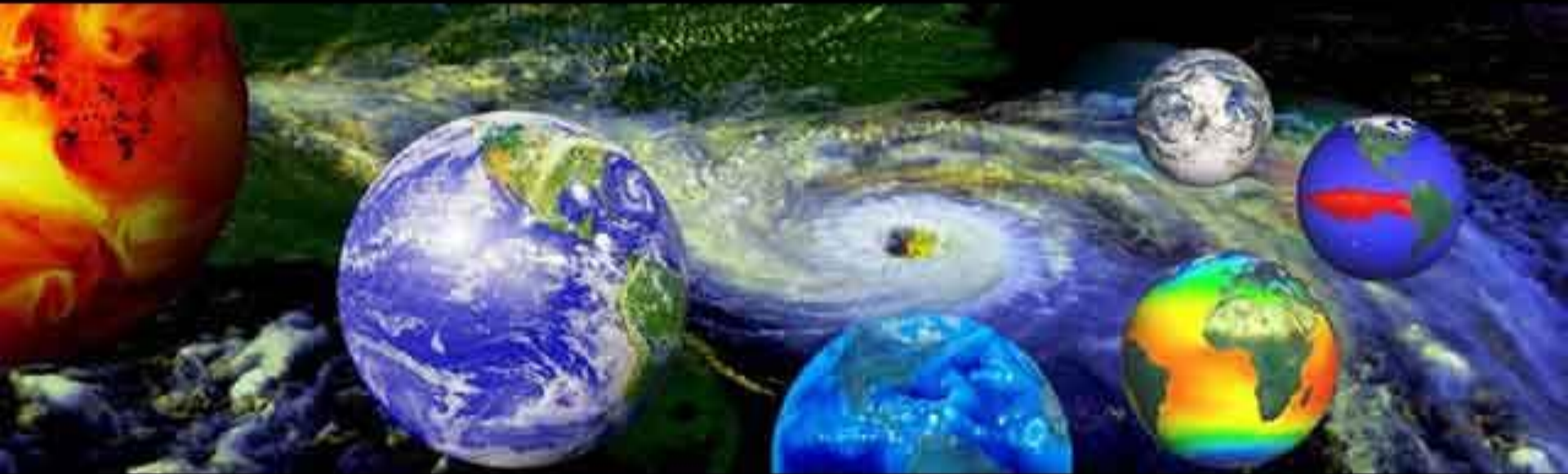


CLIMATOLOGIA DE DATOS DE ALTIMETRIA



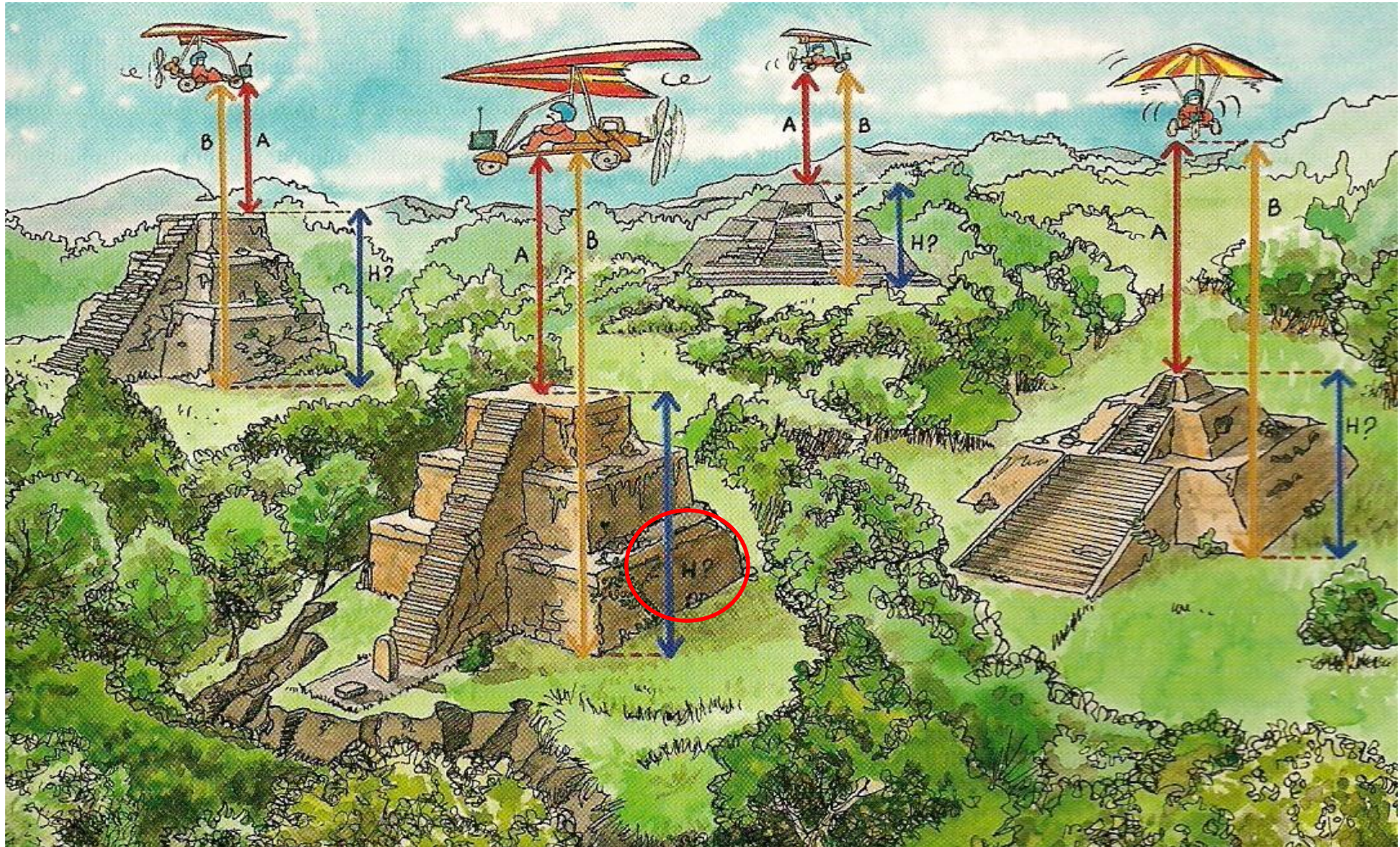
Artistic Panorama - Views of Earth

2° CURSO SOBRE CT ACAPULCO 2009

CONTENIDO

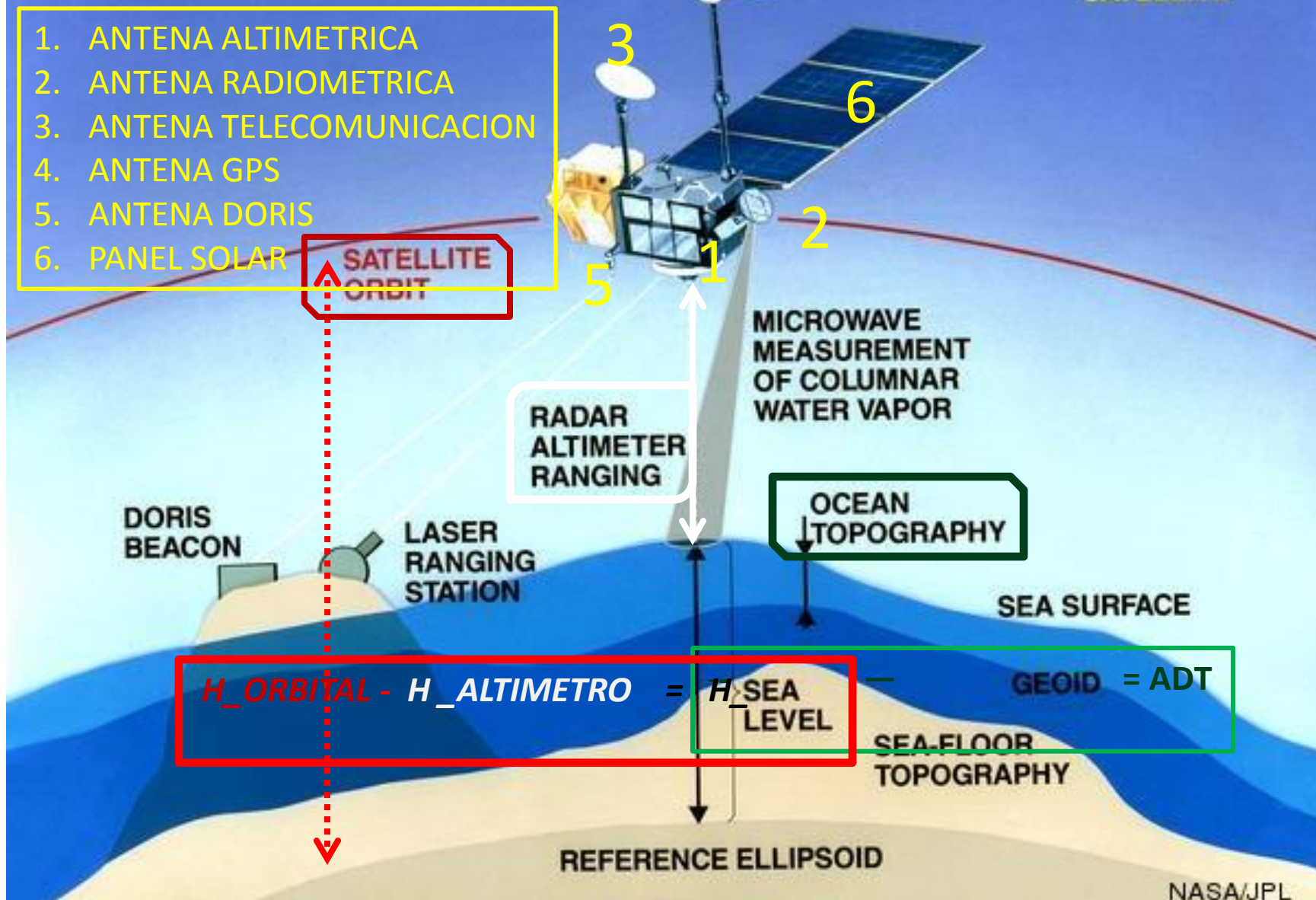
- PRINCIPIO DE MEDICION POR ALTIMETRÍA.
- ASPECTOS TÉCNICOS DE LA ALTIMETRÍA.
- VARIABILIDAD TEMPORAL DEL NM GLOBAL.
- FACTORES QUE MODULAN LA VARIACIÓN DEL NM
- DISTRIBUCION ESPACIAL DEL NM GLOBAL.
- VARIABILIDAD x-t DEL NM EN MARES MEXICANOS
- LA RELACIÓN NM vs CICLONES TROPICALES.

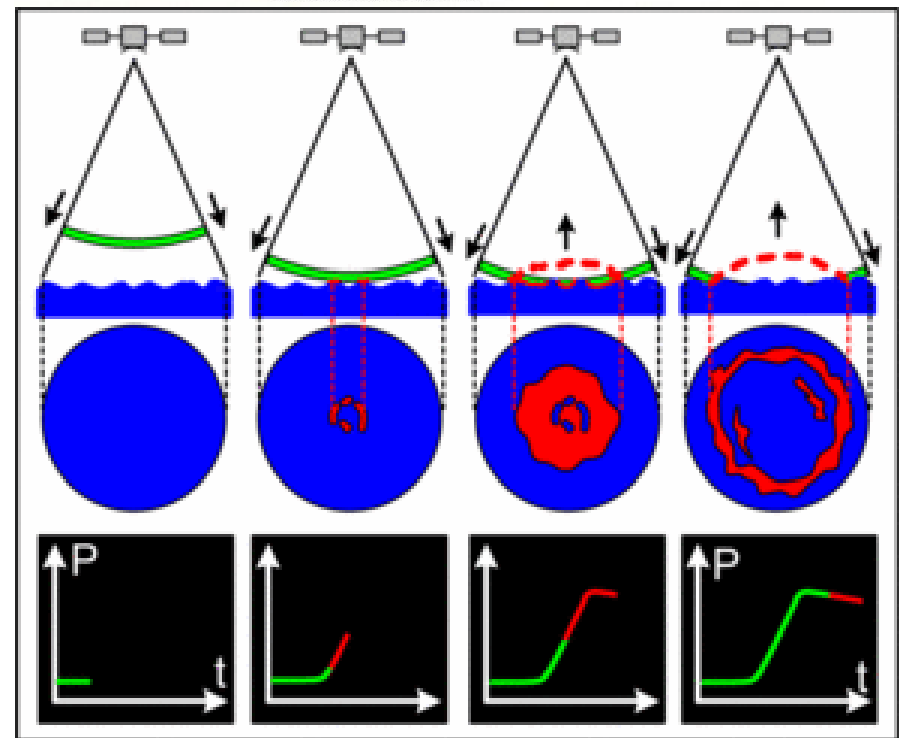
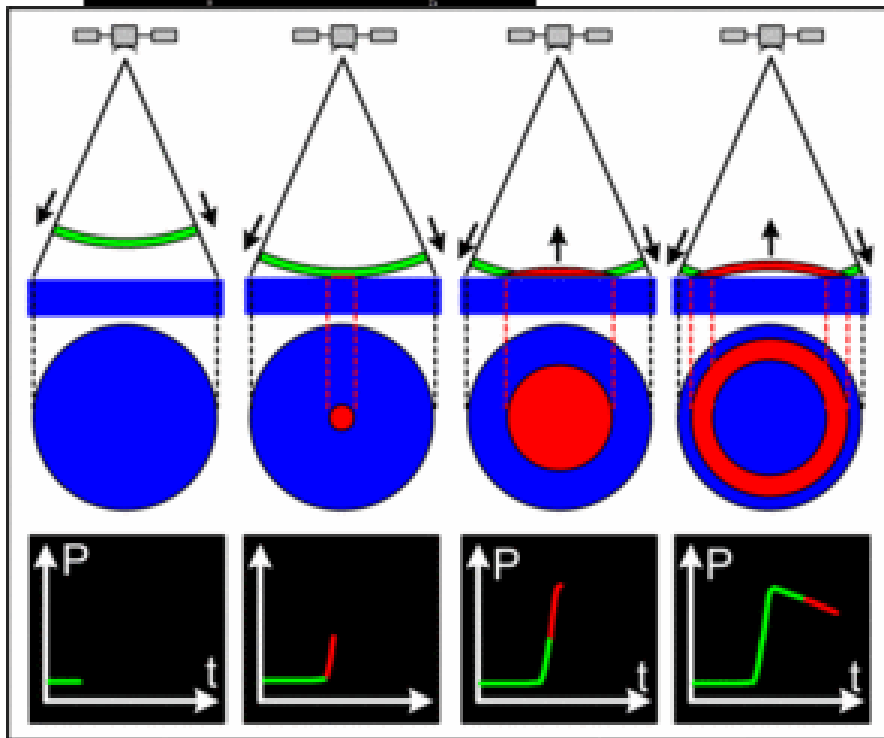
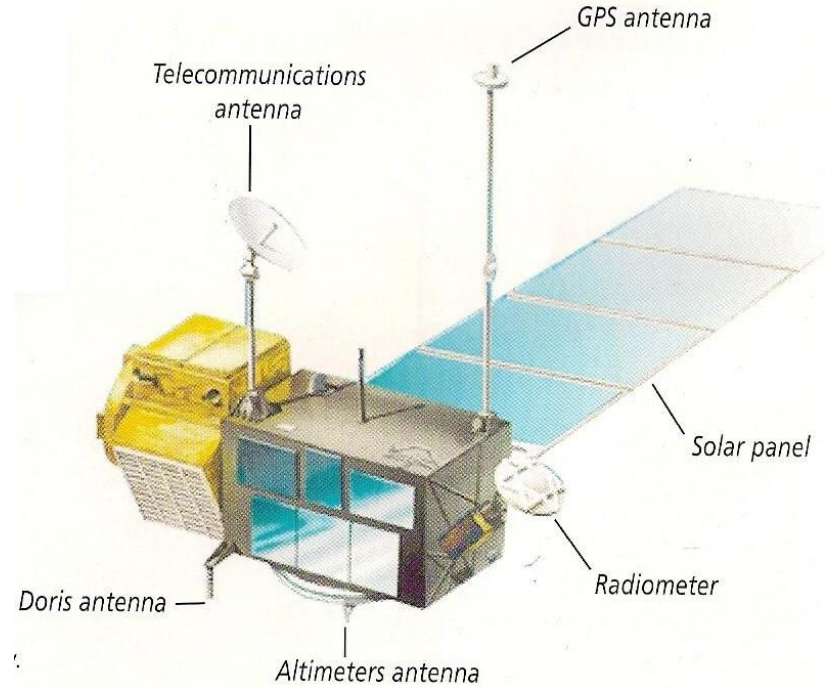
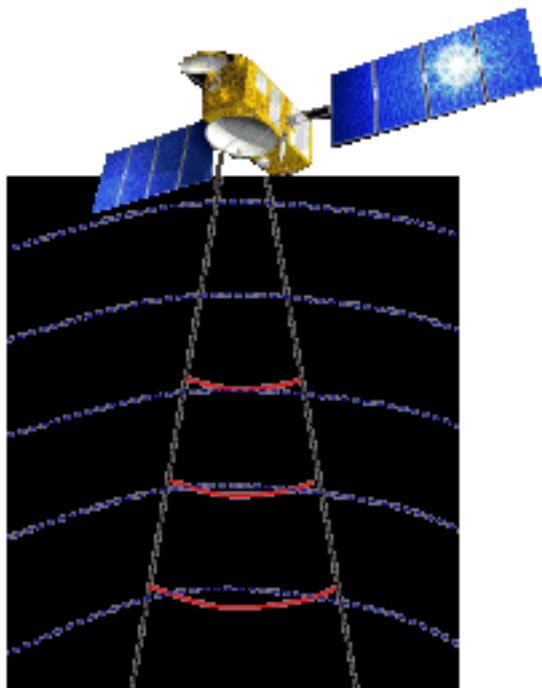
Principio básico de Altimetría

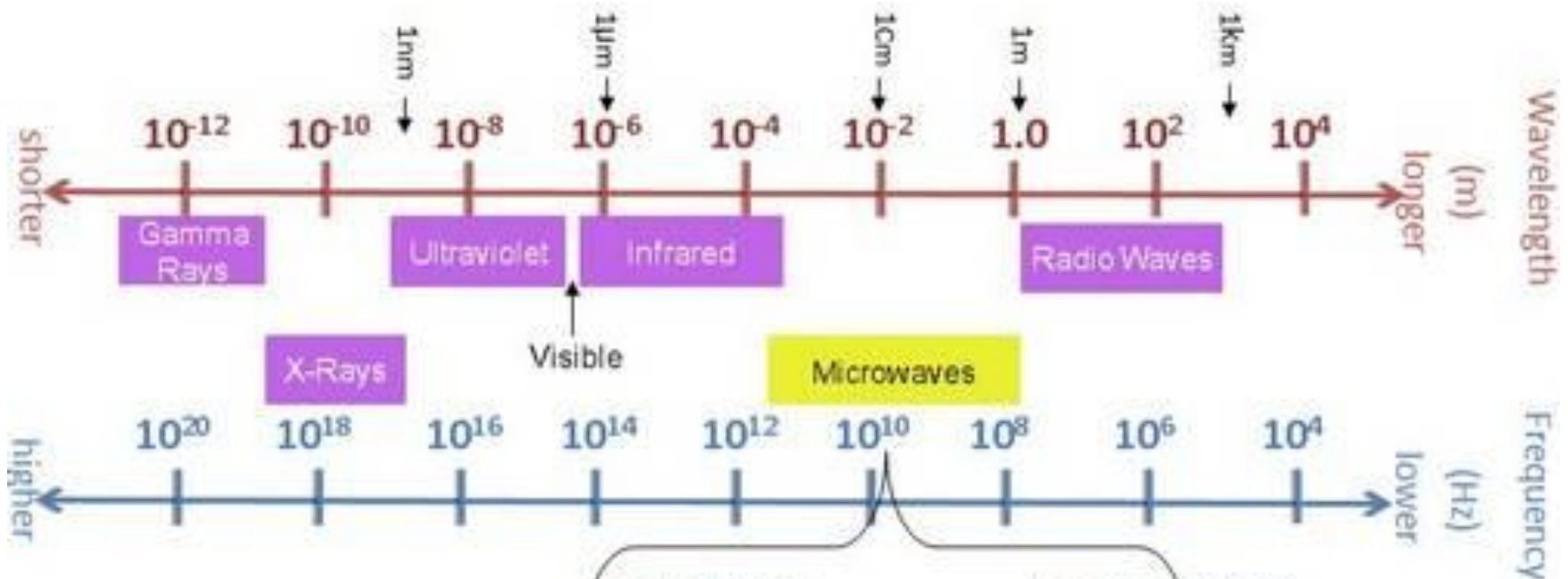


TOPEX/POSEIDON MEASUREMENT SYSTEM

- 1. ANTENA ALTIMETRICA
- 2. ANTENA RADIOMETRICA
- 3. ANTENA TELECOMUNICACION
- 4. ANTENA GPS
- 5. ANTENA DORIS
- 6. PANEL SOLAR







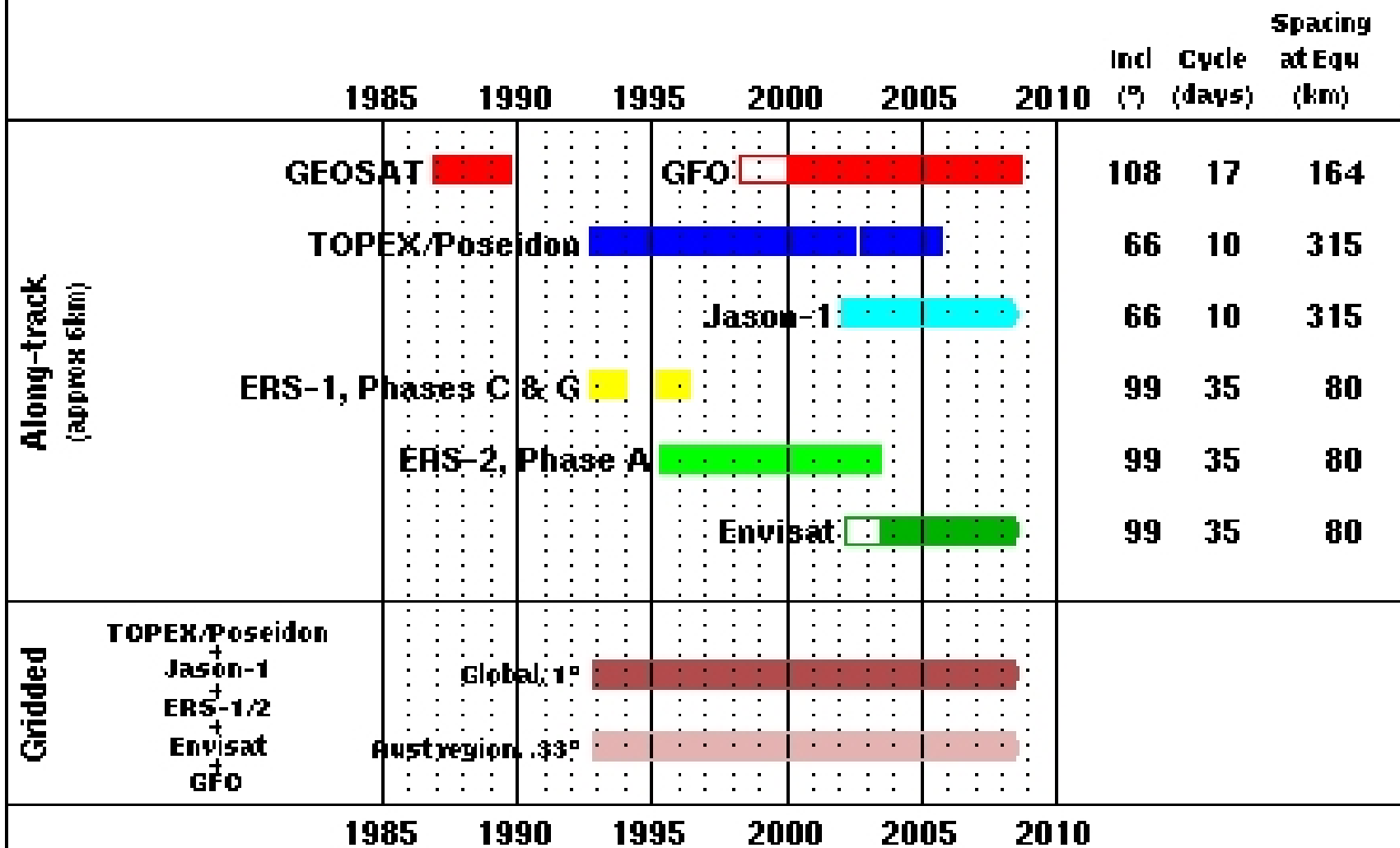
Wavelength (m)	Frequency (GHz)
1.0	0.3
P-band 30 - 100 cm	1
L-band 15 - 30 cm	2
10^{-1} S-band 7.5 - 15 cm	4
C-band 3.75 - 7.5 cm	8
X-band 2.4 - 3.75 cm	12.5
Ku-band 1.67 - 2.4 cm	18
K-band 1.1 - 1.67 cm	26.5
10^{-2} Ka-band 0.75 - 1.1 cm	40
millimetre band	
10^{-3} sub-millimetre band	

Sensible a perturbaciones atm →

Altamente sensible a altas concentraciones de vapor de agua atmosférico →

NO DATOS en lluvia = 1.5 mm/h

SATELITE	AÑO OPERACION	CARACS. DE ORBIT A	OBJETIVO
Skylab	1973		Experimental
Geos-3	1975-78		Mainly geodetic
Seasat	1978 (3 months)	800km, 3-day repeat, inclination=78°, retrograde	Oceanographic
GEOSAT Geodetic Mission	1985-1986 (18 months)	800km, non-repeating	Geodetic
GEOSAT ERM (Exact Repeat Mission)	1986-1990	800km, 17-day repeat, inclination=78°, retrograde (included Seasat orbit)	Oceanographic
ERS-1 other phases	various, 1991 on	Various modes, including a brief geodetic phase	
ERS-1 phases C & G	1992-1993 y 1995-1996	800km, 35-day repeat, inclination=81°, retrograde, sun-synchronous	Oceanographic
TOPEX/Poseidon	1992-2005	1340km, 10-day repeat, inclination=66°, prograde	First truly high quality oceanographic altimeter
ERS-2	1995-2003	As for ERS-1 phases C&G	
GFO (GEOSAT F-On)	2000-present	As for GEOSAT	Follow-on of GEOSAT ERM
Jason-1	2001-present	As for TOPEX/Poseidon	Follow-on of TOPEX/Poseidon mission
Envisat	2002-present	As for ERS-2	
Jason-2	launch planned for June 2008	As for Jason-1	Follow-on of TOPEX/Poseidon and Jason-1

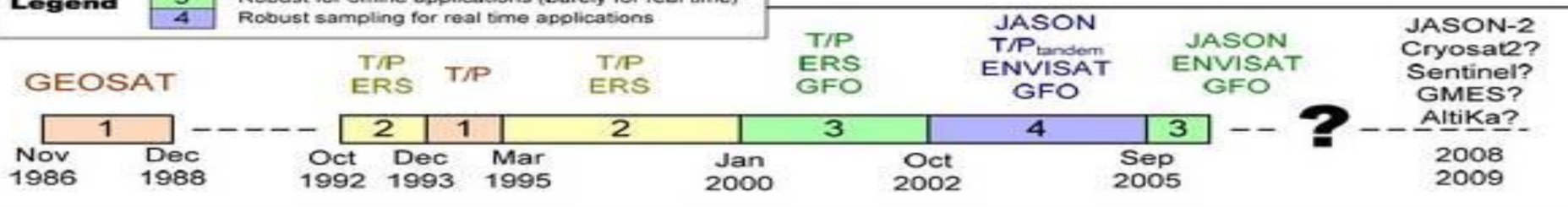


Filled bars: data available on-line

Bars ending with a point continuing

Color Legend

1	Insufficient for offline meso-scale applications
2	Minimum for off-line applications
3	Robust for offline applications (barely for real time)
4	Robust sampling for real time applications

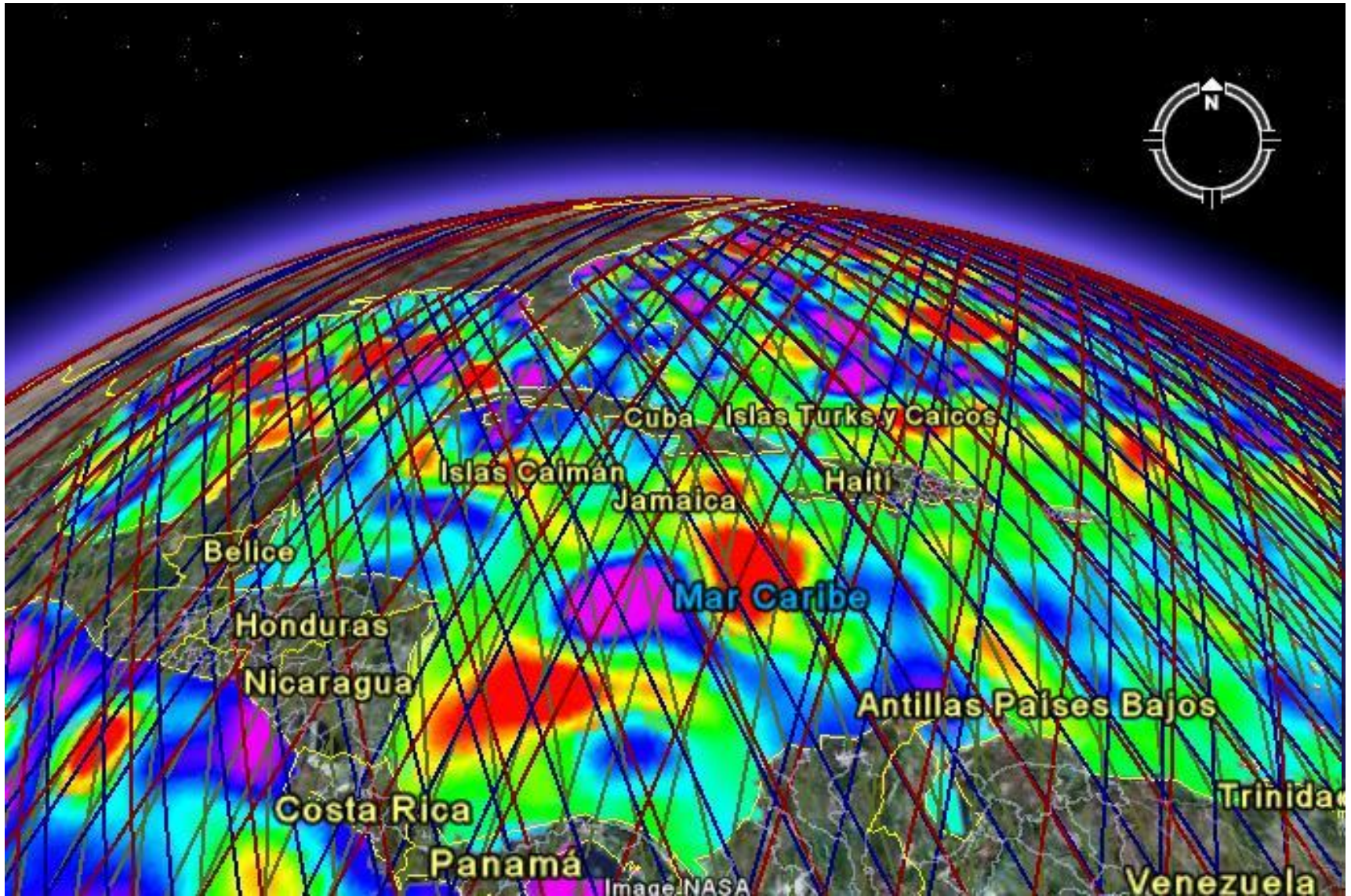


Recorrido del satélite

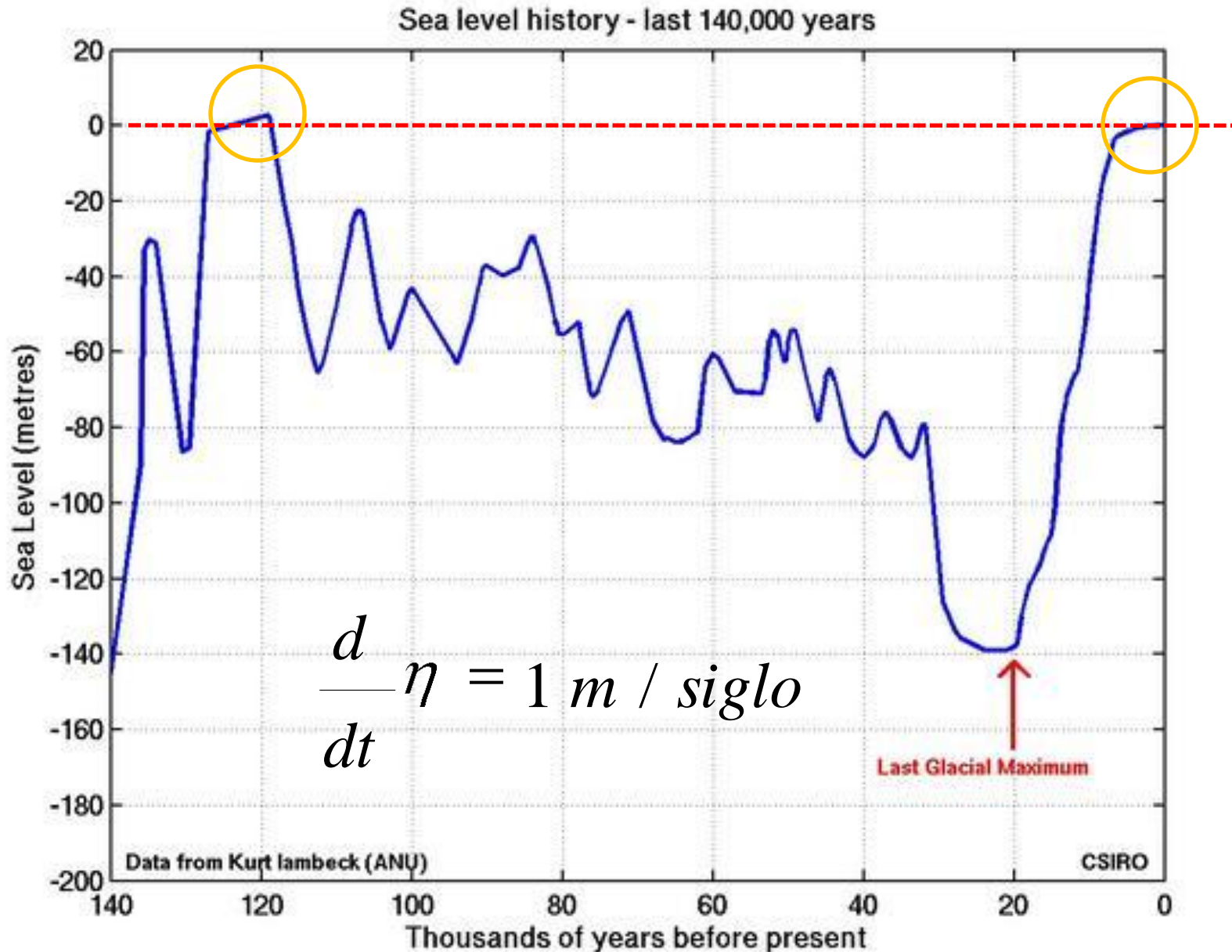
— JASON

— ENVISAT

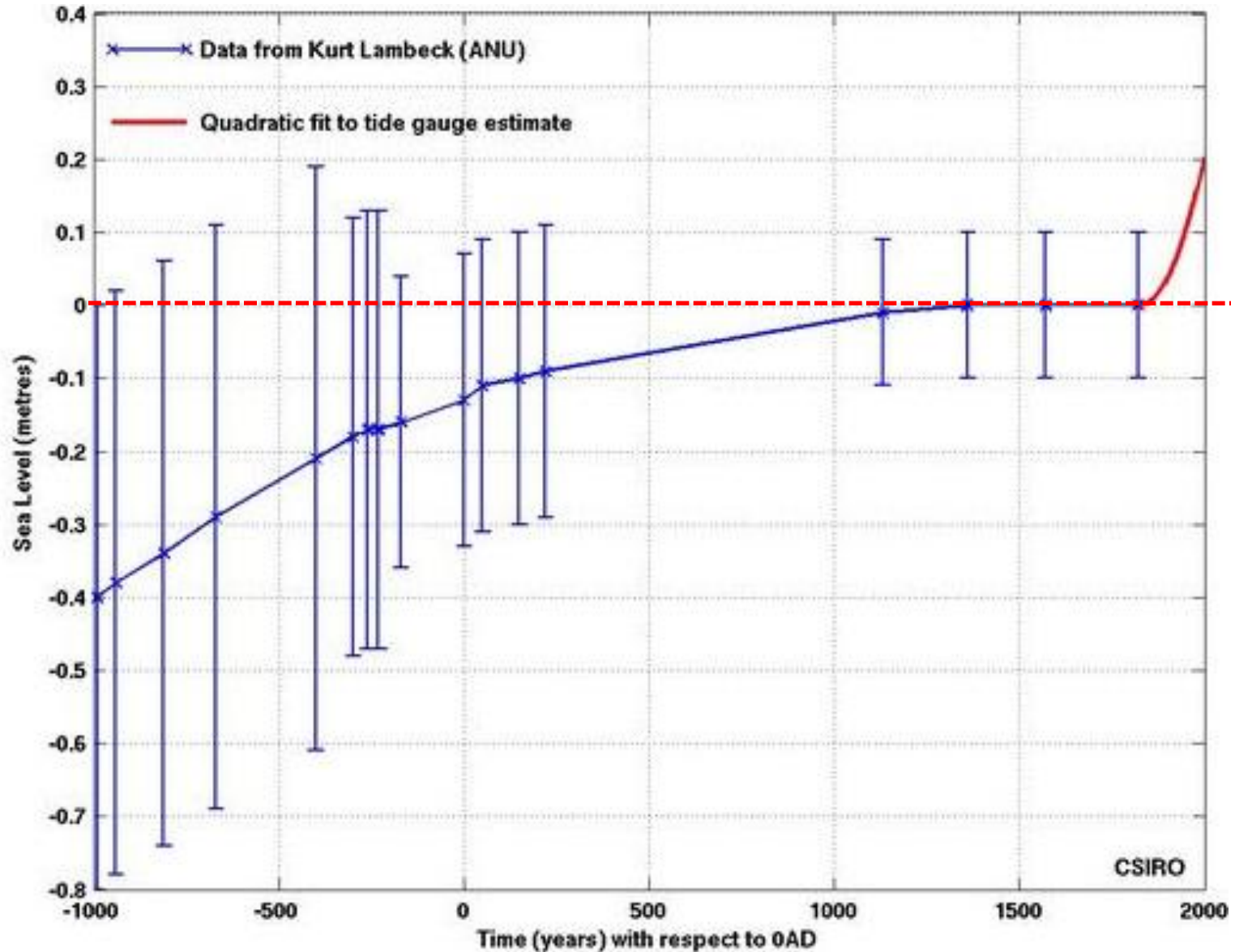
— GFO



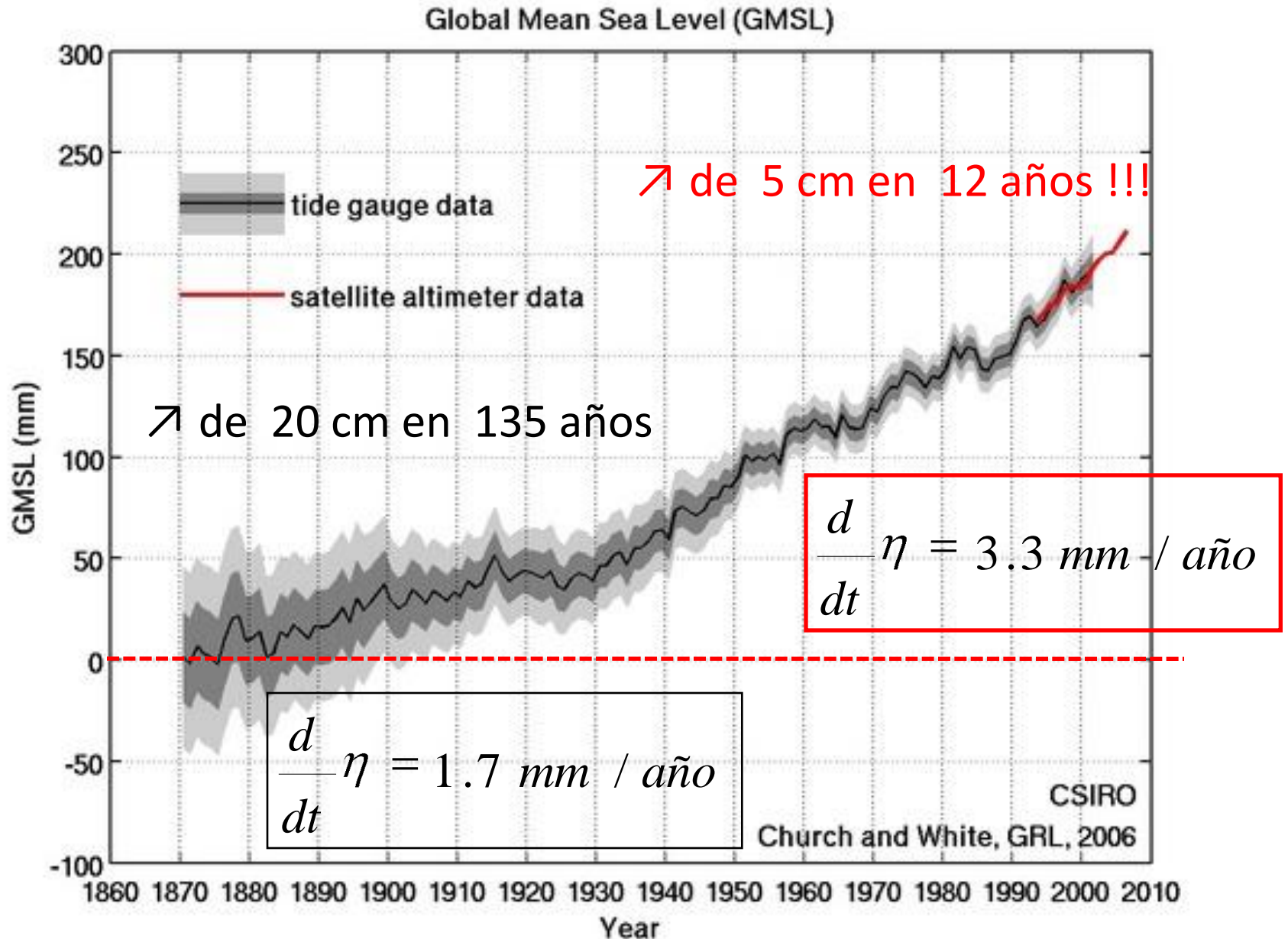
Escala secular (14kaños atrás)



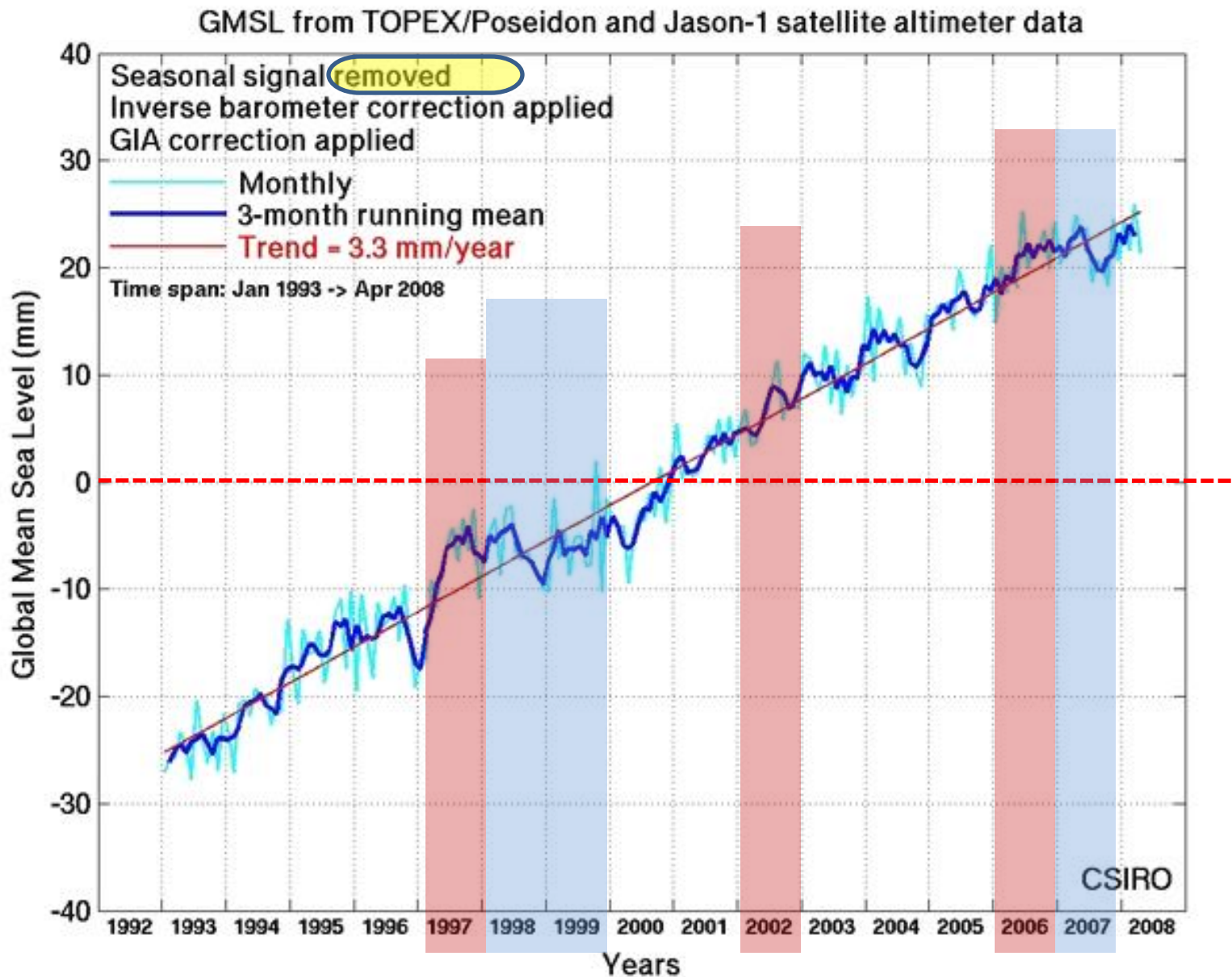
Escala larga de 10^2 años (3mil años atrás)



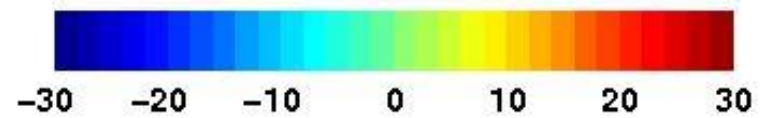
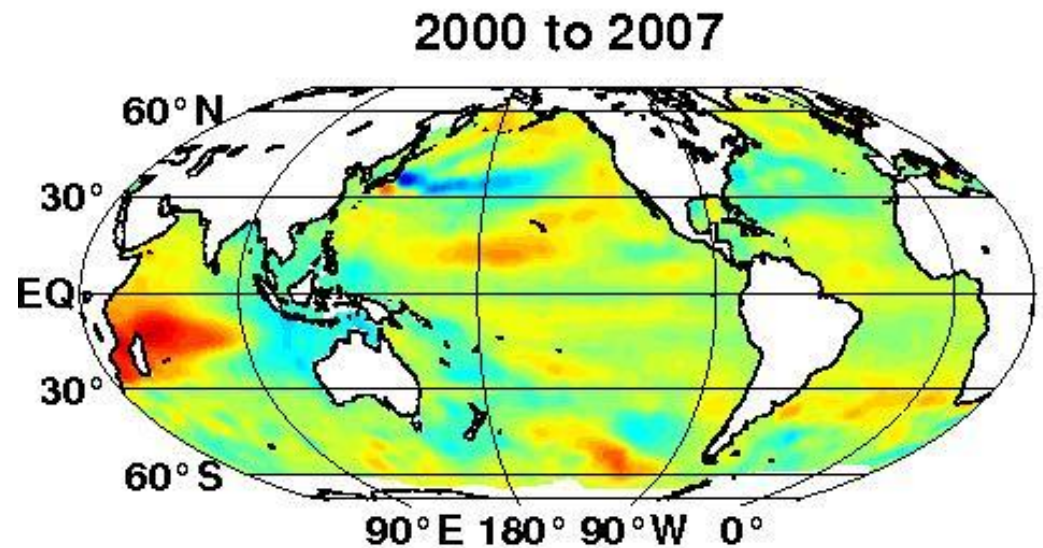
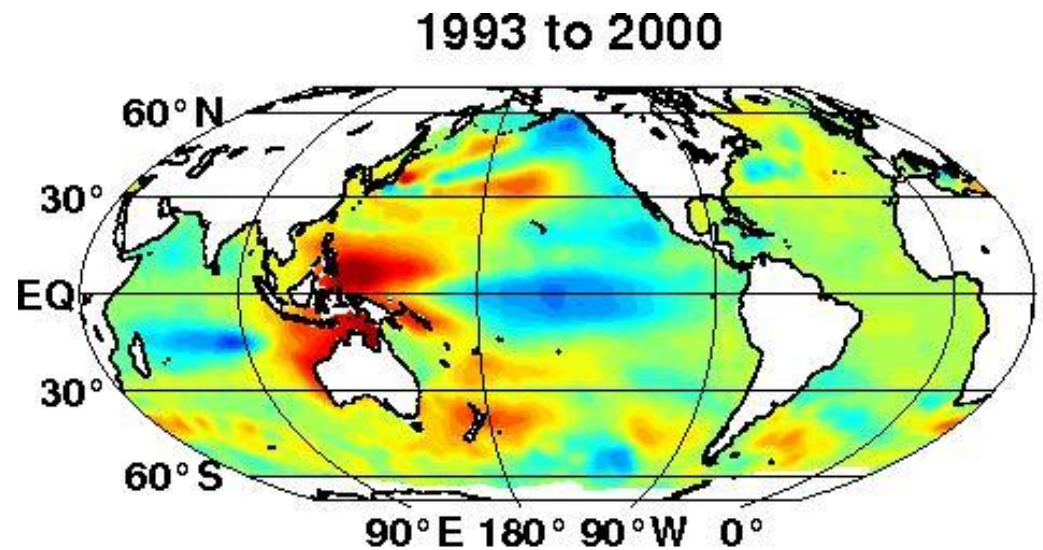
Escala interdecadal (140 años atrás)



Escala interanual (15 años atrás)



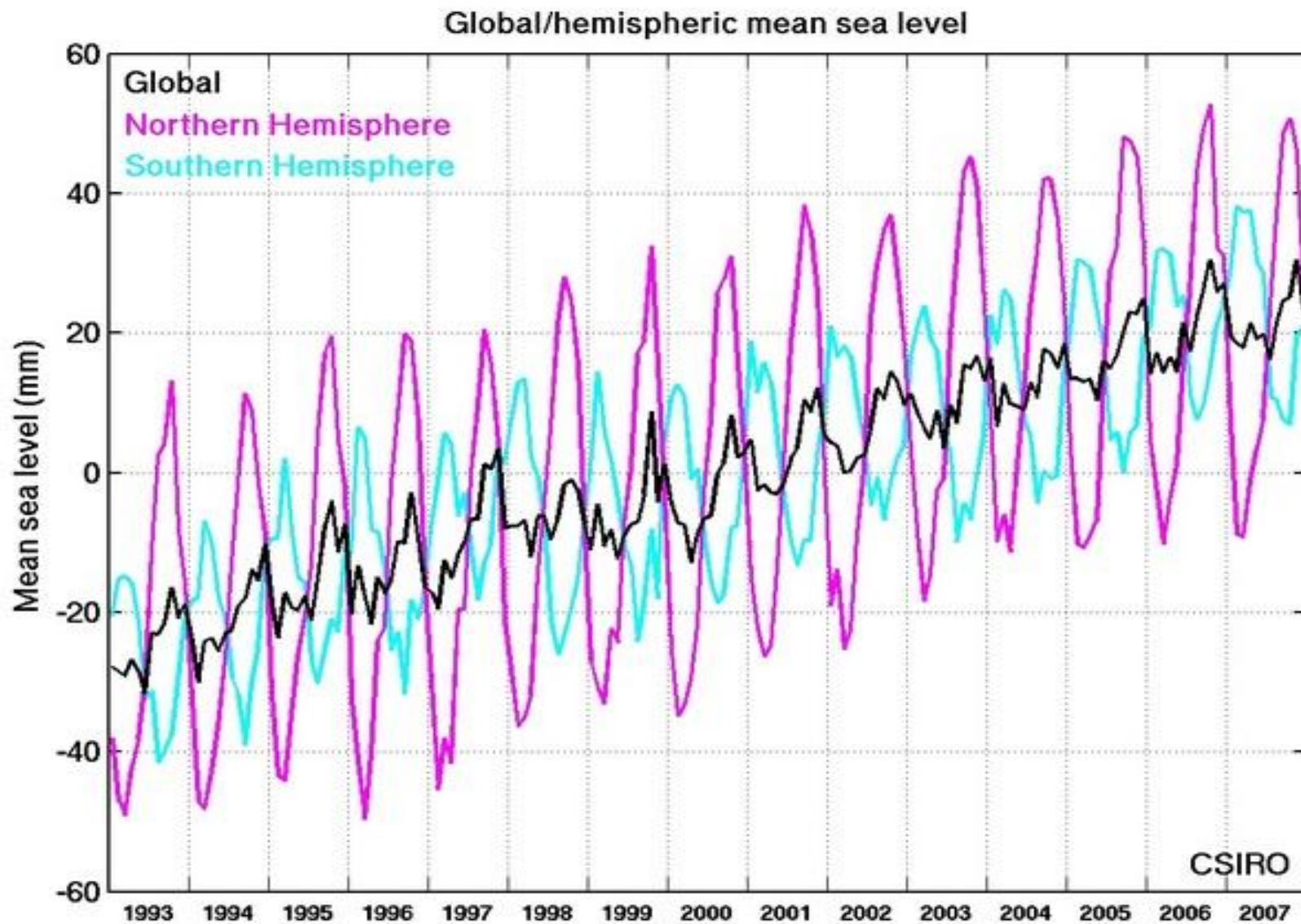
Tendencias Globales



mm/year

CSIRO

Escala interanual Hemisférica



Factores que modulan variaciones en NMM

Cambios en la circulación oceánica superficial y profunda
Sobre-elevaciones de tormenta

Reservorios de Agua continental
Variaciones en descargas de Ríos
Incremento de Acuíferos
Infiltración subterránea

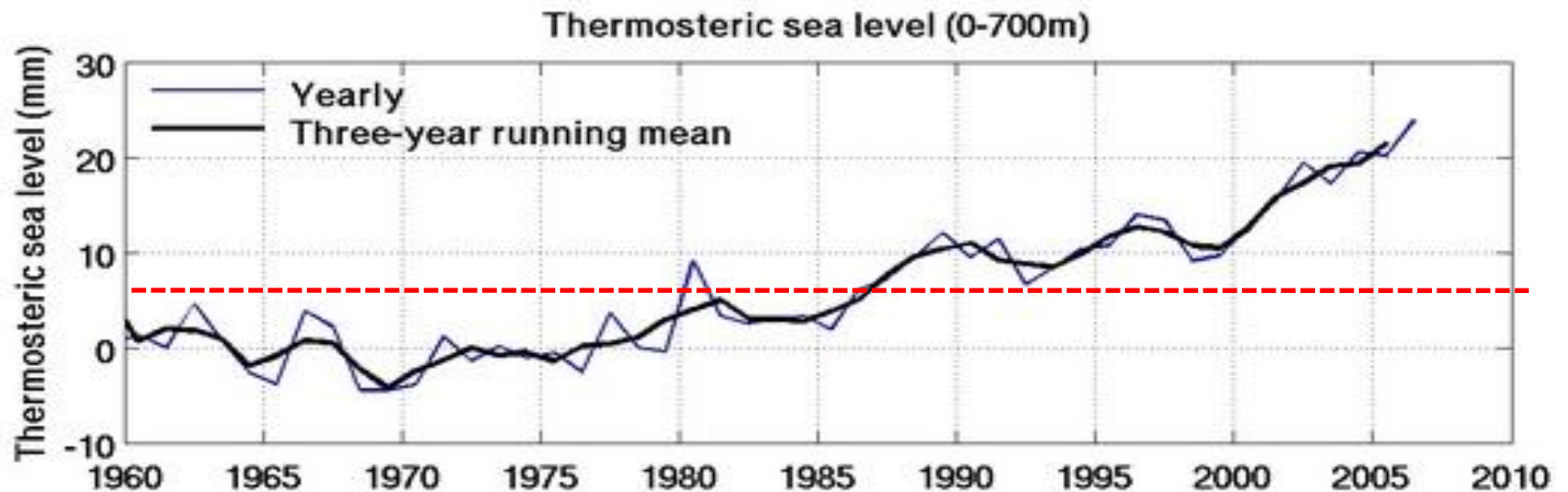
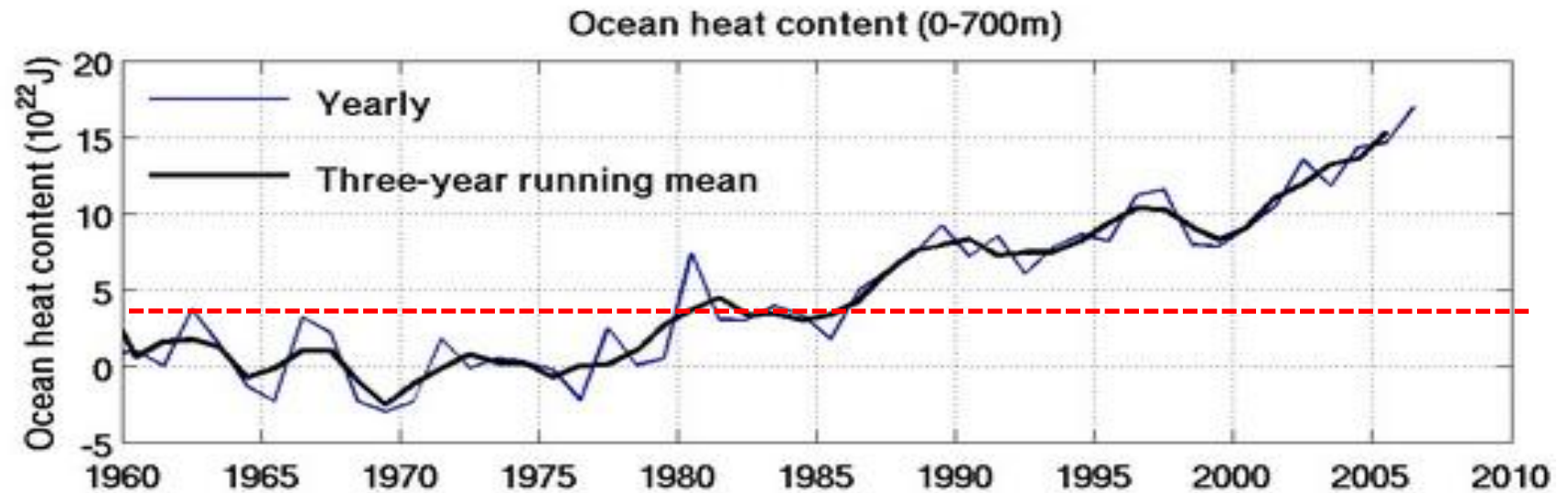
Expansión de agua por calentamiento

Subsidencia en los deltas de Ríos
Transporte de sedimentos
Desplazamientos tectónicos

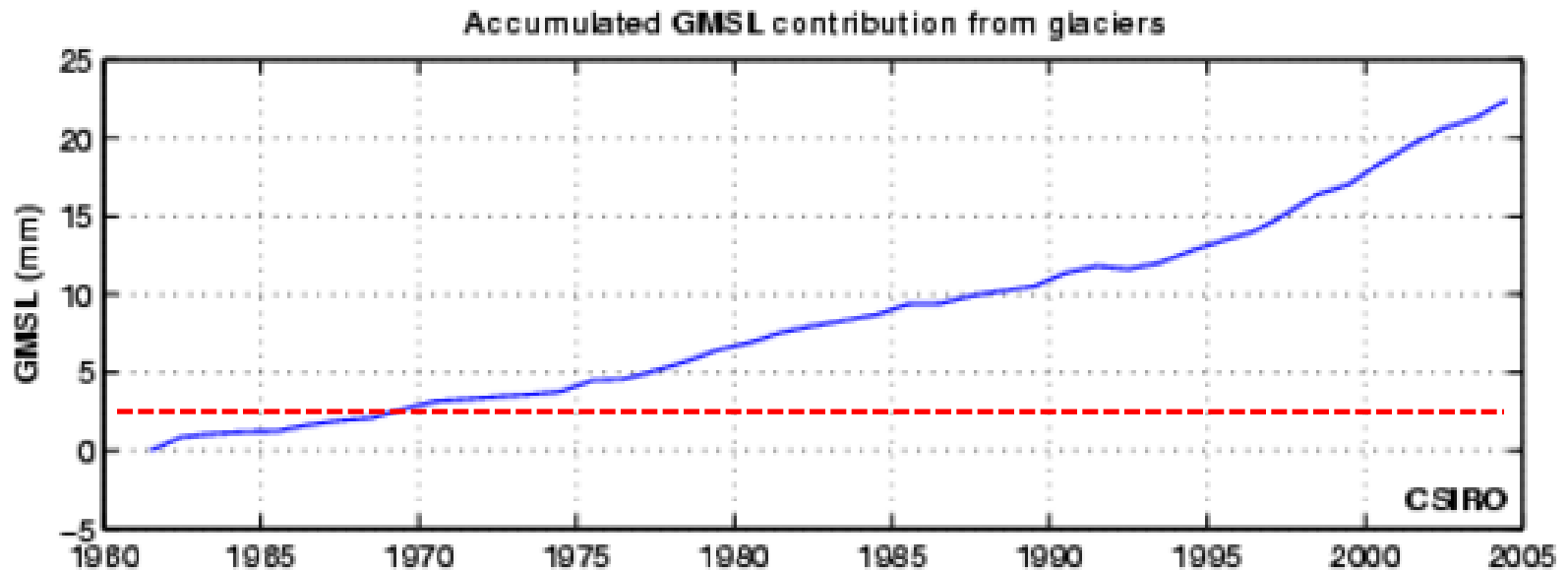
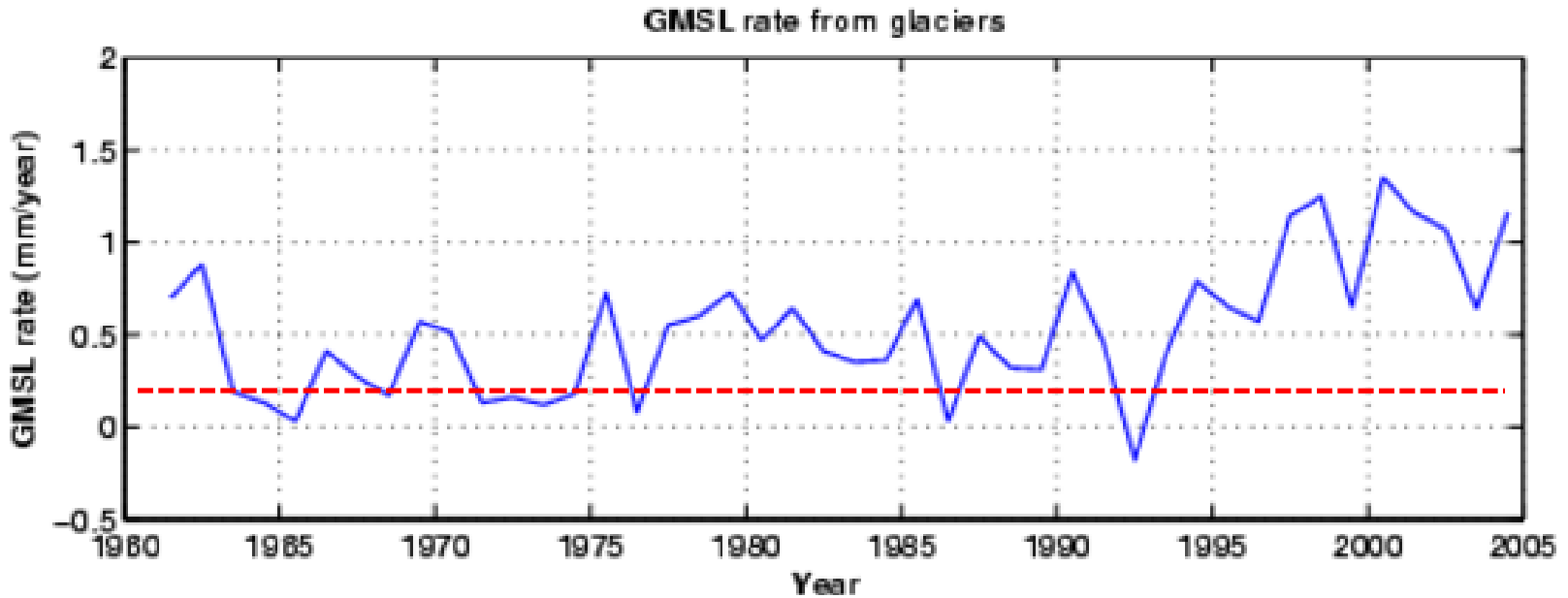
Intercambio de agua almacenada en glaciares y capas de hielo



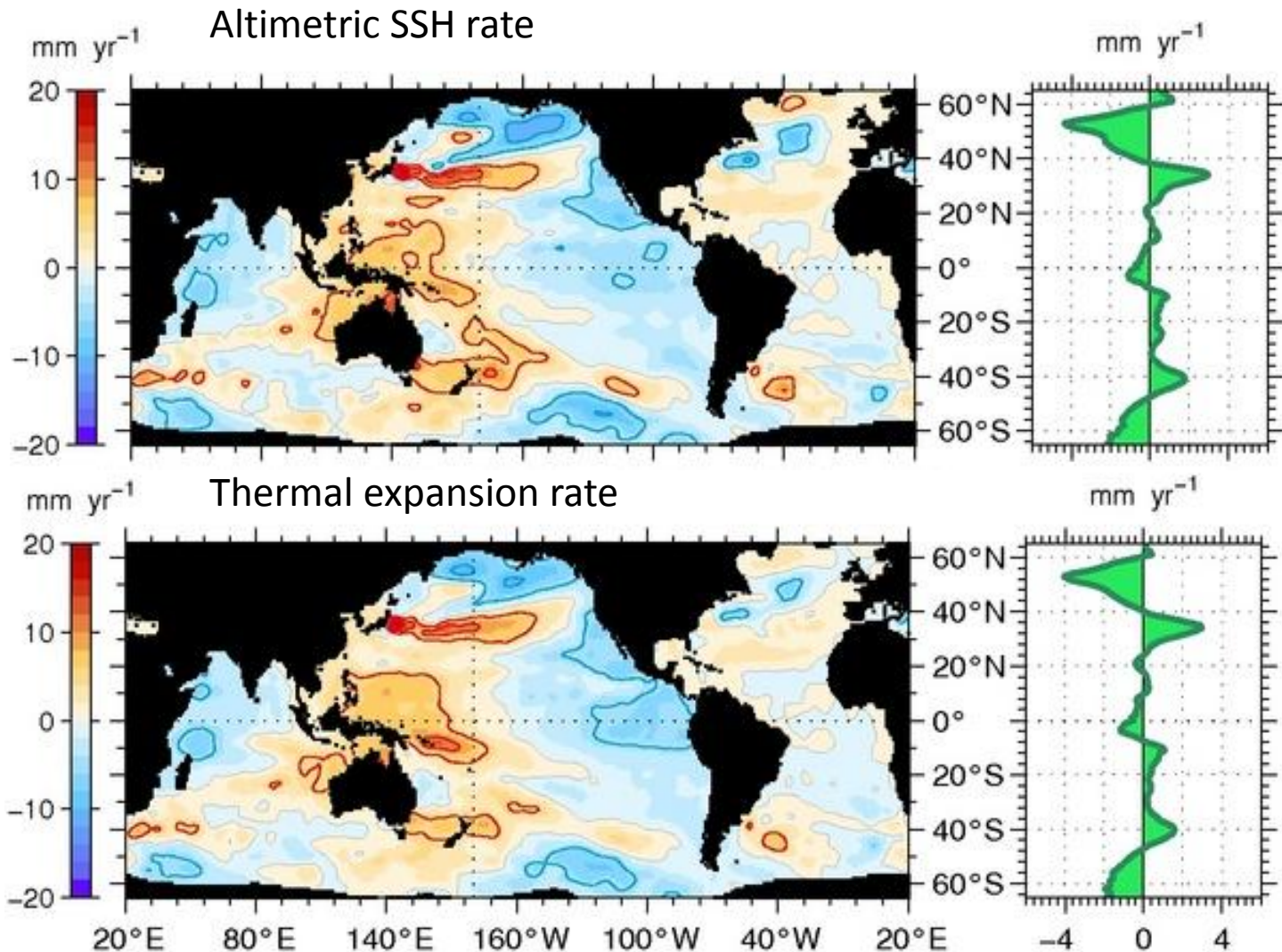
OHC vs Thermosteric SL



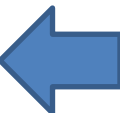
Contribución de glaciares al NMm



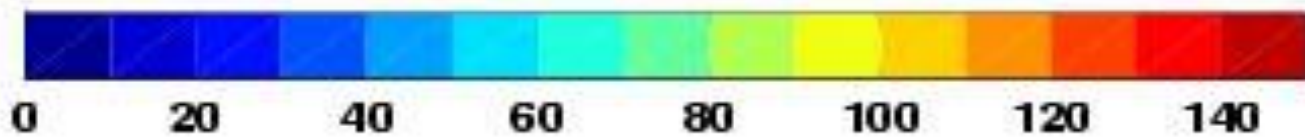
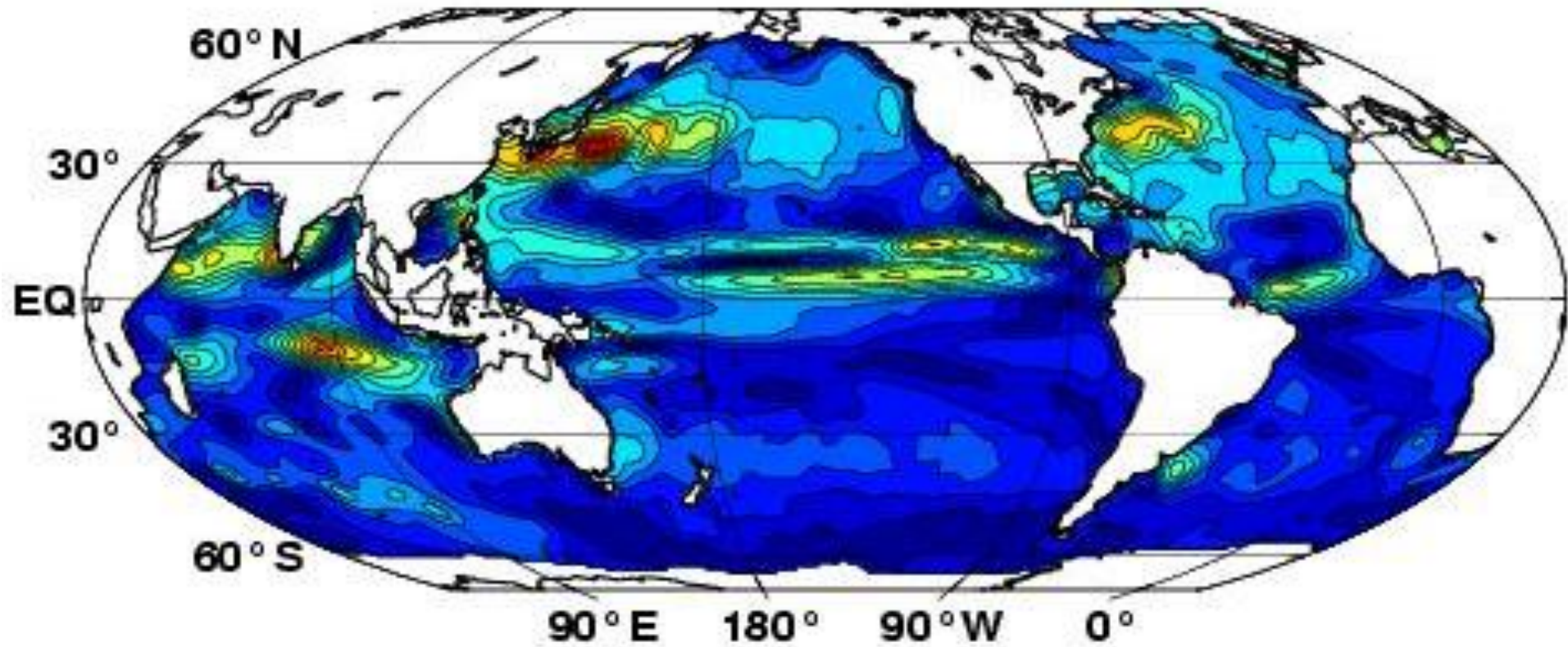
Contribución de la expansión térmica



Church et al., 2008 .



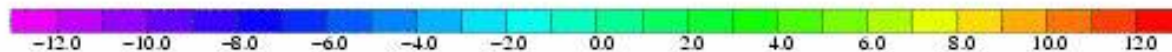
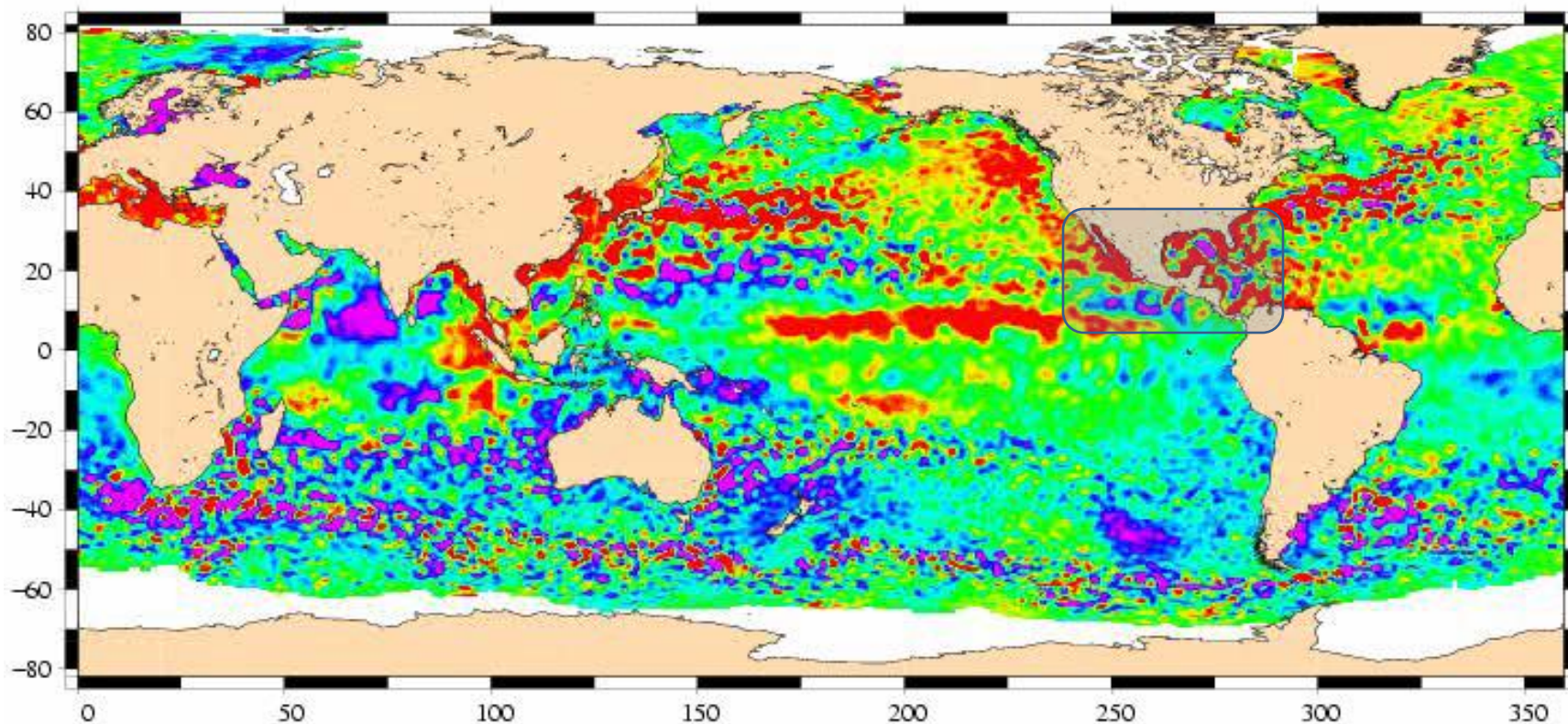
Amplitud Anual Global del NM



millimetres

CSIRO

1992/10/14

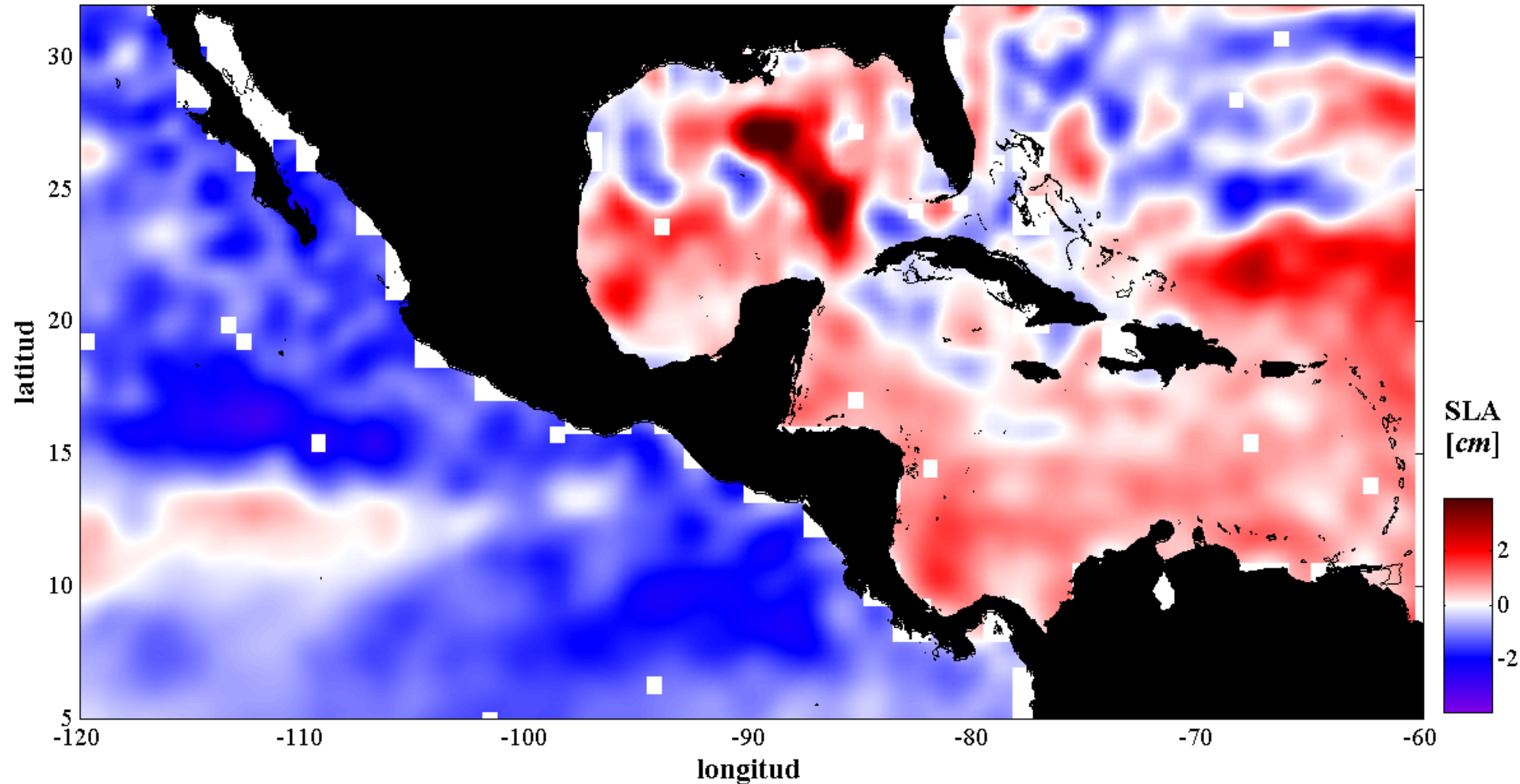


SLA relative to a 7 year mean (cm)



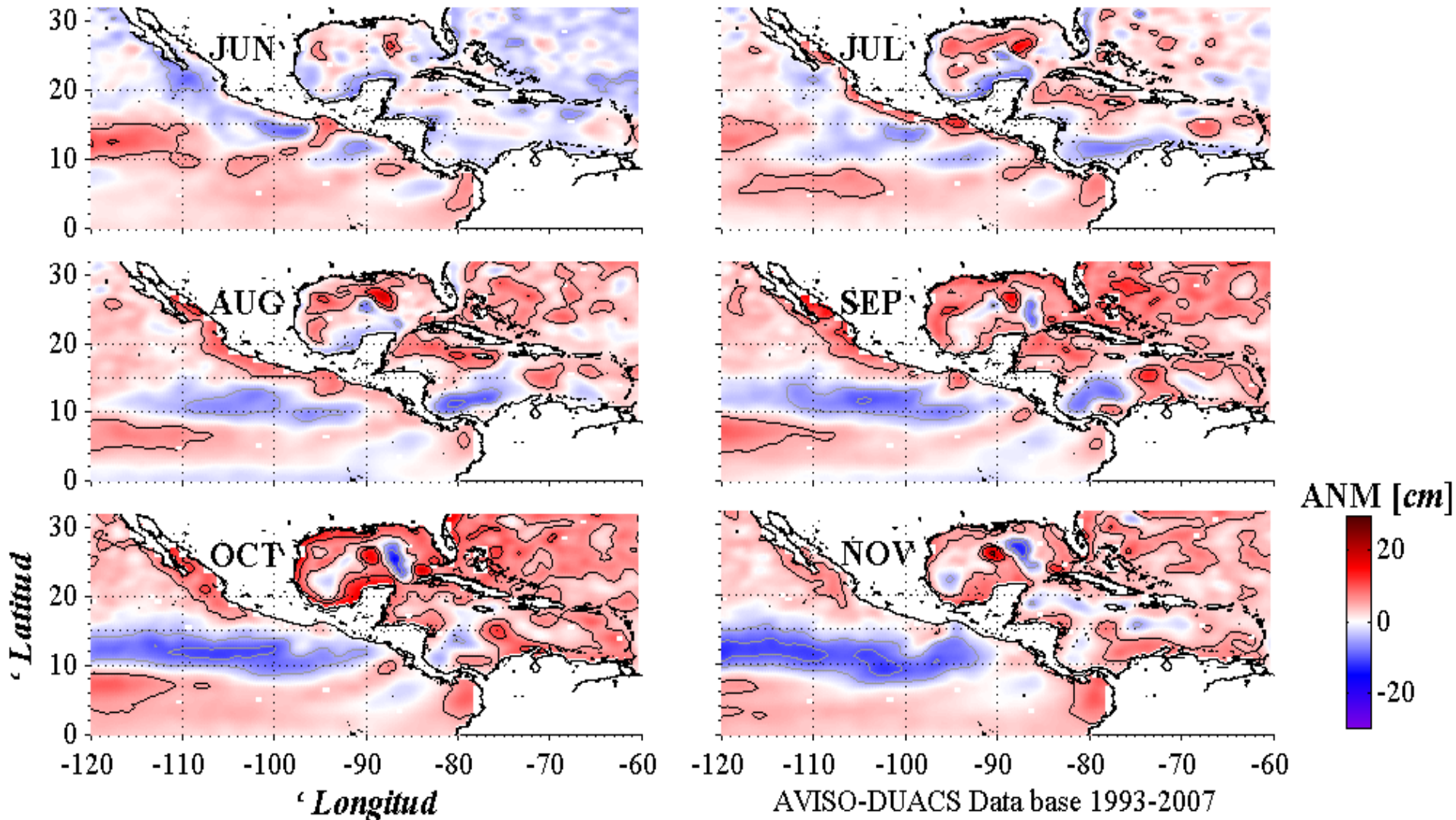
NMm en Mares Mexicanos

Campo medio 1993-2007 Mares Mexicanos

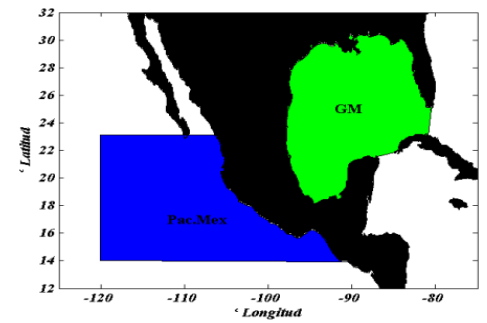


Variabilidad de los Campos medios mensuales

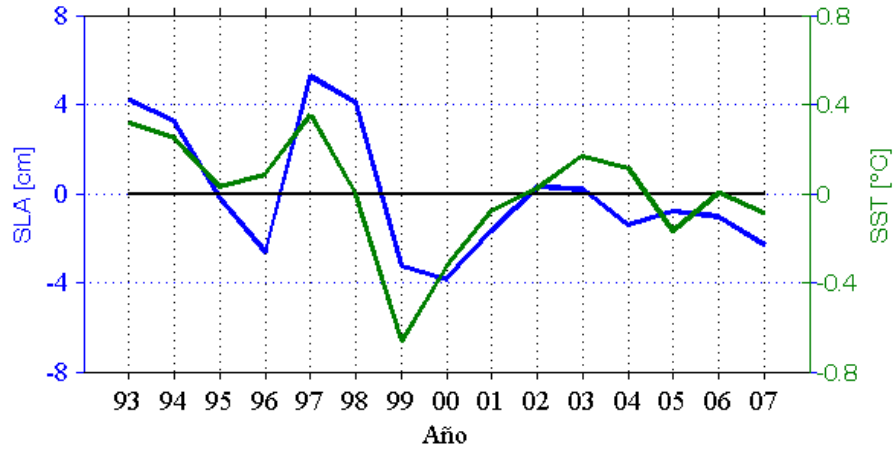
ANM MEDIA 1993-2007



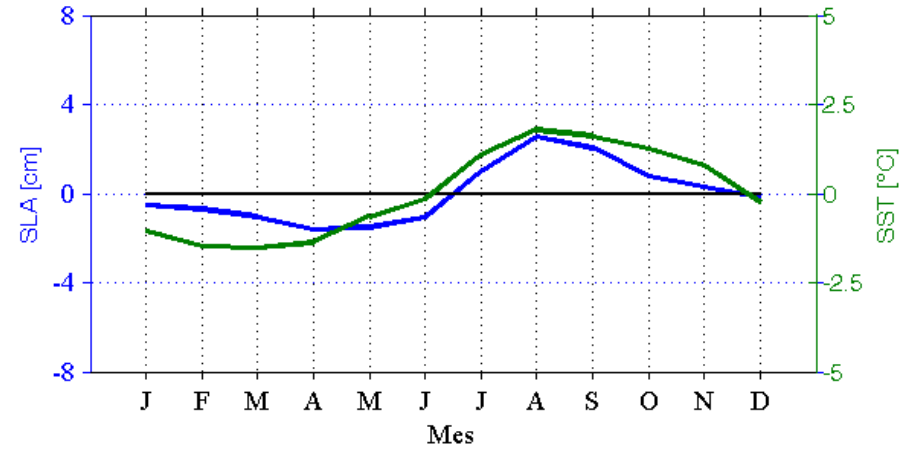
Series de tiempo promedio



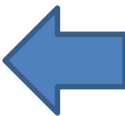
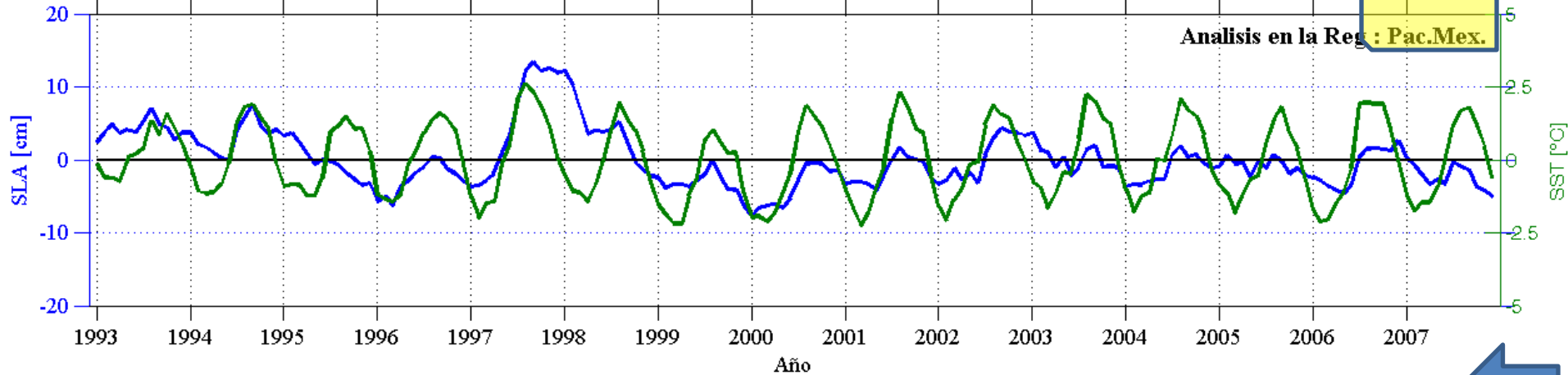
Promedios anuales



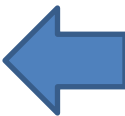
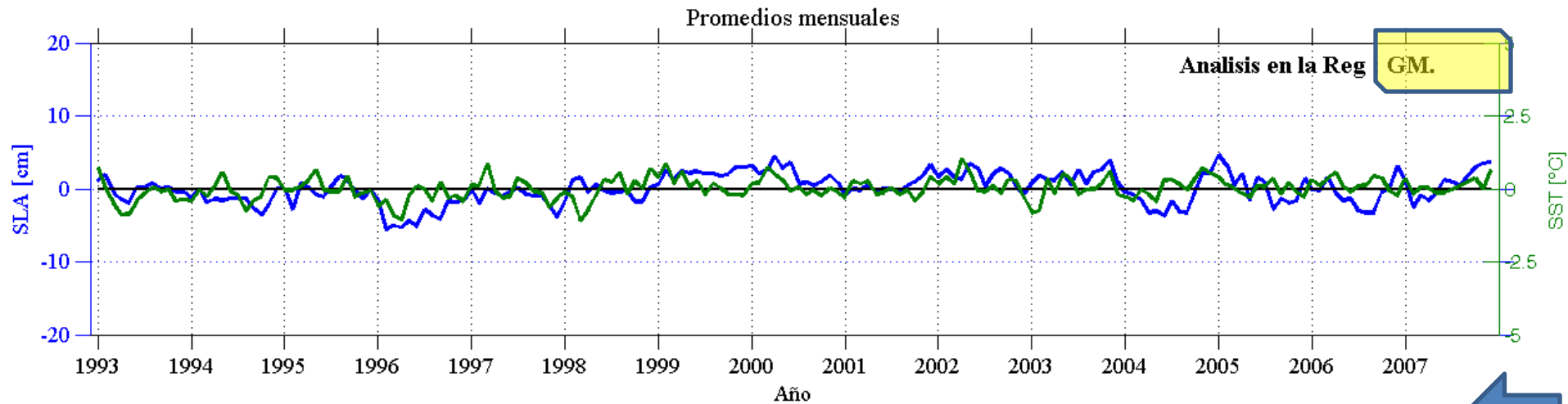
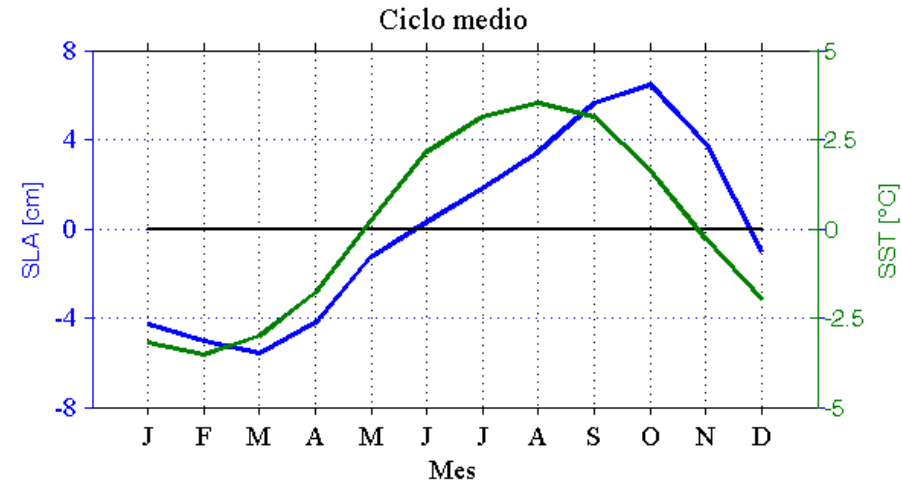
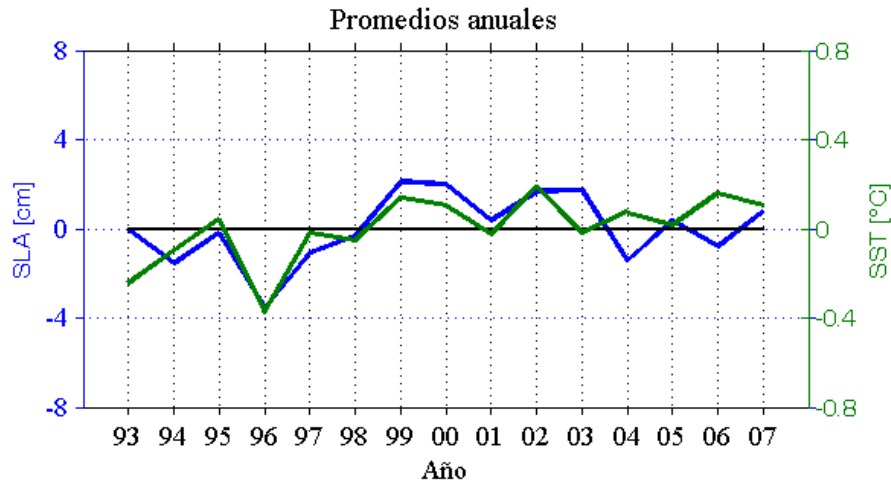
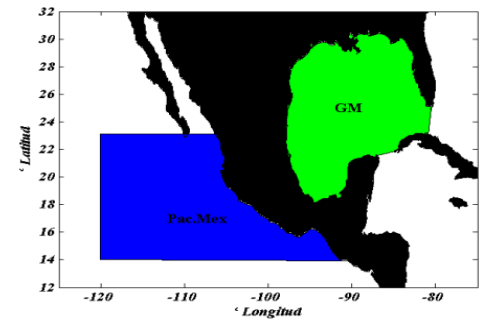
Ciclo medio



Promedios mensuales

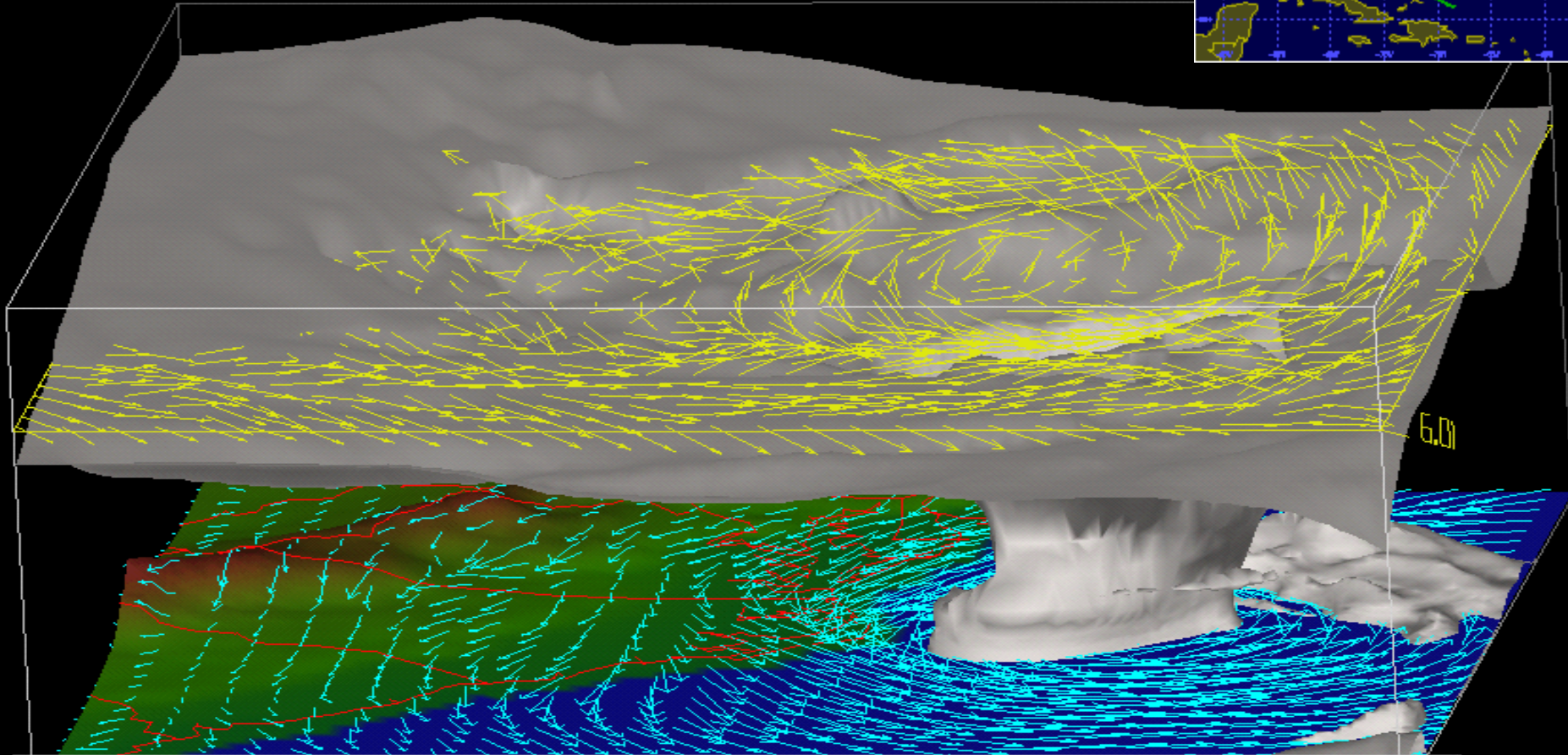
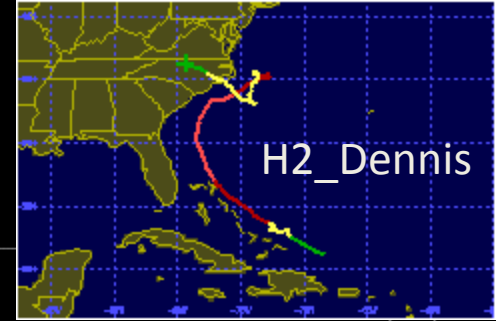


Serst sin la Señal ANual



01:00:00
01 Sep 99
1 of 24
Wednesday

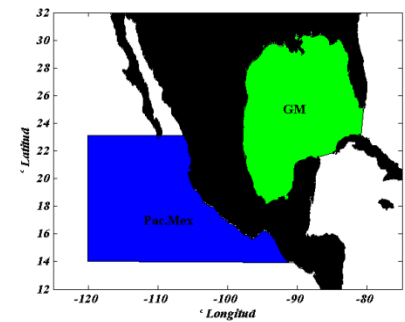
Relación NM vs CT



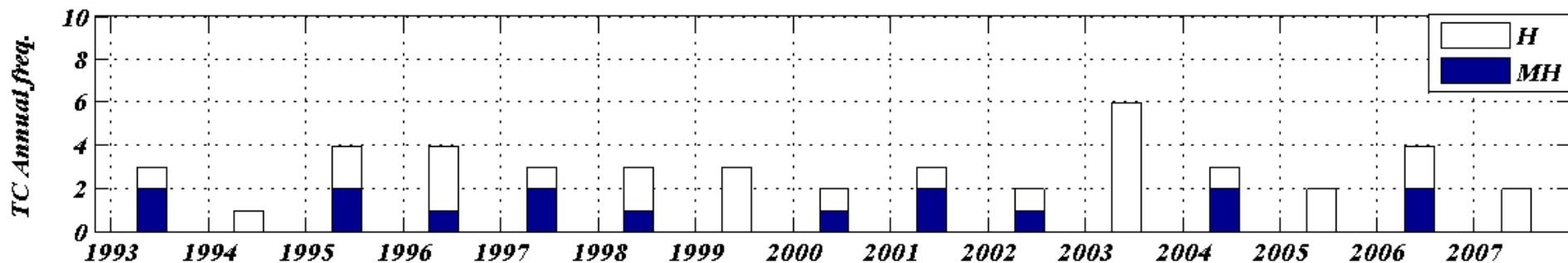
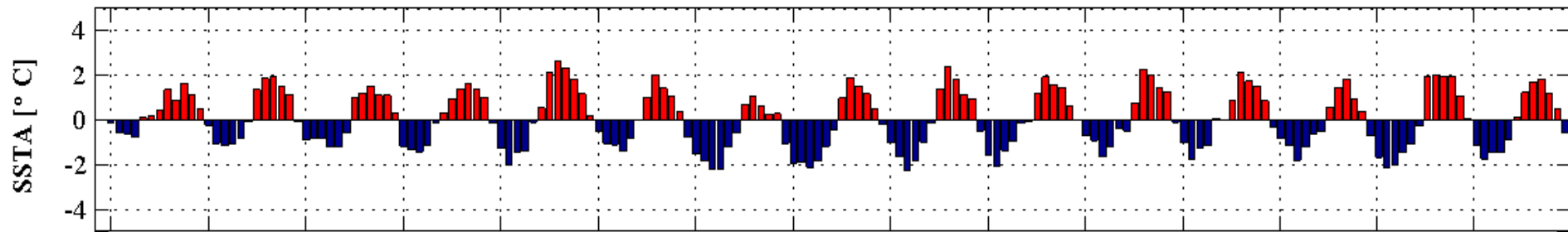
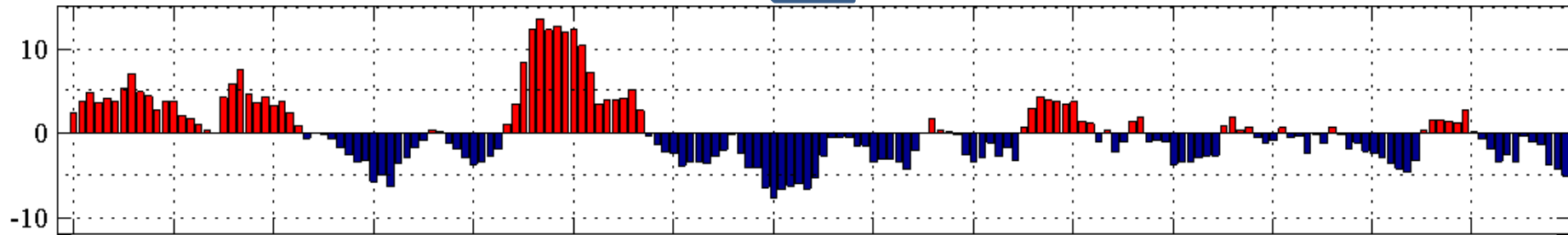
wind-driven surge →

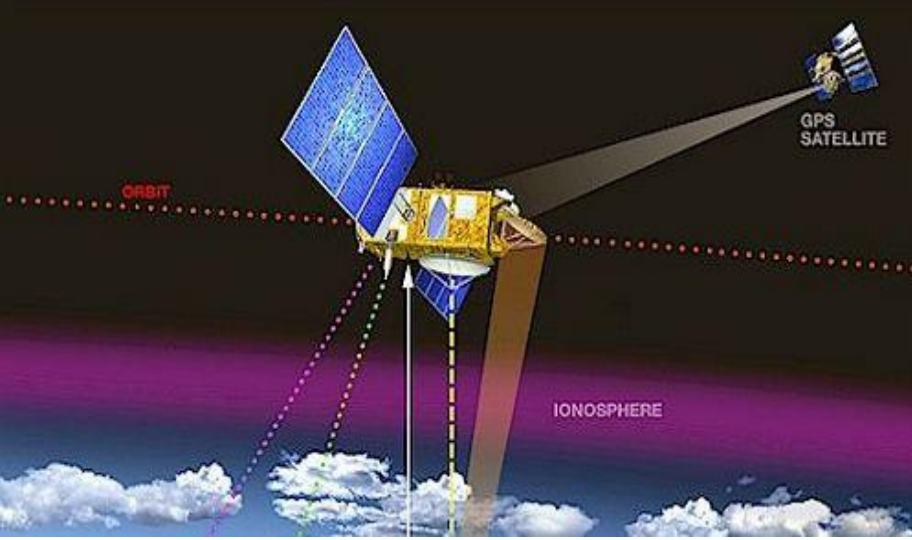
← pressure surge

Variabilidad interanual de COSAIH (SSTA, SLA)



Interannual Anomaly timeseries averaged into **PTM** and their relation to H-frequency intensity

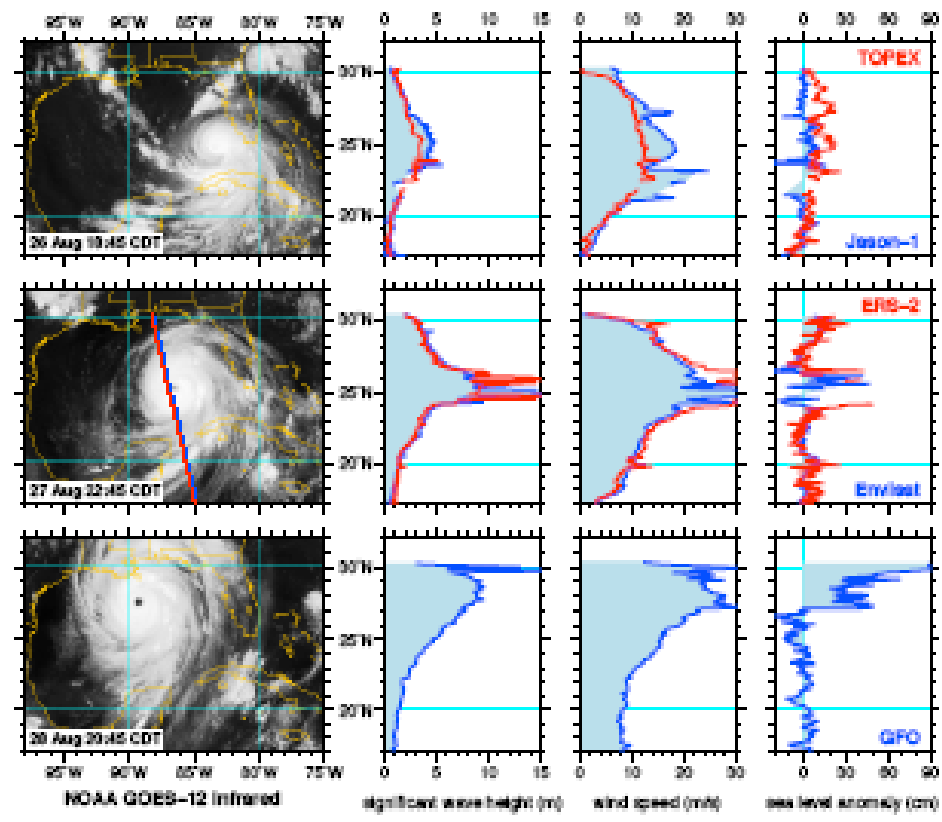
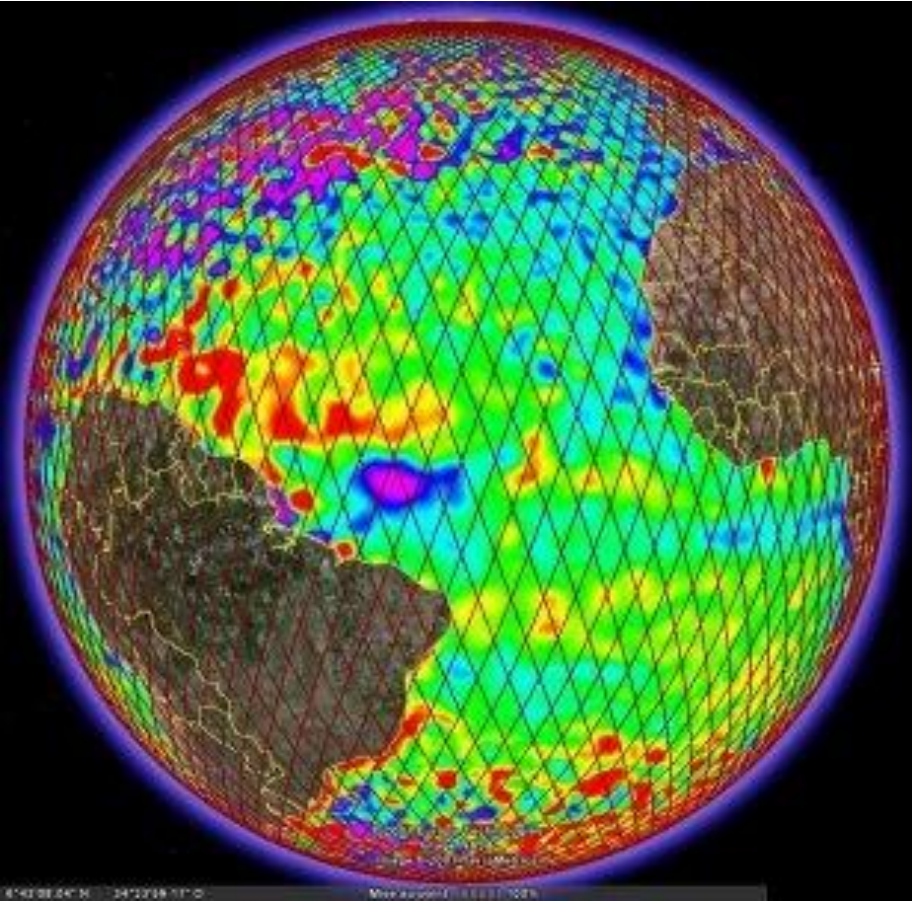




ALTIMETRIA

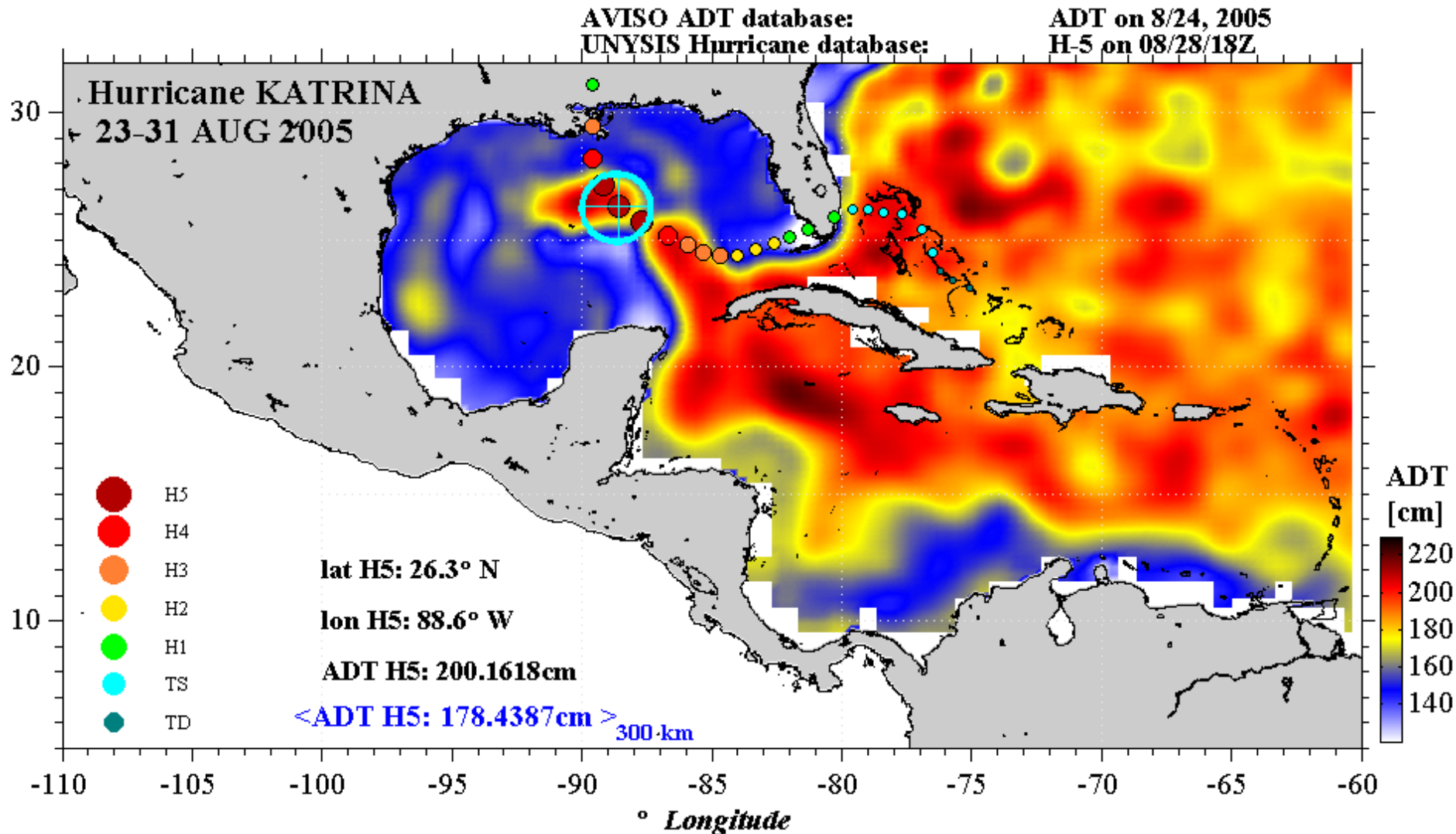
Scharroo, R., W. H. F. Smith, and J. L. Lillibridge (2005), Satellite altimetry and the intensification of Hurricane Katrina, *Eos Trans. AGU*, 86 (40), 366.

Katrina – Wind, Wave, Sea Level Anomaly

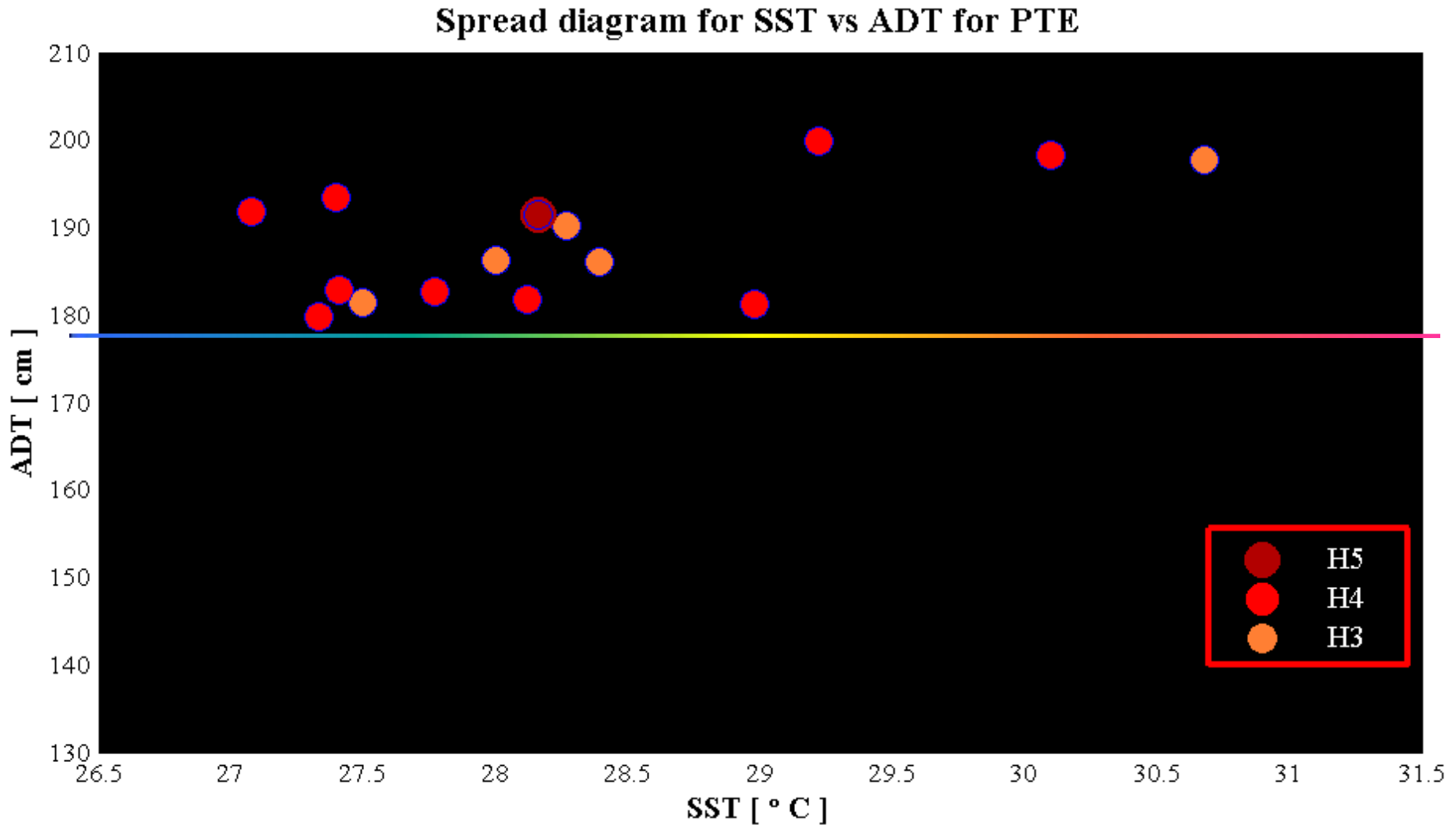


SWH Viento SLA

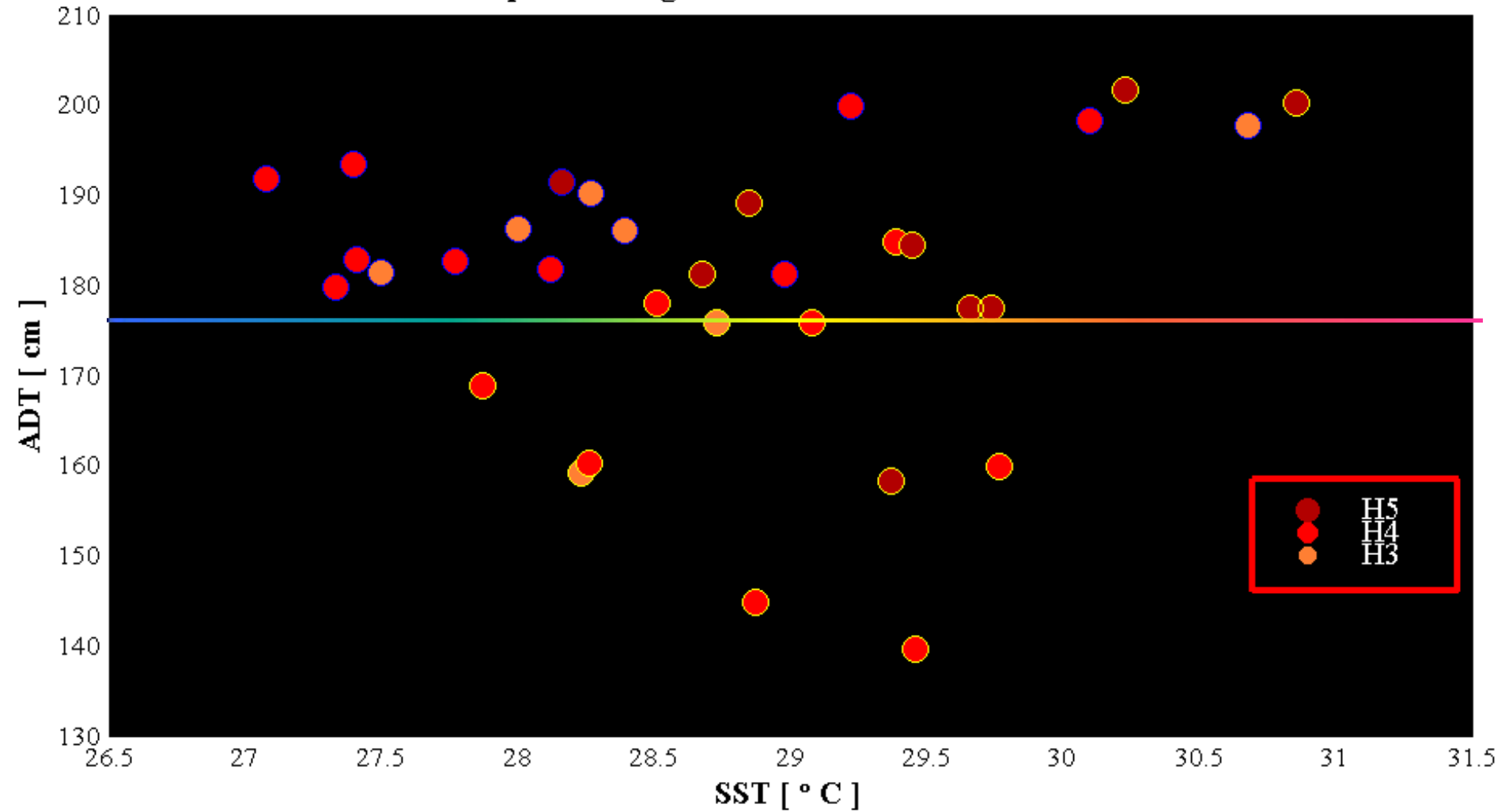
Identificación de COSAIH



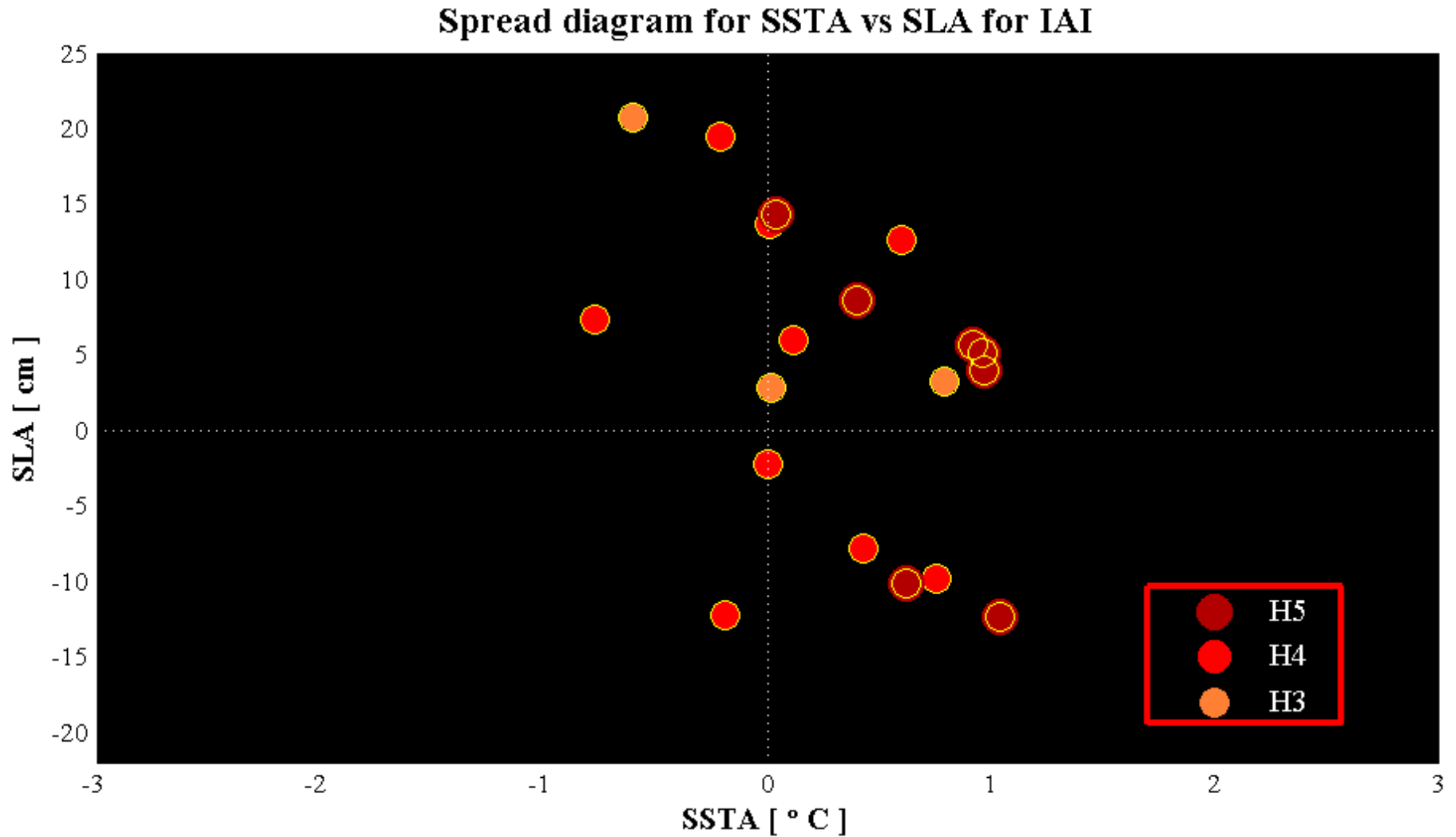
Valores umbrales de SST & ADT



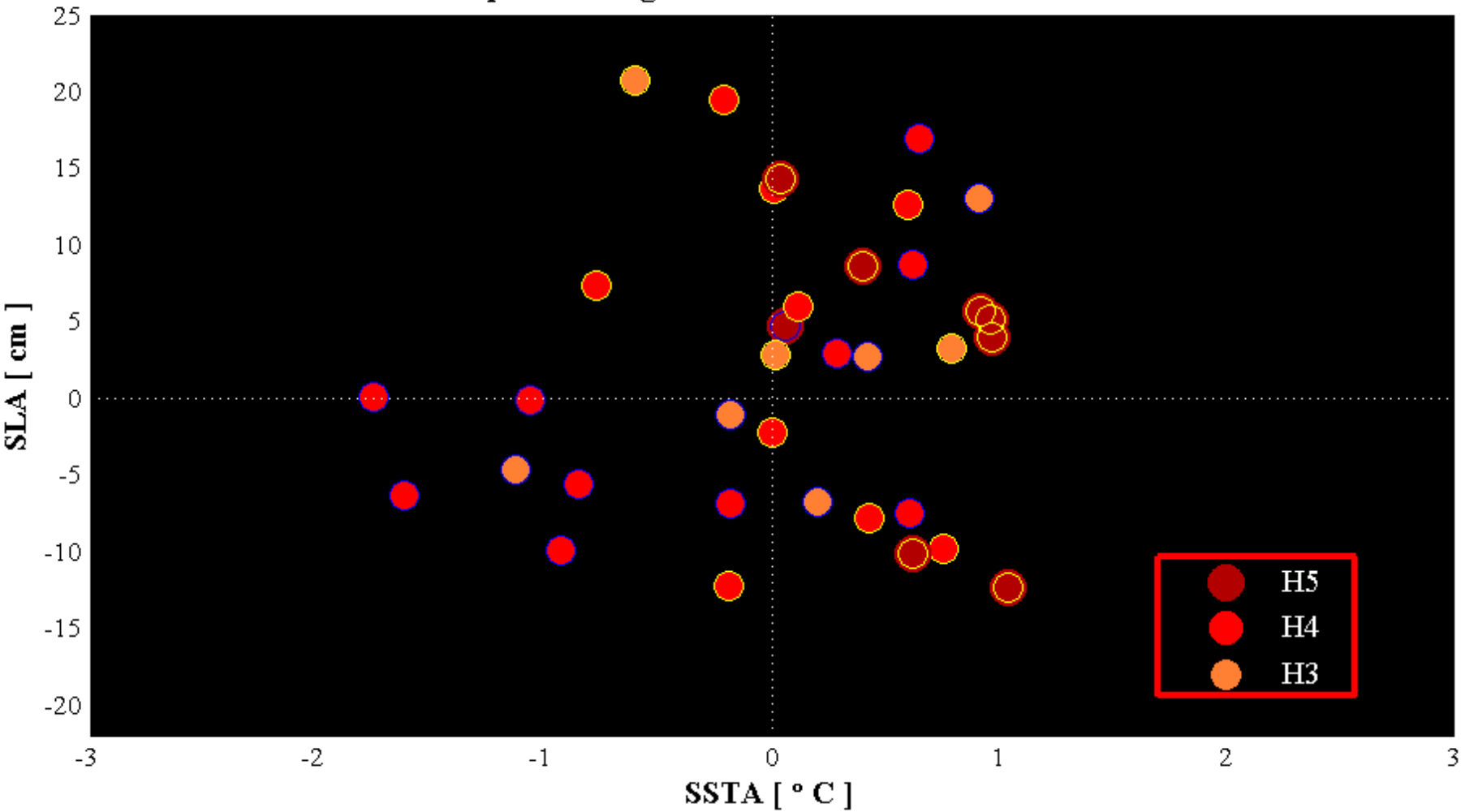
Spread diagrams for SST vs ADT for PTE vs IAS



Dispersión de anomalías

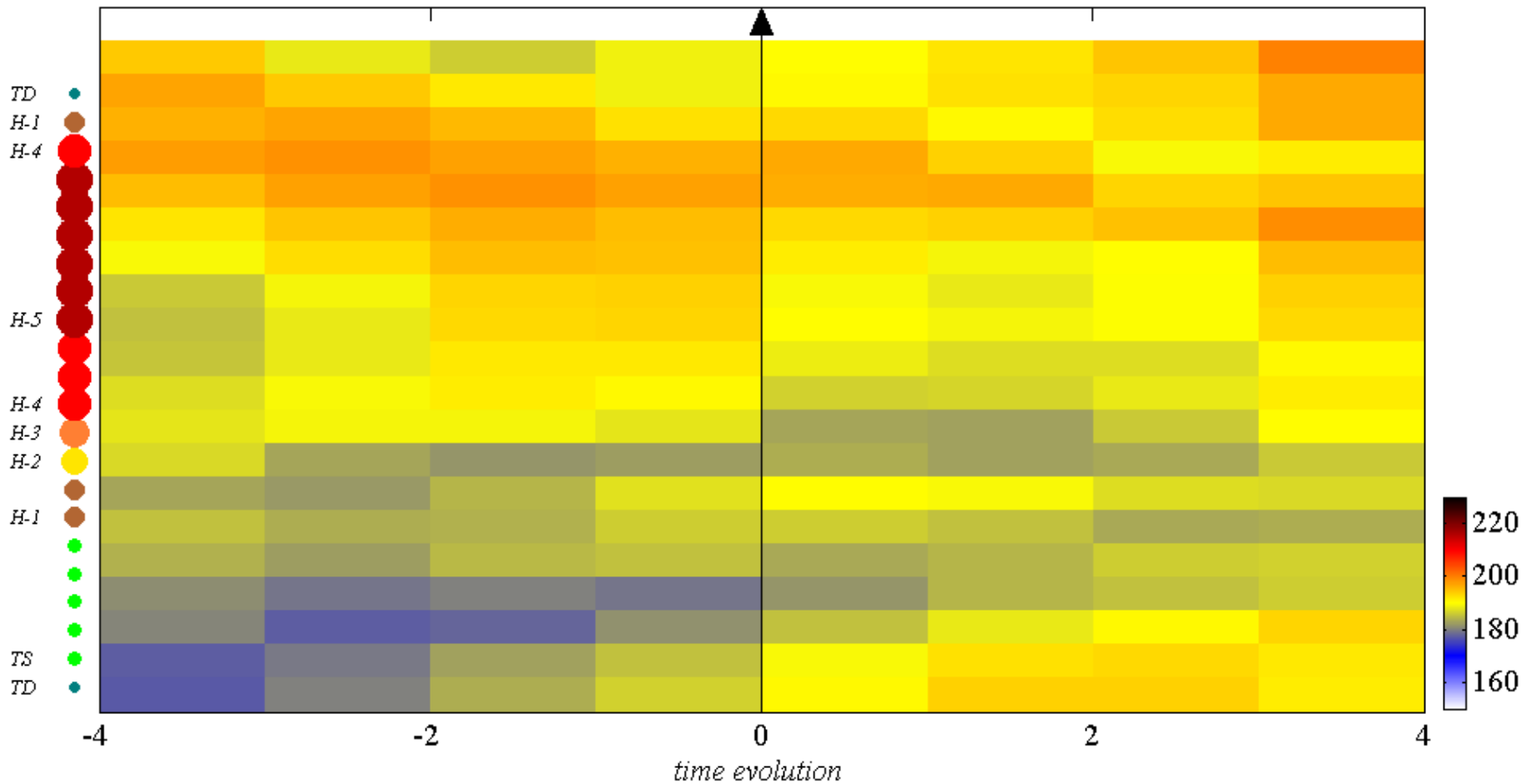


Spread diagram for SSTA vs SLA for PTE vs IAS



COS (ADT) anteriores y posteriores relativas a c/registro del CT

Along track time series of ADT around each TC registered point



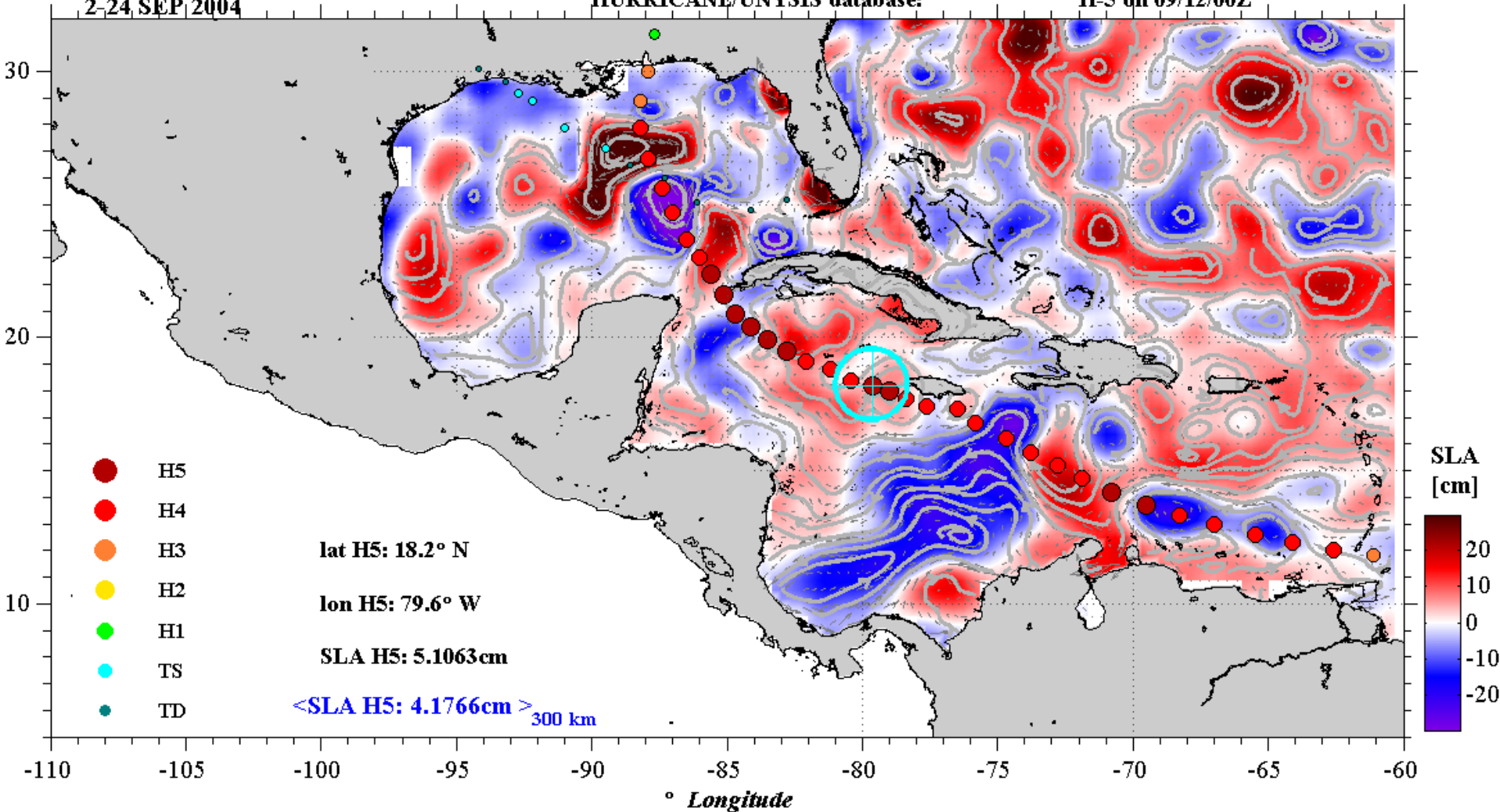
H5 Kenna PTE, 2002

Campo geostrofa rel. a SLA

Hurricane IVAN
2-24 SEP 2004

AVISO SLA database:
HURRICANE/UNYSIS database:

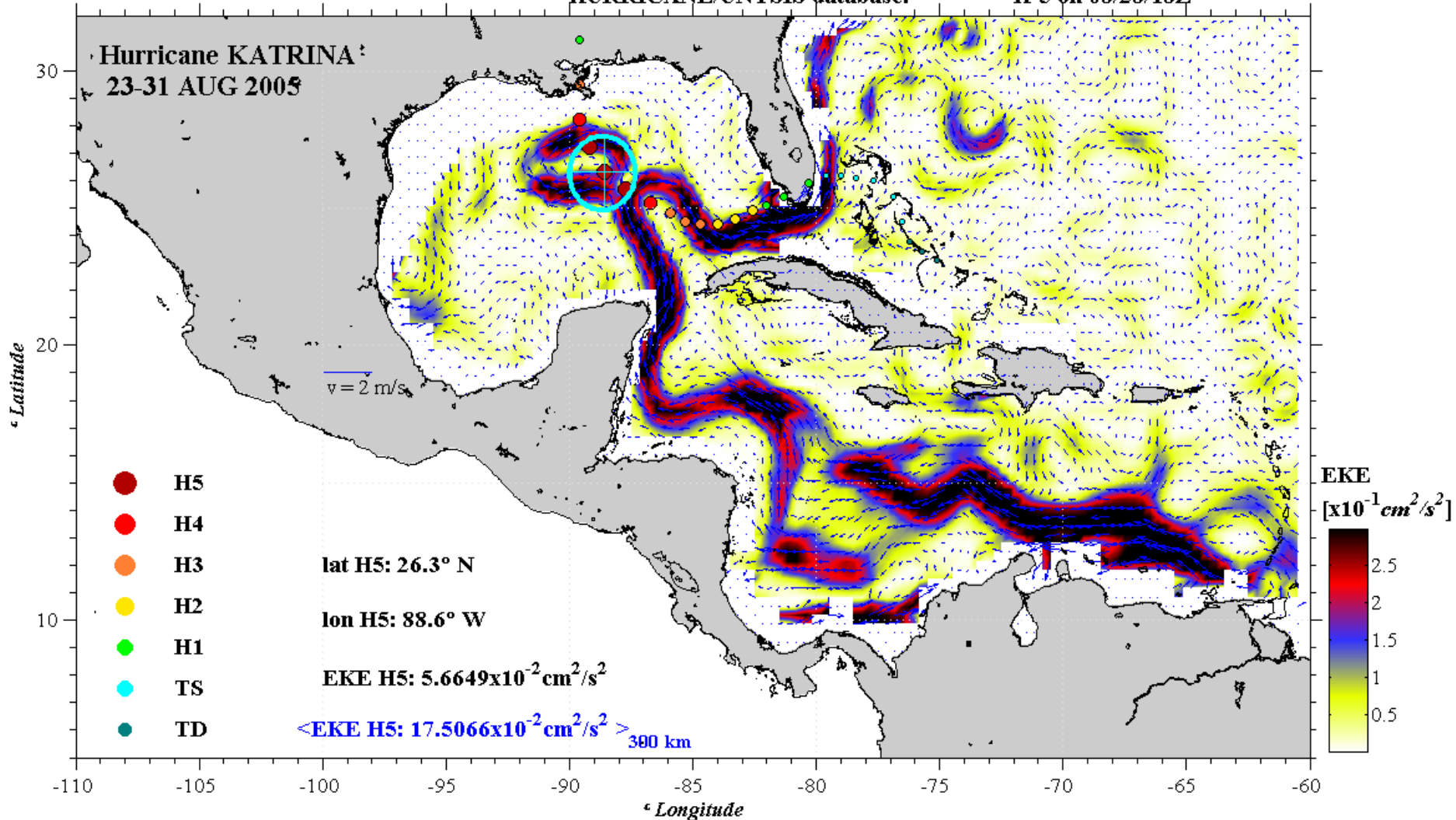
SLA on 9/11, 2004
H-5 on 09/12/00Z



EKE ~ H4 : Katrina 2005, GM

ADT/DUACS EKE database:
HURRICANE/UNYSIS database:

EKE on 8/24, 2005
H-5 on 08/28/18Z



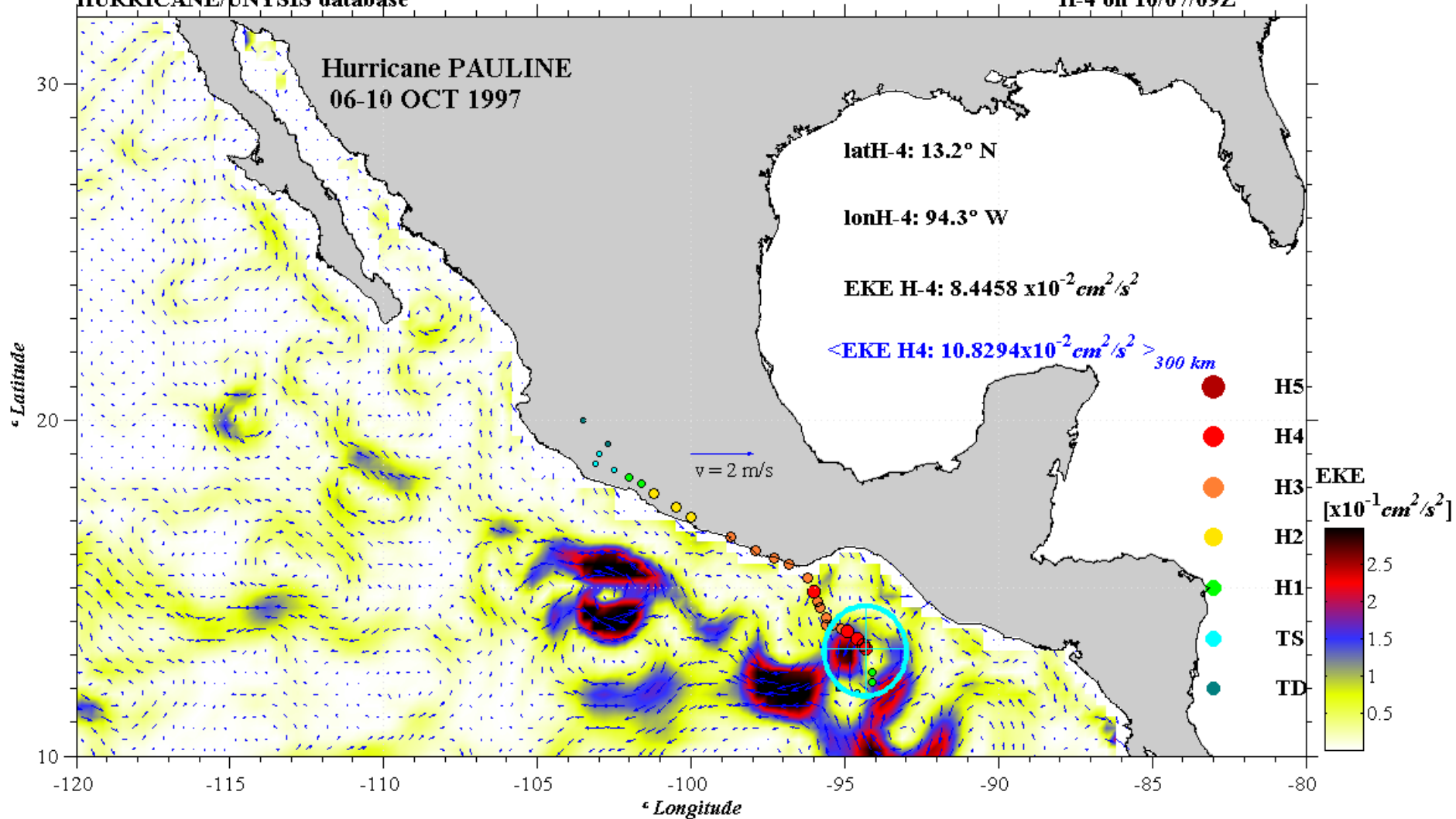
EKE ~ H4 : Pauline 1997, PTE

ADT/DUACS database

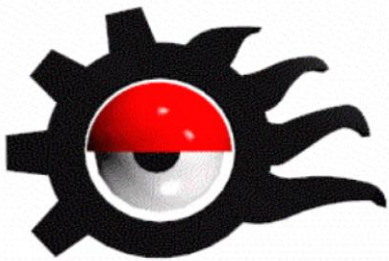
EKE on 10/1, 1997

HURRICANE/UNYSIS database

H-4 on 10/07/09Z



GRACIAS !!!



www.cicataaltamira.ipn.mx
CICATA-IPN Altamira, orzosam@yahoo.com