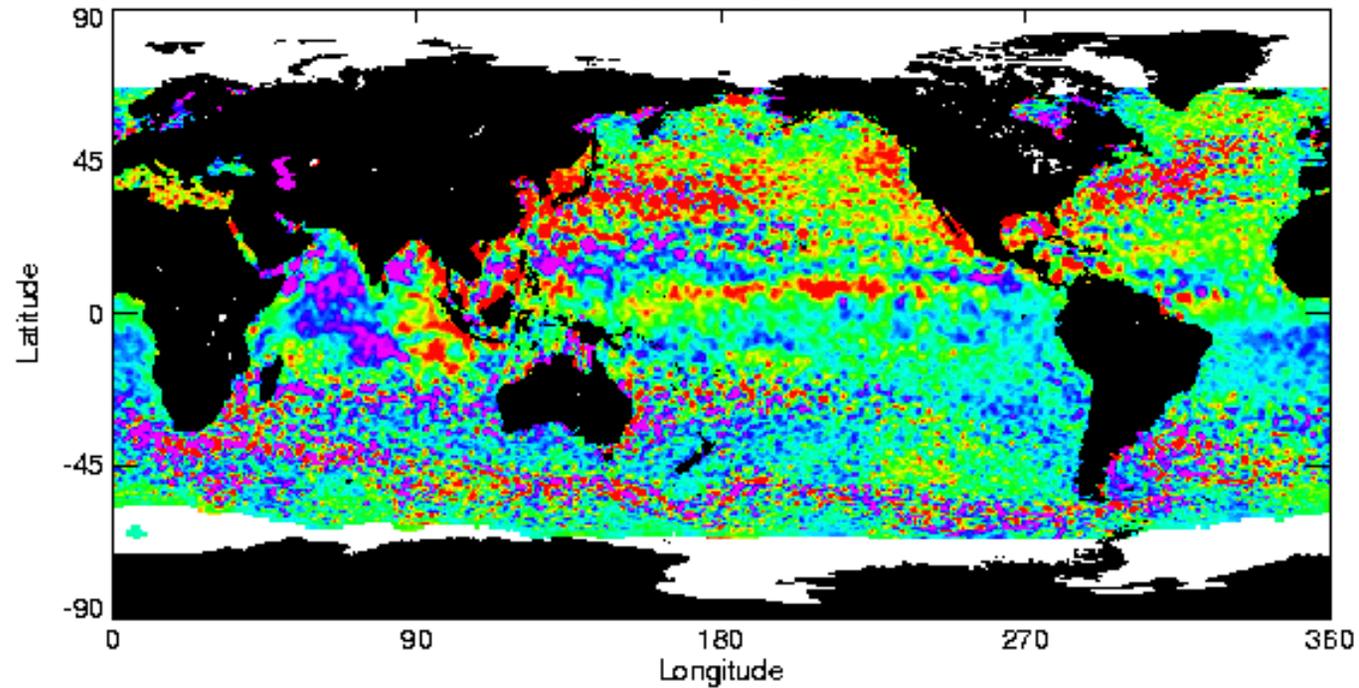
JPL



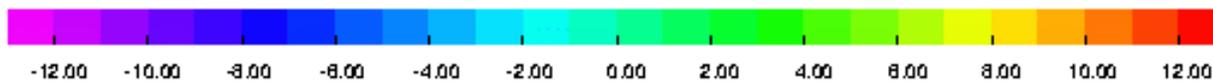
01/03/94

SEA LEVEL ANOMALY - T/P - (cm)

01/11/1992



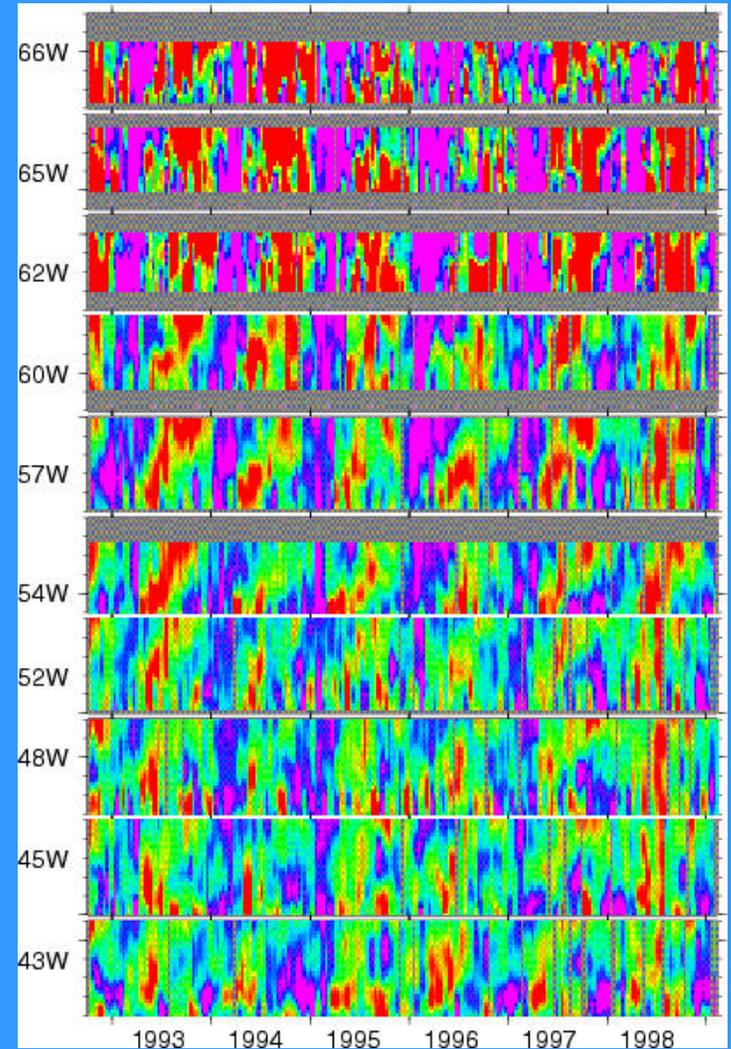
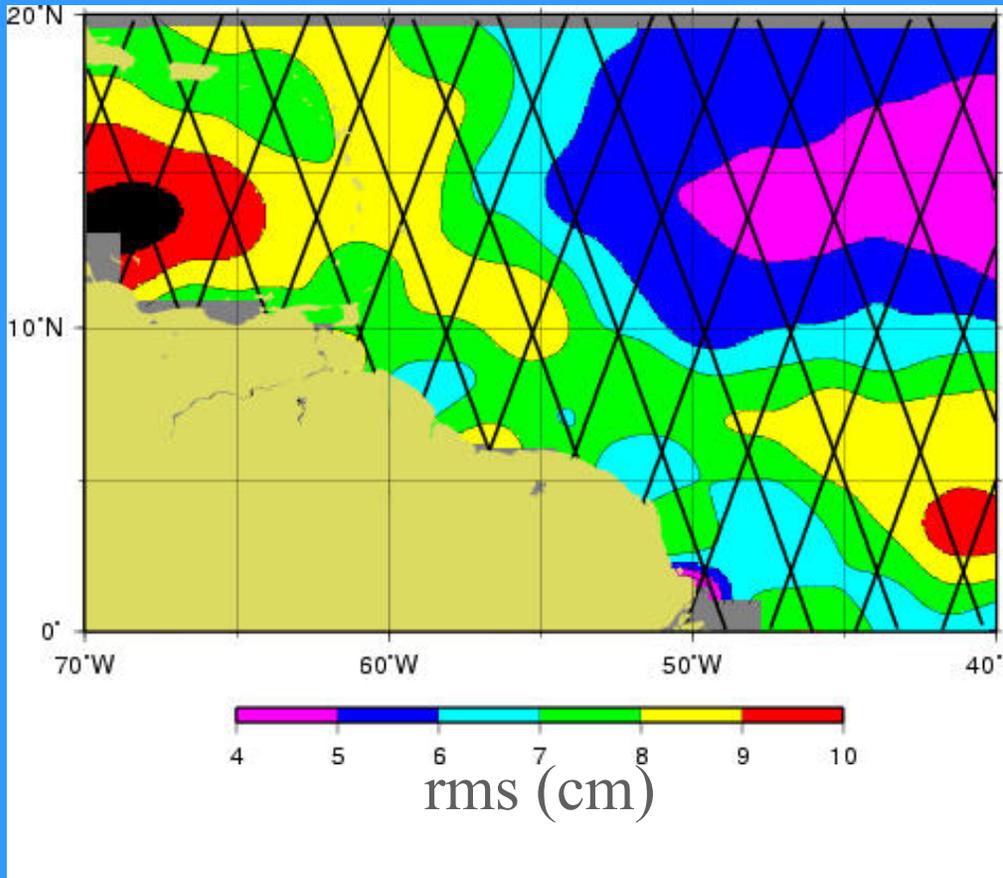
Blsize : 1.00000
Minimum value -208.280
Maximum value 159.880



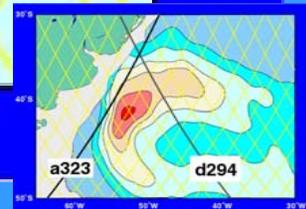
Anomalias de altura

rms de SH o de SHA ?

Diagrama de espacio-tiempo
(Hovmoller)

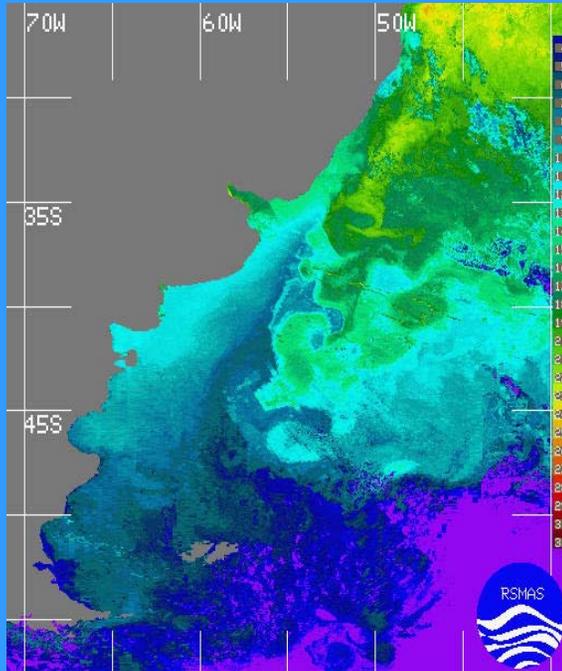


Variabilidad de altura de superficie

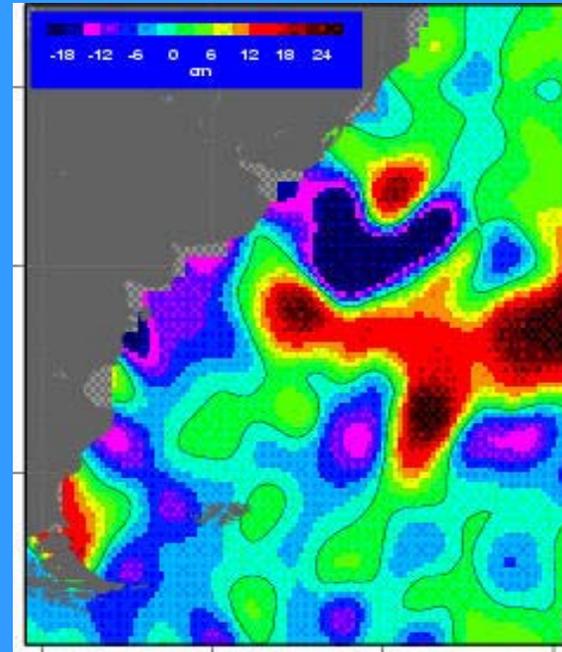


Altimetria versus AVHRR y Seawiffs

Septiembre 9, 2001



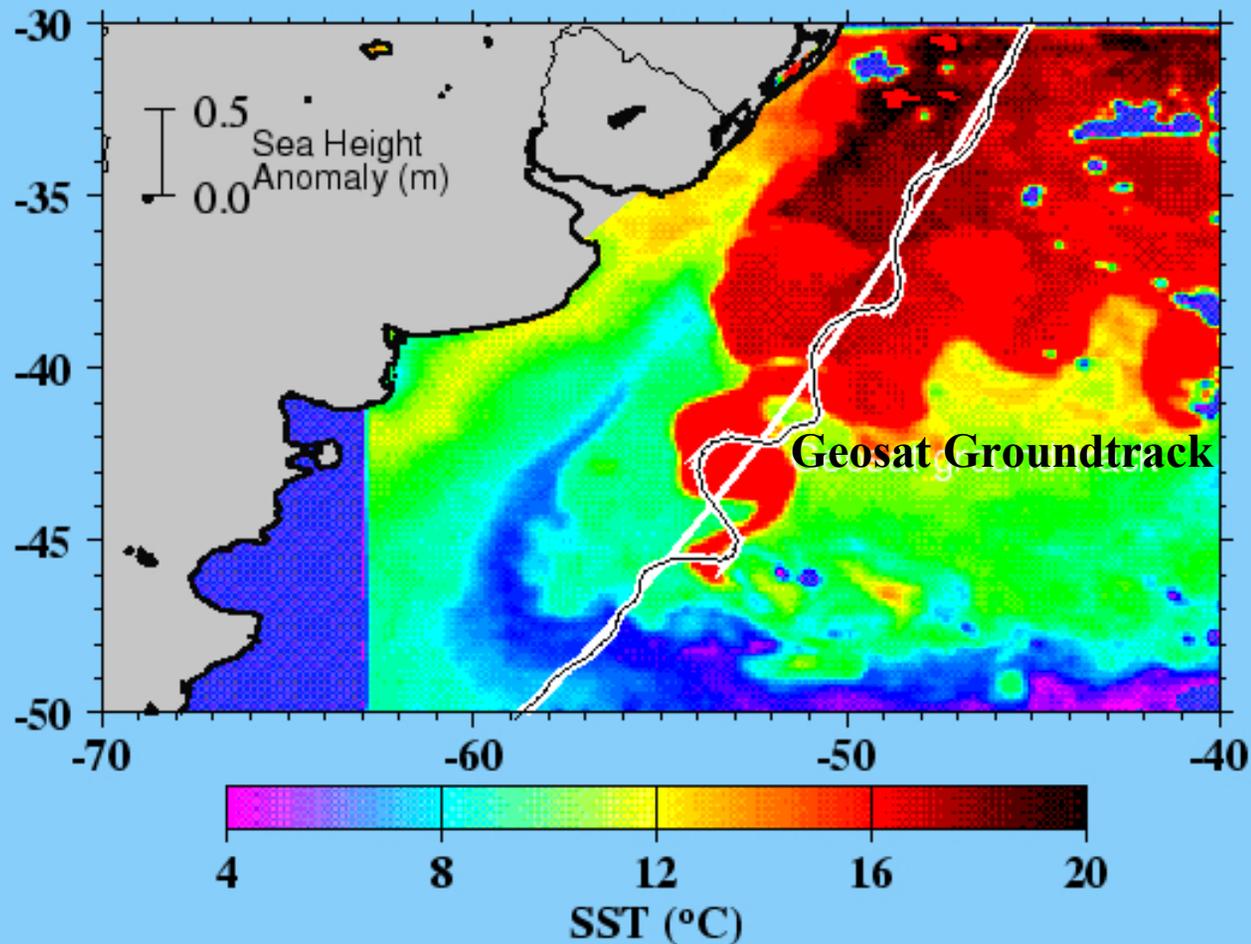
Septiembre 1-10, 2001



AVHRR y ALTIMETRIA

Brazil-Malvinas Confluence Region

Sea Surface Temperature (°C) and Sea Height Anomaly (m)
Aug 1-5 1988



Preguntas:

Cual es el rango de la variacion del nivel del mar:

- 1. a traves de una corriente oceanica**
- 2. debido al fenomeno de El Nino**
- 3. debido al calentamiento/enfriamiento del agua**
- 4. por el paso de un huracan**
- 5. por las mareas**
- 6. por la surgiente debido a una tormenta**

Preguntas:

Son los altímetros suficientemente buenos para medir por si solos variaciones del nivel del mar en zonas costeras ?

Son los mareografos suficientemente buenos para por si solos medir las variaciones del nivel del mar en zonas costeras ?

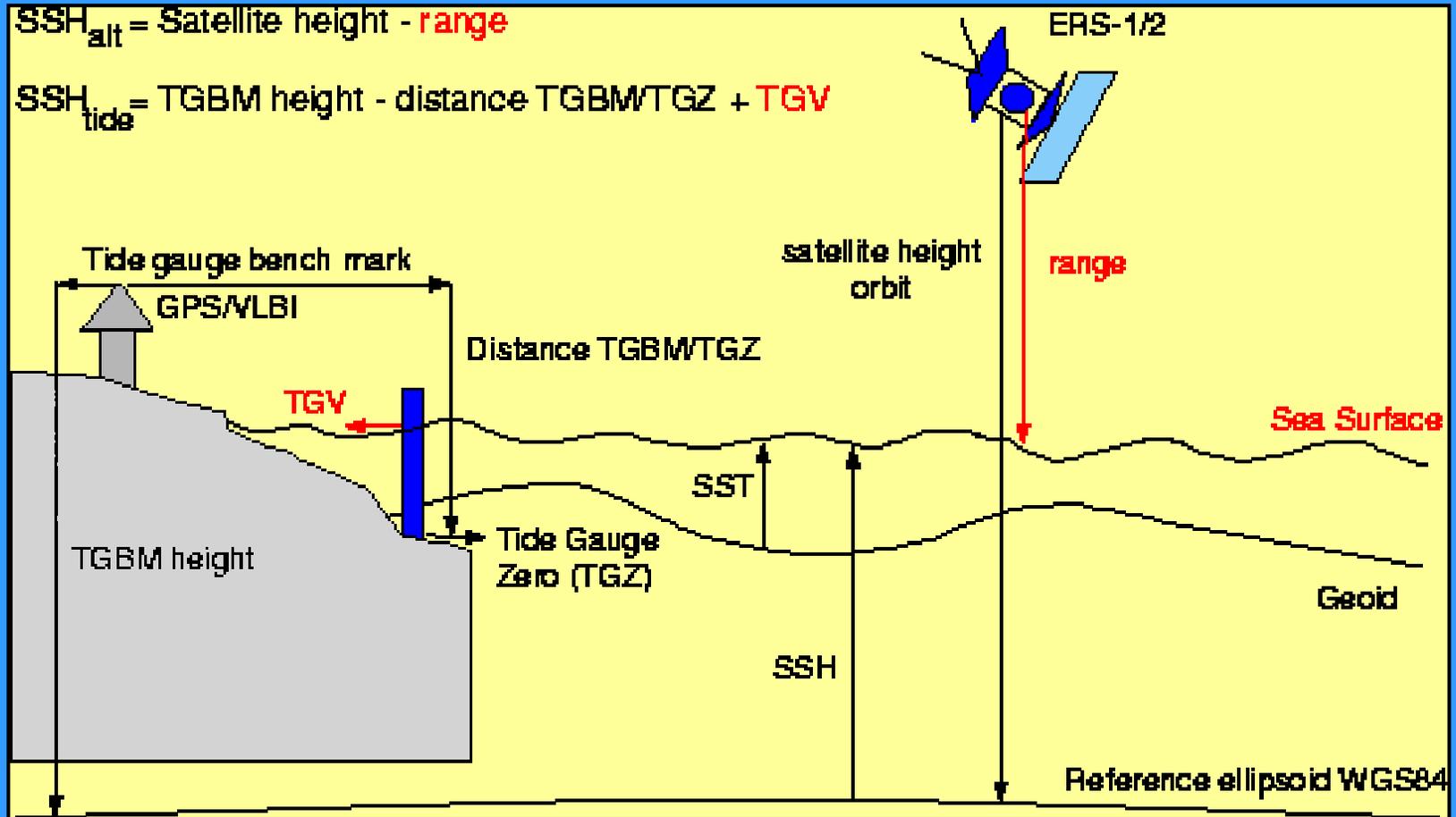
Preguntas:

Son los altímetros suficientemente buenos para medir por si solos variaciones del nivel del mar para estudios climaticos ?

Son los mareografos suficientemente buenos para por si solos medir las variaciones del nivel del mar para estudios de cambios climaticos ?

La respuesta es mas bien politica que cientifica.

Altimetros y mareografos.....



Source: A. Braun (GFZ, Germany)

.....no miden lo mismo

Preguntas:

Que fenomenos causan variaciones

1 Periodicas

2 No periodicas

del nivel del mar ?

Usos y aplicaciones de Altimetria



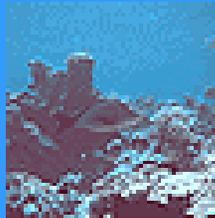
Tiempo
(weather)



rastreo



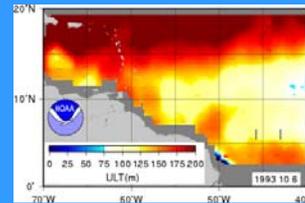
clima



corales



huracanes



**Dinamica
Oceanica**

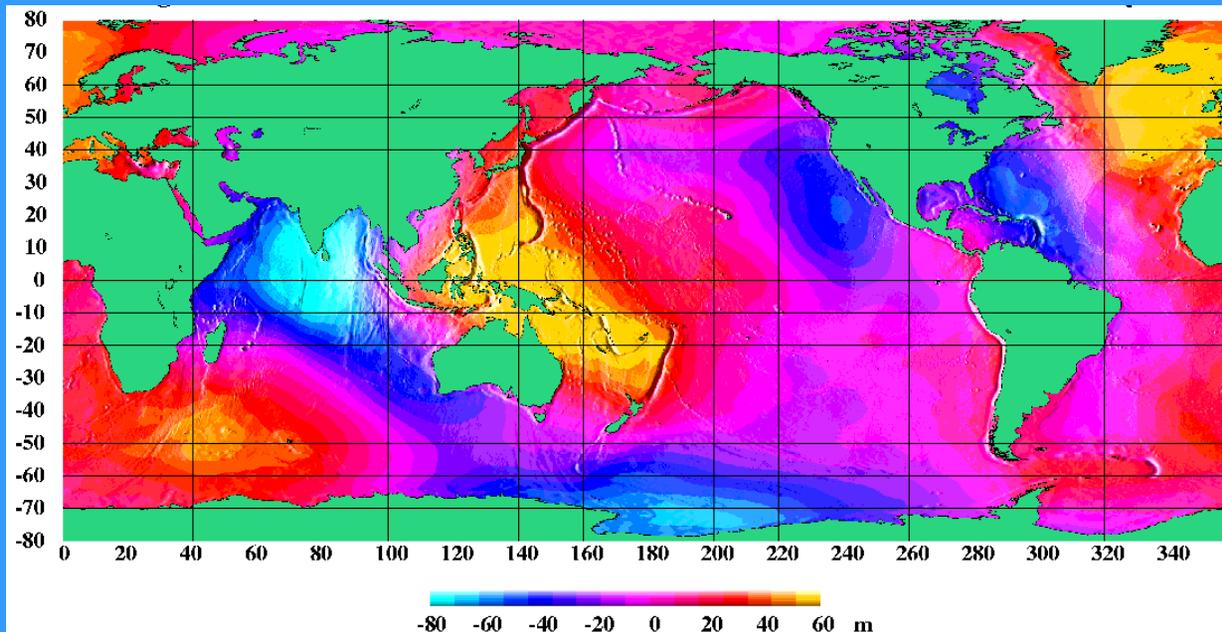


industria

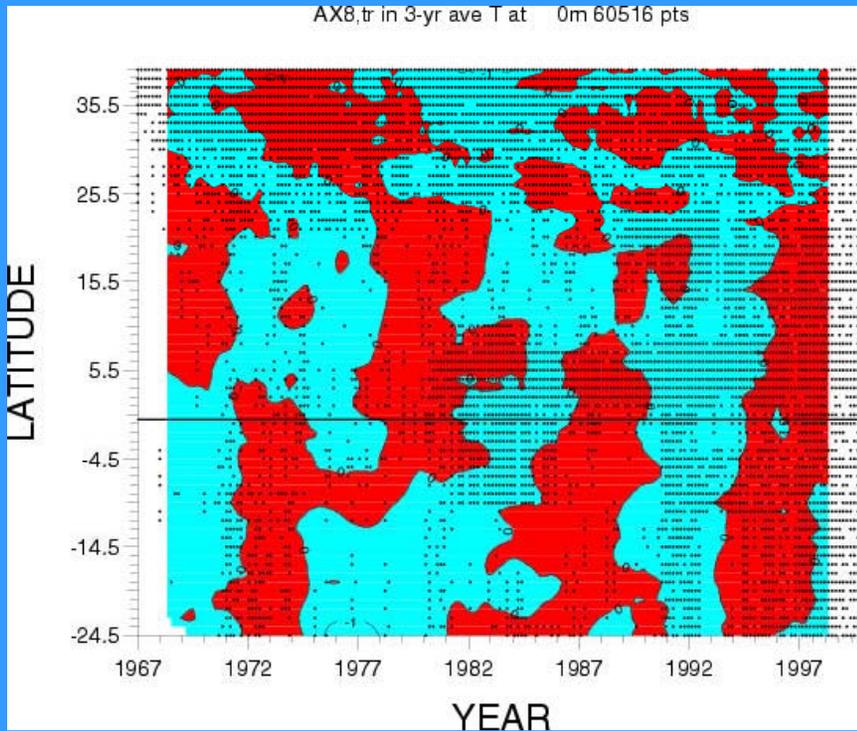
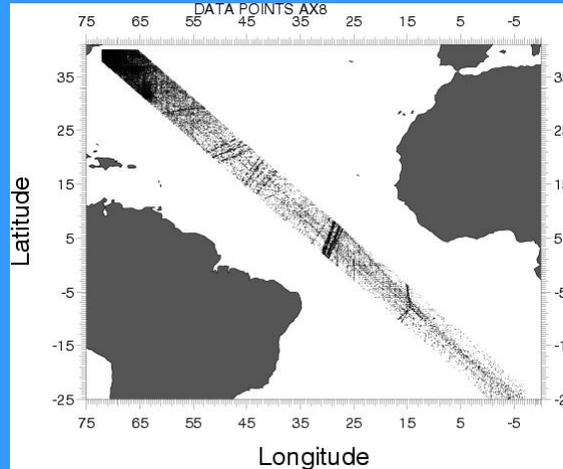
Aplicaciones

Nivel del mar:

-Para investigar variabilidad periodica y no periodicas: estacional (ciclo annual), interanual (anillos, frentes...), decadal (NA), otros periodos (El Nino),... con 10 anos de datos.



Datos de temperatura a lo largo del Atlantico



Alguien ve alguna Senial ?

R. Molinari
NOAA/AOML

Pregunta :

Que es la termoclina estacional ?

Que es la termoclina permanente ?

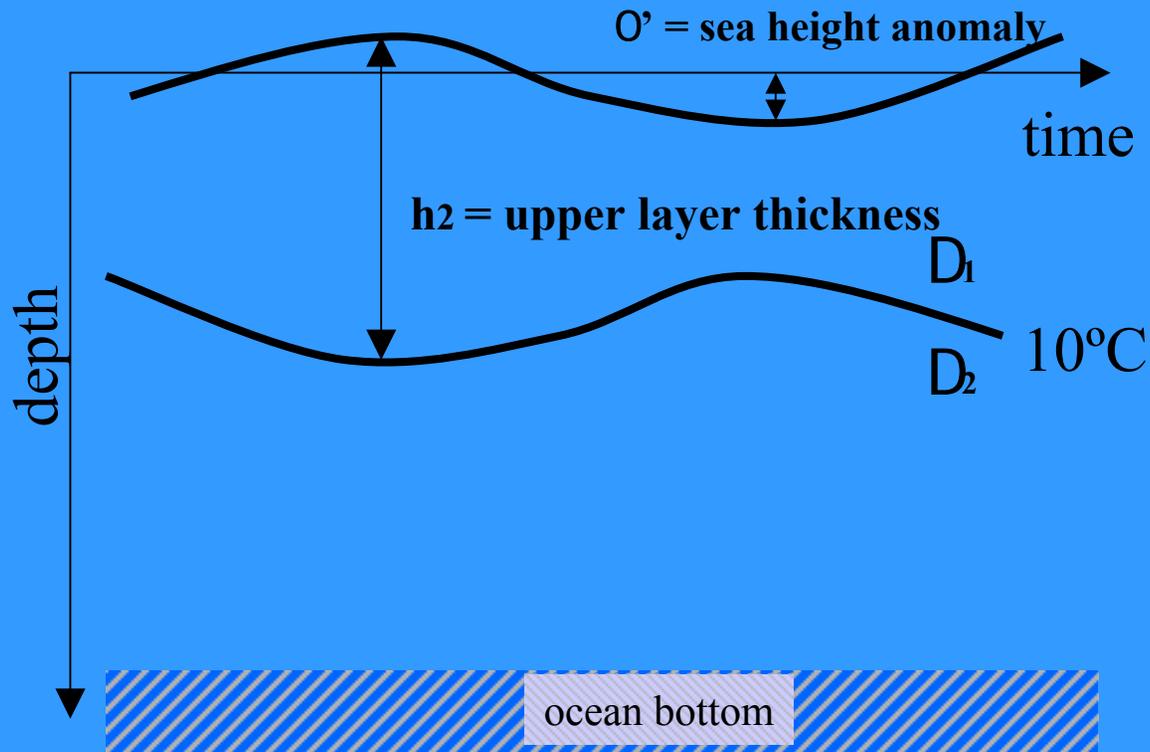
Se puede estimar la temperatura subsuperficial con datos altimetricos ?

Los cambios en la altura (dinamica) del oceano se deben en parte a la variacion de la estructura termica de los primeros cientos de metros (en profundidad) en el mar.

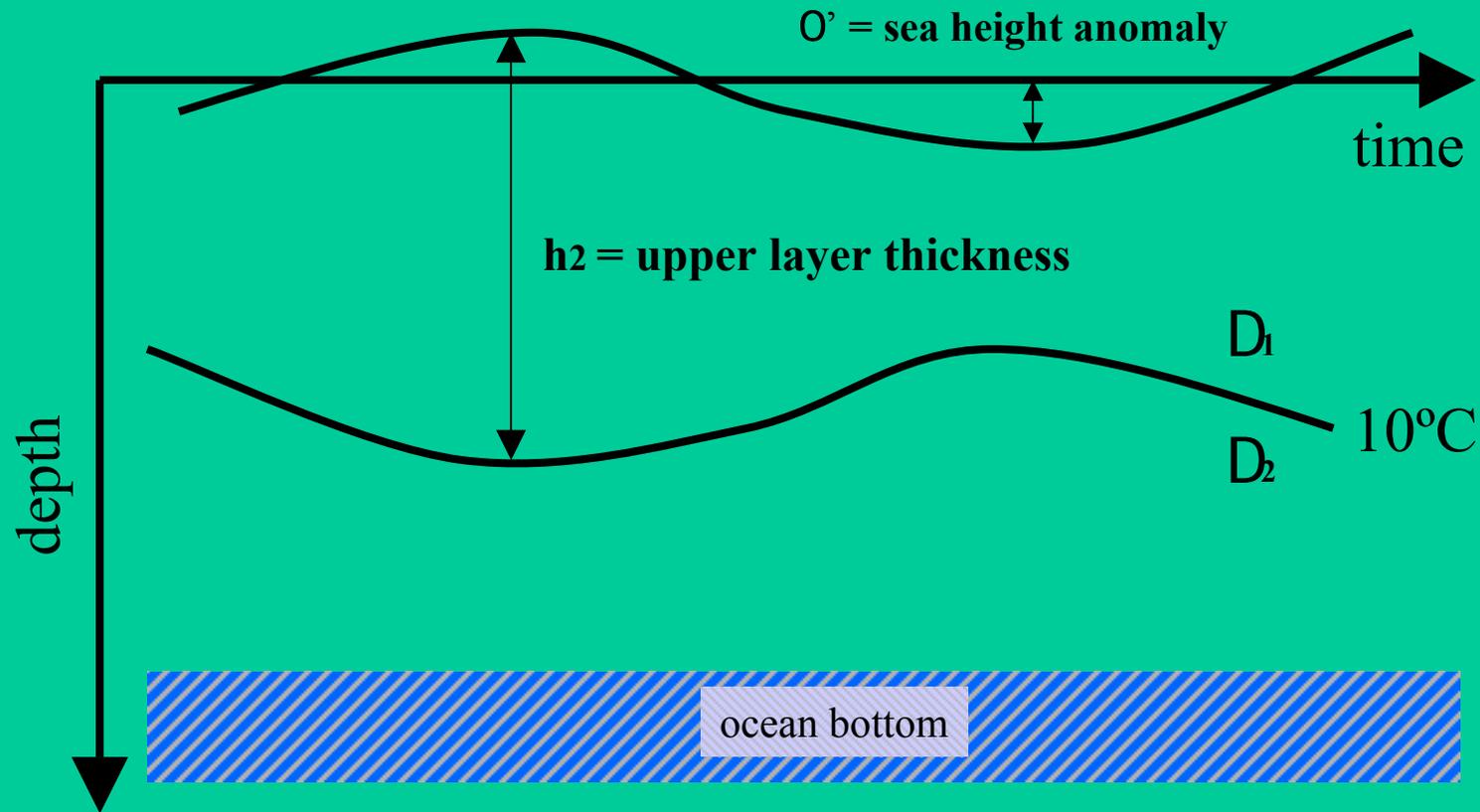
En general, y como una primera aproximacion, los cambios en la profundidad de la termoclina son proporcionales a los cambios de altura de superficie.

Metodologia

1. Two-layer reduced gravity approximation,
2. Upper layer thickness and location of the BC front, and
3. Baroclinic transport.



Approximacion de modelo de dos capas



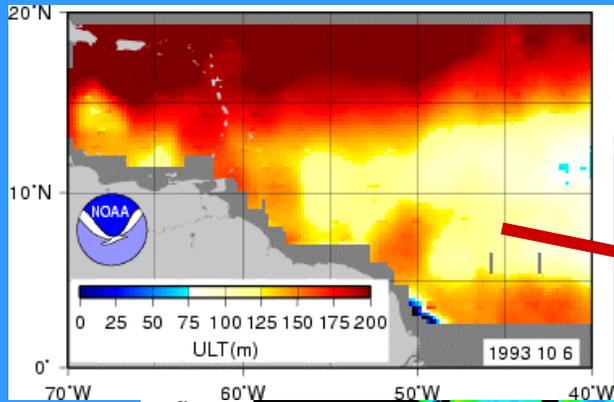
$$h_2(x, y, t) = \bar{h}_2(x, y) + [1/\bar{\rho}(x, y)] O'(x, y, t) + B'(x, y)$$

$$\bar{\rho}(x, y) = [\bar{D}_2(x, y) - \bar{D}_1(x, y)] / \bar{D}_2(x, y)$$

$$\text{Baroclinic Transport} = [g'(x, y) / 2f(y)] * \Delta h_2^2(x, y, t)$$

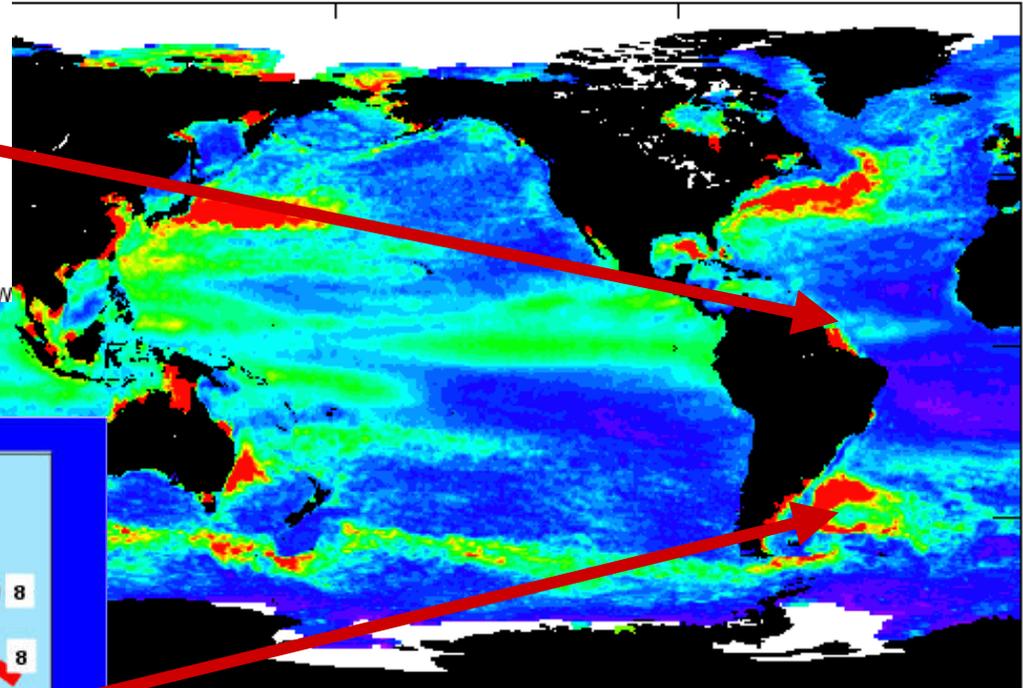
$$g'(x, y) = \varepsilon(x, y) * g(x, y)$$

Variabilidad del nivel del mar



Latitude

12/92 - 11/98



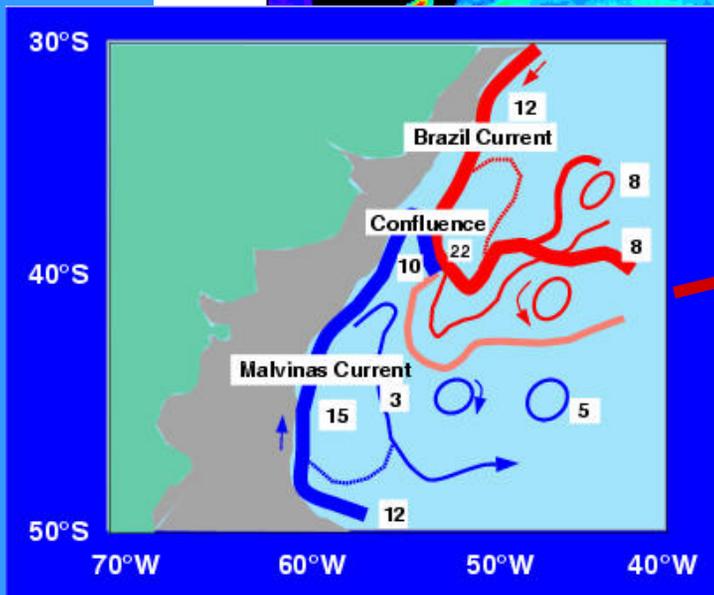
Longitude

180

270

360

8.00 10.00 12.00 14.00 16.00 18.00 20.00



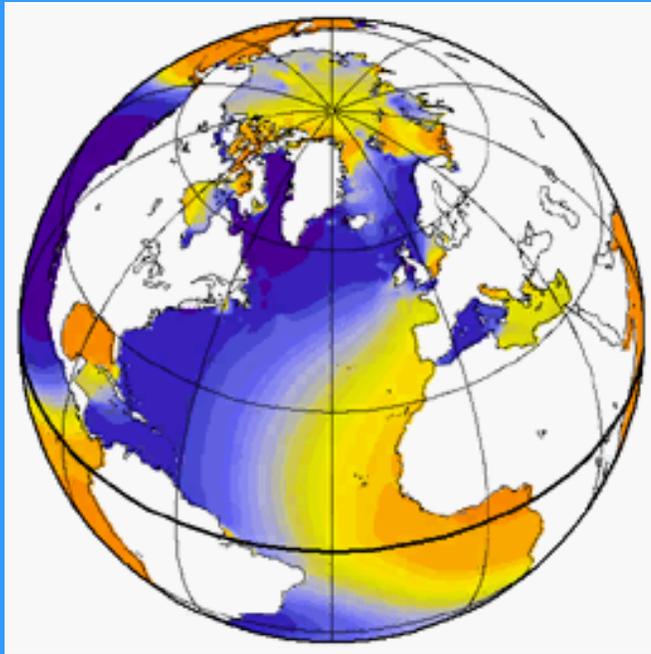
Pregunta:

Cuales son las componentes principales de Mareas ?

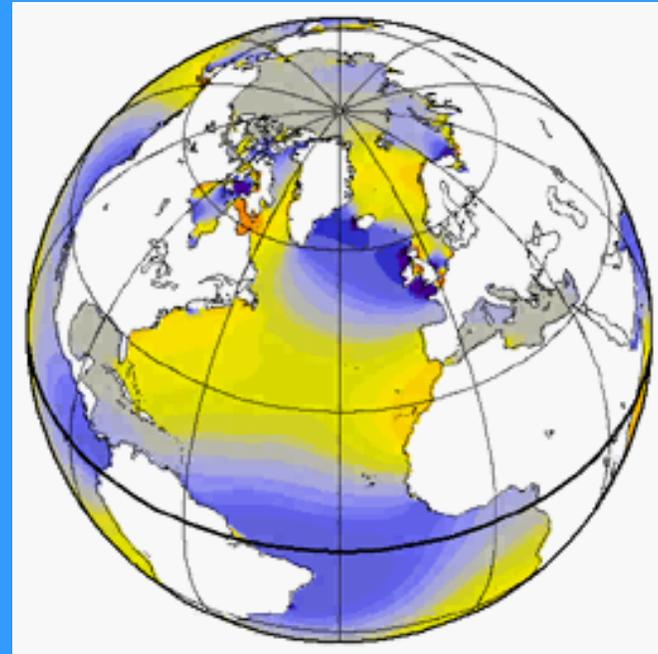
Que pueden decir que mediciones de M2 y K1 fuera de areas costeras ?

Mareas

K1



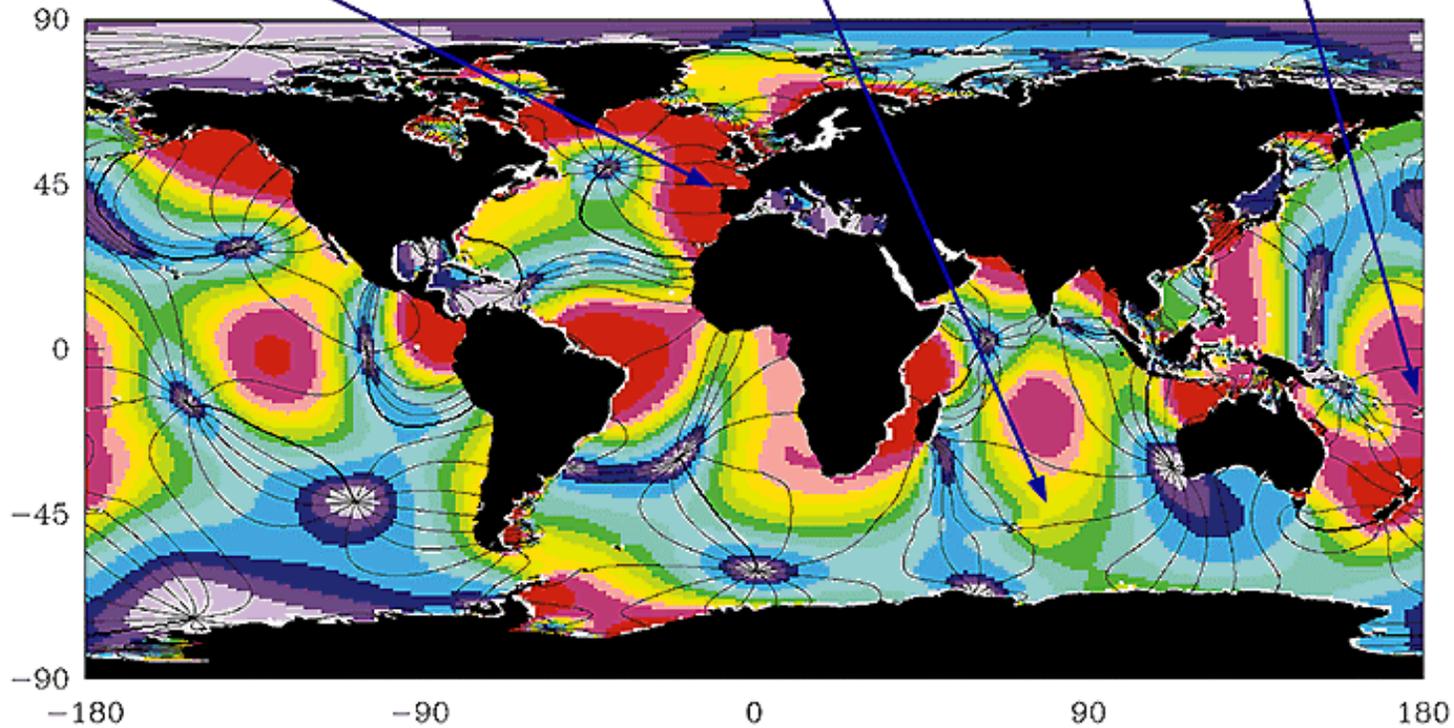
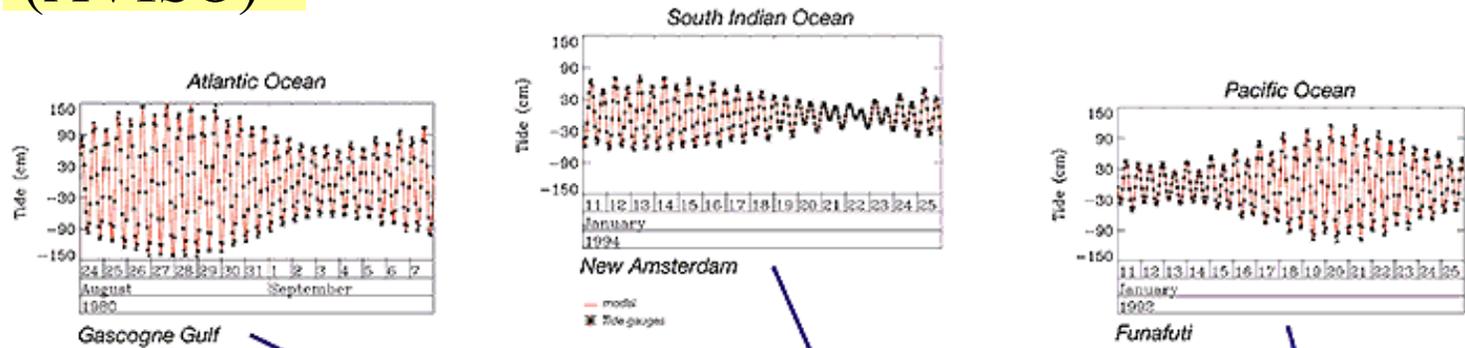
M2



CNES

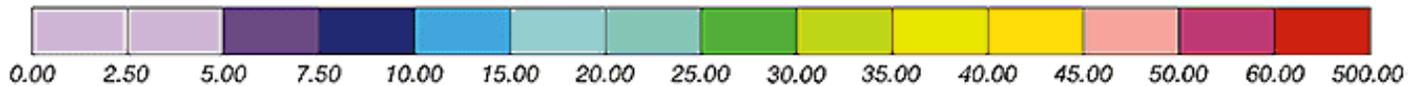
(AVISO)

The up and down of the ocean tides



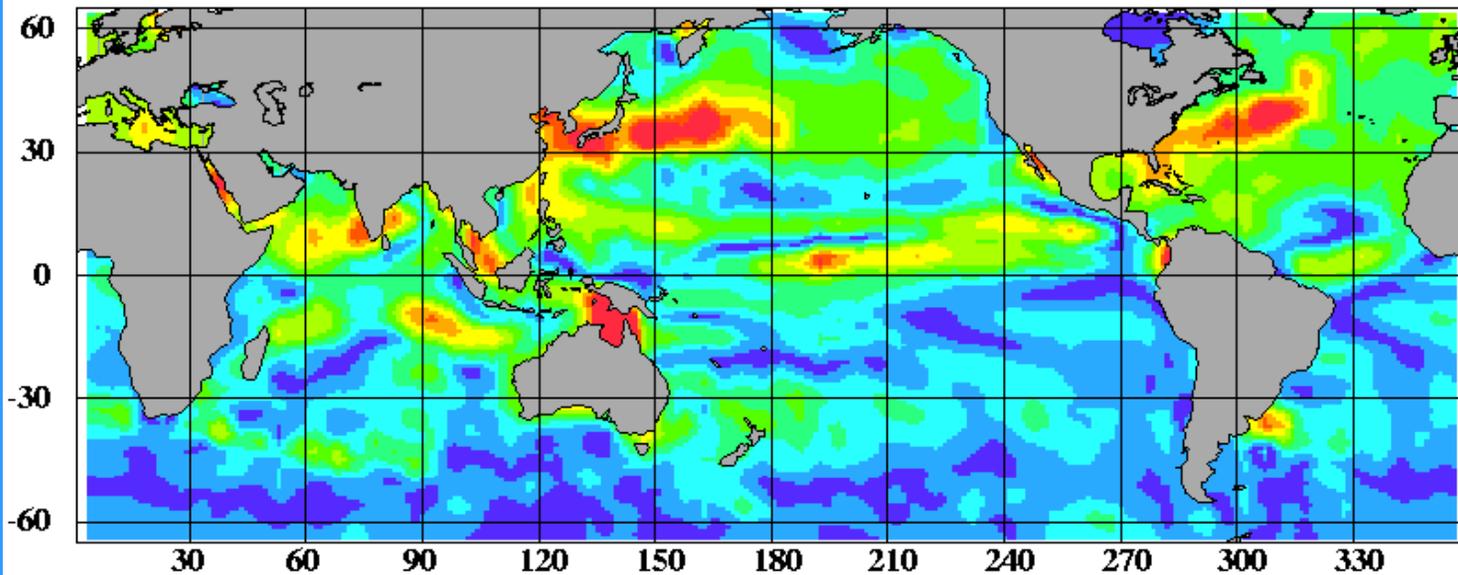
Cophase lines drawn with a 30° interval (0° phase has a larger drawing)

Centimeters

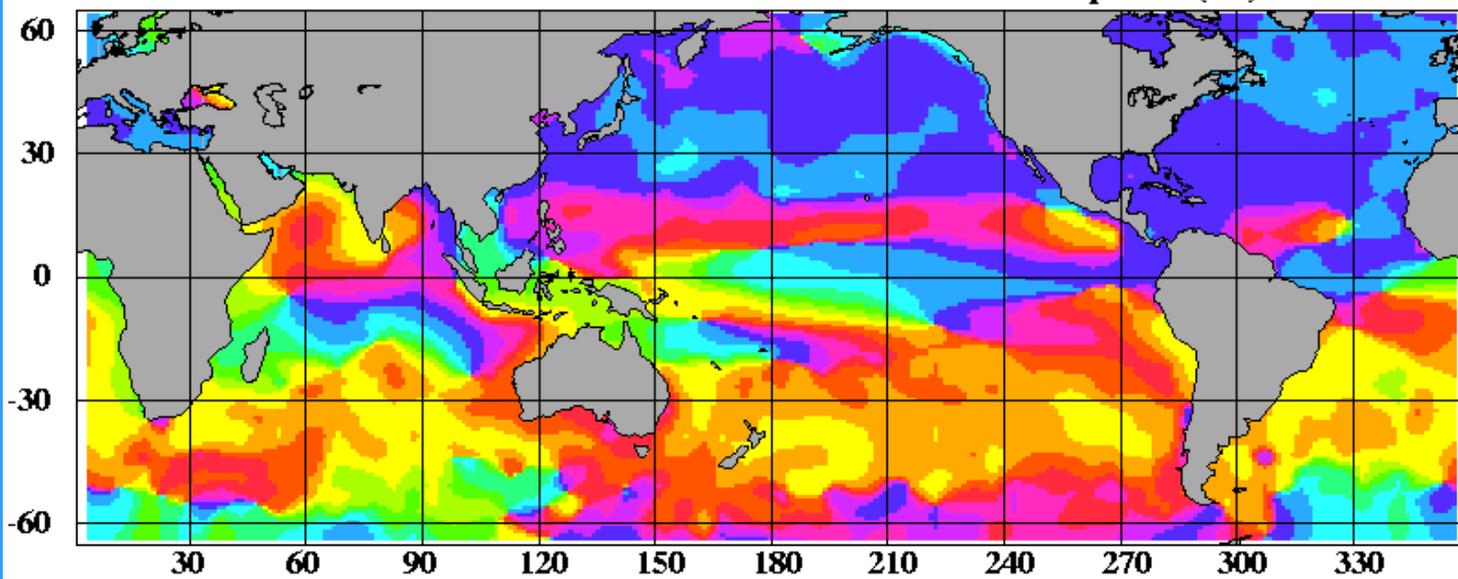


Source : IMG/LEGI, Grenoble 1995

Annual Cycle of Sea Level Height (TOPEX/POSEIDON, cy:1-157)



0.0 3.0 6.0 9.0 12.0 Amplitude (cm)



-180. -90. 0. 90. 180. Phase (degree)

El Niño - 1997

25 MAR 97

25 APR 97

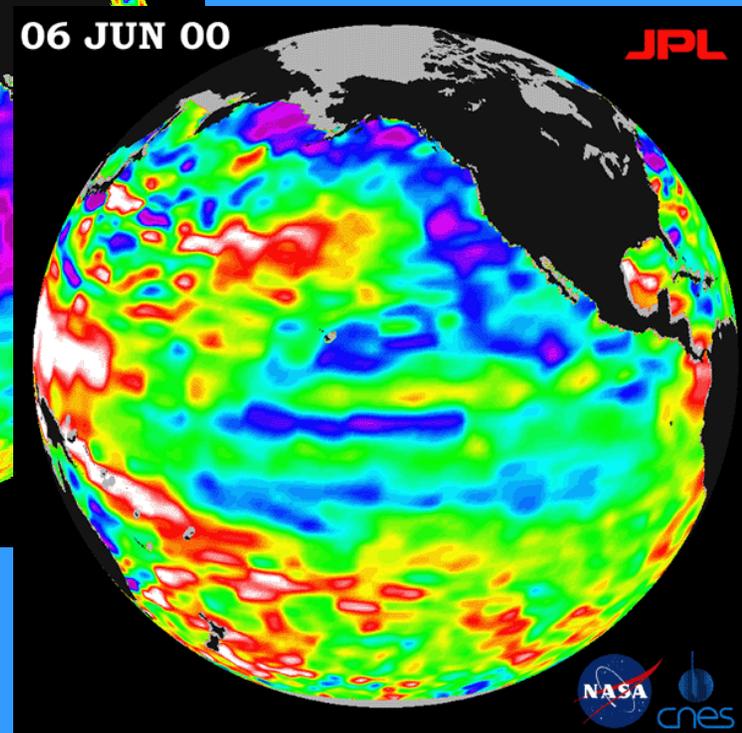
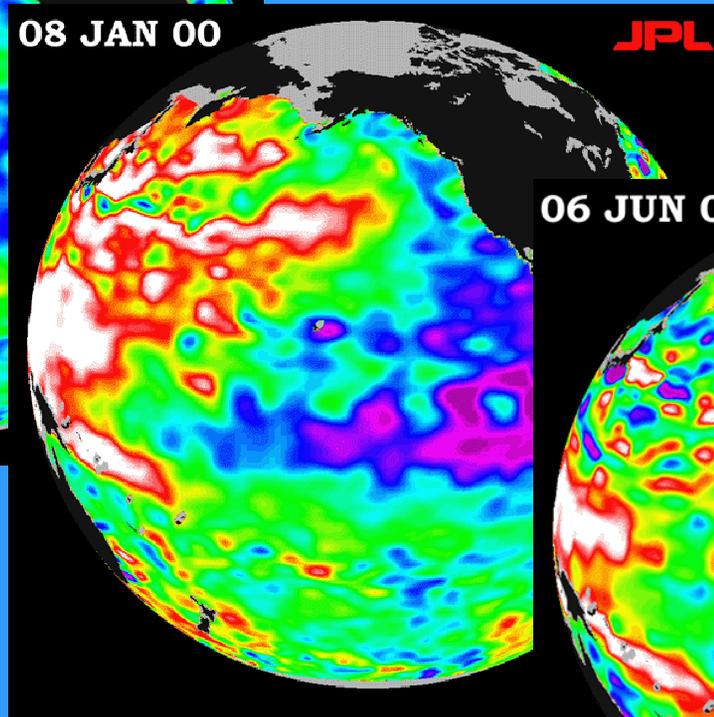
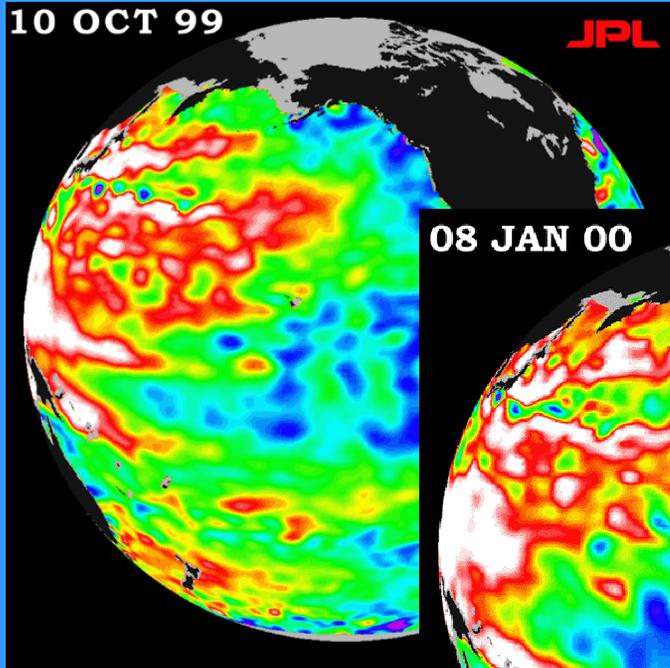
25 JUN 97

10 Dec 97

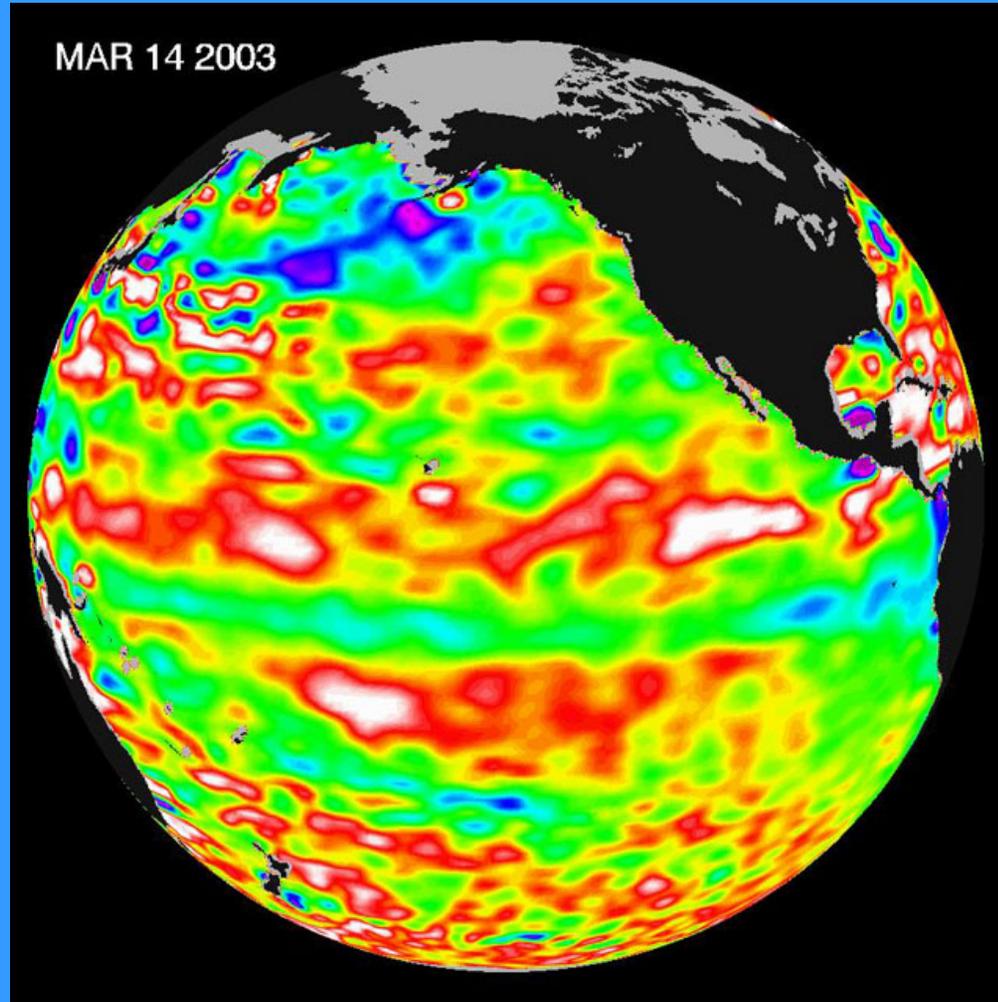
JPL



La Niña - 2000

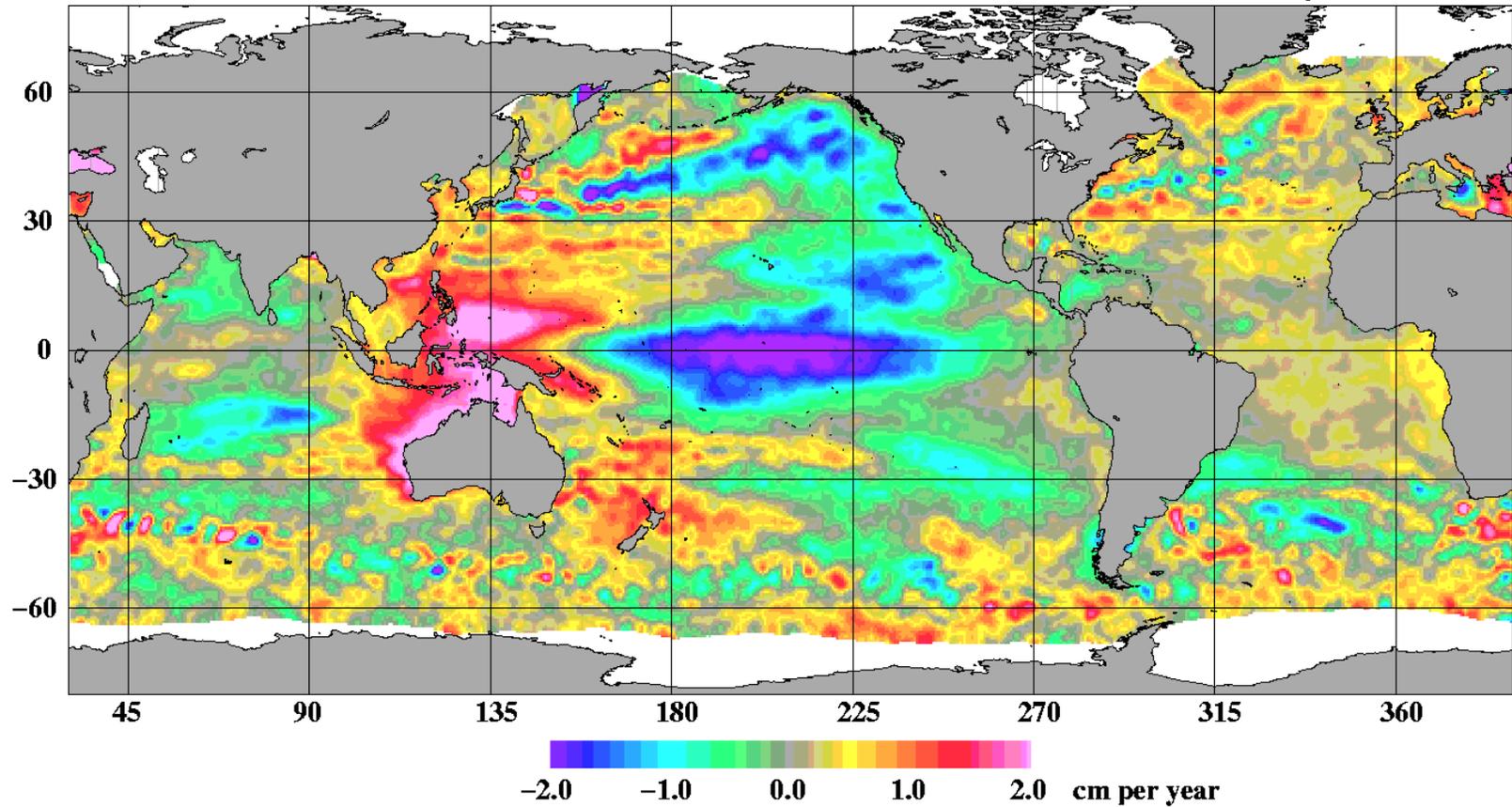


El Niño - 2003



NASA/CNES

Sea level trends from TOPEX/POSEIDON altimetry



Servicios de distribución de datos

Las siguientes agencias tienen datos de altímetro disponibles en forma pública:

- ESA
- NASA, CNES,
- U.S.-Navy



Otras agencias tienen datos procesados o con adicional valor disponibles:

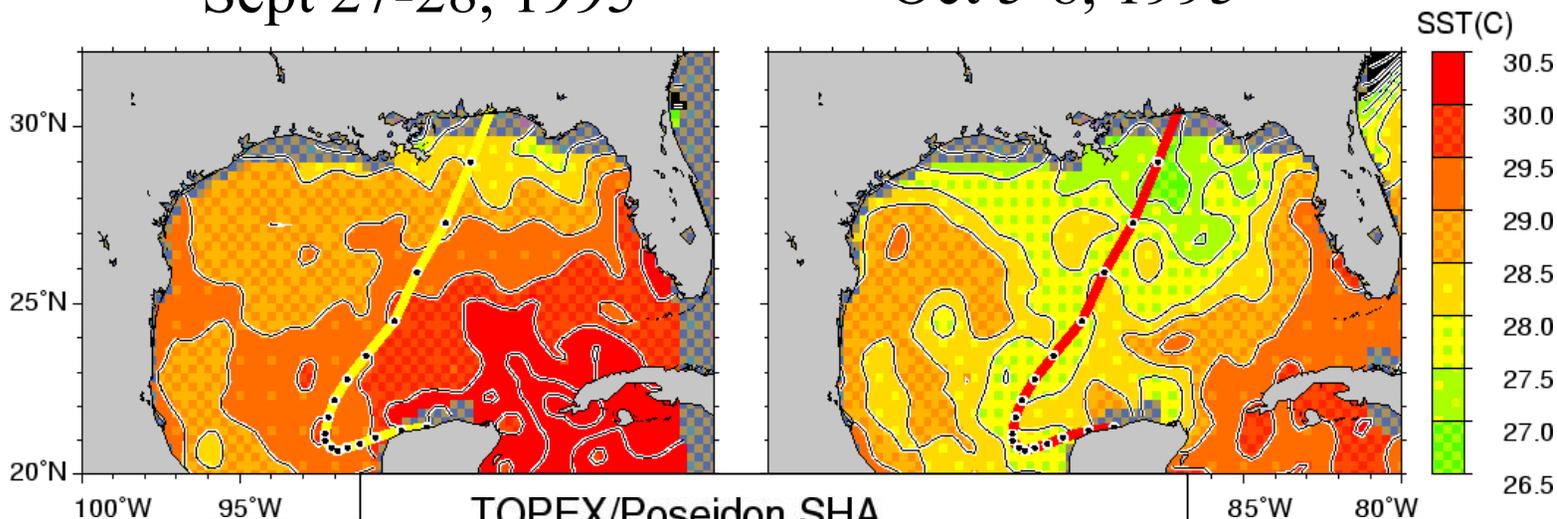
1. Space agencies (NASA/JPL, CNES/CLS)
2. Research institutions (CSR, DEOS, KMS, GFZ)

AVHRR vs ALTIMETRY

AVHRR

Sept 27-28, 1995

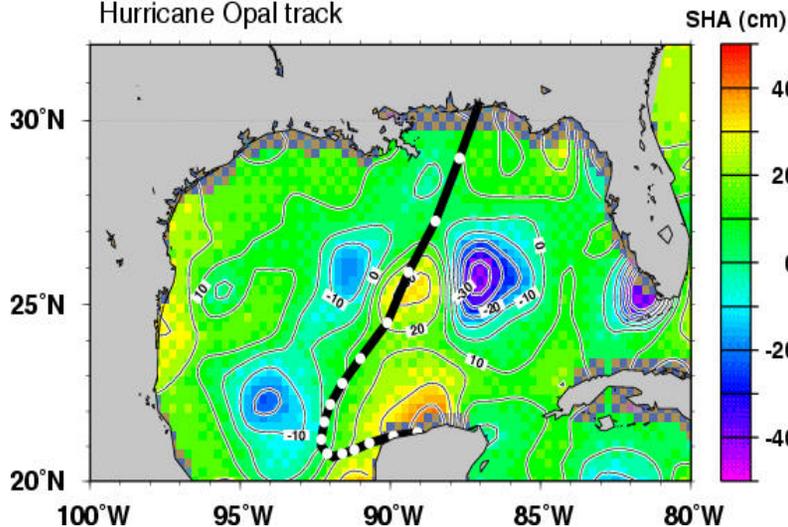
Oct 5-8, 1995



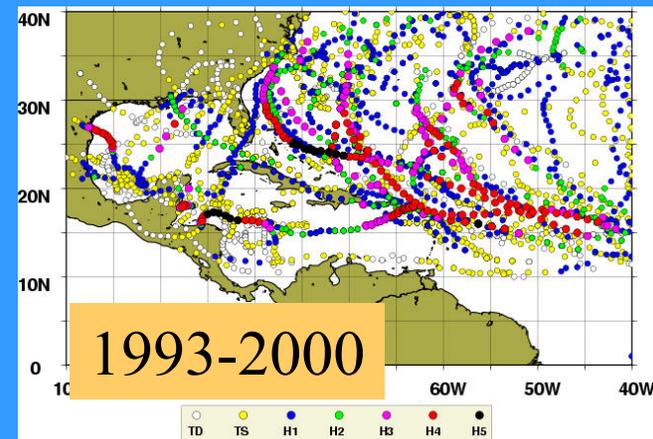
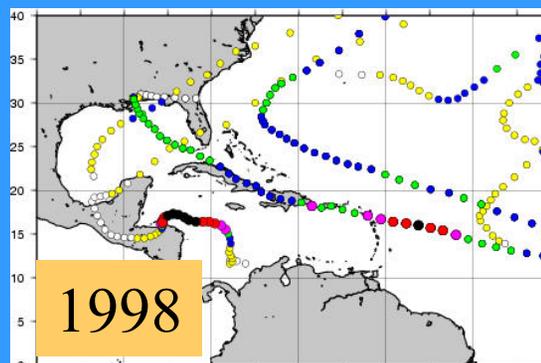
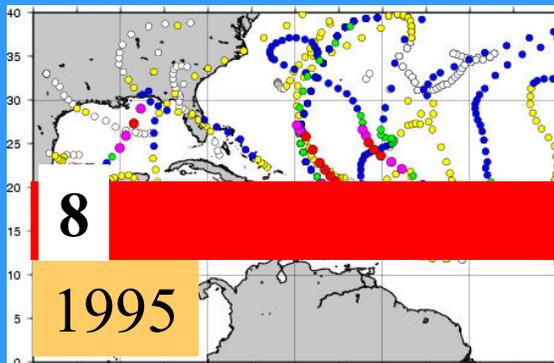
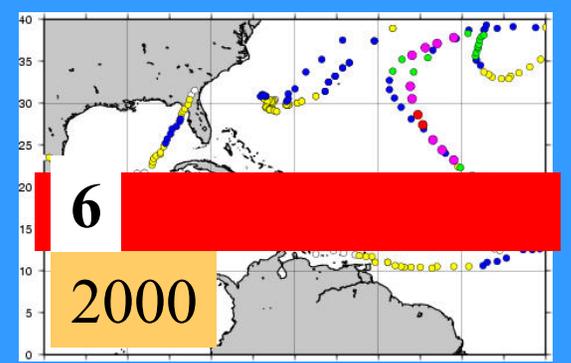
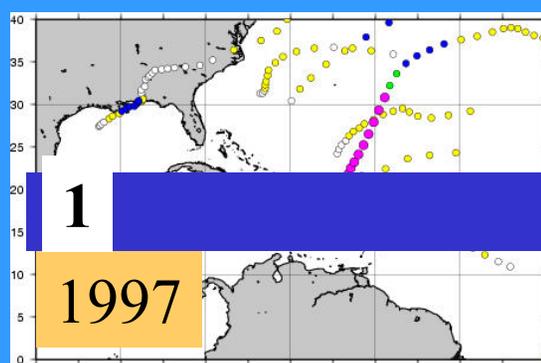
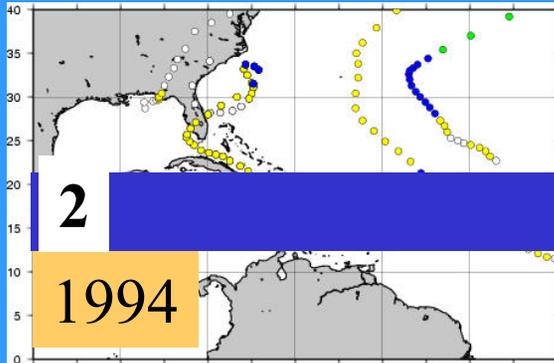
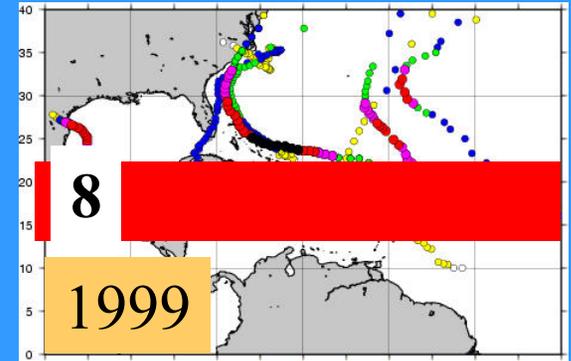
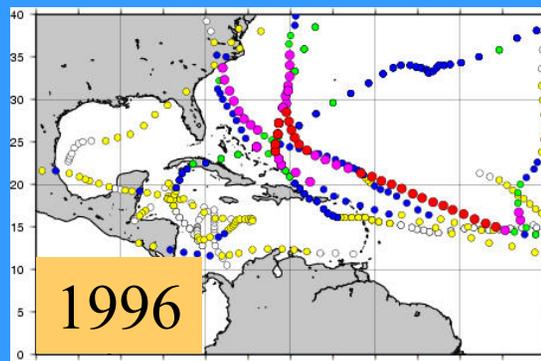
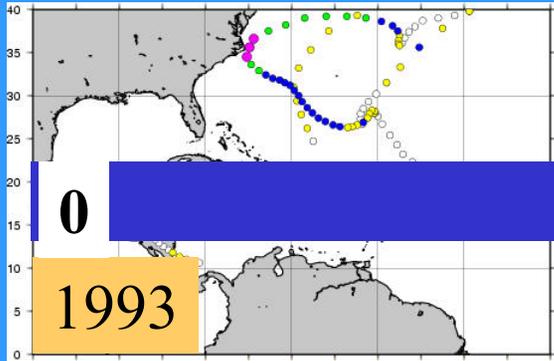
TOPEX/Poseidon SHA

SEPT 28 - OCT 8 1995

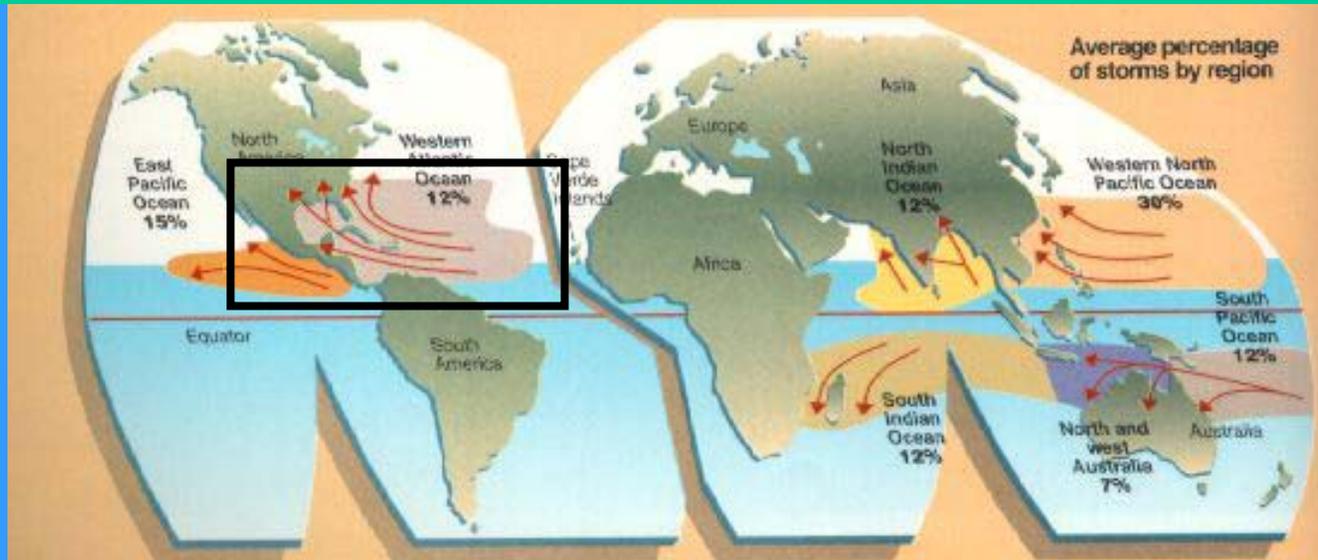
Hurricane Opal track



Hurricanes in the North Atlantic during 1993-2000



Donde Ocurren los Hurcanes ?



From SDSU web page

Regiones:

- Atlantic
- Northeast Pacific
- Northwest Pacific
- North Indian
- Southwest Indian
- Southeast Indian/Australian
- Australian/Southwest Pacific

Servicios de distribución de datos

Las siguientes agencias tienen datos de altímetro disponibles en forma pública:

- ESA
- NASA, CNES,
- U.S.-Navy

Otras agencias tienen
adicional valor de

1. Space agencies (
2. Research institutions (GFZ)

ALTIMETRY DATA DISTRIBUTION

 **National Environmental Satellite,
Data, and Information Service**

 **The Real Time Ocean Environment**

Sea Surface Height Products
Physical Oceanography DAAC 

http://podaac.jpl.nasa.gov:2031/

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Guide Documents

in partnership with the Raytheon Company Jet Propulsion Laboratory
California Institute of Technology

Data Catalog [PO.DAAC](#) [SEARCH](#) [ORDER](#) [FTP](#) [E-MAIL](#) [FEEDBACK](#)

Data Services
Documentation
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FAQ
EOS Data Gateway
Public Interest / Education
Mailing List
Related Links
About PO.DAAC

Data Set Documents

AVHRR Sea Surface Temperature, ATSR-2 Brightness Temperature

- [AVHRR Oceans Pathfinder - Sea Surface Temperature Data Set](#)
- [AVHRR Oceans Pathfinder Monthly Sea Surface Temperature CD_ROM](#)
- [AVHRR Oceans Pathfinder SST and Buoy Matchup Data Set](#)
- [AVHRR Weekly Global 18km Gridded MCSST Data Set](#)
- [AVHRR monthly global MCSST coregistered with CZCS data CD-ROM \(Miami, GSFC\)](#)
- [AVHRR Pathfinder Global 9km SST Climatology \(JPL\)](#)
- [AVHRR Pathfinder and Erosion Global 9km SST Climatology \(Casey, Cornillon\)](#)
- [ATSR-2 Gridded Brightness Temperature Data Set \(ESA\)](#)
- [AVHRR Orbital 9km MCSST Level 2](#)

Opening http://podaac.jpl.nasa.gov/images/left_nav_sitespodaac.gif

MODIS

NAVOCOANO MCSST
HRPT_LAC
ATSR
NCEP Reynolds SST
MCSST
WOCE

TOPEX/POSEIDON, GEOS-3, and GEOSAT Altimeters Sea Surface Height

- [TOPEX/POSEIDON Merged Geophysical Data Record Generation B](#)
- [GEOS-3 Altimeter Geophysical Data Record](#)
- [GEOSAT Altimeter Geophysical Parameters Colocated with NDBC Buoy Data \(Glazman\)](#)
- [Sea surface temperature and height, global 0.5 and 1.0 deg grids \(JPL, WOCE v3\)](#)

QuikSCAT Ocean Wind

- [Seawinds on QuikSCAT Level 3 Daily, Gridded Ocean Wind Vectors \(JPL QuikSCAT Project\)](#)
- [Seawinds on QuikSCAT Level 3-Derived Surface Wind Stress \(JPL\)](#)
- [Seawinds on QuikSCAT Level 2B-Derived Surface Wind Stress \(JPL\)](#)
- [BYU Daily Browse Images of QuikSCAT Sigma-0 Measurements \(D. Long\)](#)

NSCAT Ocean Wind

- [NSCAT Scatterometer Ocean Wind Product CD-ROM \(JPL\)](#)
- [NSCAT Scatterometer Global 25km Sigma-0 and Ocean Winds \(Dumbar\)](#)
- [NSCAT Scatterometer Science Product, Levels 1, 7, 2, 3 \(JPL\)](#)
- [BYU High Resolution Images of NSCAT Sigma0 Measurements \(D. Long\)](#)

SSM/I and SMMR Ocean Wind and Atmospheric

Document: Done (7.15 secs)

File Edit View Search Go Bookmarks Tasks Help

Back Forward Reload Stop <http://www7320.nrlssc.navy.mil/altimetry/index.html>

Home Netscape Search Bookmarks

The Real Time

A real time look at our world

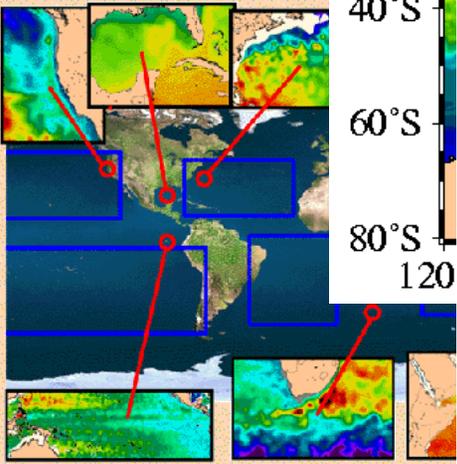


- Altimetry Data Archive
- Data Processing
- Data Sources

Data Analysis

- Altimetry Drop Plots
- Applied Orbit Error Corrections
- Percent of Data Utilized
- Altimeter Intercomparisons

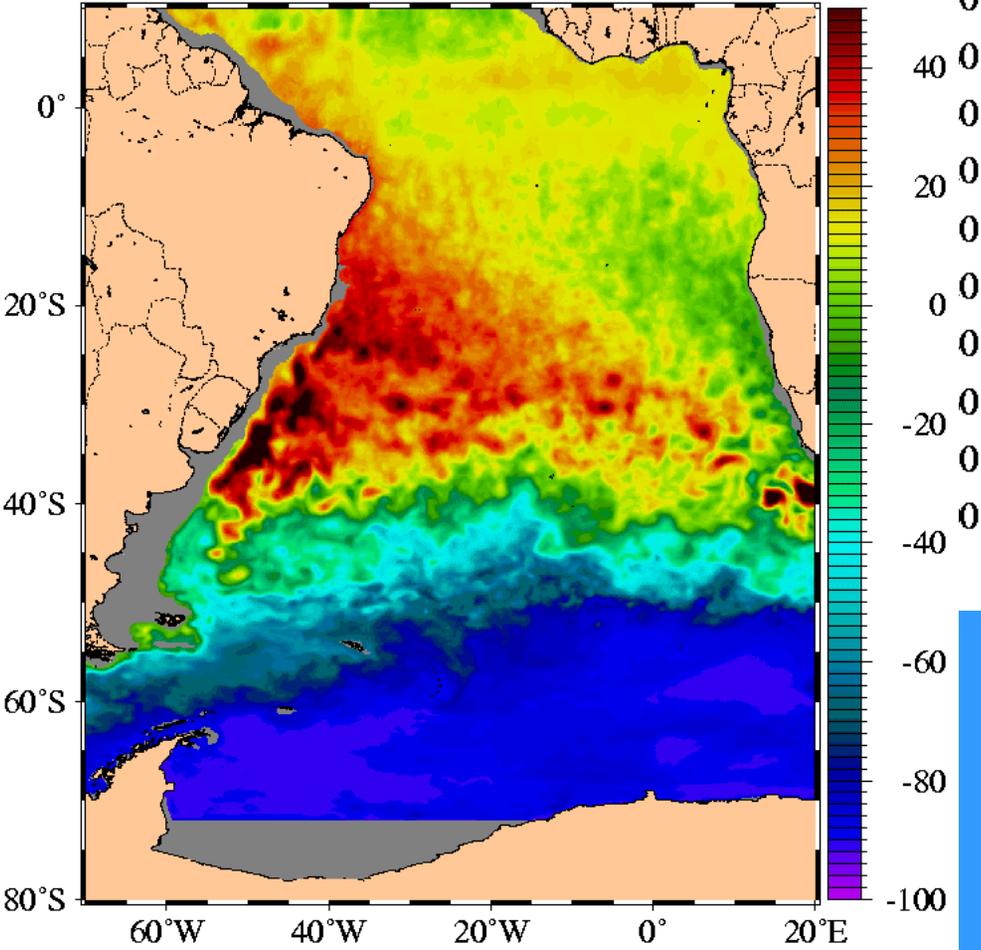
Click on the map regions above to see



Sea Surface Height (cm)

Sea Surface Height (cm)

Global NLOM 1/16° 04-07-2003



20°N
0°
20°S
40°S
60°S
80°S
120

60°W 40°W 20°W 0° 20°E

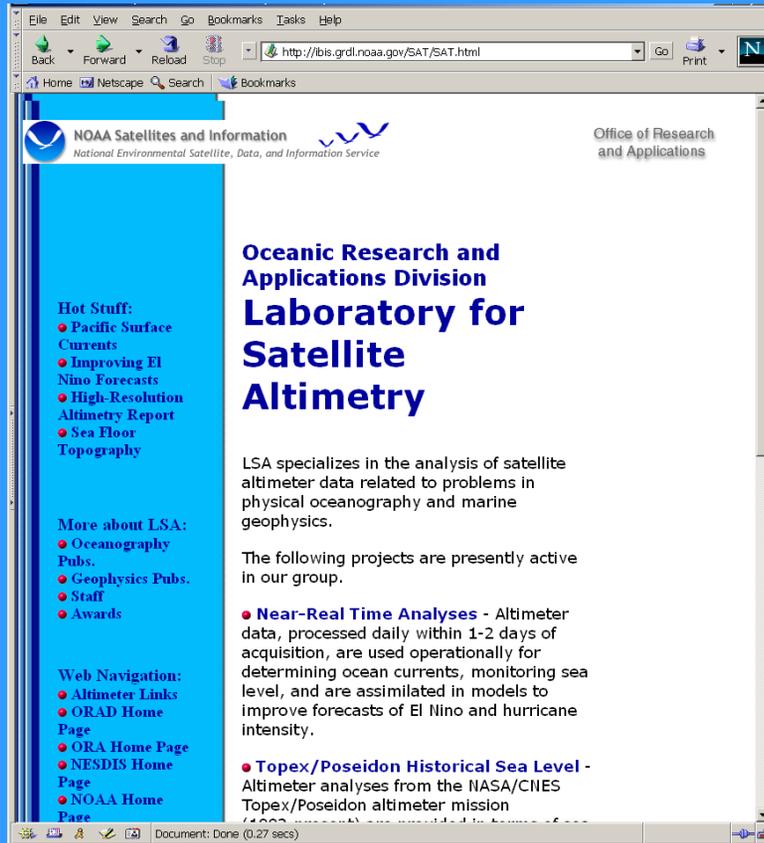
0
40
20
0
-20
-40
-60
-80
-100

For additional information on any of the topics contained in this document, please contact the following individuals:

Real time altimeter processing [Kirk Whitmer](#)

Document: Done (5.508 secs)

http://ibis.grdl.noaa.gov/SAT/SAT.html



File Edit View Search Go Bookmarks Tasks Help
Back Forward Reload Stop http://ibis.grdl.noaa.gov/SAT/SAT.html Go Print

Home Netscape Search Bookmarks

 **NOAA Satellites and Information**
National Environmental Satellite, Data, and Information Service

Office of Research and Applications

Oceanic Research and Applications Division Laboratory for Satellite Altimetry

Hot Stuff:

- Pacific Surface Currents
- Improving El Nino Forecasts
- High-Resolution Altimetry Report
- Sea Floor Topography

More about LSA:

- Oceanography Pubs.
- Geophysics Pubs.
- Staff
- Awards

Web Navigation:

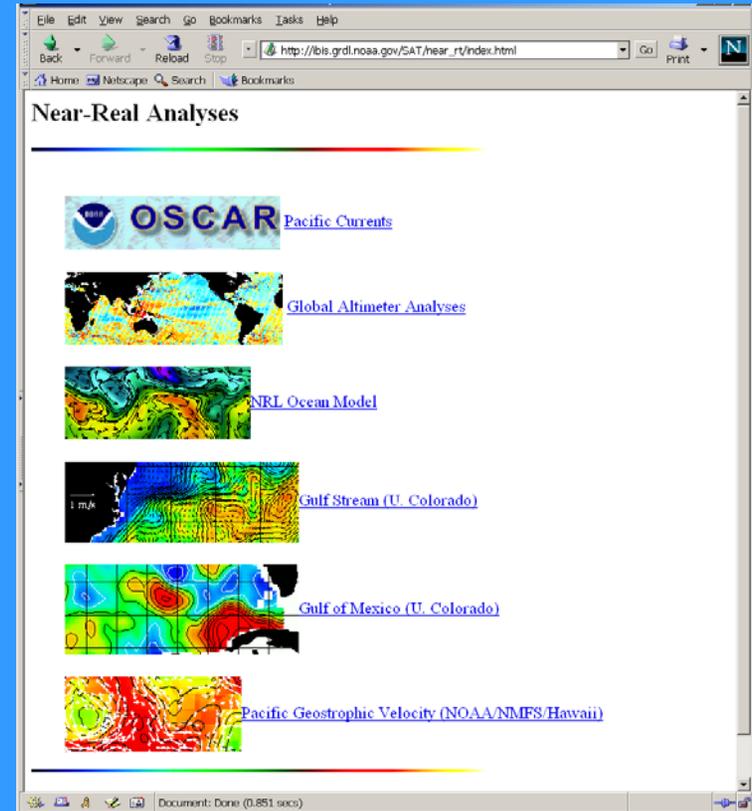
- Altimeter Links
- ORAD Home Page
- ORA Home Page
- NESDIS Home Page
- NOAA Home Page

LSA specializes in the analysis of satellite altimeter data related to problems in physical oceanography and marine geophysics.

The following projects are presently active in our group.

- **Near-Real Time Analyses** - Altimeter data, processed daily within 1-2 days of acquisition, are used operationally for determining ocean currents, monitoring sea level, and are assimilated in models to improve forecasts of El Nino and hurricane intensity.
- **Topex/Poseidon Historical Sea Level** - Altimeter analyses from the NASA/CNES Topex/Poseidon altimeter mission (1992-present) are provided in terms of sea level anomalies (SLA) and sea surface height (SSH).

Document: Done (0.27 secs)

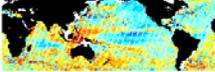


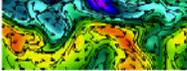
File Edit View Search Go Bookmarks Tasks Help
Back Forward Reload Stop http://ibis.grdl.noaa.gov/SAT/hear_rt/index.html Go Print

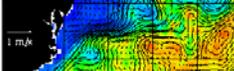
Home Netscape Search Bookmarks

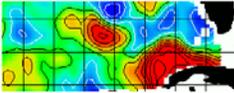
Near-Real Analyses

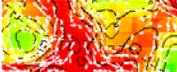
 [Pacific Currents](#)

 [Global Altimeter Analyses](#)

 [NRL Ocean Model](#)

 [Gulf Stream \(U. Colorado\)](#)

 [Gulf of Mexico \(U. Colorado\)](#)

 [Pacific Geostrophic Velocity \(NOAA/NMFS/Hawaii\)](#)

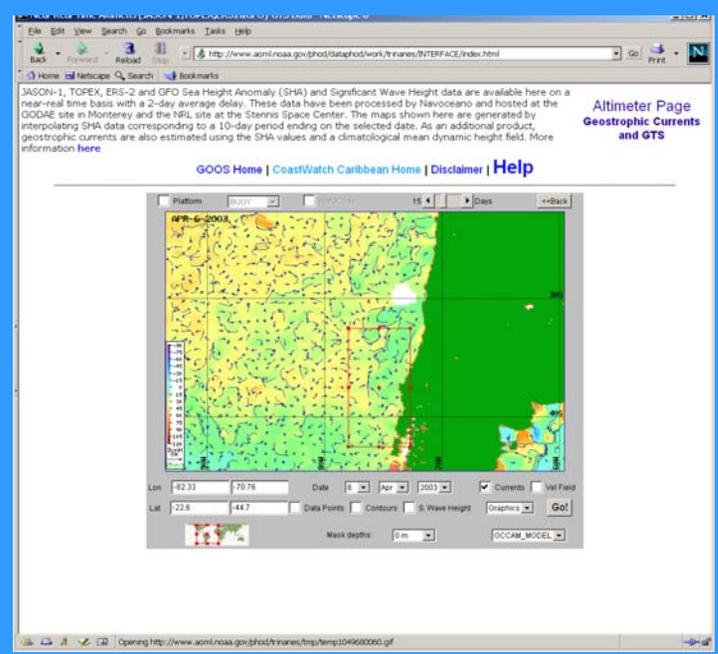
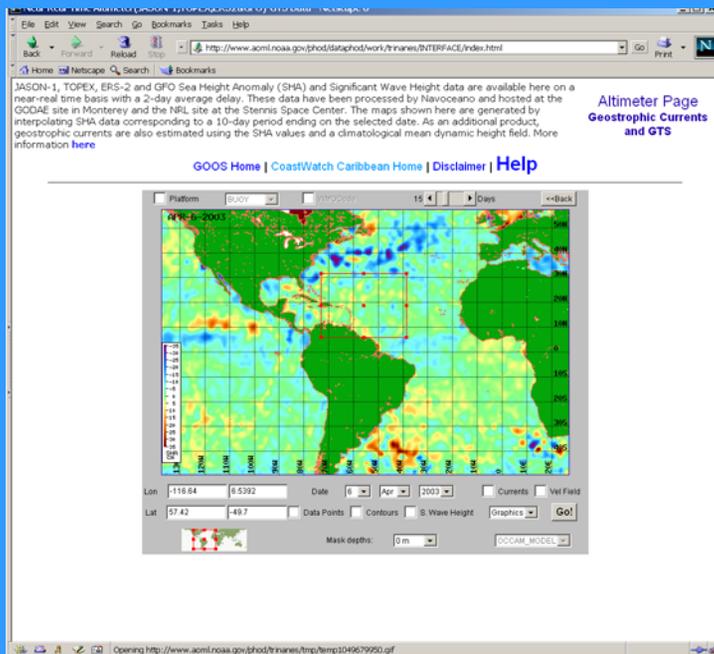
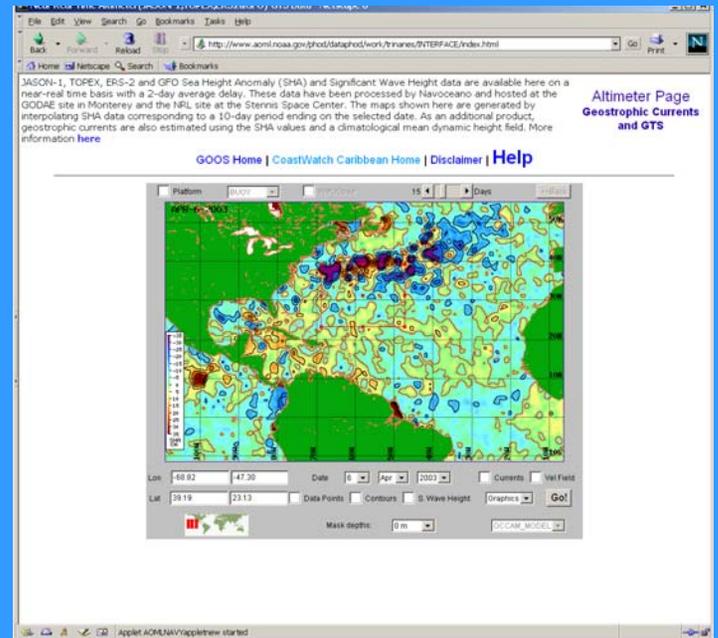
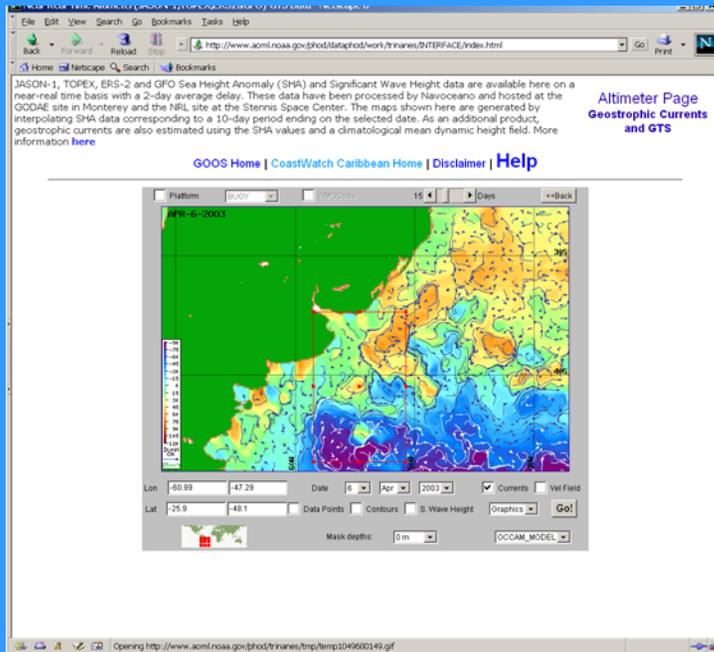
Document: Done (0.851 secs)

The screenshot shows the homepage of the CoastWatch Caribbean Regional Node. At the top, there is a NOAA logo and the text "CoastWatch Caribbean Regional Node". Below this, a paragraph states: "The CoastWatch Caribbean Regional Node is part of the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Environmental Satellite, Data, and Information Service, CoastWatch Program". A prominent link reads "Visually Impaired people, please, follow this link!". Below this are four icons with corresponding text: a question mark for "Get information on the CoastWatch Caribbean node and web site.", a satellite for "Access CoastWatch Caribbean satellite data.", a software box for "Download CoastWatch software packages.", and a computer for "Give feedback on the web site or products." At the bottom, there are links for "Privacy Notice" and "Disclaimer", and a copyright notice for 1999.

The screenshot shows the "Satellite Data" page. It features a header with "CoastWatch" and "Satellite Data". Below the header is a navigation menu: "Information | Data | Software | Sites | Education | Feedback | News". The main content area contains two paragraphs: "The Caribbean Regional Node web site is designed to supply users with satellite data files and previews in near-real-time. Image data is available for a number of different regions and product data types. Access to CoastWatch satellite data is free and unrestricted." and "CoastWatch users can download data files for use with one of the CoastWatch software packages, plot data using the web site online preview, or convert data to other data formats for use in GIS or scientific plotting packages." Below the text are four data categories, each with an icon and a brief description: "Visual Catalog" (satellite icon), "Database Query" (database icon), "Processed Data Directory" (book icon), and "Near Real Time Wind Data" (wind icon). A fifth category, "SST Anomalies", is also listed with a map icon.

The screenshot shows the "Data Sets" page. It features a header with "Atlantic Oceanographic and Meteorological Laboratory" and a navigation menu: "Ocean & Climate | Coastal & Regional | Hurricanes | Site Map | Staff | Data Sets | Contact Information | Research Divisions". Below the header is a "Data Sets" section with a list of data categories, each with an icon and a brief description: "Near Real Time Wind Data", "Hurricane Heat Potential", "Hurricane Array Buoys", "VRML Wind Page", "Altimeter and GTS Data", "Atlantic SST maps", "Climatologies", and "Color Data". At the bottom, there are links for "Back to main page" and "USDOC | NOAA | NESDIS | CoastWatch".

The screenshot shows the "Data Sets" page of the Atlantic Oceanographic and Meteorological Laboratory. It features a header with "Atlantic Oceanographic and Meteorological Laboratory" and a navigation menu: "Ocean & Climate | Coastal & Regional | Hurricanes | Site Map | Staff | Data Sets | Contact Information | Research Divisions". Below the header is a "Data Sets" section with a list of data categories, each with an icon and a brief description: "Near Real Time Wind Data", "Hurricane Heat Potential", "Hurricane Array Buoys", "VRML Wind Page", "Altimeter and GTS Data", "Atlantic SST maps", "Climatologies", and "Color Data". At the bottom, there are links for "Back to main page" and "USDOC | NOAA | NESDIS | CoastWatch".



COASTWATCH CARIBBEAN HOME | HOME | REAL TIME WIND DATA | DATA | SOFTWARE | SITES | EDUCATION | FEEDBACK | NEWS | HELP

File Edit View Search Go Bookmarks Tasks Help

Back Forward Reload Stop http://cwcarrbbean.aoml.noaa.gov/java2/java.html

Home Netscape Search bookmarks

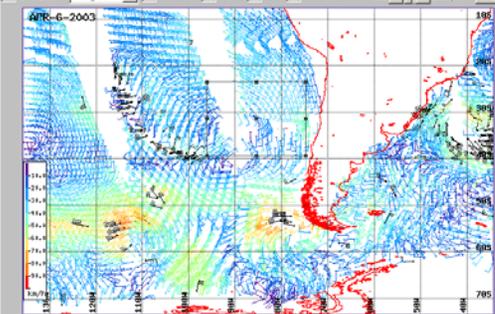
This page displays vector and wind speed data from QuikSCAT, ERS-2, SSM/I, TMI and drifter platforms. Recently, altimeter-derived winds have also been made available through the same interface. You can also extract the wind data as ASCII or binary files. You can move to the preferred area using the main graphical zone or the smaller map. Data feeds our databases hourly and are made available through this page. Altimeter-derived winds have a 1-day average delay. Due to disk space limitations, **only six months of measurements from current date are guaranteed**. More information [here](#)

**Near-Real Time
Wind Data**

| GOOS Home |

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Grid Data? 1 degree VV Field SSM TMI Altimeter 33 Sample << Back



Apr 6 - 2003

Lon -109.60 -60.33 Date 6 Apr 2003 QSCAT ERS2 Drifter

Lat -7.62 -73.7 0-12h 12-24h Remove RF

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Back Forward Reload Stop http://cwcarrbbean.aoml.noaa.gov/java2/java.html

Home Netscape Search bookmarks

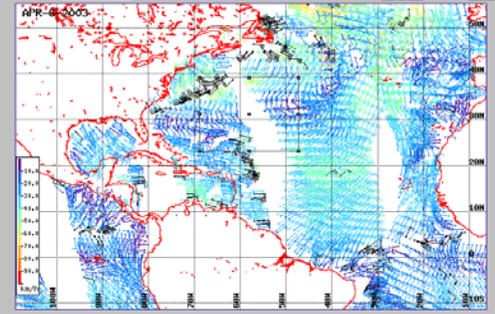
This page displays vector and wind speed data from QuikSCAT, ERS-2, SSM/I, TMI and drifter platforms. Recently, altimeter-derived winds have also been made available through the same interface. You can also extract the wind data as ASCII or binary files. You can move to the preferred area using the main graphical zone or the smaller map. Data feeds our databases hourly and are made available through this page. Altimeter-derived winds have a 1-day average delay. Due to disk space limitations, **only six months of measurements from current date are guaranteed**. More information [here](#)

**Near-Real Time
Wind Data**

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Apr 6 - 2003

Lon -68.92 -47.30 Date 6 Apr 2003 QSCAT ERS2 Drifter

Lat 20.19 23.13 0-12h 12-24h Remove RF

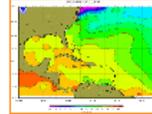
www.aoml.noaa.gov/phod/cyclone/data



Altimeter-derived Sea Height Anomaly Upper Layer Thickness, Sea Surface Temperature and Hurricane Heat Potential in the Western North Atlantic

Date: Jun 25 2001

Altimetry and Hurricane Intensification



[Maps](#)

2001 Hurricane Season

Hurricane Advisories

- [Gustavo Goni's Homepage](#)
- [NOAA/AOML/PHOD](#)
- [DAC Data Products](#)
- [HRD Home](#)

Links

Altimetry

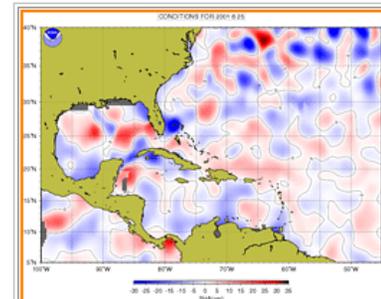
- NOAA/NESDIS
- NASA/JPL
- AVISO
- Univ. Colorado

Hurricanes

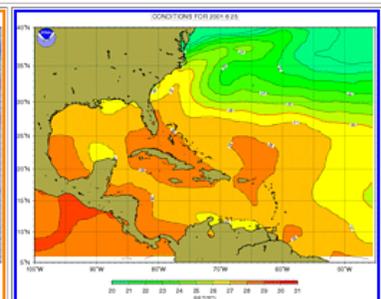
- NOAA/AOML/HRD
- FAQ: Hurricanes
- NOAA/NWS
- Univ. Miami
- Unisys Weather

Altimetry & Hurricanes

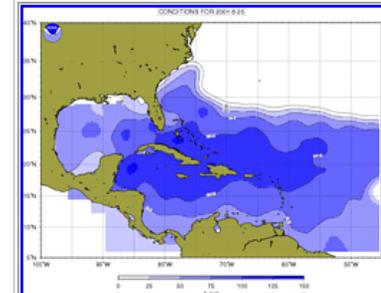
- Univ. Colorado



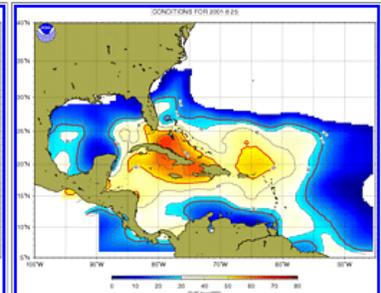
Sea Height Anomaly



Sea Surface Temperature



Upper Layer Thickness



Hurricane Heat Potential

Hands on Training

**Estimar las condiciones oceanicas
(anomalias de altura, temperatura de
superficie, corrientes geostroficas) en el
Oceano Pacifico Este afuera de Chile.**

**Observar la evolucion de las anomalias de
altura de superficie del mar en el
Oceano Pacifico ecuatorial y
relacionarla con el fenomeno de El
Nino.**