Twelve years of Images of the Month on Aviso web

Telling stories of altimetry

Aviso web
www.aviso.oceanobs.com

- Created in 1995
- Frequently updated:
  - Background updates
  - About two news (at least) per week
  - « hot news » (hurricanes, flooding, storms, events…)
  - **Regular chronicles**
    - “Lively data” (since 2003) (~monthly)
    - “press review” (since 2002) (~weekly)
    - Image of the Month

“Image of the Month”

- A regular chronicle since November 1998
- To highlight the variety of subjects linked with altimetry and Doris:
  - Oceanography,
    - from altimetry alone,
    - but also merging satellite sensors (altimetry/SST, altimetry/ocean color, altimetry/SAR…),
    - or merging techniques (altimetry/in situ, altimetry/models…)
  - But also:
    - Climate studies
    - Rivers and lakes height measurements
    - Ice studies
    - Some satellite/instrument information
- Highlighting YOUR work
- Telling stories of altimetry,

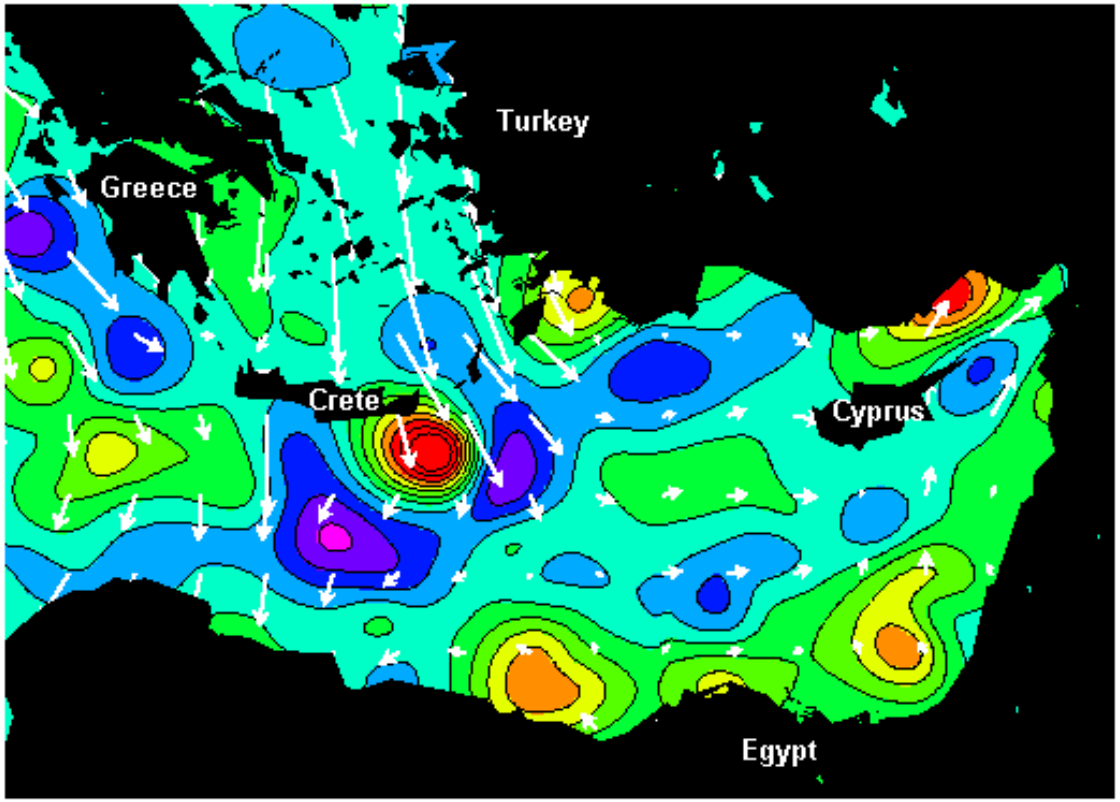
STARRING

Recurring heroes

An eddy blown by the wind

Image of the Month - Jun. 1999

Ierapetra Gyre

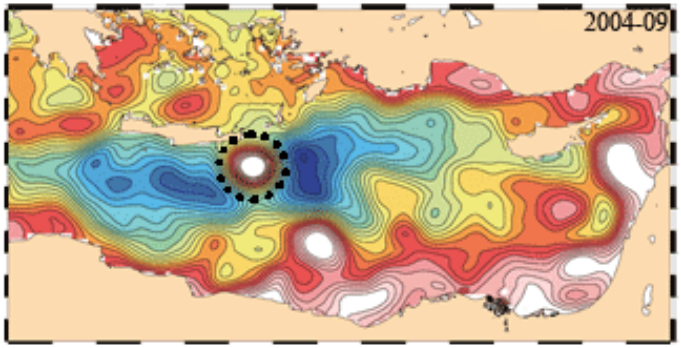


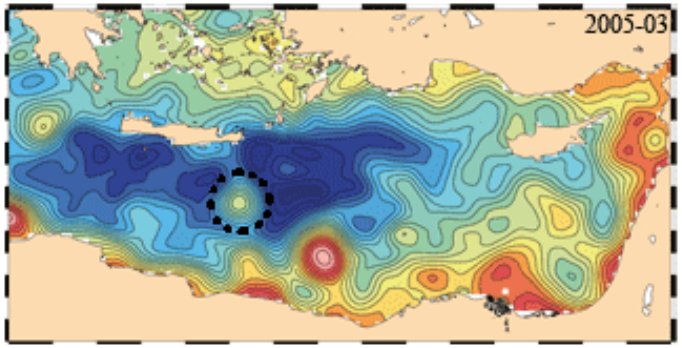
Sea level anomalies and wind speed in the Eastern Mediterranean during the summer of 1994. The anticyclonic Ierapetra gyre (in red, south-east of Crete) forms as a result of wind interactions with the relief on Crete. (Credits CLS/MATER)

The winds and sea are in constant motion and their movements are closely interdependent. The wind not only generates waves, it also drives eddy movements on the ocean surface. For example, in the Eastern Mediterranean, northerly winds called the Etesians interact with the relief on the island of Crete. The peaks on land cause the wind to change course, thus generating swirling movements which the wind transfers to the sea to form what is known as the Ierapetra gyre. The strength of this gyre depends on the speed and direction of the wind.

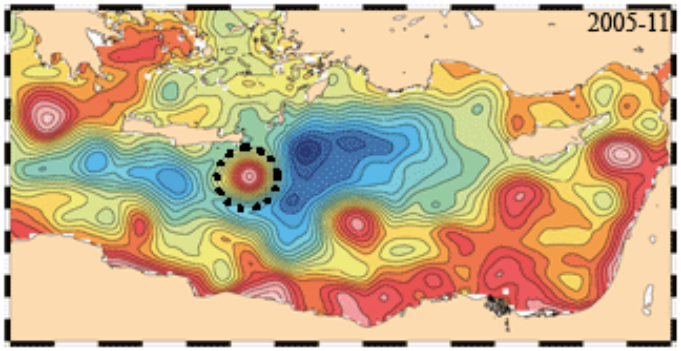
Ierapetra gyre pops in and out

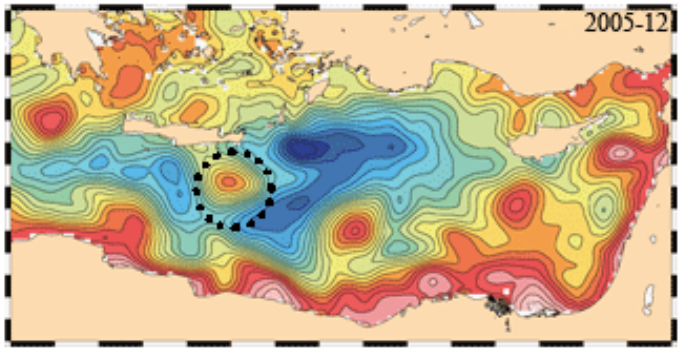
Image of the month - February 2007

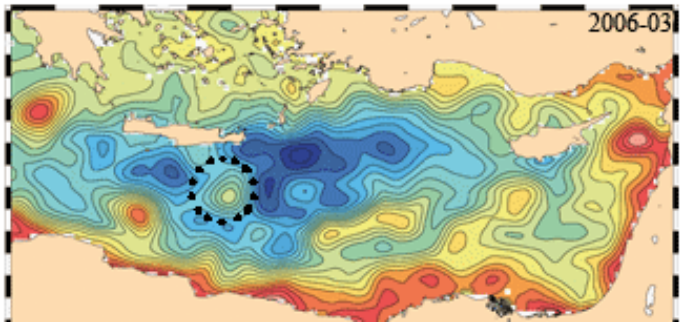


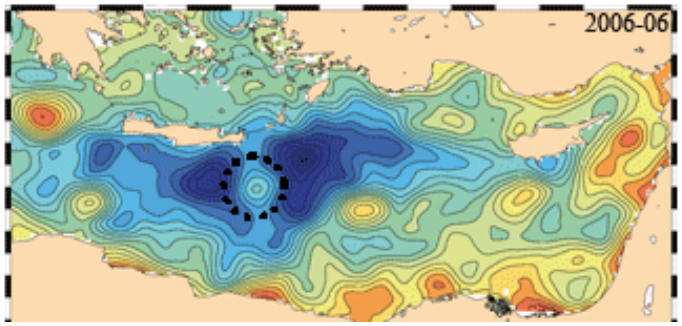


Ierapetra gyre is re-appearing in July 2004 after a period when it was missing. Between October 2004 and May 2005, it migrates first South-Westerly (October 2004 - January 2005), then South-Easterly (January 2005 - May 2005), to finish by interacting and disappearing in the current South of the basin.





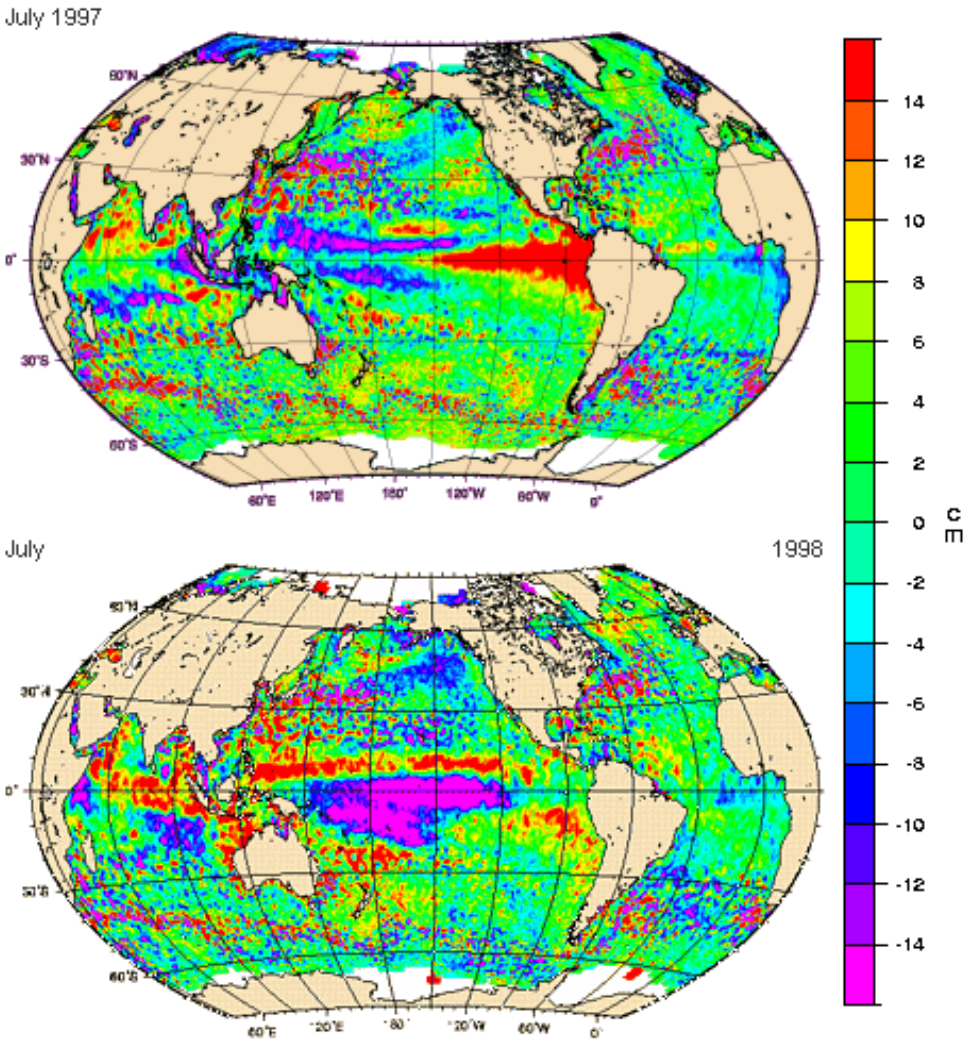




El Niño (& sister)

From El Niño to La Niña?

Image of the Month - November 1998

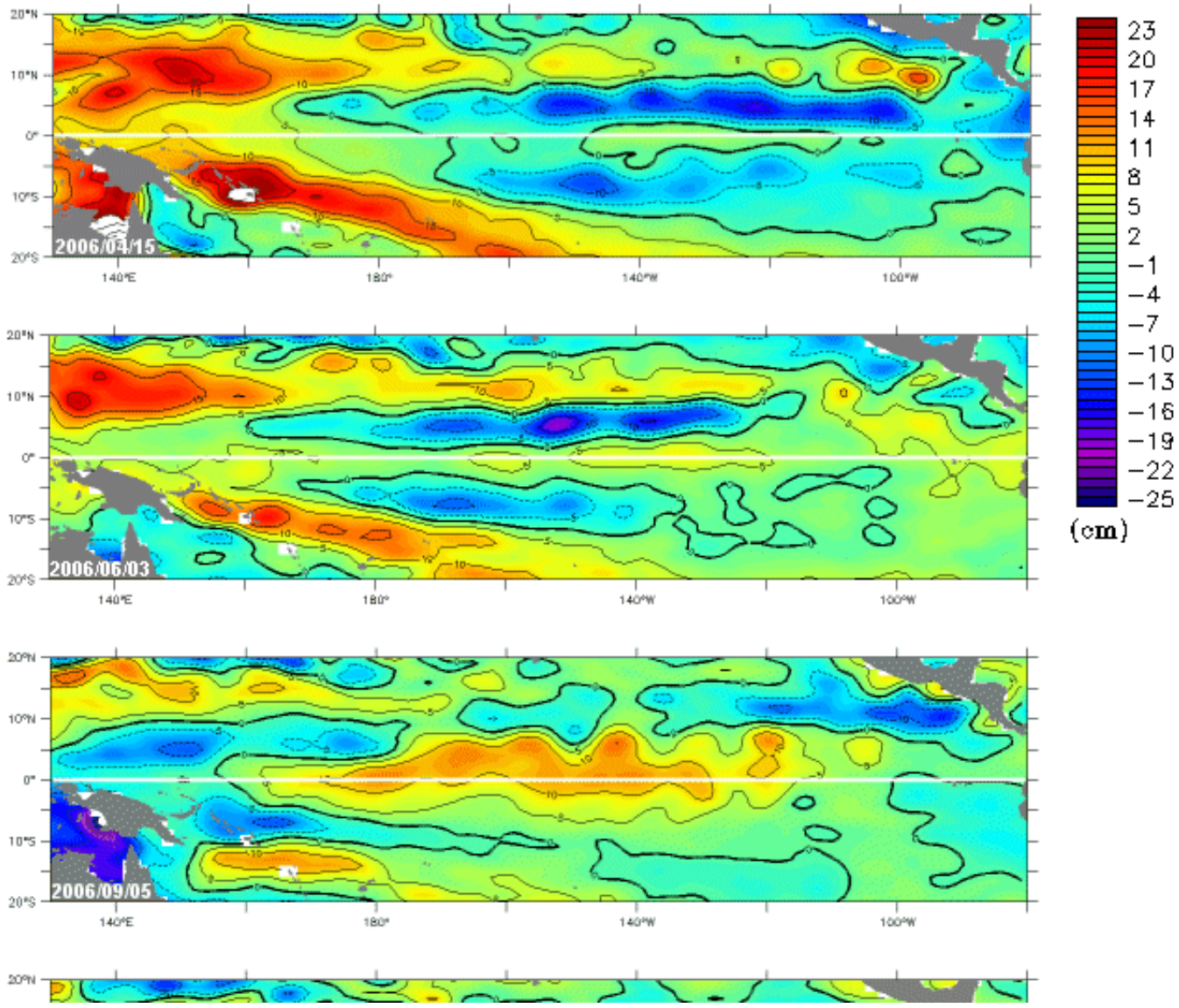


Sea Level Anomalies
(Credits *Ouacs* project, *CLS*)

El Niño on time for Christmas

Image of the month - January 2007

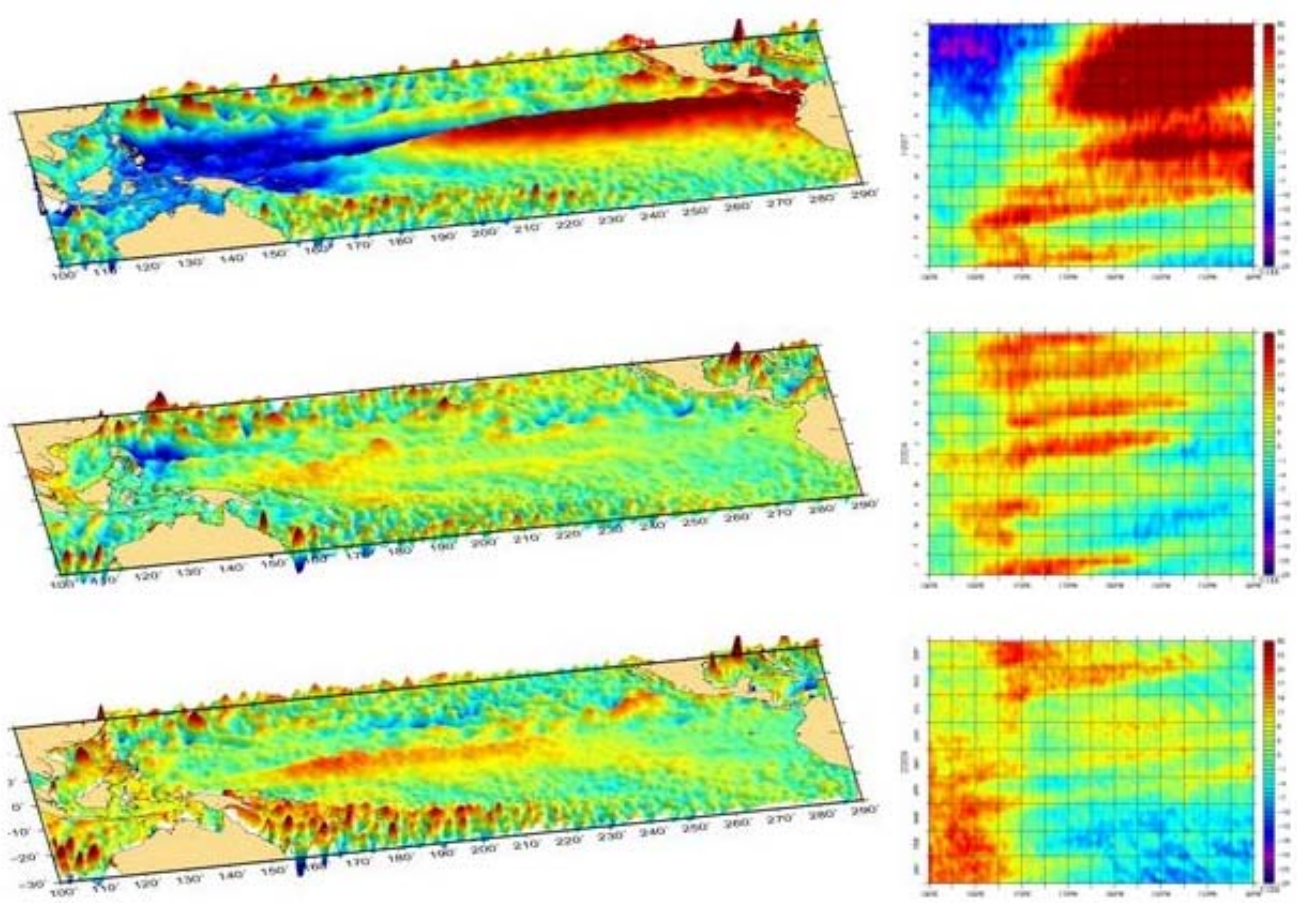
El Niño (& sister)



El Niño (& sister & brother)

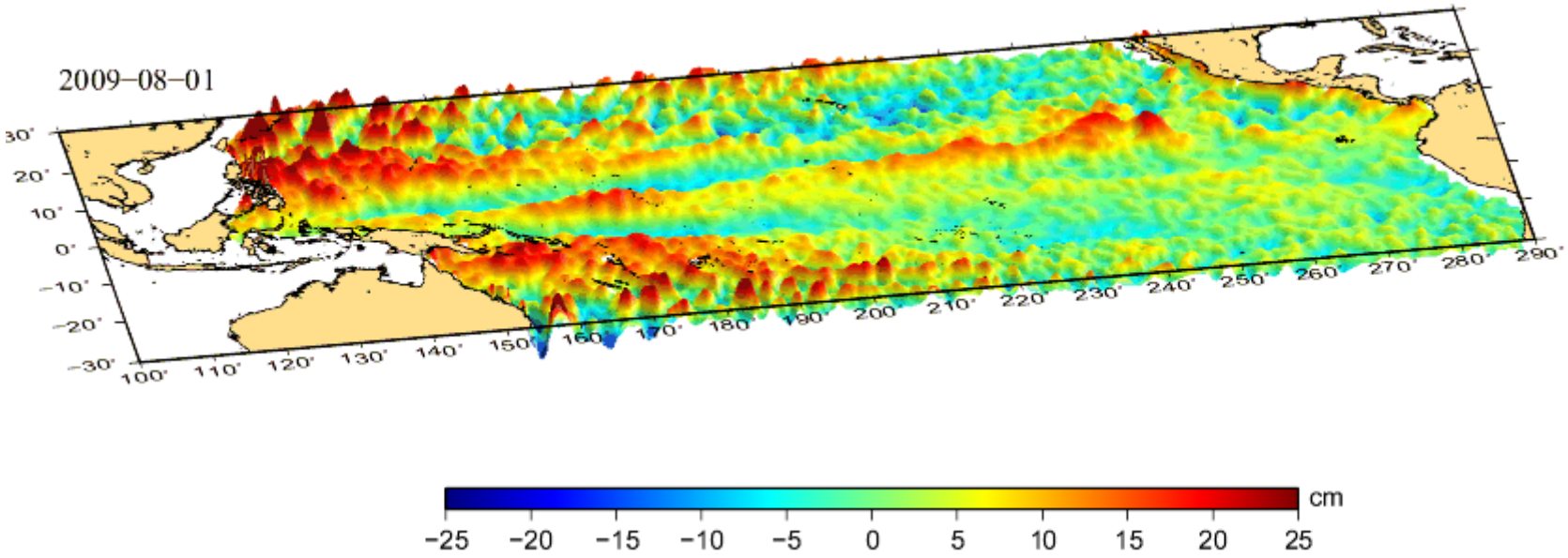
If it's not El Niño, then it must be his brother...

Image of the Month - November 2009



Maps of sea height anomalies measured using altimetry in October 1997, 2004 and 2009, and a longitude-time diagram on the equator for each of these years. In 2004 you can clearly see that the relatively small-scale phenomenon does not reach 90°W (coasts of South America). It would appear that the situation in 2009 is also of this type.

El Niño
(& sister)

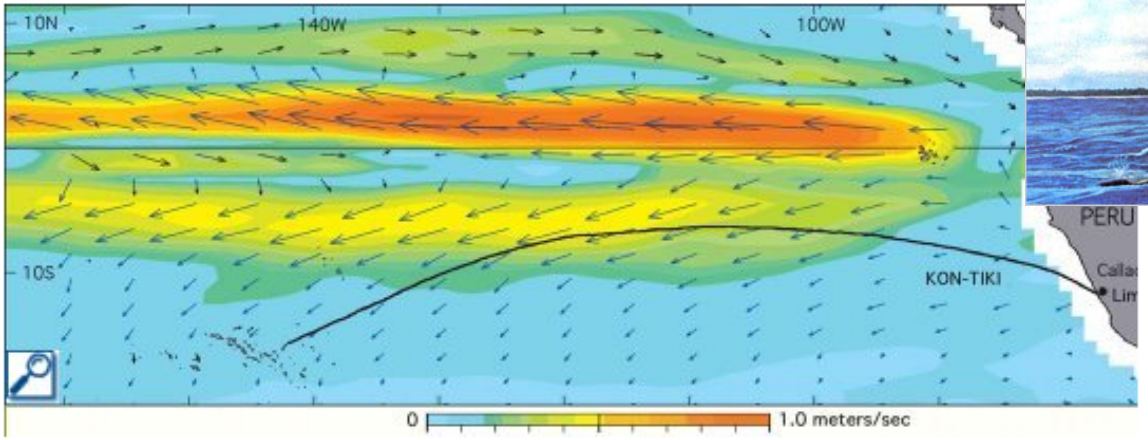


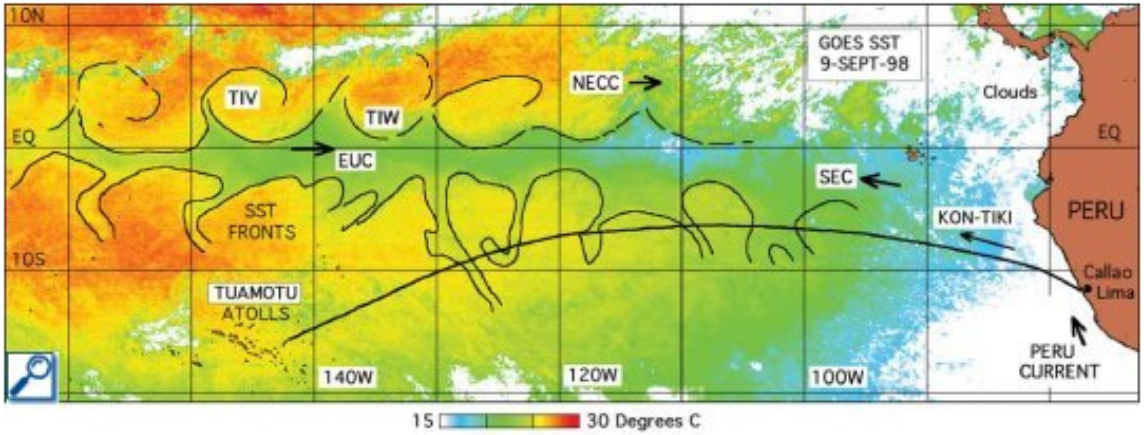
Action!
Suspense!

Adventures in the South seas…

Satellites shed light on the Kon Tiki story

Image of the month - August 2005

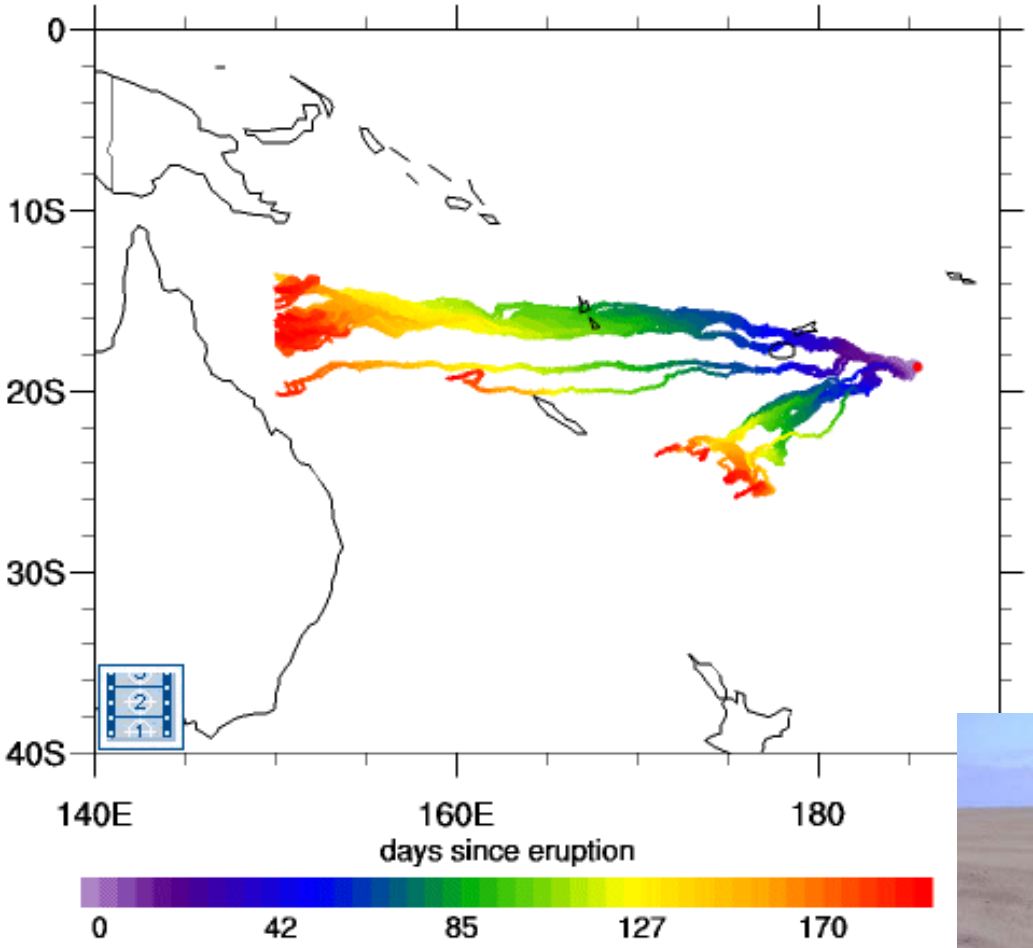




Average currents over 10 days (above), obtained by altimetry and wind data from scatterometers, and surface temperature (below) in September 1998 also showing the route taken by the Kon Tiki in 1947 (black line). Turbulent fronts are clearly visible on the surface temperature map (Credits *Noaa* / Oscar project)

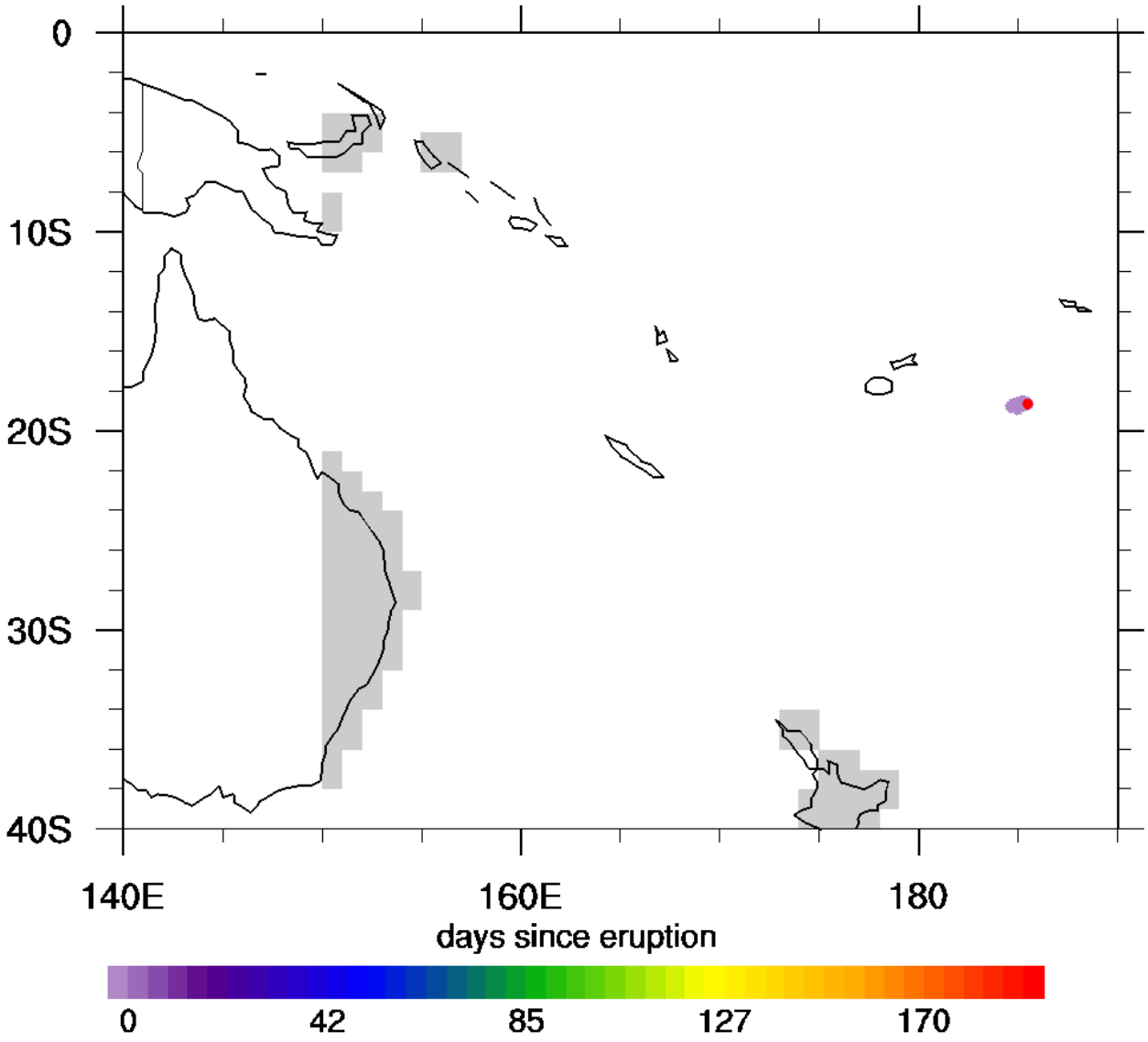
Like a stone carried away by the current

Image of the month - January 2008



Trajectories of the pumice rafts produced during the 2006 Home Reef volcano eruption, calculated using altimetry combined with wind data to estimate and forecast the currents (click on the image to see the animation). (Credits University of New South Wales/Kingston University London/Yale University)

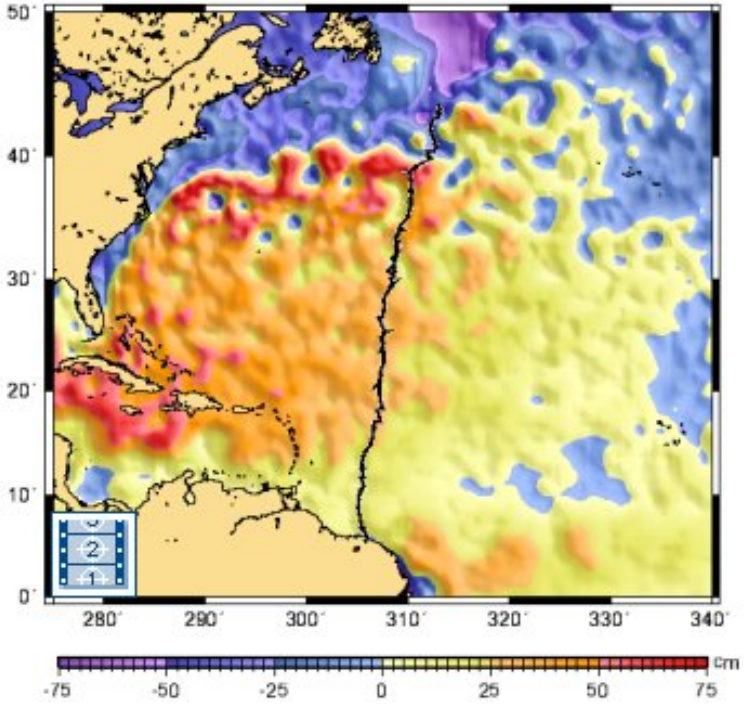
http://yacht-maiken.blogspot.com/2006/08/stone-sea-and-volcano.html


0
10S
20S
30S
40S
140E
160E
180
days since eruption
0
42
85
127
170

Unexpected meetings…

Leartherback turtles round eddies

Image of the month - July 2004



The leatherback turtle is an endangered species. Its study should help protecting it, in particular by defining areas where it is most likely in interaction with fisheries -- fishing being one of the most critical threat on their survival.

Argos trackings of some turtles from their nesting beach in Guiana and Surinam give ideas on their paths. By overlaying those paths on altimetry sea surface heights, correlations can be tried between their behavior and ocean circulation. For example, it seems that they like warm eddies border, where currents accumulate their usual prey, jellyfishes.

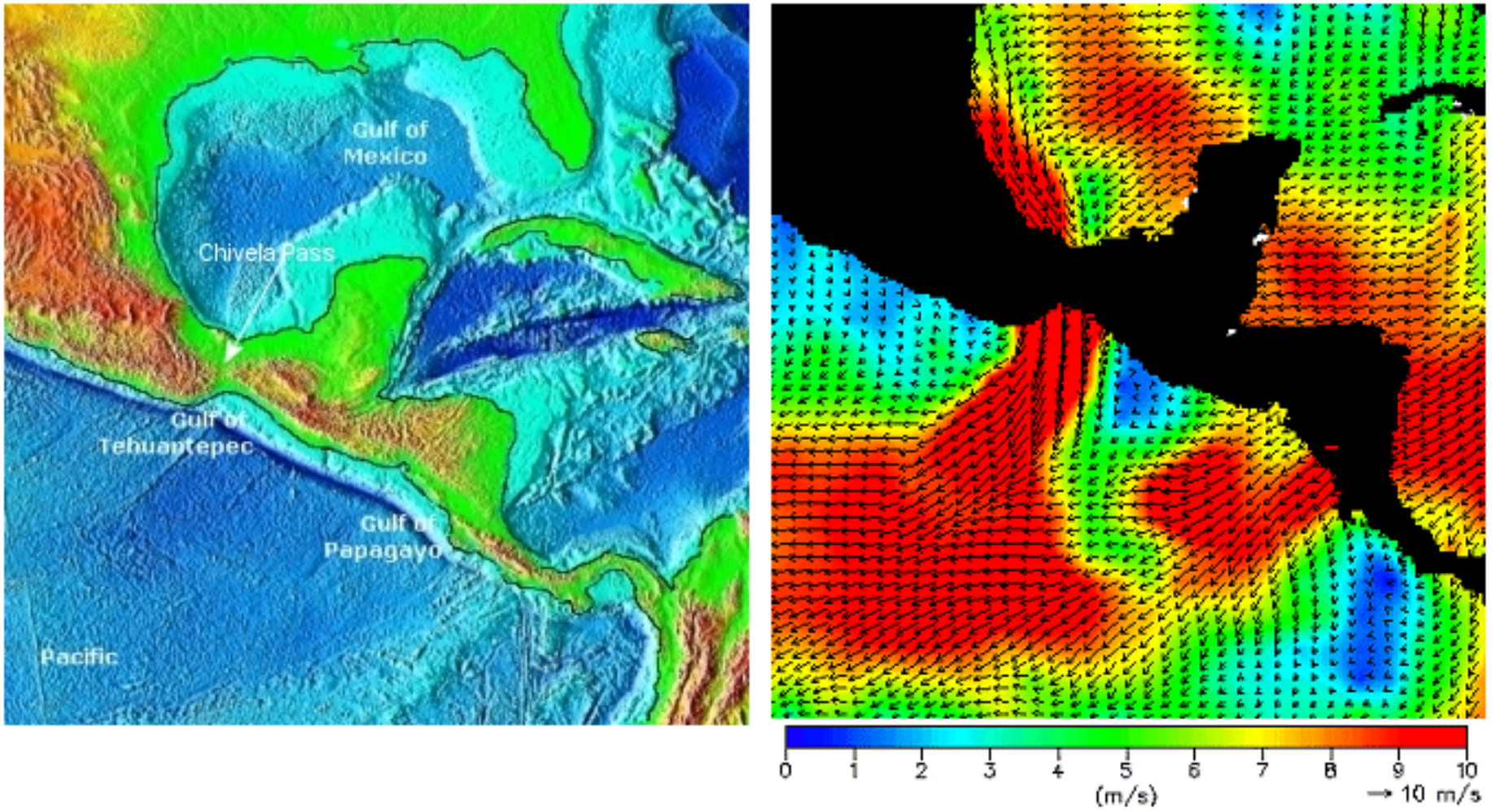
Leatherback turtle path overlayed on absolute dynamic topography maps (*MADT*). This turtle went due North after leaving its nesting site in French Guiana, and then slowed down in the nutrient-rich front area between *Gulf Stream* and Labrador Current. On September 13, 2000 (above), this turtle is swiming at the eddies border (click on the map to see the animation, 1.2 Mb, or a higher résolution version, 3.9 Mb). (Credits *CLS* / CEPE/*CNRS*).

Leatherback turtle with an Argos beacon. Photo J.Y. Georges, CEPE/*CNRS*.

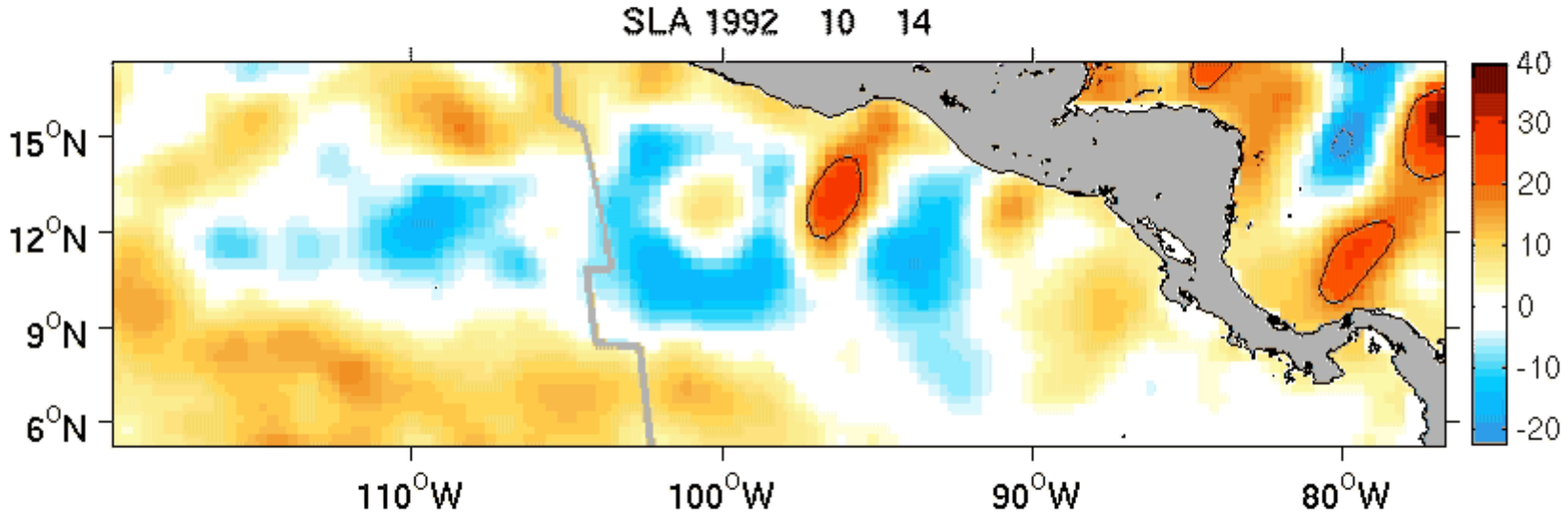
…with creatures of the dark ages

Tehuantepec eddies

Image of the month - June 2006

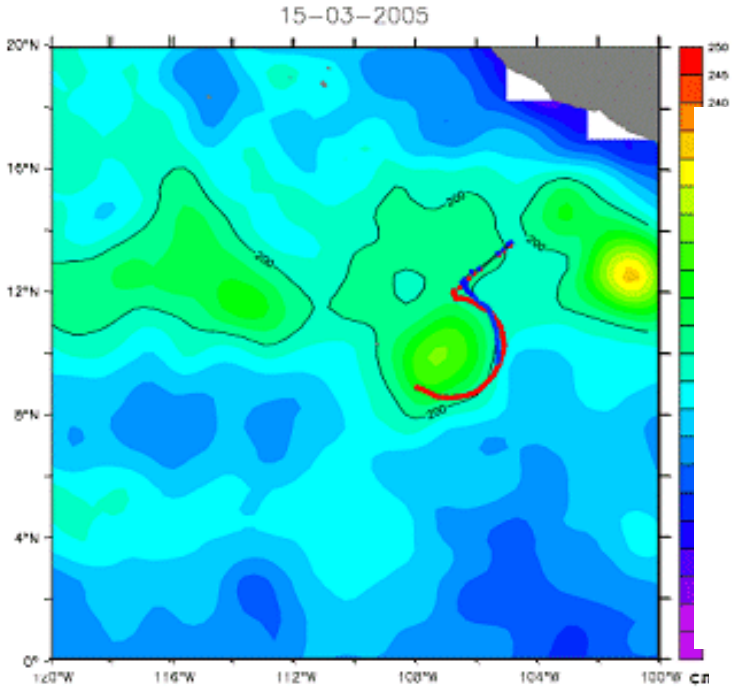


Topography of the Tehuantepec area (left), and winds both sides of the isthmus, as measured by scatterometers (right). Winds from the Gulf of Mexico cross the isthmus through the Chivela Pass, narrow and much lower than the surroundings, thus creating a jet wind. (Credits *Noaa* (topography) and *Coaps* (wind map))

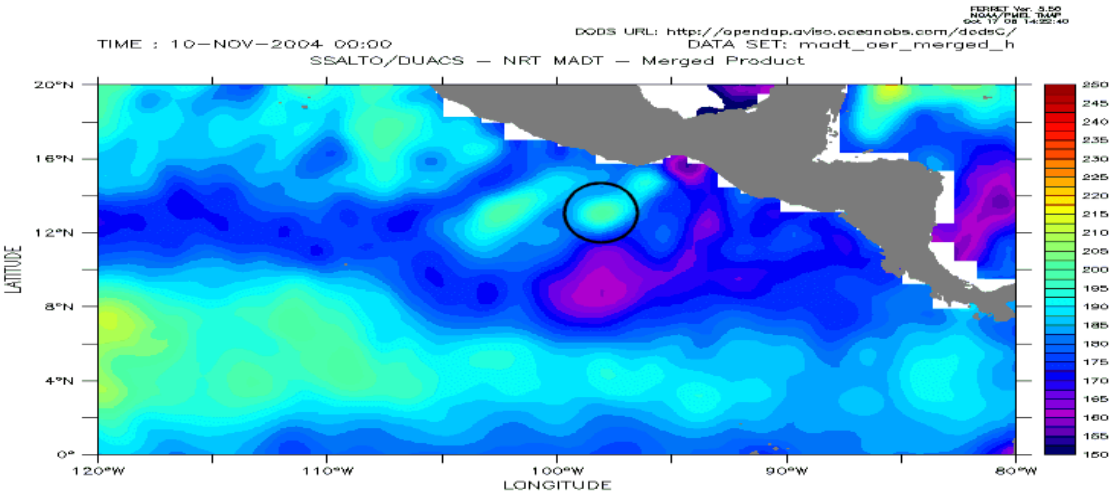

SLA 1992 10 14
15°N
12°N
9°N
6°N
110°W
100°W
90°W
80°W
40
30
20
10
0
-10
-20

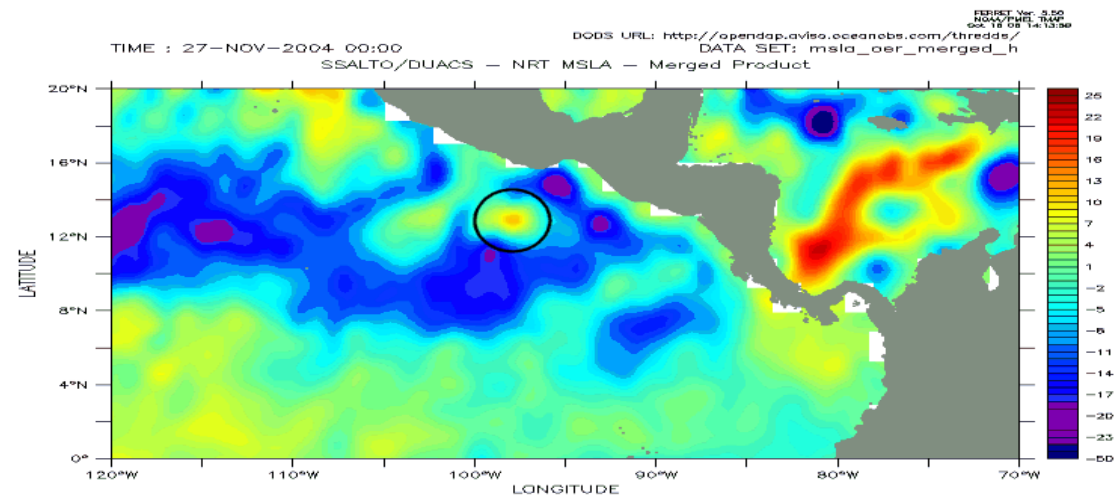
Argonautica buoys around a Tehuantepec eddy

Image of the month - November 2006



'Clipperton' (red) and 'Aladerive' (blue) buoys (the latter being built by students) around an eddy visible on the dynamic topography map on March 15, 2006.

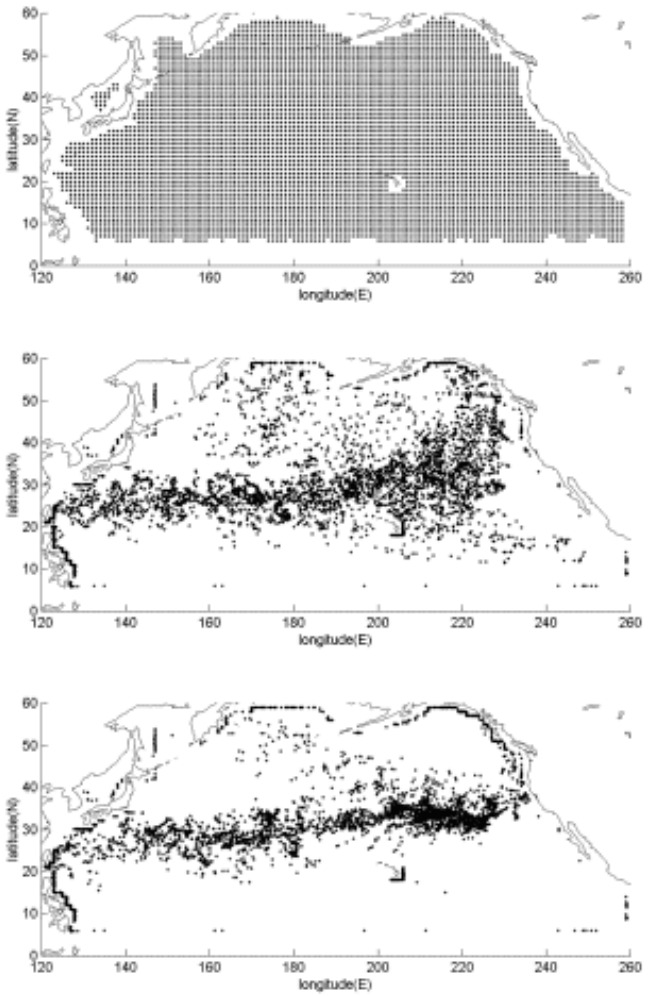




…between scientists and kids

Where does all the waste go?

Image of the month - February 2001



Simulated drift of waste floating in the Northern Pacific, showing its initial position (top) and spread after one year (middle) and after two years (bottom). Notice how waste quickly accumulates near the same latitude, despite being evenly spread to begin with. (Credits Kubota Lab., Tokai

Plastic waste washed up on a beach
(Credits *Ifremer*/Olivier Barbaroux)

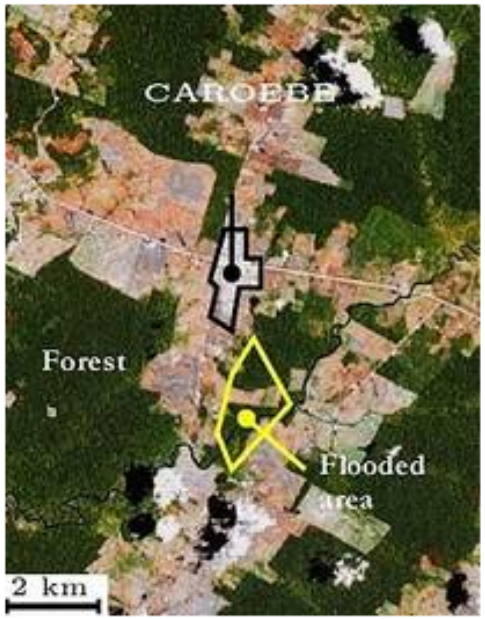
Dumping of waste into the sea has become a major ecological problem. In particular, plastic waste floating on the surface and drifting with the winds and currents poses a danger to marine life. Some sea mammals and birds swallow plastic bags and choke to death, mistaking them for jellyfish.

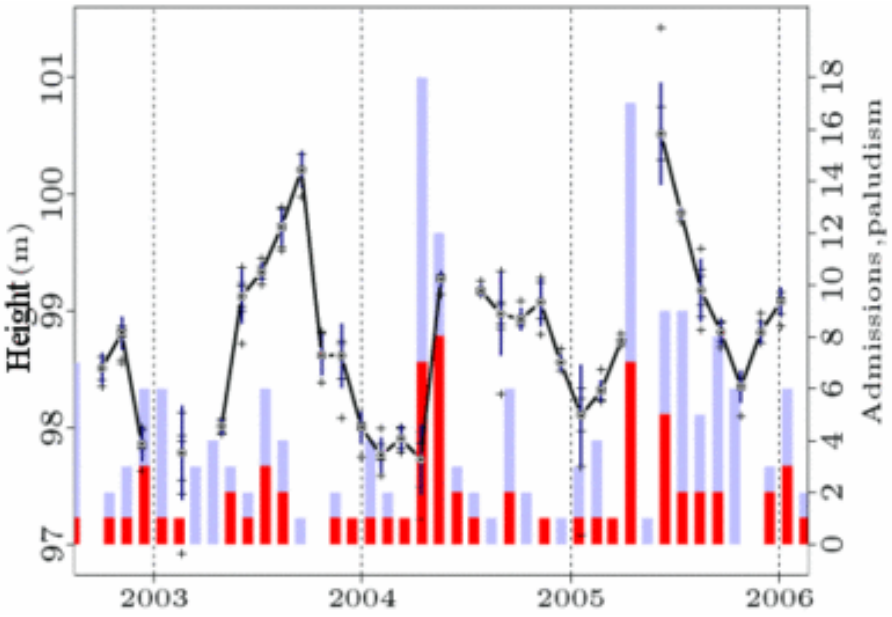
Simulating waste drift helps us to understand why it tends to accumulate in certain areas, and to determine the speed at which it moves. Satellite altimetry data in particular are a valuable aid for simulations, providing useful information about ocean circulation.

…between Nature & Human beings

Malaria and altimetry in the Amazon

Image of the month - March 2007





Water level variations measured by the Envisat satellite (black curve, left-hand scale) across a small area of flooding adjoining deforested areas, and hospital admission numbers (bar chart, right-hand scale) for infectious parasitic diseases including malaria (shown in red) for the nearest town, Caroebe (Brazil). A clear correlation can be seen between the water level and the incidence of infectious parasitic diseases: both follow an annual cycle and appear to be increasing over the longer term.
(Credits *IRD*).

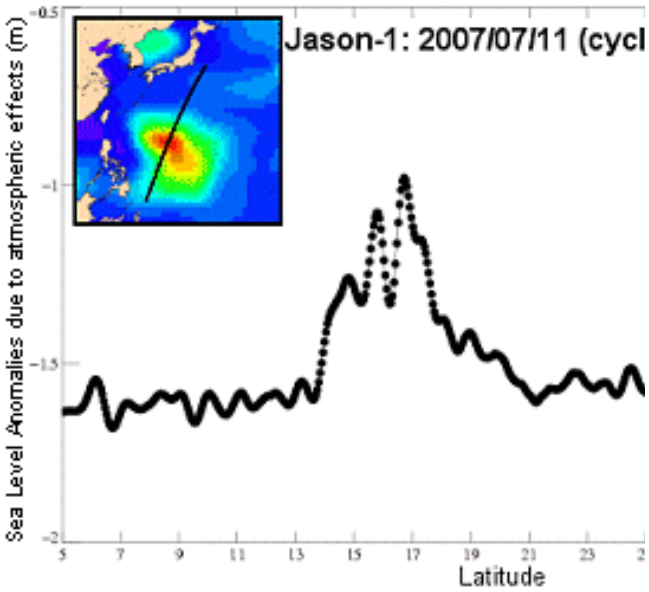
Human pressure on natural areas (deforestation, etc) influences the (re)mergence of vector diseases such as malaria, which are transmitted by insects or hematophagous mites (typically, all the diseases are transmitted by mosquitoes). Changes in vector populations are determined in part by water dynamics in the areas of flooding. This is why continuous monitoring of these areas, such as that which can be achieved using altimetry satellites, is so important in this context.

… between Human beings & Nature

Raging elements!

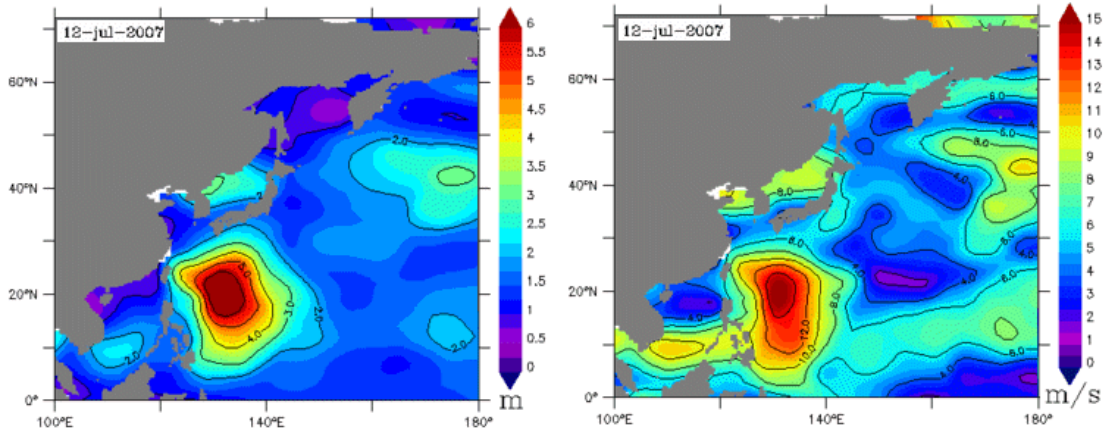
Altimetric views of a typhoon

Image of the Month - August 2007

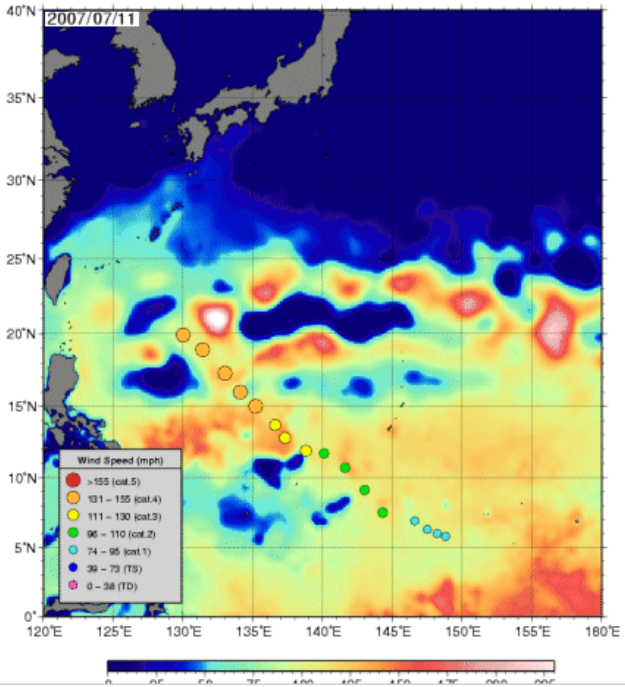


Sea level anomalies due to the effects of atmosphere on overlaid on a significant wave height map at the same tim Specific processing were applied in such extreme cases

Man-Yi typhoon struck the Japanese Okinawa several casualties, as well as important mater year; Man-Yi is probably the strongest typho typhoons depending on the region) feed upon t than 33 m/s --118,8 km/h --are a criterion to cl follow.



Hauteurs significatives de vagues et vitesse du vent le 12 juillet 2007.
Voir l'animation de hauteur de vagues : gif animé, flash ou avi et de vitesse du vent : gif animé, flash ou avi entre le 7 et le 14 juillet 2007.
(Credits CLS/Cnes)

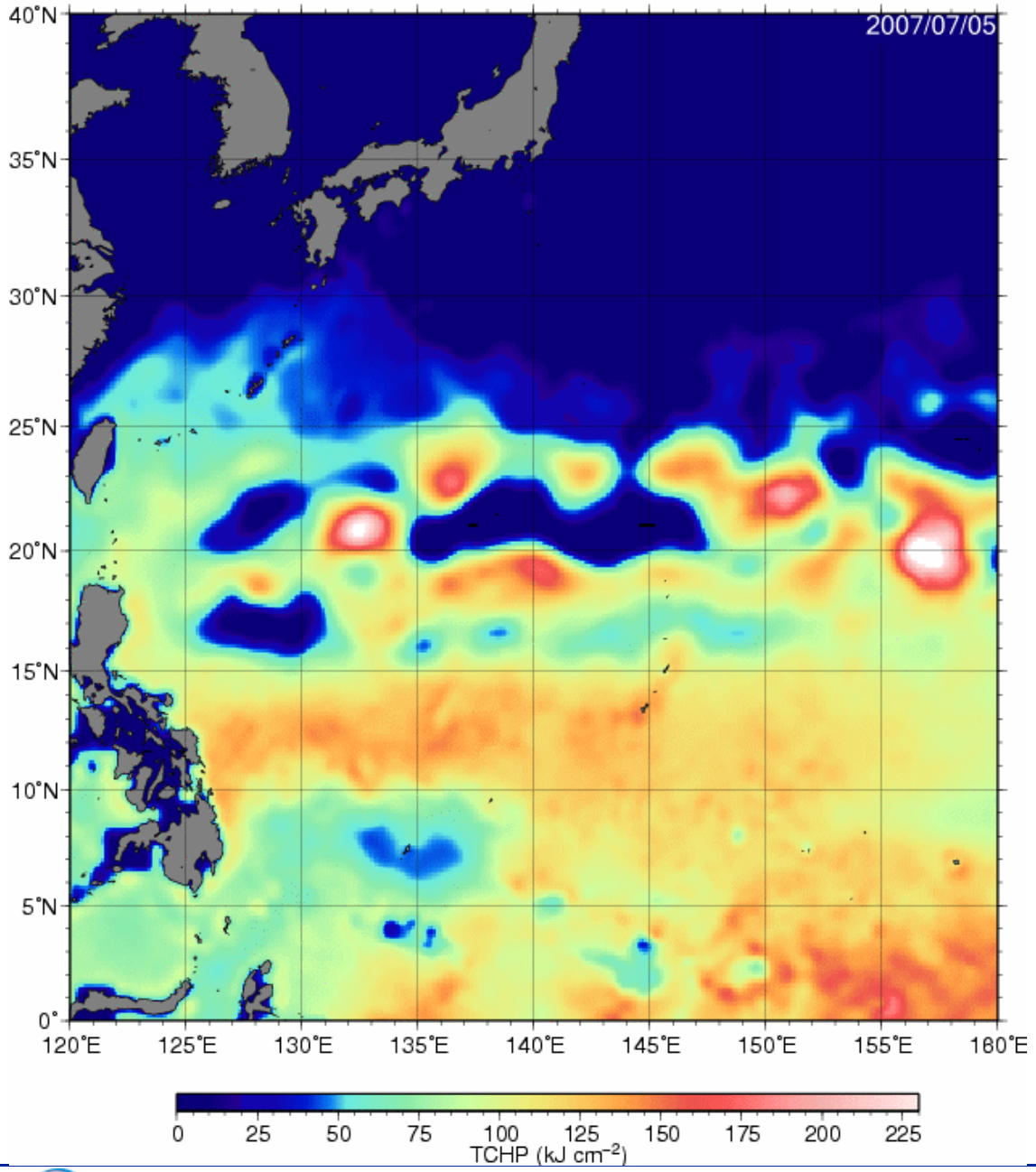


L'altimétrie peut être utilisée pour l'observation, la connaissance et la prévision des cyclones sous différents aspects :

- mesure de la hauteur significative de vagues et de la vitesse du vent sous la trace du satellite (qui peut passer plus ou moins loin de l'oeil du cyclone)
- calcul des effets de l'atmosphère (pression et vents) sur la hauteur de mer,
- possibilité d'intensification d'un cyclone s'il passe au-dessus d'un tourbillon et/ou d'un courant chaud

Enfin, les données altimétriques sont assimilées dans des modèles, soient météorologiques (hauteur significative de vagues et vitesse du vent en temps réel), soient océaniques. Ces derniers permettent de calculer des paramètres physiques de l'océan et des échanges océan-atmosphère.

Voir l'animation de potentiel de chaleur cyclonique entre le 5 et le 17 juillet 2007 : *gif animé, flash or avi*



Potentiel de chaleur cyclonique, calculé en utilisant des mesures altimétriques combinées à des mesures de température de surface et des observations in situ pour le 11 juillet 2007 : le typhon Man-Yi semble s'intensifier quand il passe sur des zones de plus fort potentiel de chaleur.

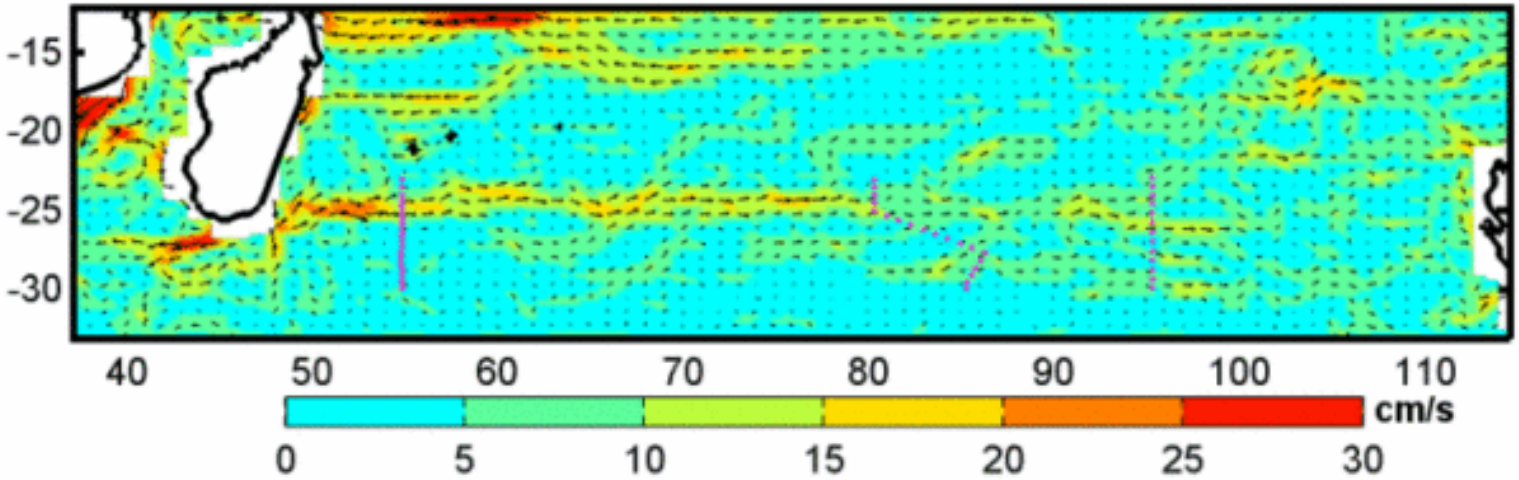
Discoveries!

Discovering a current in the 21st century with altimetry

Image of the month - April 2007

Ocean currents can be discovered in the 21st century: oceanographers found a current, the South Indian Counter Current, looking closely at altimetry data. This surface current, which goes eastwards from Madagascar at about 25°S is the counterpart of a westward current closer to Equator. If it can't be seen at every time, averaging current velocities in the region shows it clearly.

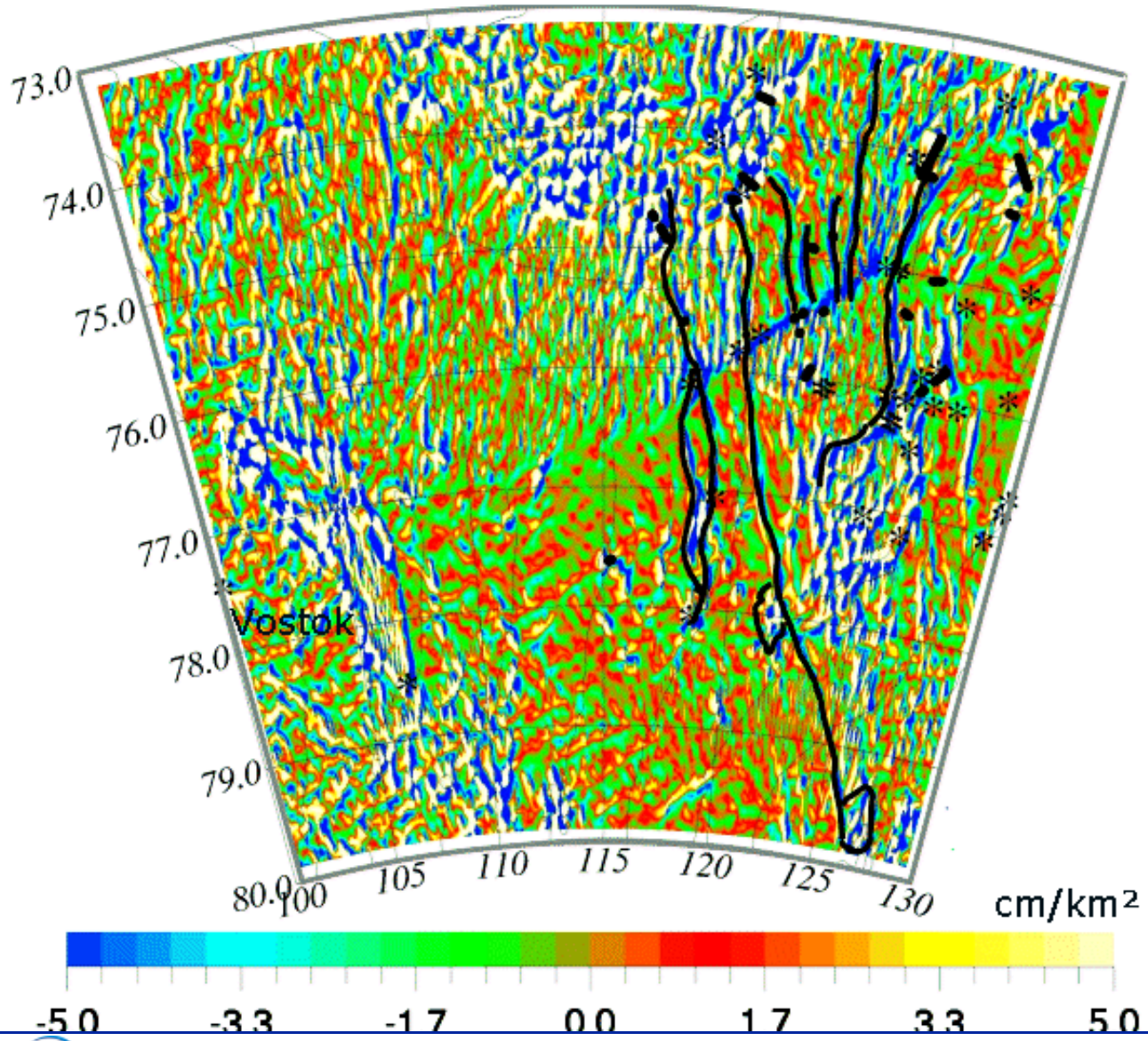
Altimetry measurements represent a huge quantity of information on the ocean (a *Topex/Poseidon* 10-day cycle gathered more measurements than the previous 100 years of *in situ* measurements). Continuity of these measurement over long period will bring to light new phenomena, not very proeminent on instantaneous views, but that show up over longer periods.



Geostrophic surface currents (deduced from Absolute dynamic topography) averaged over 5 years (August 2001 - May 2006) East of Madagascar. A narrow current is visible at about 25°S from Madagascar to about 100°E, with an attenuation from 80°E. Pink lines are in situ observations (*Woce* program data), that confirm this current. (Credits University of Cape Town).

Water flowing under the ice

Image of the month - June 2007

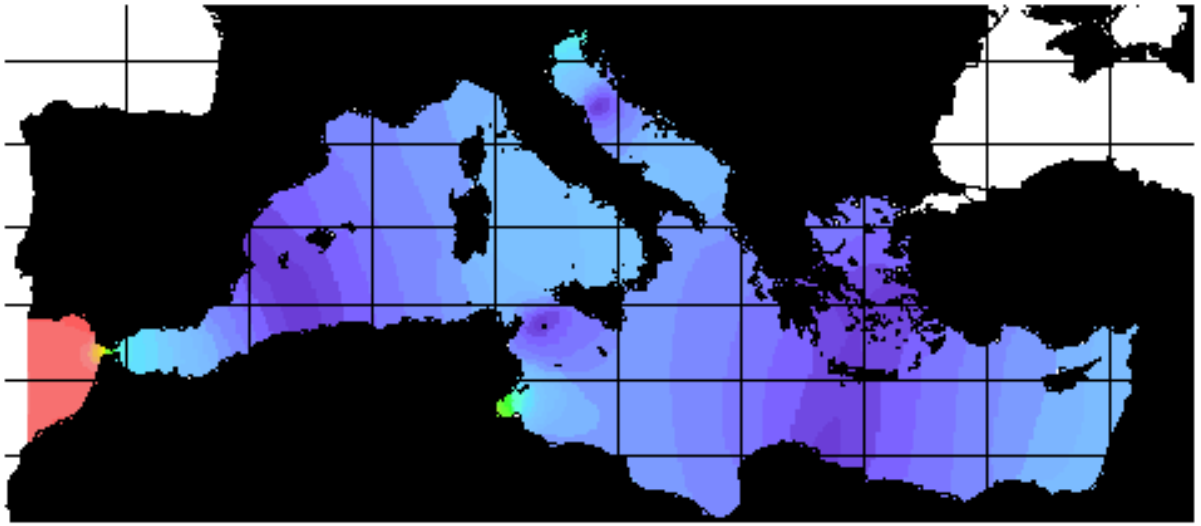


Ice surface topography curvature map in the area between Lake Vostok and Dome C in Antarctica. Black lines show the hydrological network detected under the ice that links the small sub-glacial lakes in the area (marked with stars).
(Credits *Legos*)

Truths challenged!

Mediterranean tides are more than meets the eye

Image of the Month - October 1999



Amplitude (in cm) of the principal (M2) lunar tide in the Mediterranean predicted by the CEFMO model (release 2000). (Credits *Legos*)

Most people associate the Mediterranean with small tides. However, this is not to say there are no tides at all. Indeed, they generate a mean variation of about 40 centimeters, but atmospheric conditions often hide the rise and fall in sea level. Headwinds or, more often, higher-than-normal atmospheric pressure attenuate the effect of these tides, sometimes making them virtually impossible to see.However, for example, the Gulf of Gabes off the coast of Tunisia has a range of nearly two meters. In other areas, such as the Adriatic and south of Sicily, tides are very small in the vicinity of amphidromic points where the tidal range is zero. The Atlantic affects tides in the Strait of Gibraltar, but its influence soon declines further east.

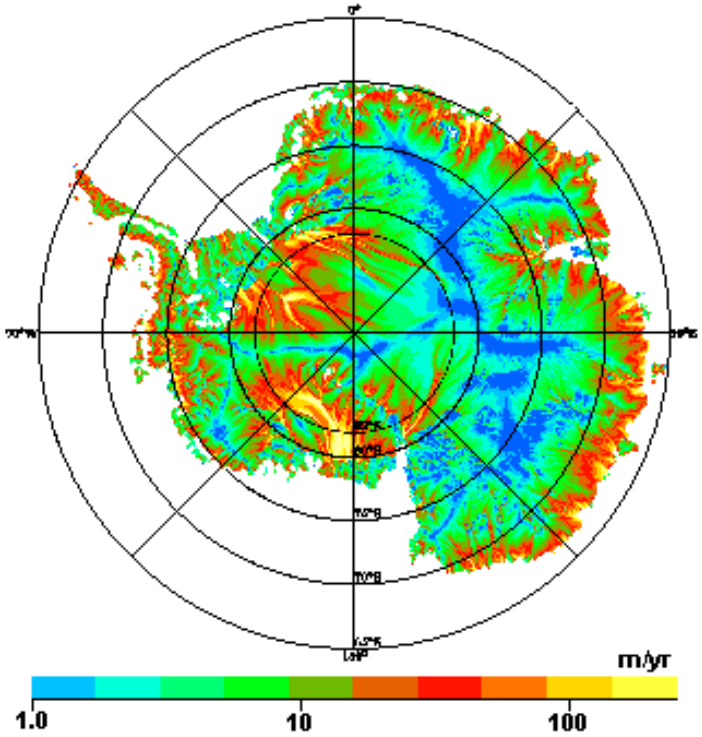
Altimetric measurements, coupled with in situ tide gauge readings and assimilated into models, help us predict tides with greater accuracy. *Tide* predictions are useful for shipping, fishing fleets, and coastal engineering.

No tides in the Mediterranean ?

Rivers of ice in Antarctica

Image of the Month - April 2000

Antarctica, a still continent?



Speed of ice flow in Antarctica, derived from *ERS*-1 topography measurements (geodetic phase) (Click to display a full image - 100 Kb) (Credits *Legos*)

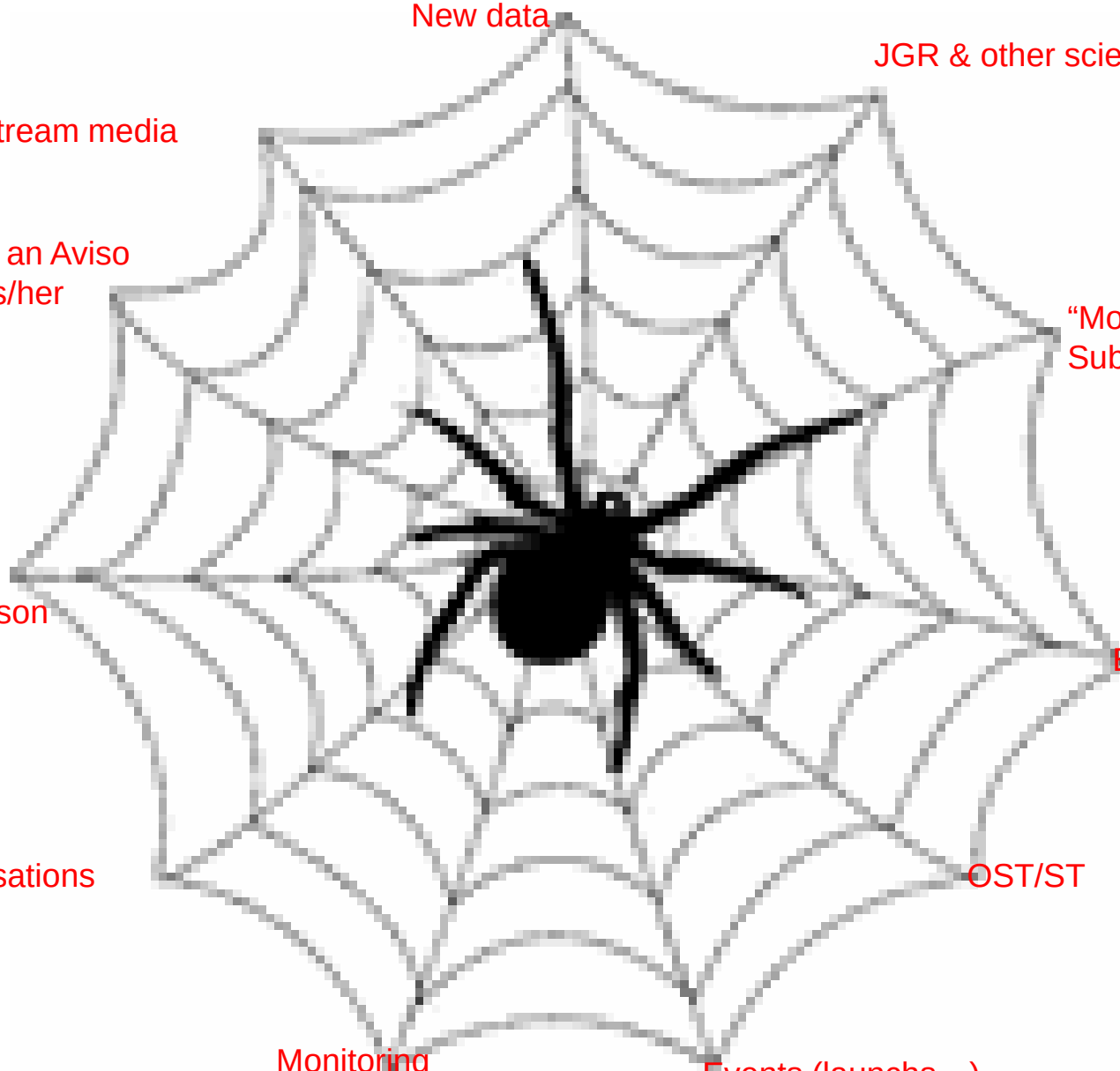
Observing the ocean surface is not the only application of satellite altimetry. Satellites also serve to measure the surface topography of sea ice and glaciers on land-although ice and sea water do not, of course, reflect the radar altimeter beam in the same way. *ERS*-1 and *ERS*-2 are two Earth observation satellites providing coverage of the Earth's polar ice caps up to 82 degrees north and south, thus allowing us to observe large areas of the Antarctic.

By measuring the relief of glaciers, we can determine how fast they are moving. We now know from satellite observations that fast-flowing "rivers of ice"-moving at speeds up to one kilometer per year, comparable to that of glaciers in the Alps or the Andes-are found a long way inland. Such findings are completely changing our understanding of the polar ice caps.

Recipe…

- Find likely subjects (**illustrated** ones!) & sources
- Choose a subject, trying to get the mix right on a year span:
  - a pinch of climate,
  - two hints of *in situ*,
  - add some other sensors,
  - freeze a little with some ice-related fields,
  - Stir with high waves (e.g. a hurricane or typhoon)
  - And let it flow with hydrology
- Widen the horizon – not everything from Toulouse (nor France, nor Europe!)
- Contact the author(s)
- Write, make up into web page and publish
- Let it known…

Where do those subjects come from?


New data
JGR & other scientific journals
Mainstream media
Work description by an Aviso User, sending of his/her article
"Motivation" as filled in the Subscription form
Alert by a contact person
EGU, ESA…
& other meetings
Conversations
OST/ST
Monitoring
(routinely plotted maps, regular events)
Events (launchs…)

… and you’re welcome to suggest