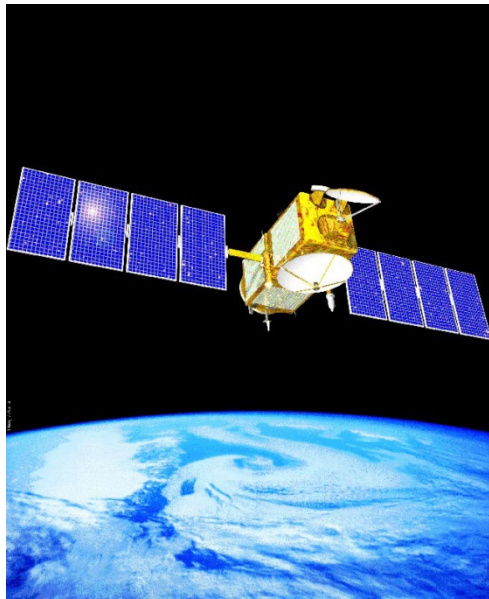


Jason-1 : 11.5 years of scientific achievements

(or, the little engine who could ...)

Rosemary Morrow, Pascal Bonnefond, Lee-Lueng Fu, Josh Willis, Thierry Guinle & Glenn Shirtliffe, and many others...



When Jason-1 was launched he had a mission lifetime of 3-5 years

Instead, he had an extraordinary 11 ½ year life:

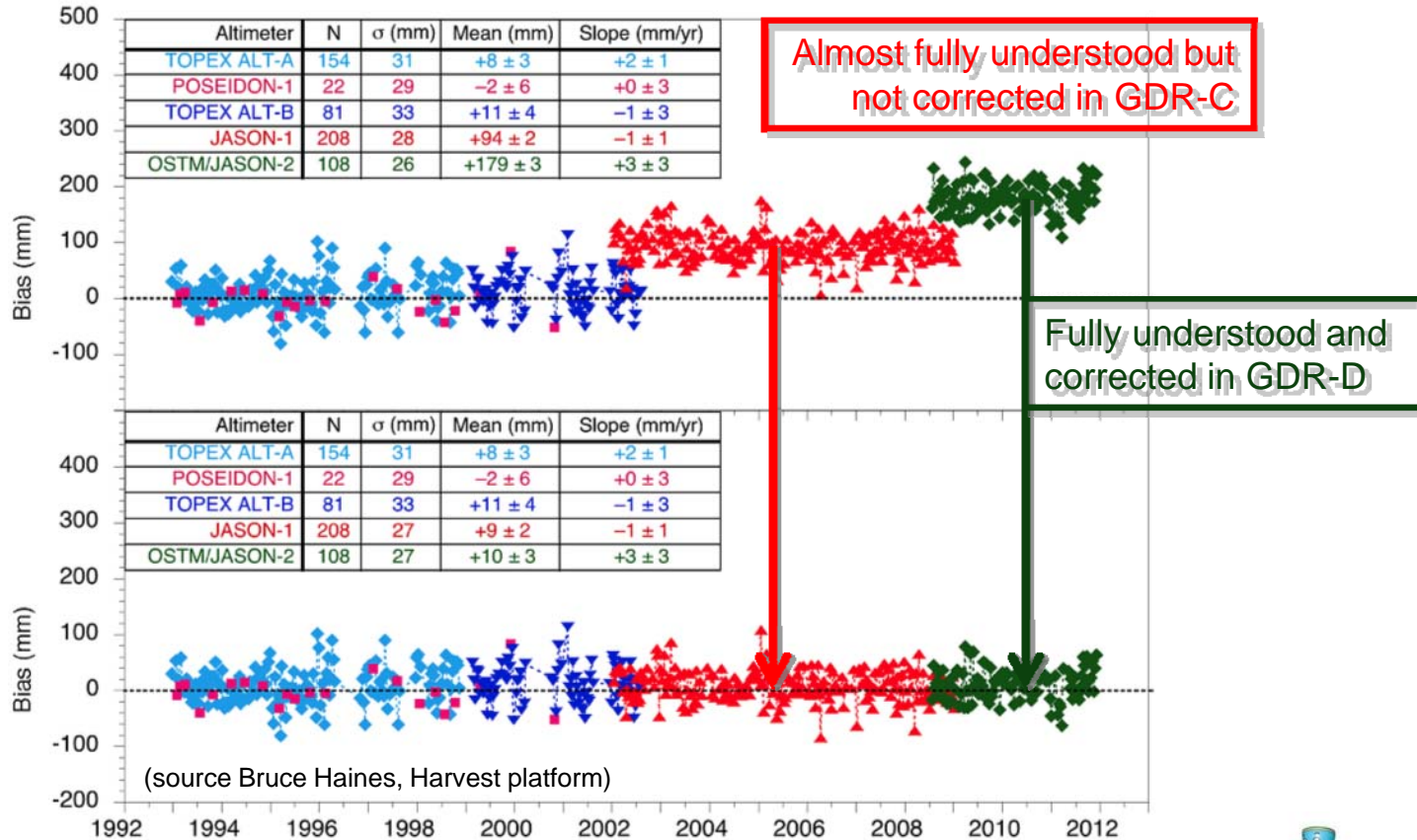
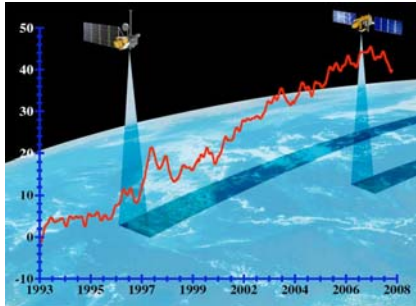
2002-2008 :
Reference mission

2009-2012 :
Interleaved orbit

2012 -2013 :
Geodetic orbit

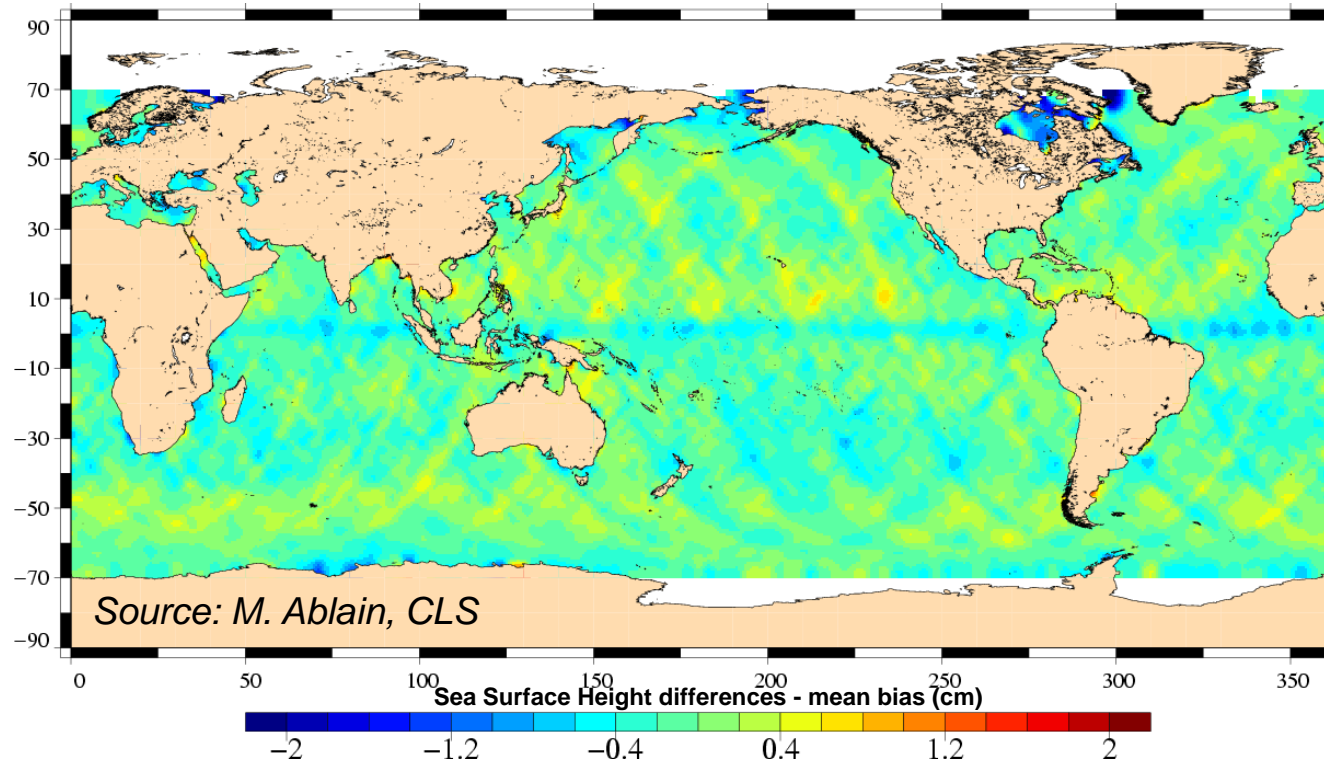


Building long-term time series using consistent data records from multiple satellites.



Building long-term time series using consistent data records from multiple satellites.

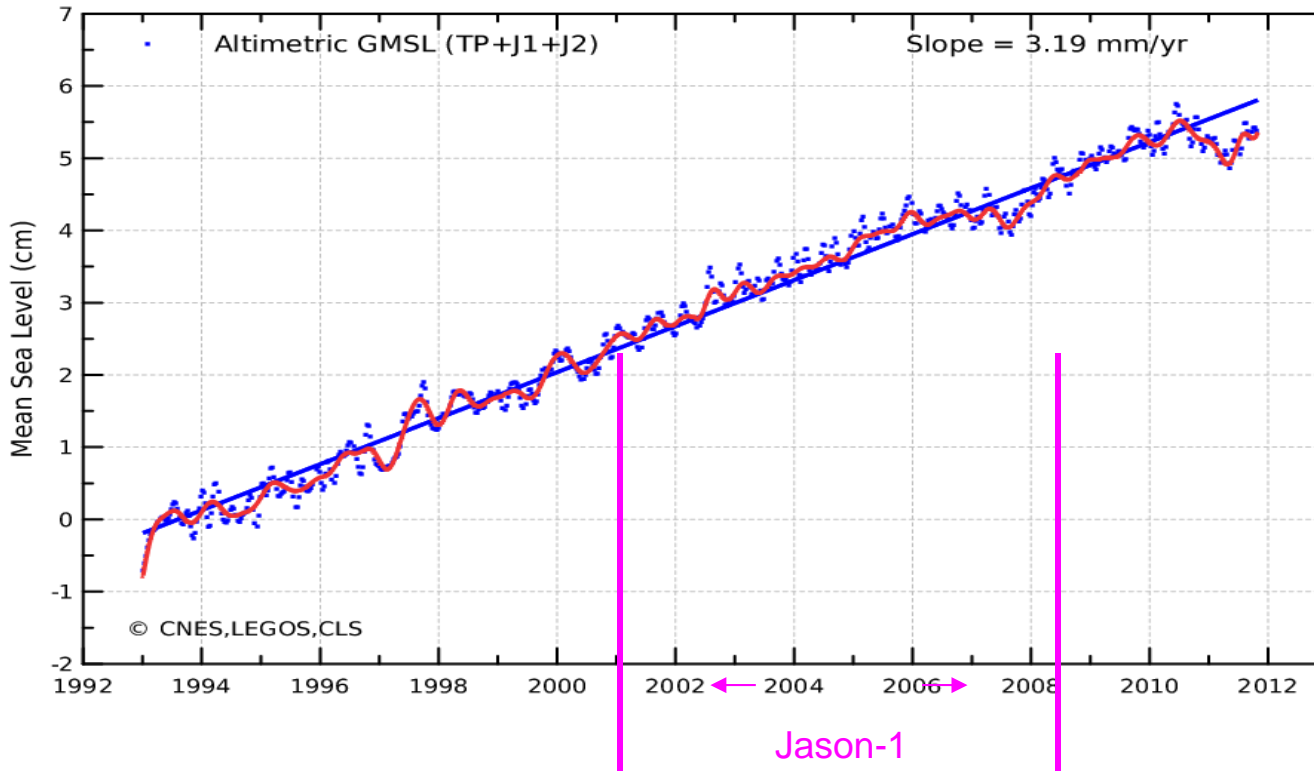
T/P – Jason-1 Sea Surface Heights during the Formation Flight Phase



New SSB for T/P and Jason-1, consistent orbits for T/P and Jason-1, new ranges for T/P (LSE) and Jason-1 (MLE4)

Jason-1 : 11.5 years of accomplishment, OSTST - 9 Oct 2013

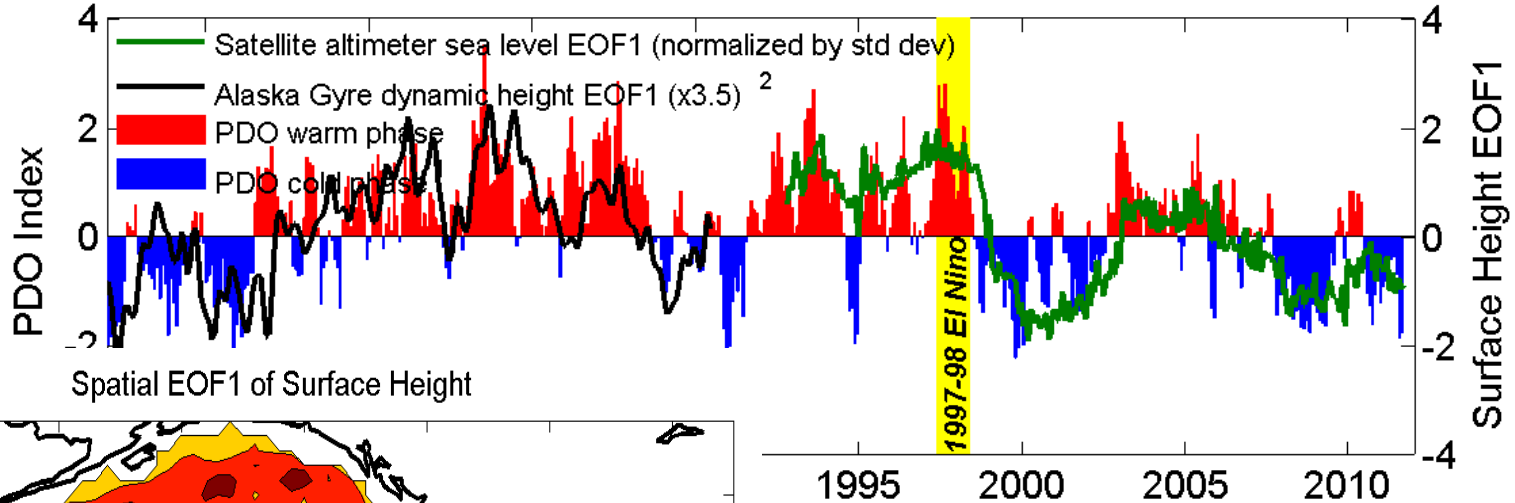
Global Observations of sea level rise



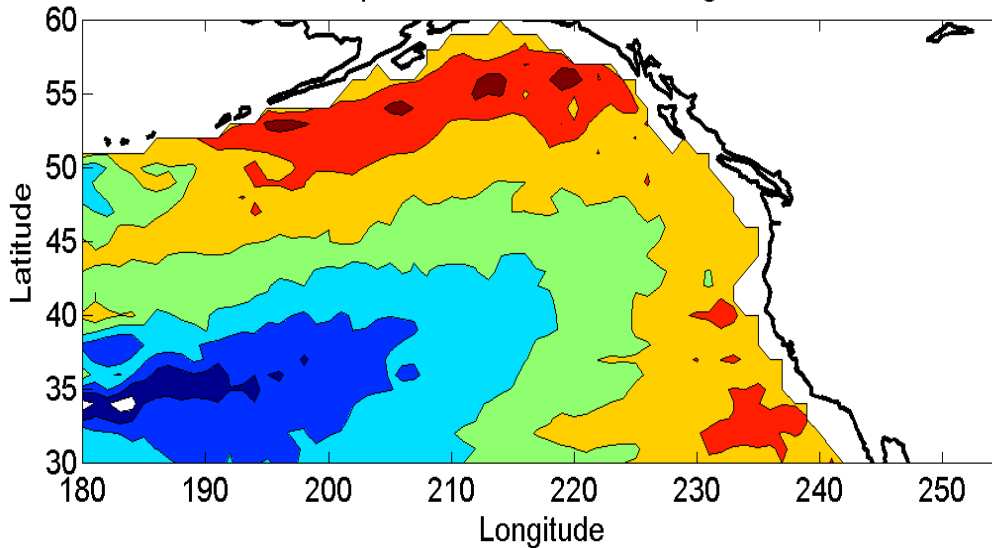
Seamless transition of the global mean sea level record from Topex/Poseidon to Jason-1 to Jason-2



PDO SST Index and Surface Height EOF's as of Sep.29,2011



Spatial EOF1 of Surface Height

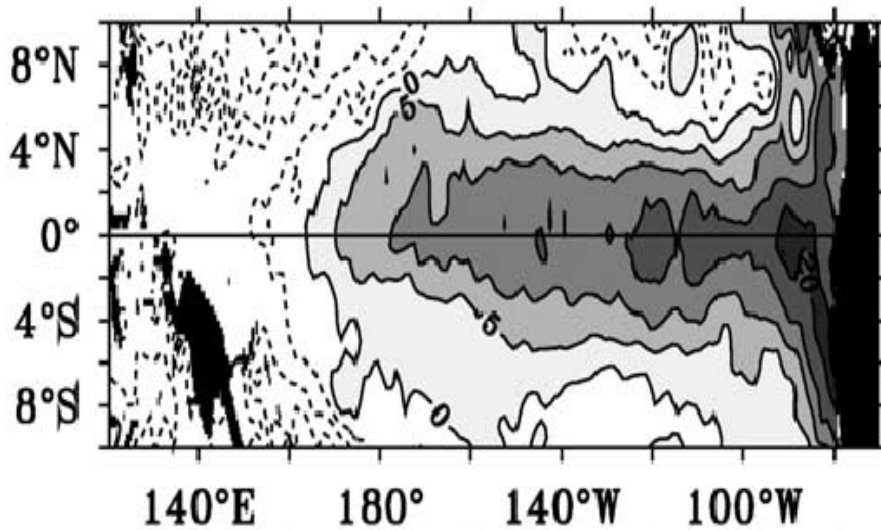


As the record length grew to longer than 10 years, decadal signals in SSH began to emerge

Cummins et al. (2005)

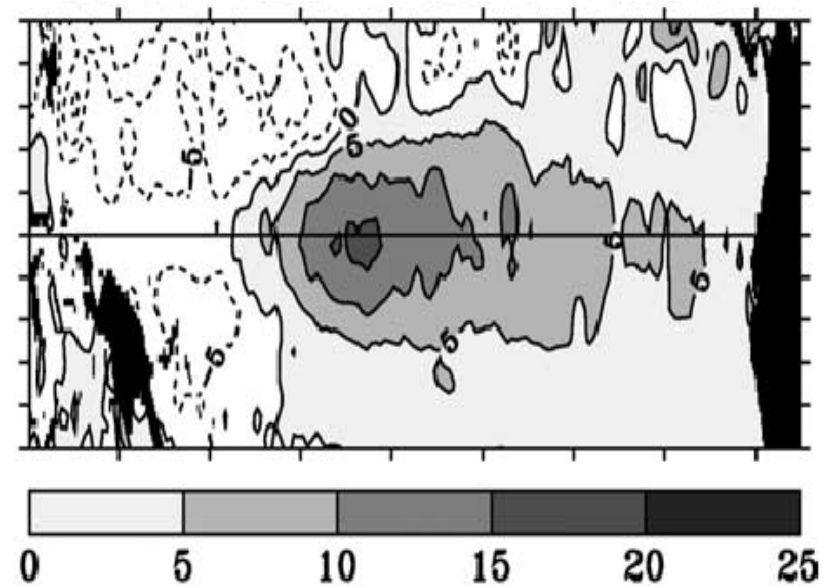


East Pacific El Niño



1997-1998

Central Pacific El Niño



2002-2003

(Bosc and Delcroix., 2008)



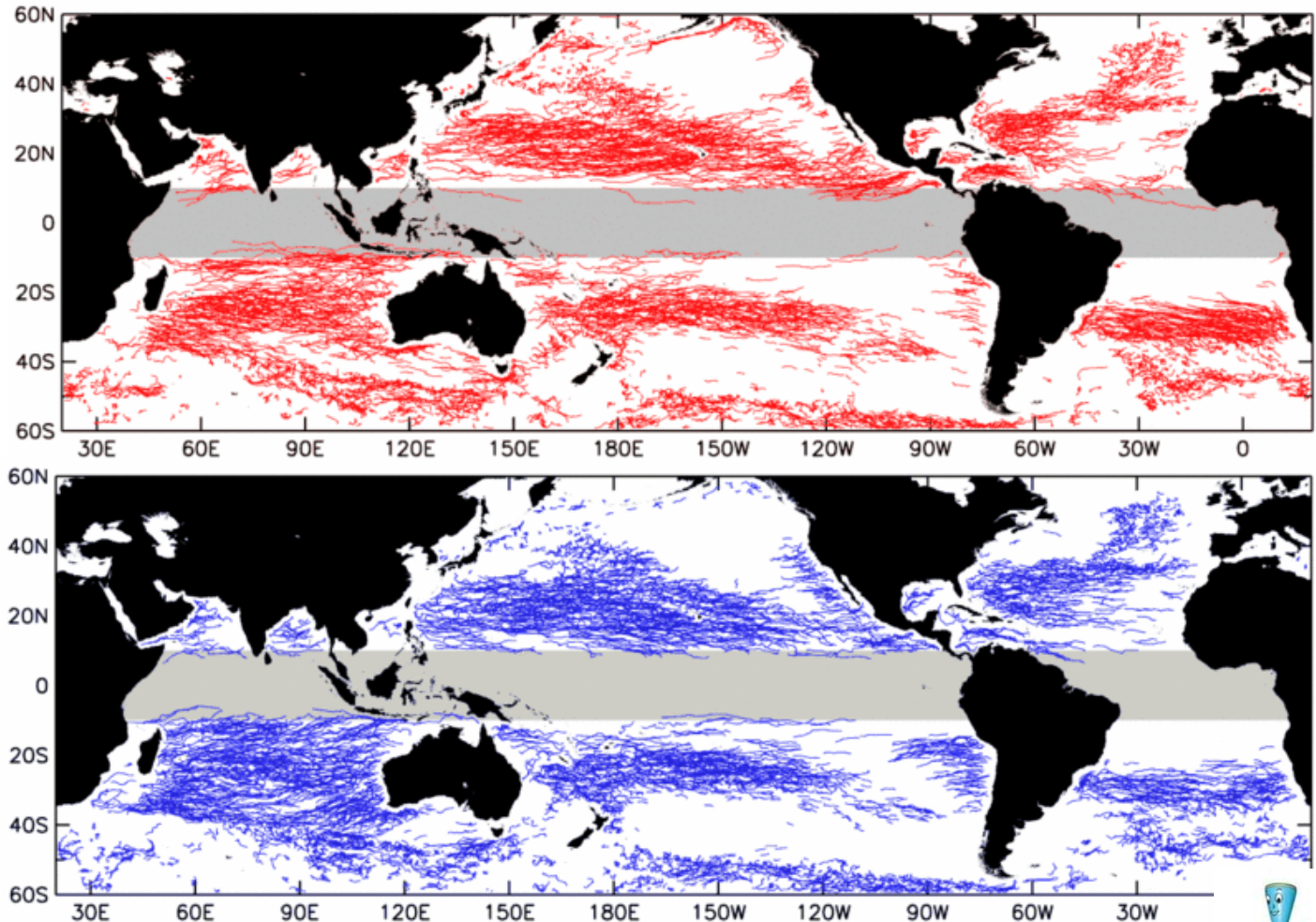
dual mission : T/P-ERS then J1-ENV

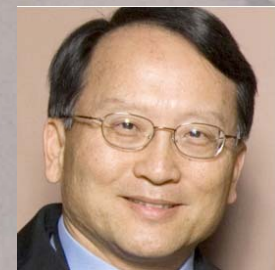
Tracking eddies
from 16 years of
dual mission
altimetry

**Anticyclones
(warm)**

Cyclones (cold)

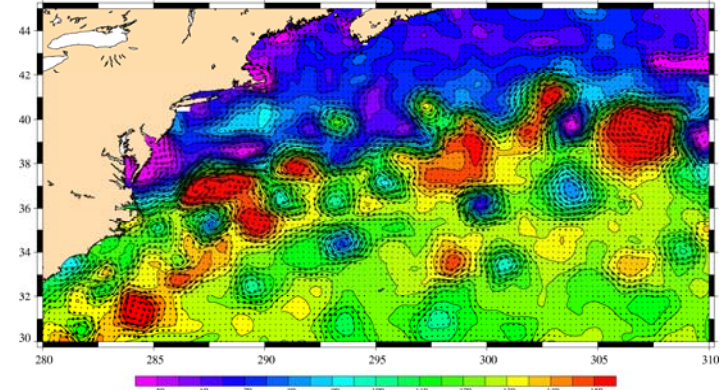
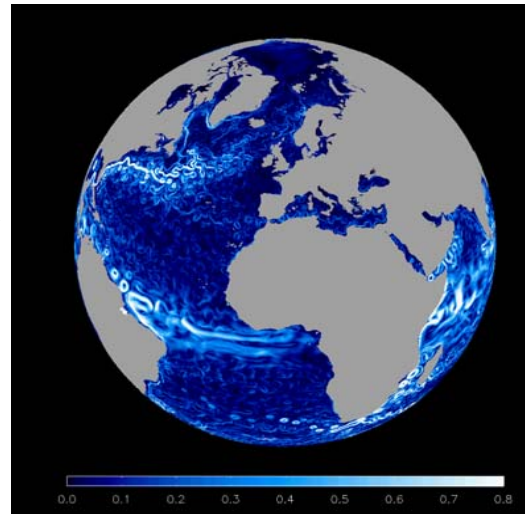
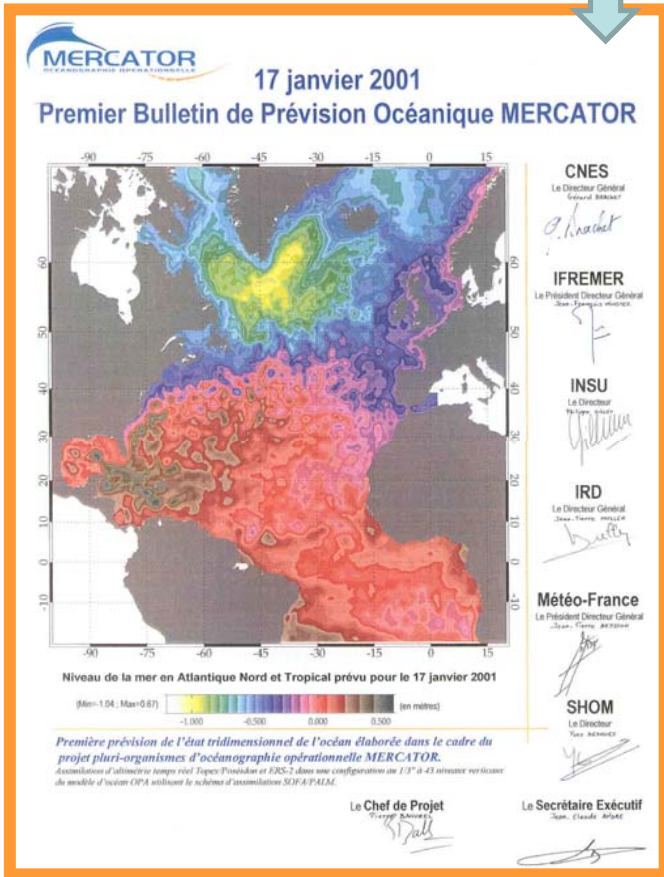
Chelton et al (2007)







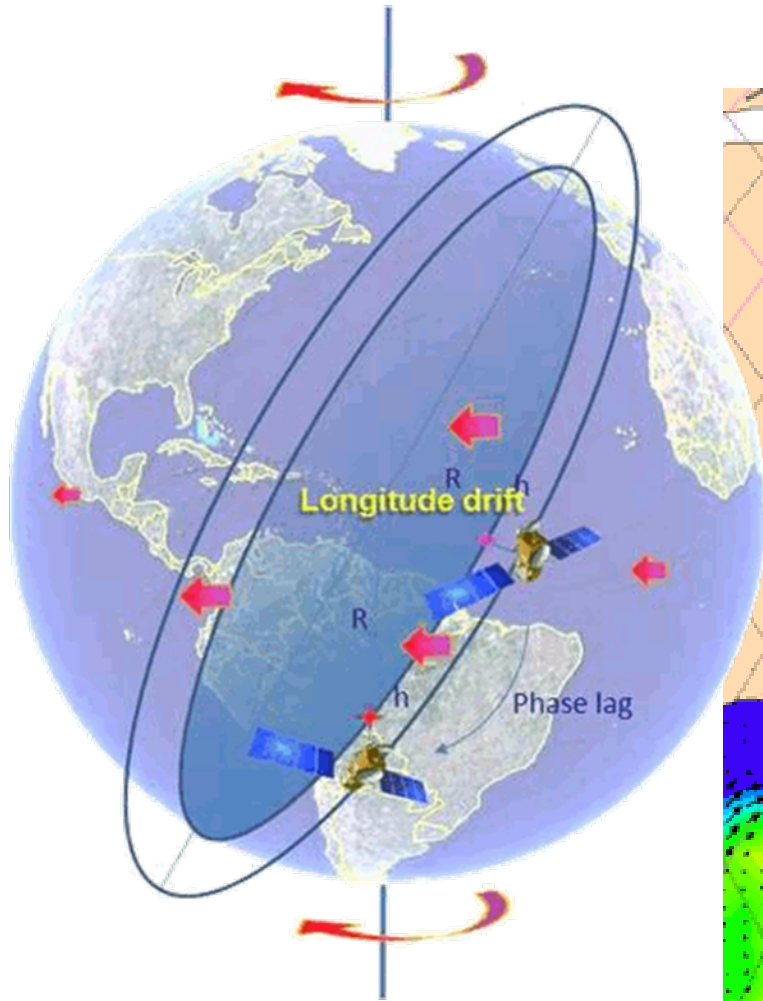
**Mercator Ocean (2002-2013+):
1st bulletin at 1/3° in N Atlantic
to global 1/12° system**



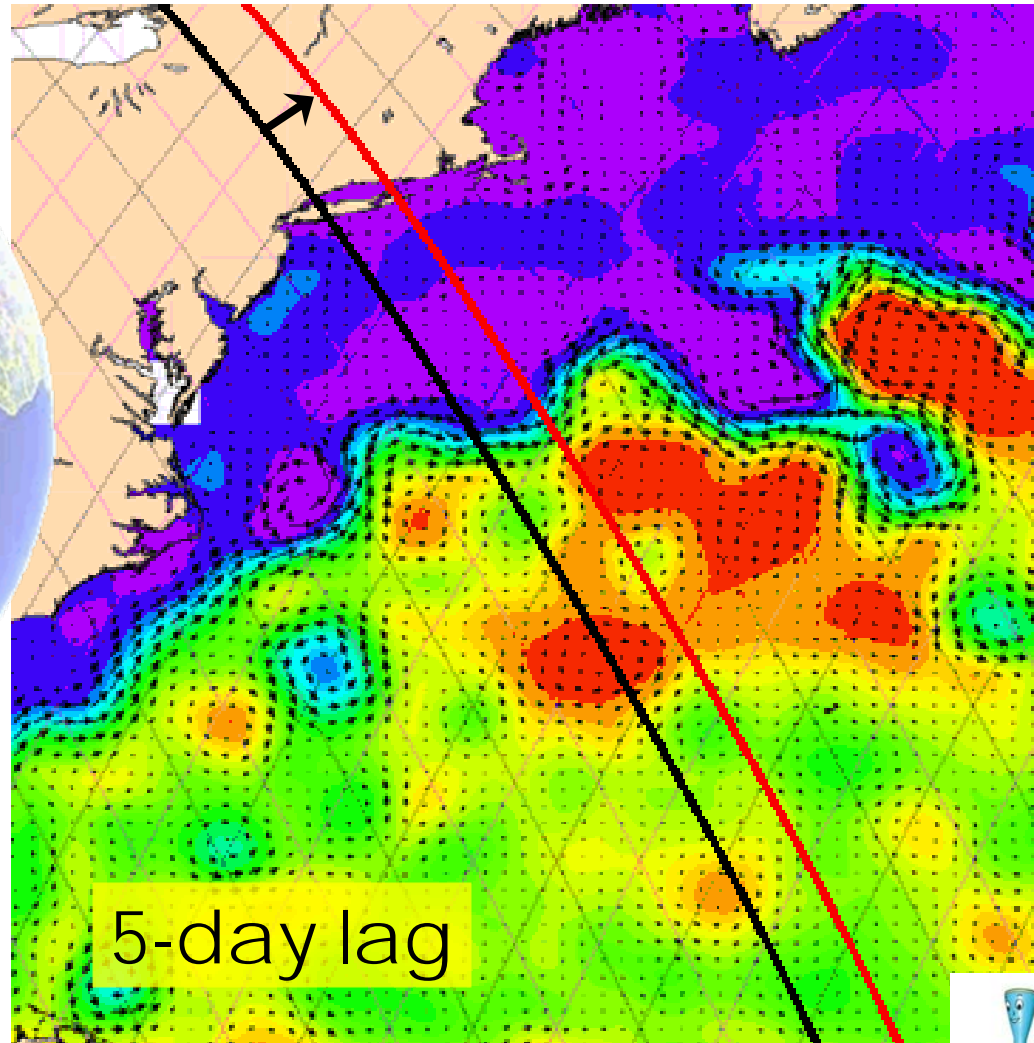
**High resolution sea level and currents from
Jason-1, ERS-2 and GFO**

<http://www.aviso.oceanobs.com/duacs>

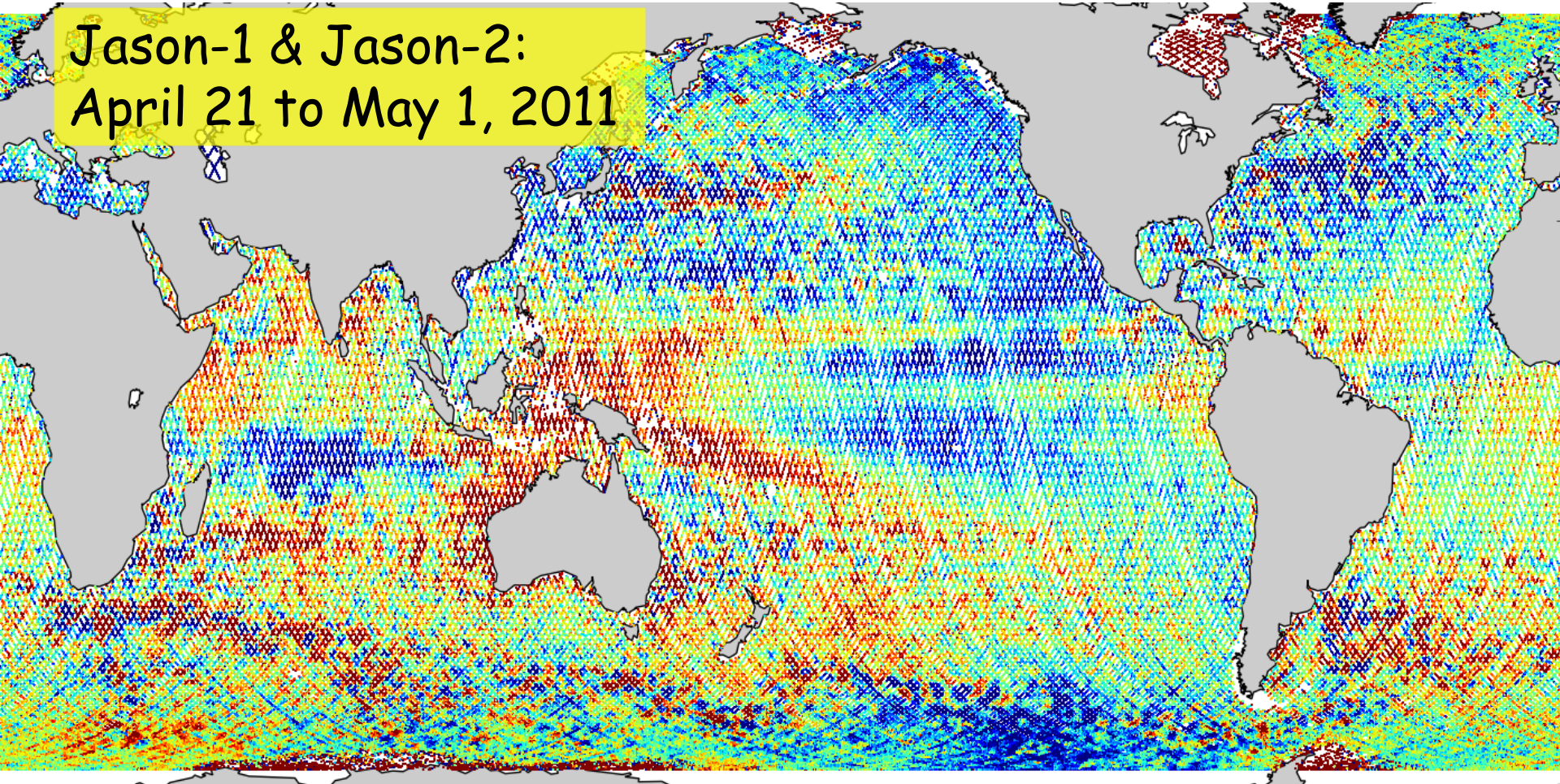




Jan-Feb, 2009



Jason-1 & Jason-2:
April 21 to May 1, 2011

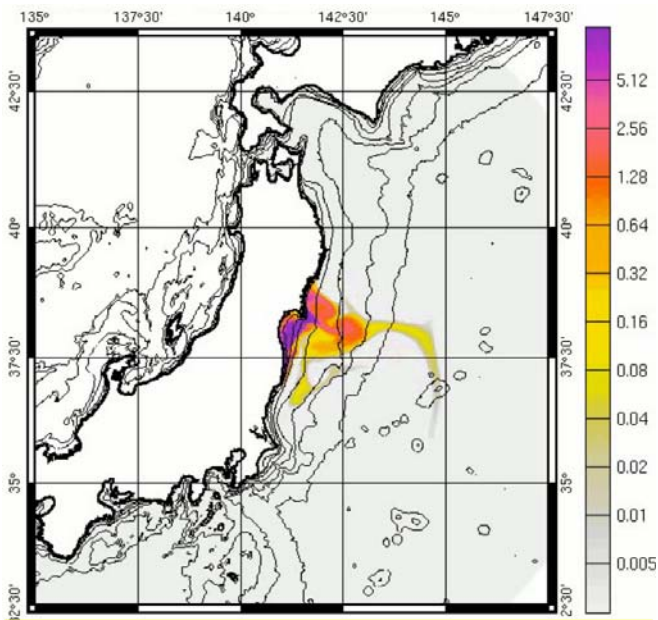


Jason-1 and Jason-2 data used in ocean models to predict dispersion of radioactive particles

Fukushima Nuclear Reactor

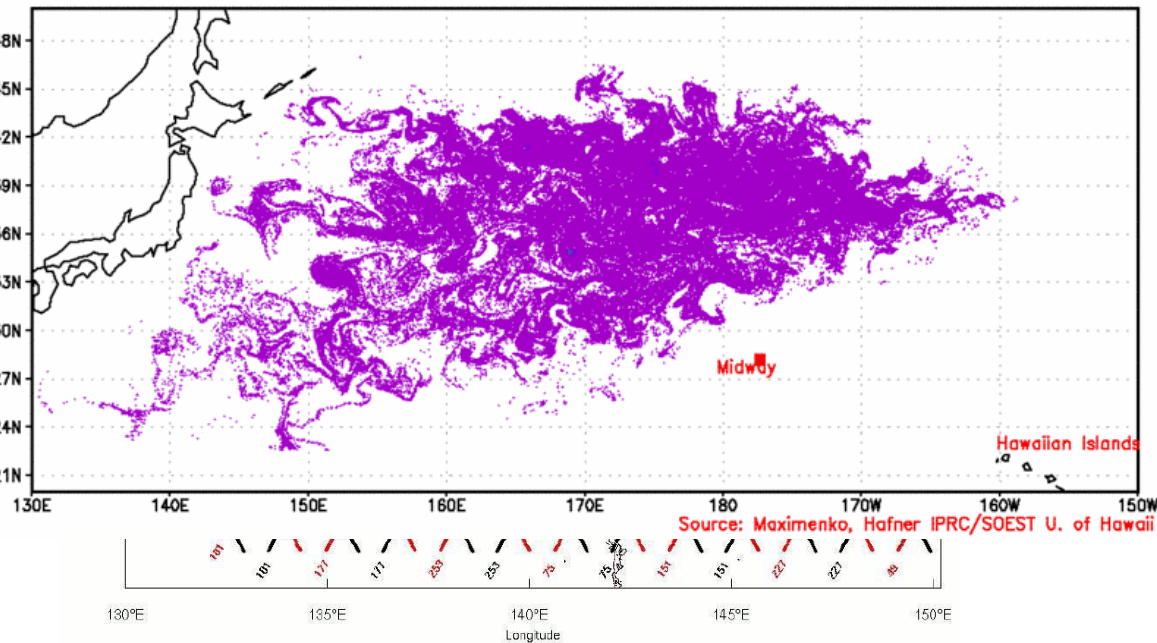


MAR 2011



From SIROCCO, Toulouse at the request of IAEA

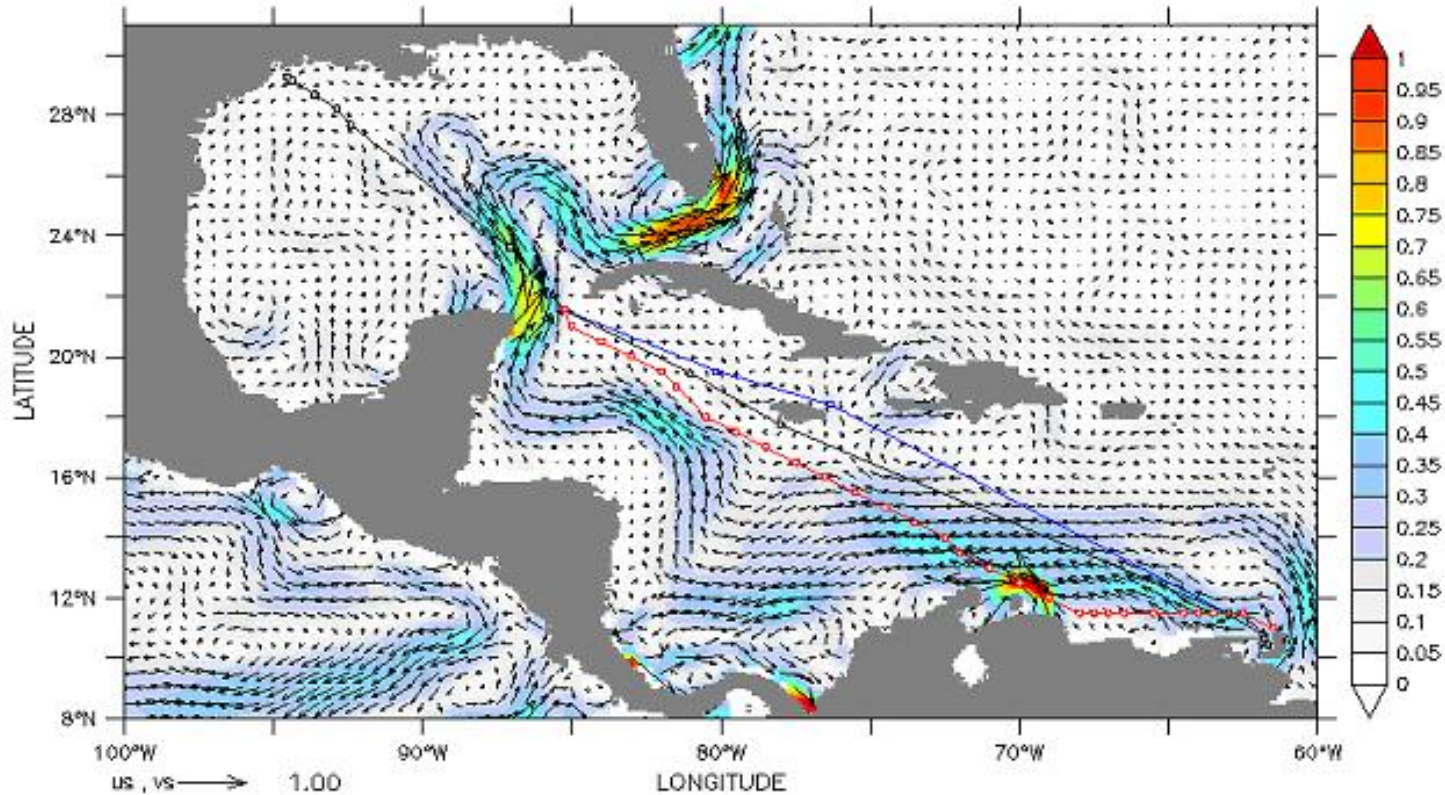
08JAN2012



& Monitoring Tsunami debris



Courant_total_climato_z0



Time : 01-MAR-2008

Current (m/s)

Gain of 5 T of fuel over the Trinidad – Houston line
by optimising the route using assimilated currents



Nearing official retirement, Jason-1 started having some operational problems.

High risk of losing control of the satellite and leaving 2 altimeters (T/P & J1) with a collision and debris risk on the long-term climate orbit altitude

San Diego OSTST Meeting : Oct 2011 :

“ After considering **recommendations made by the OSTST** regarding the ongoing operation of Jason-1, NASA and CNES agreed to **continue operating Jason-1** in its present (interleaved) orbit **until the launch and validation of a new altimeter mission such as SARAL/AltiKa** (scheduled for launch in 2012). After this (or at the end of 2013, whichever comes first), **Jason-1 will be maneuvered into a geodetic orbit ...”**

Indeed, Jason-1 was moved to a geodetic orbit, with a good mesoscale sub-cycle, in May 2012.



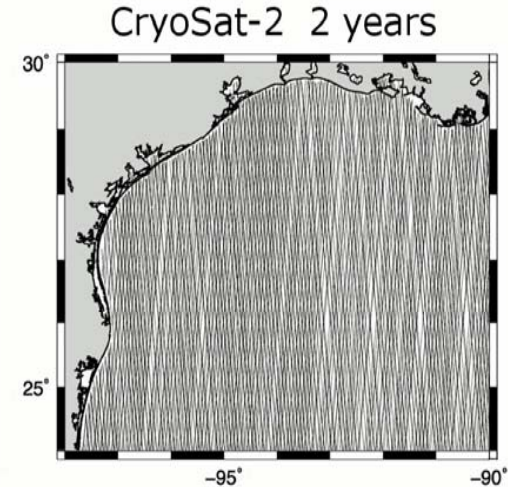
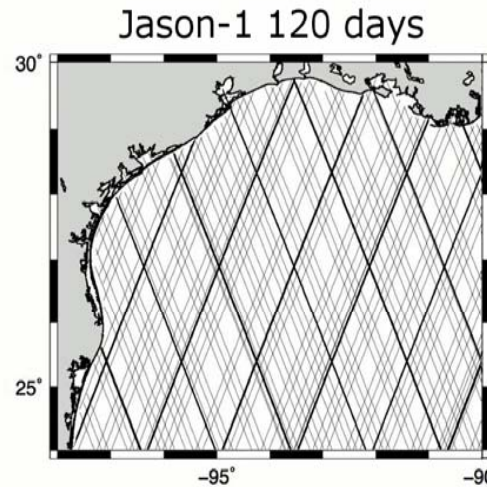
Why make geodetic measurements from Jason-1?

Past geodetic altimeter missions provided valuable short-scale geoid observations (Geosat-GM, ERS-GM, CR-2)

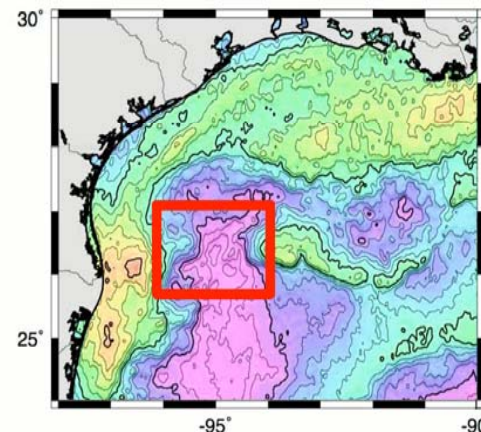
These high-inclination orbits provide mainly the N-S geoid slope in the tropics. Jason-1, on a lower inclination, provides valuable E-W gradients

Selected 406-day geodetic orbit had good sub-cycles for mesoscale studies

Help chart seamounts > 1 km



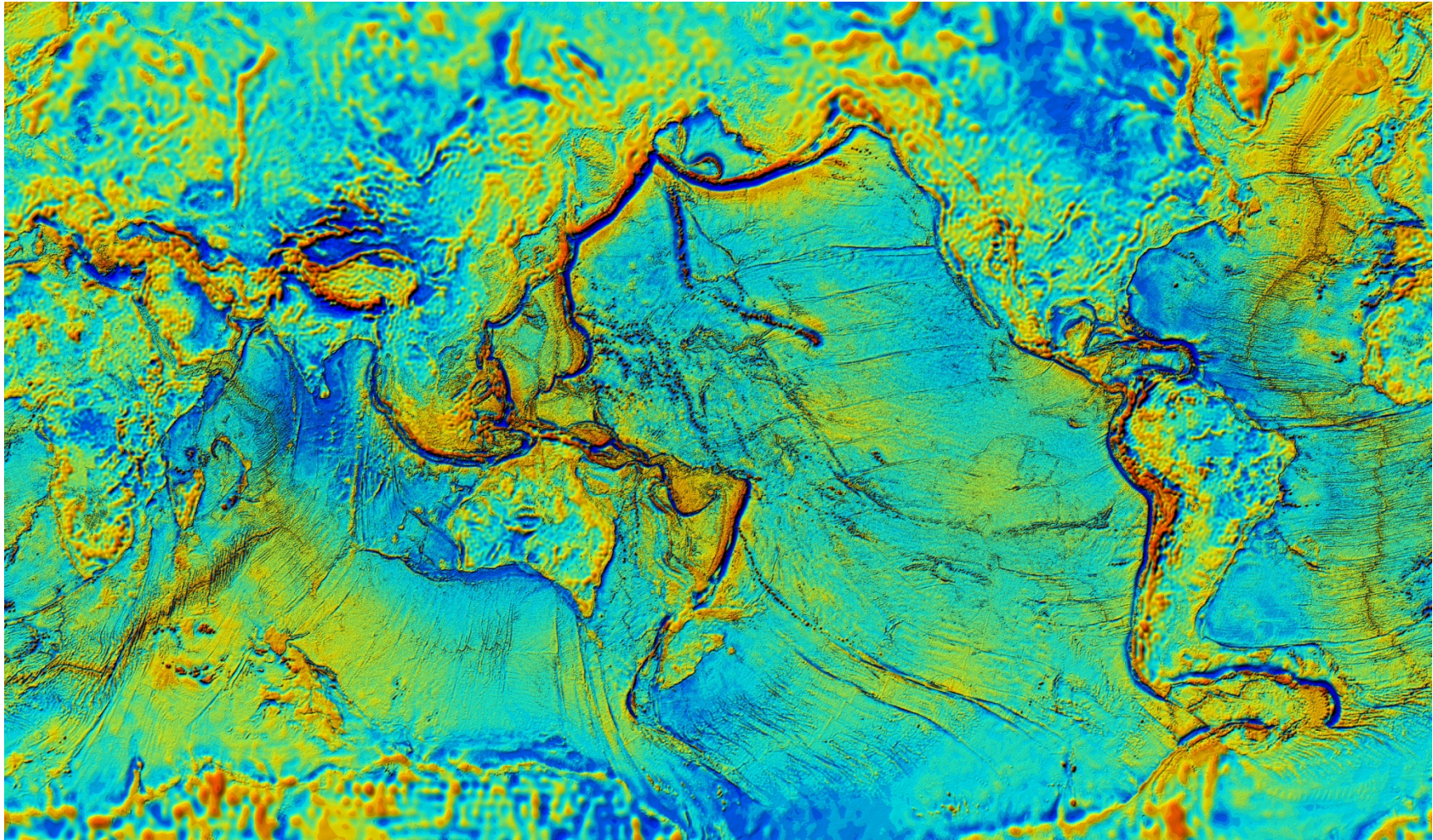
Marine Gravity (10 mGal Contours)



Including the first 120 days of Jason-1 data improves agreement with in situ obs by 16 %.

(W. Smith, Pers. Comm.)



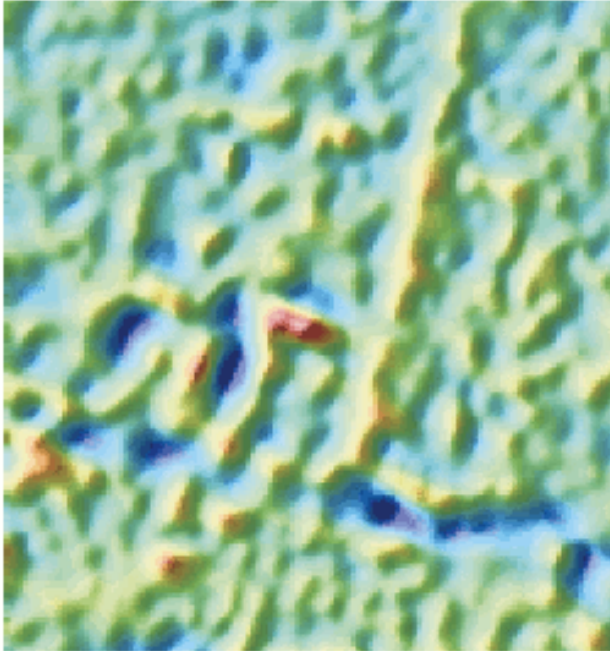


D. Sandwell, pers. Comm.

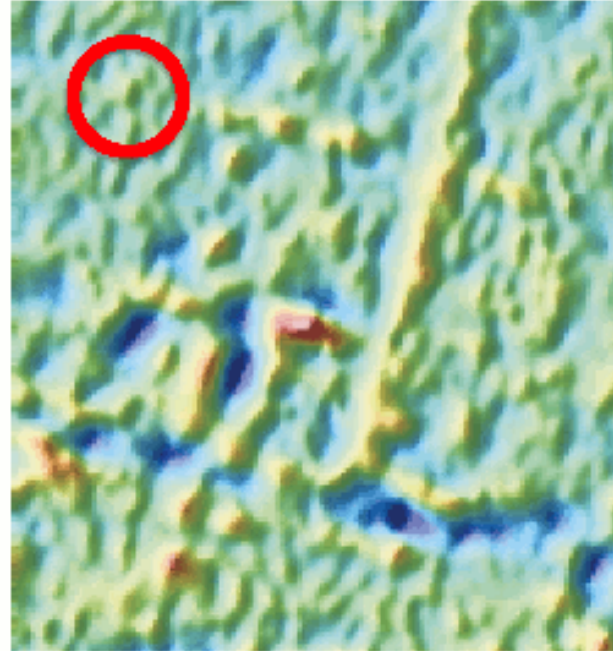


Marine Gravity improvements in the Pacific

Without Jason-1



With Jason-1



Estimates of sea floor topography near the East Pacific Rise made without (left) and with (right) Jason-1 data during the geodetic mission. Adding the Jason-1 geodetic data sharpens features in the abyssal hills and has revealed a new seamount, as highlighted by the red circle. (*W. Smith, Pers. Comm.*)



Due to the dedicated work by the CNES and NASA operations teams, Jason-1 continued making precise observations until :

- SARAL/ALtiKa was launched (25 Feb 2013) and first cycles are validated
- It had completed its 406 day geodetic cycle June 17, 2013

Jason-1 passed away quietly (stopped transmitting to the ground stations) on June 21, 2013



- Throughout its long lifetime, **Jason-1 fulfilled all of its science & operational requirements**, during its reference mission, interleaved mission, and geodetic mission
- Jason-1 : start of the **long term vision of the Integrated Approach** : satellite altimetry & SST + Argo + models/assimilation
- Jason-1 provided **precise altimetry data up till the end** (still > 95% data coverage in 2013) ... *phew, I think I can ... I think I can*
- **Improved marine gravity field** from Jason-1 and CR2 helps identify undetected sea-mounts and ridges, and will improve bathymetry needed for future fine-scale ocean applications
- **Mission finished but not over** ... climate record continues and may require future J1 reprocessing
- All was possible due to the **competence & motivation of the Project & operations teams**, & the tight links with the **scientific community (SWT, OSTST)**, ... *and the little engine who could!*

