

The Scarlet Knight's Trans-Atlantic Challenge

- A ROBOT'S EXPLORATION OF THE UNKNOWN OCEAN -



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NATURE | Vol 462 | 10 December 2009

NEWS BRIEFING

a single patent into different languages. The plan awaits debate in the European parliament.

Biotech boost: The European life-sciences sector was perked up by its first large initial public offering for almost two years, after Belgian biotech firm Movetis raised €85 million (US\$128 million) on its 3 December debut. Backed by venture-capital investment, Movetis has European approval to market a constipation drug, prucalopride (Resolor).

NUMBER CRUNCH 221

The number of days unmanned underwater glider **Scarlet Knight** took to cross the Atlantic Ocean, gathering water data. It is the first craft of its kind to make the crossing.

Source: Rutgers, the State University of New Jersey

quit the agency on 2 December. Clive Spash (pictured below), an ecological economist at the Commonwealth Scientific and Industrial Research Organization in Canberra, said he had "had enough" after his paper was accepted by the journal *New Political Economy* earlier this year, withdrawn by the acting chief of his division, and then approved again on condition that parts were reworded. See go.nature.com/CoY5wX for more.



THE WEEK AHEAD

9-11 DECEMBER
New Zealand hosts the Antarctic Treaty Meeting of Experts, which will recommend ways to manage ship-borne tourism to Antarctica.
▶ go.nature.com/6UJGwI

10 DECEMBER
This year's Nobel science laureates receive their awards in Stockholm, Sweden.
▶ go.nature.com/PL8t8n

Scarlet Knight RU-27 challenge

Science and History and Magic . . .



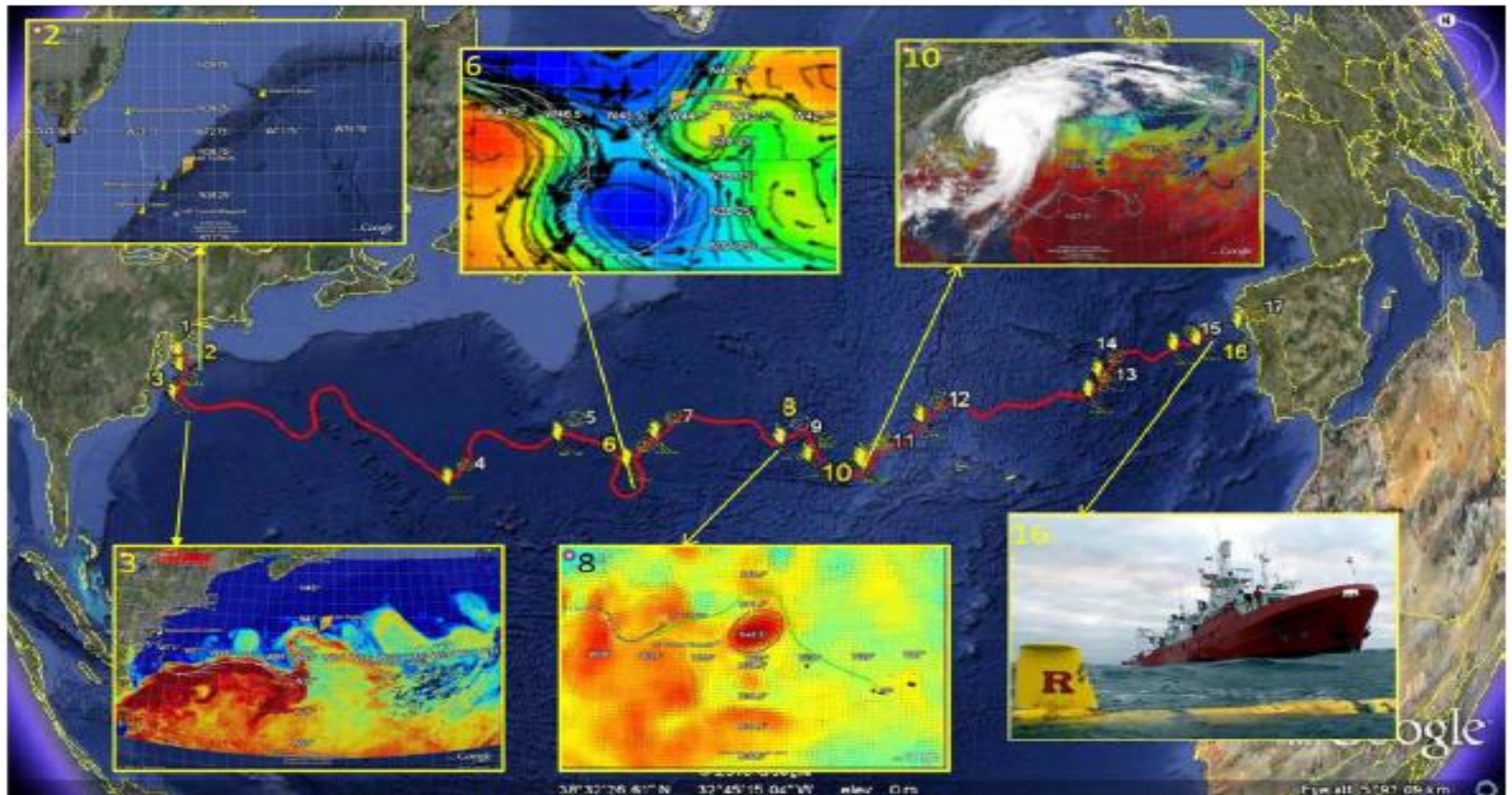
".... She was at sea for 221 days. She was alone, often in dangerous places, and usually out of touch. Her predecessor had disappeared in October 2008 on a similar trip,, probably killed by a shark...."

The Washington Post

December 15, 2009

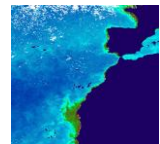
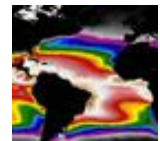
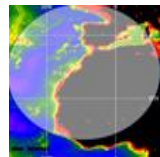
FIGURE 4

Trans-Atlantic track of RU27 marking the location of 16 significant events in the flight. Insets: (2) RU27 leaves the shallow water and fishing activity of the Mid-Atlantic Bight continental shelf; (3) RU27 navigates the meandering warm jet of the Gulf Stream flowing from Cape Hatteras to the Grand Banks; (6) RU27, after encountering a strong head-current, flies around the southern side of a large cyclonic cold-eddy; (8) RU27 approaches the Phantom Eddy in the HyCOM forecast, an artifact generated by the data assimilation scheme; (11) Hurricane Bill leaves the U.S. East Coast and turns east toward RU27; (16) RU27 is approached by the Spanish *R/V Investigador* for recovery (photo by diver Dan Crowell). (Source: Evans and Strandkov, 2009).



Pinzón path planning for the transoceanic glider *Scarlet Knight RU-27* from the ESEOO Regional Ocean Model forecast of the NE Atlantic.

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THE STATE UNIVERSITY
OF NEW JERSEY

<http://rucool.marine.rutgers.edu>



RSOC Division ULPGC

www.fcm.ulpgc.es

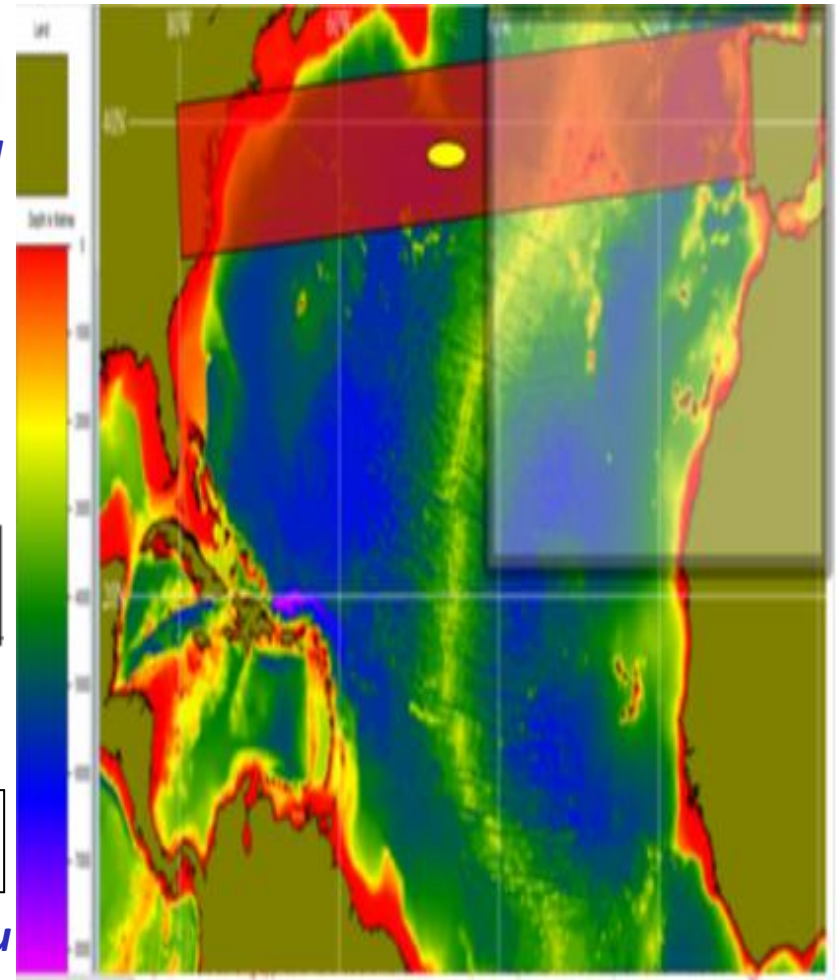
www.iusiani.ulpgc.es

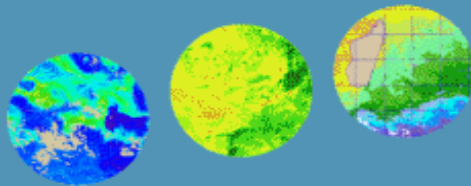
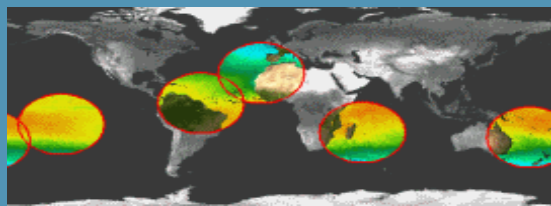


www.puertos.es



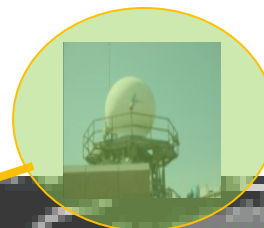
www.plocan.eu



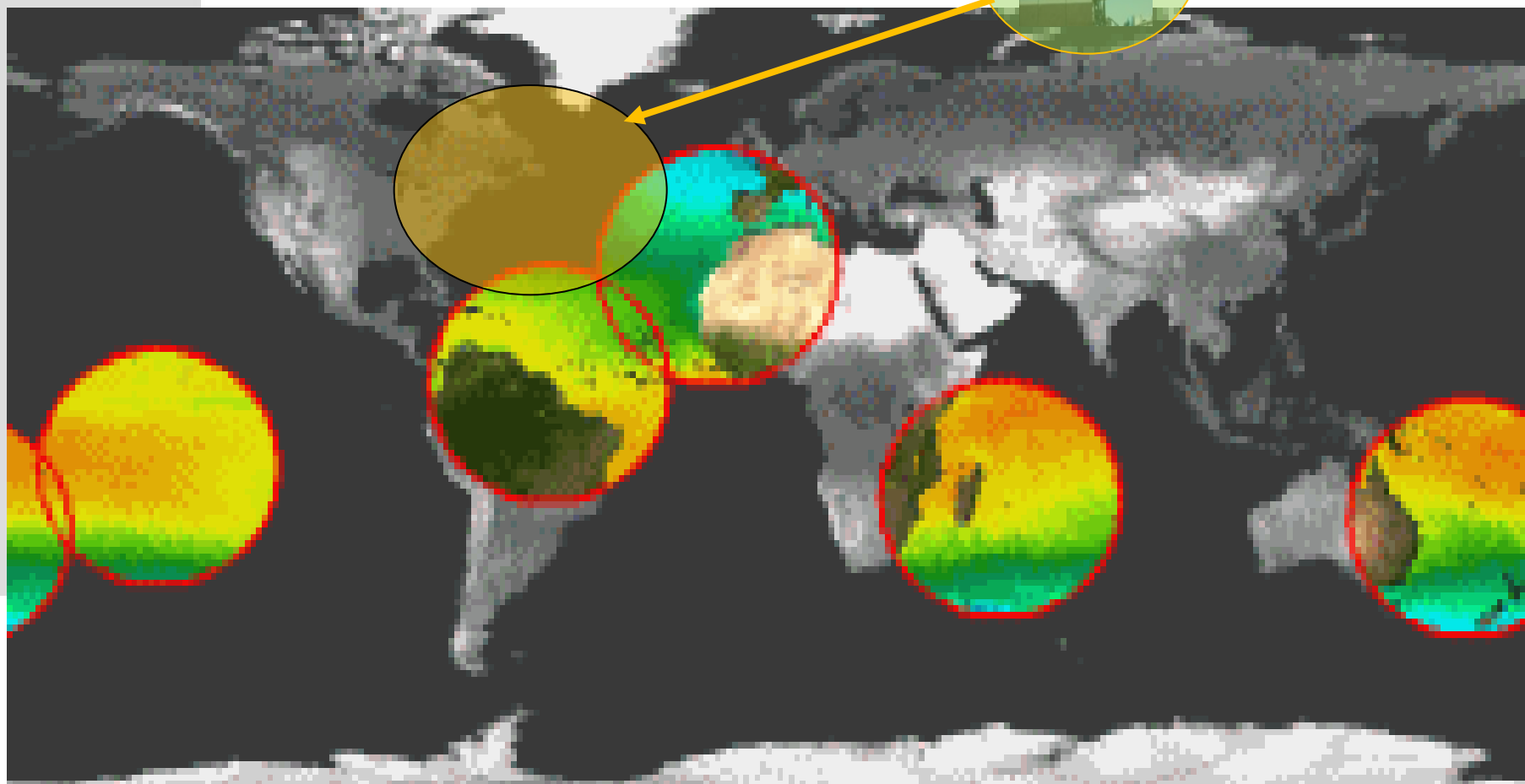


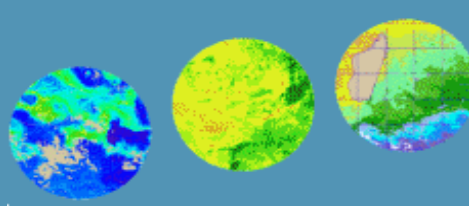
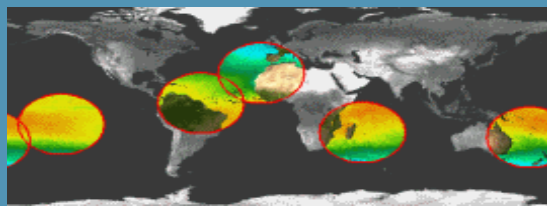
SEASnet
Le réseau de stations de réception
de l'IRD et ses partenaires

SATELLITE DATA. *Ground segment.*



RU COOL



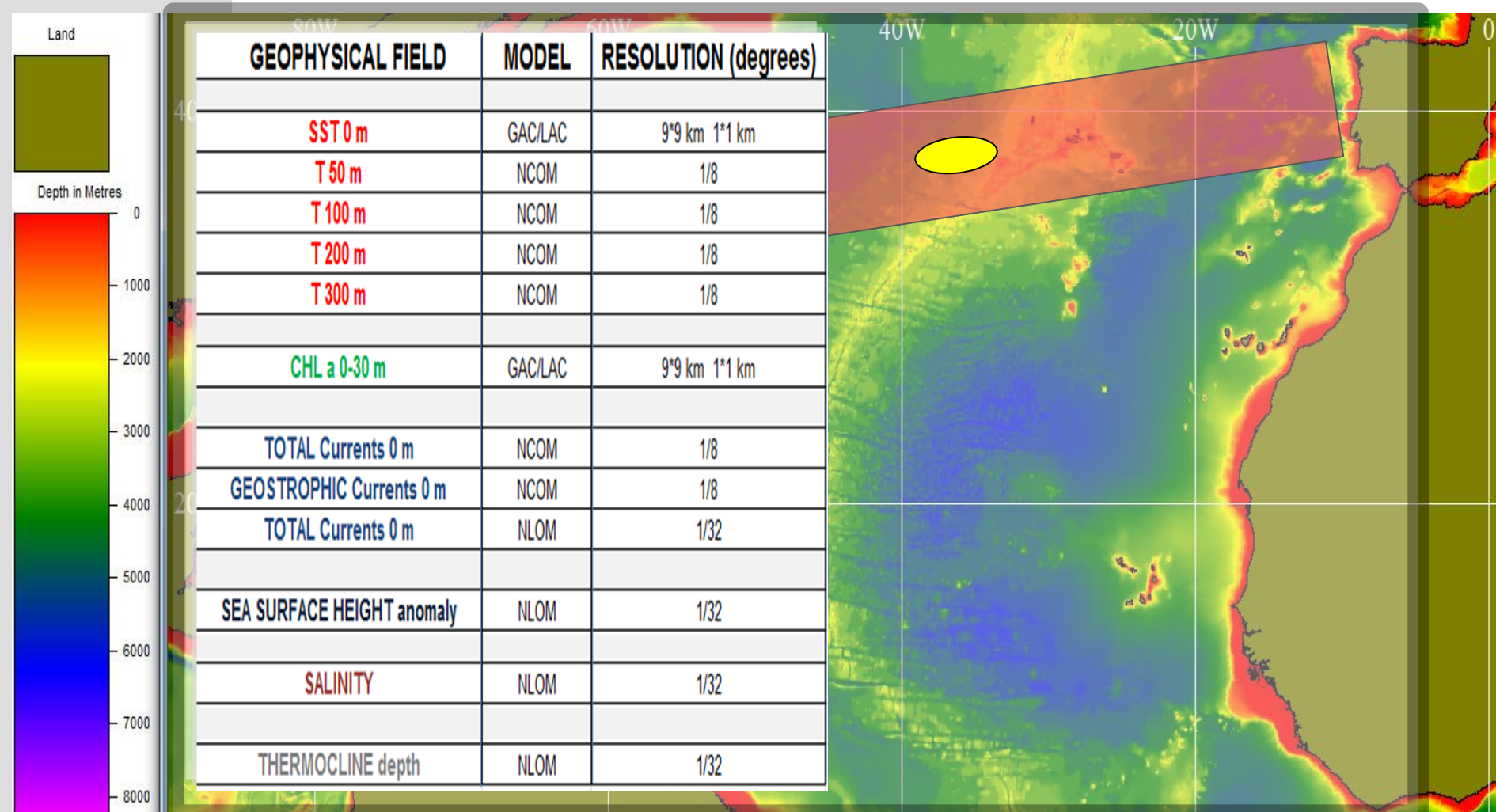


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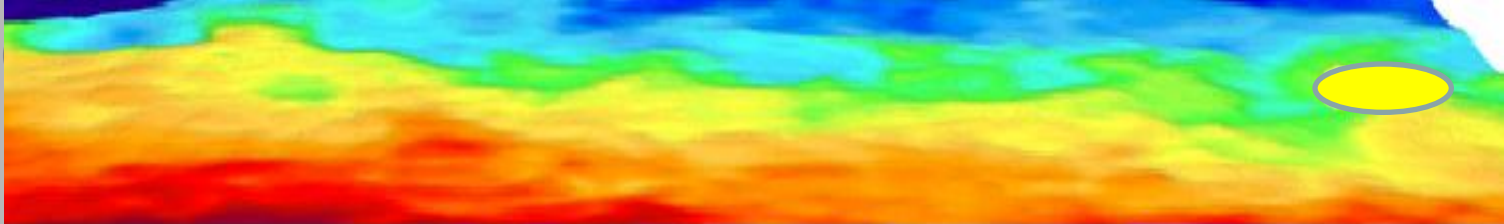
Le réseau de stations de réception
de l'IRD et ses partenaires

3.- METHODOLOGY

GLOBAL OCEAN MODELS. Geo Domain. Data Sets.



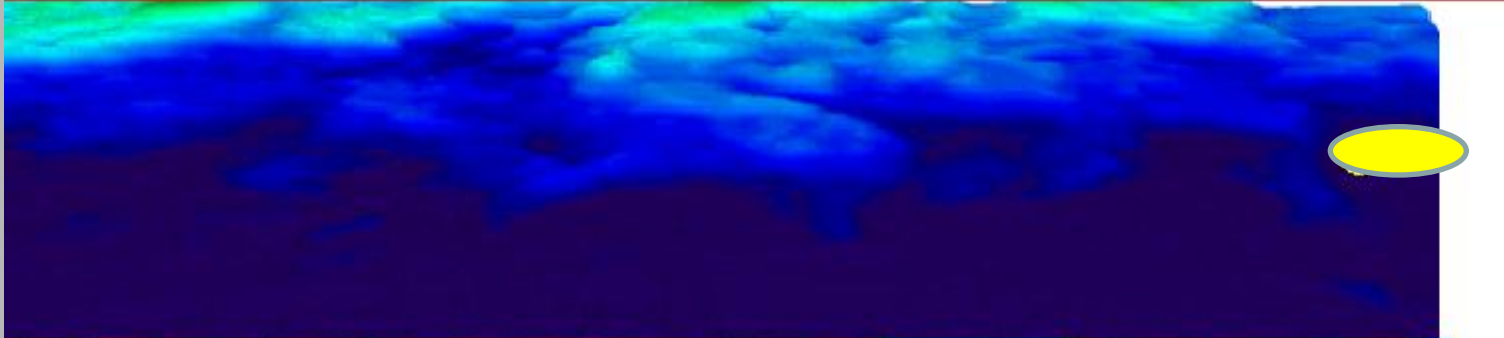
SST **3D** (4 Sep)



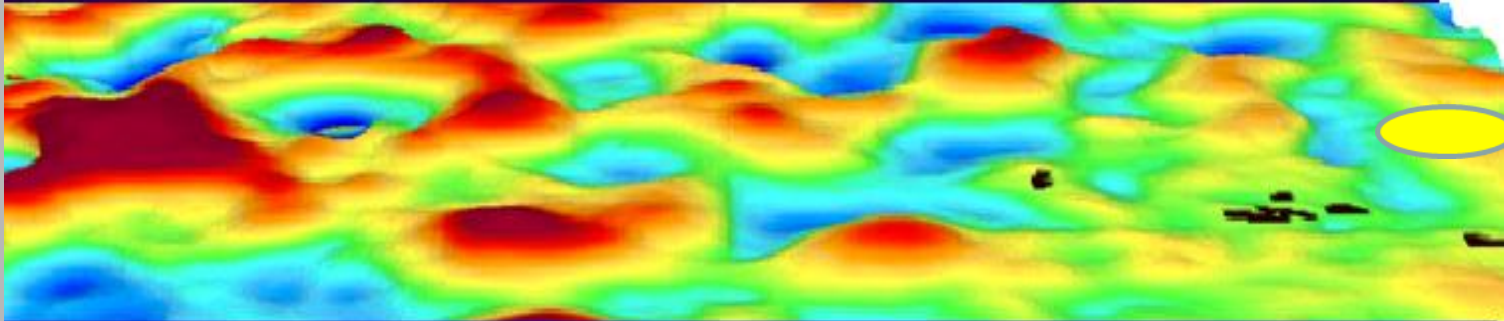
S $^{\circ}$ / $_{\infty}$ **3D** (4 Sep)



Chl **3D** (4 Sep)



SSHa **3D** (4 Sep)

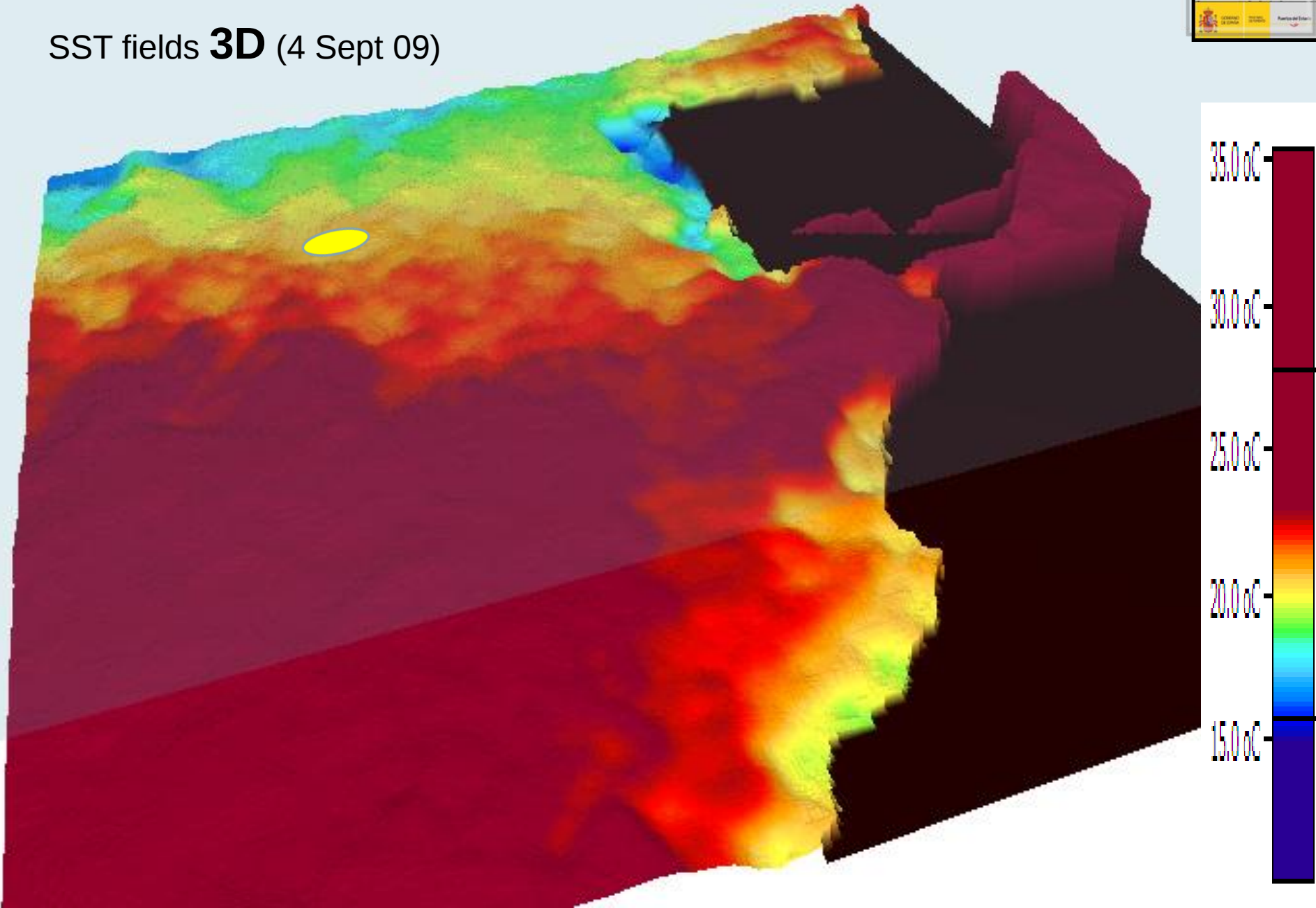


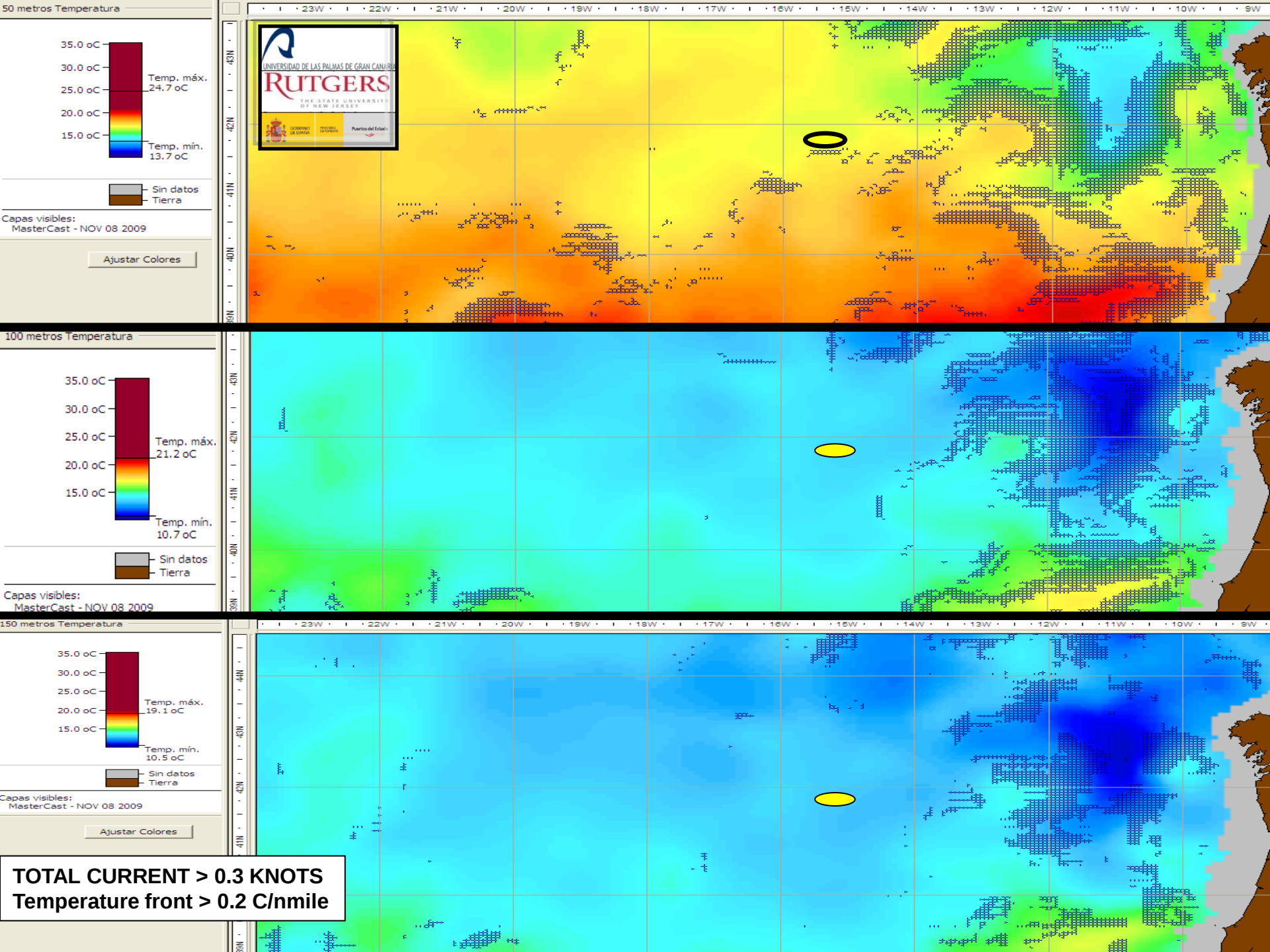
Therm**3D** (4 Sep)





SST fields **3D** (4 Sept 09)

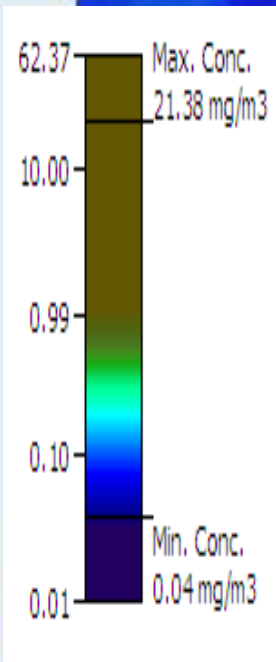




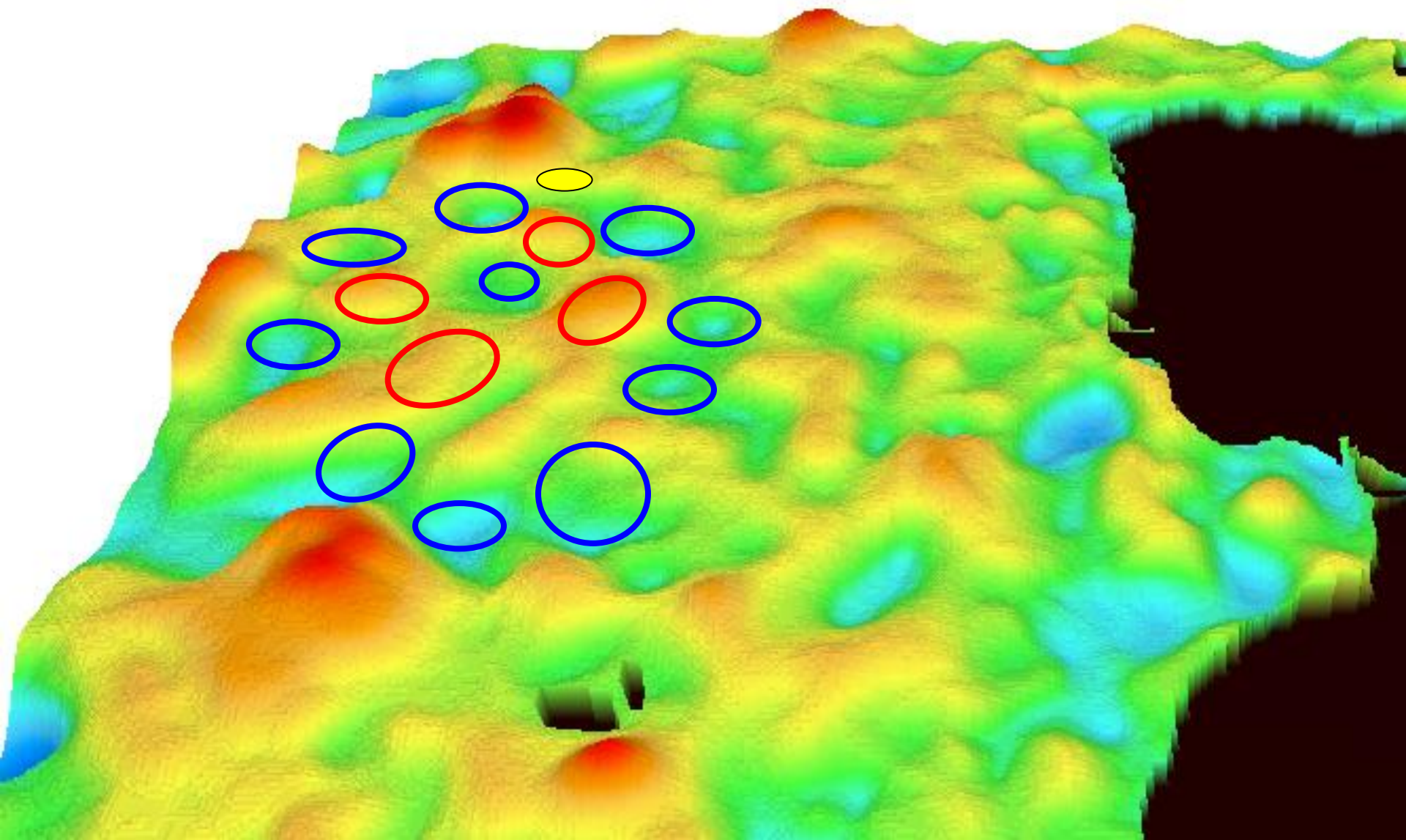


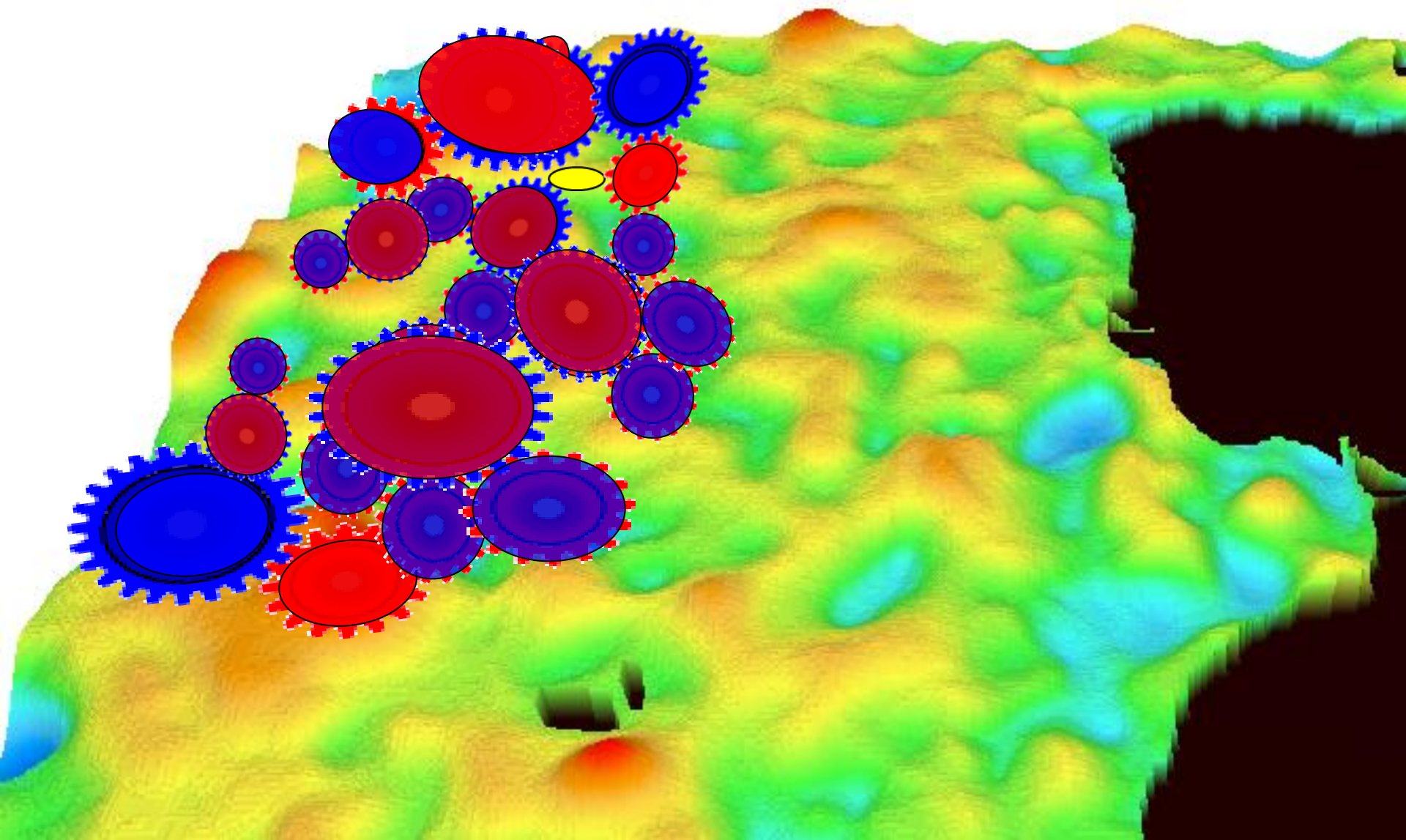
Chl a **3D** (4 sept 09)

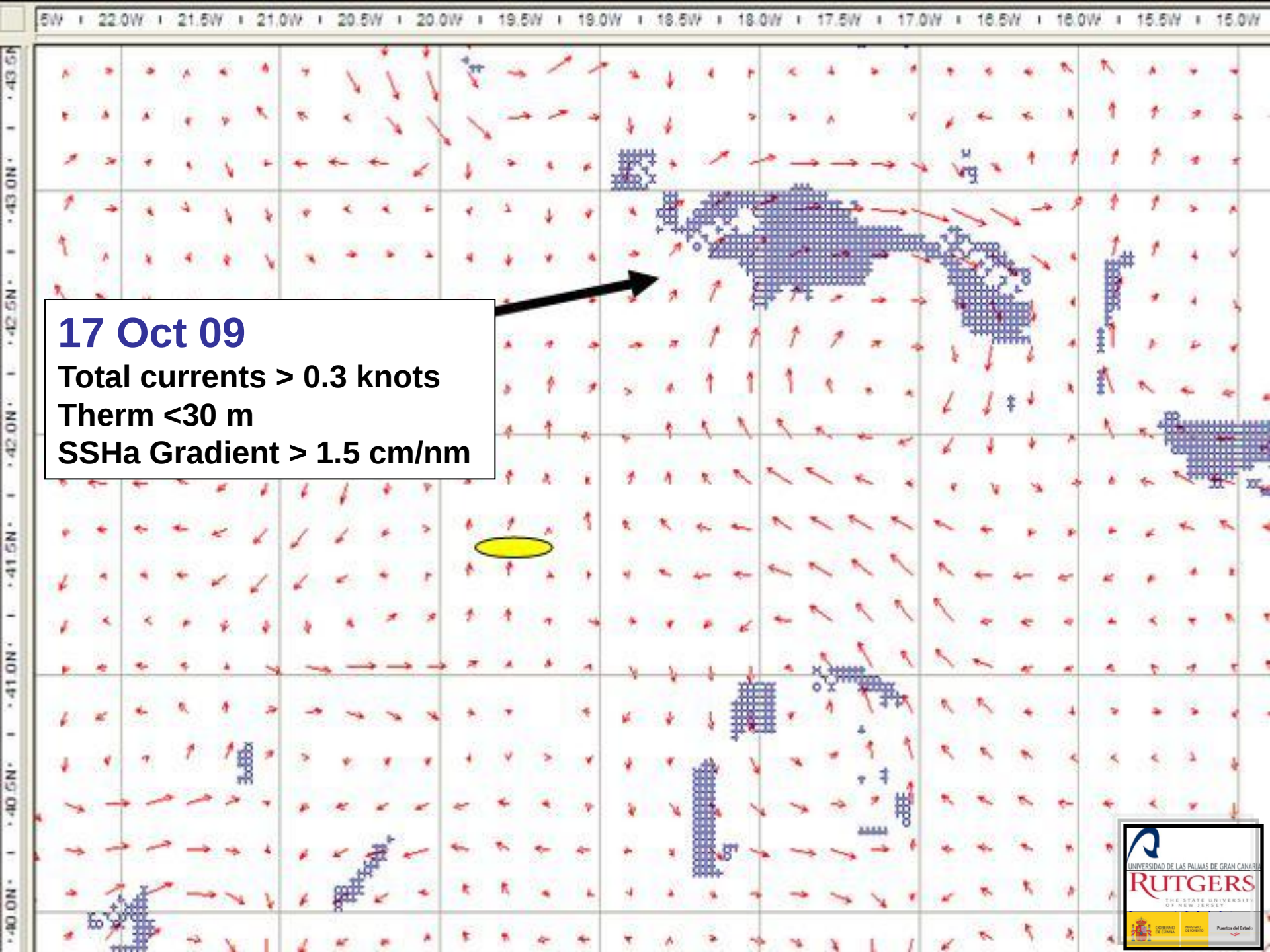
«The Eastern Garden....»



THE WALL....







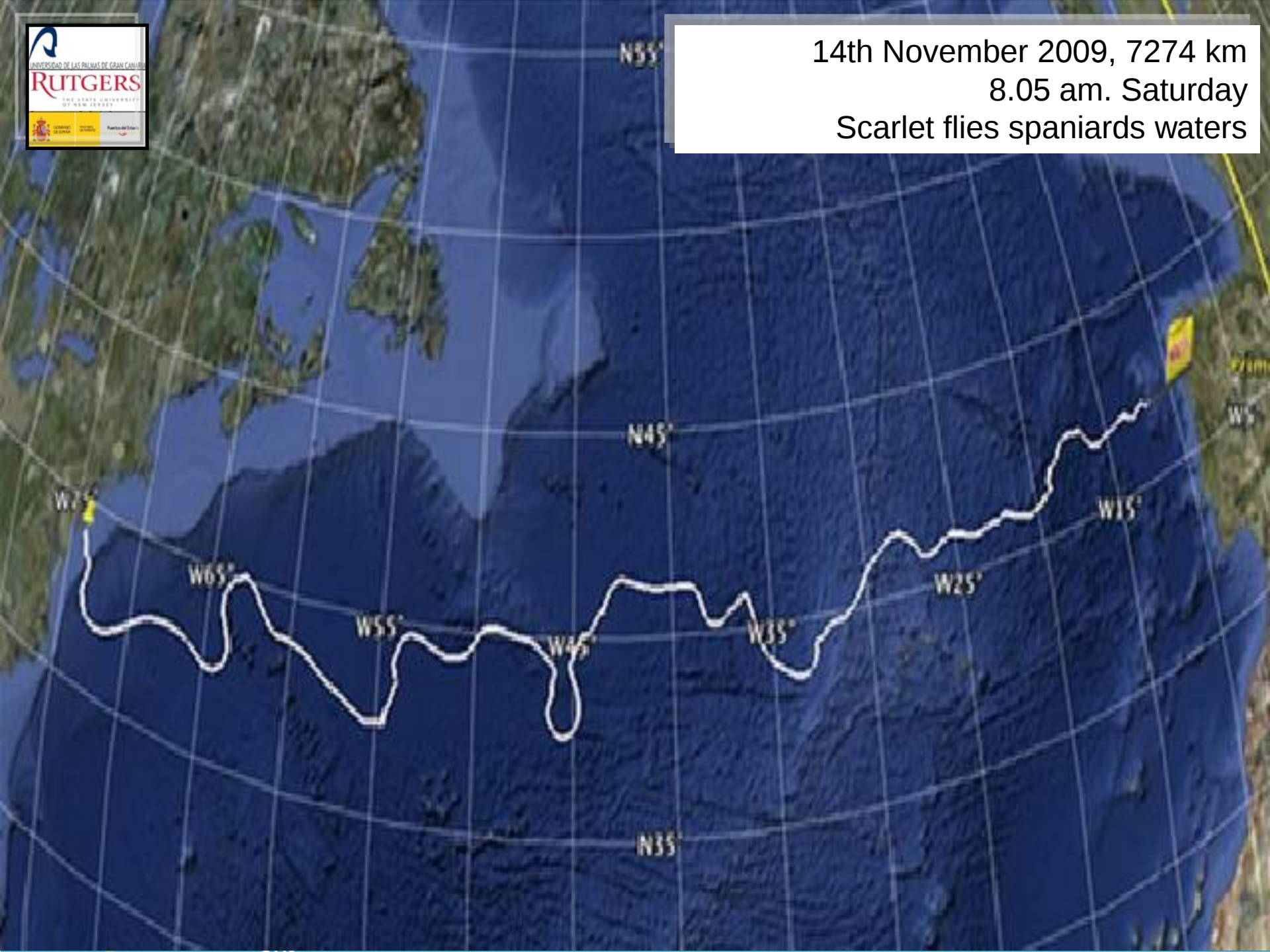
17 Oct 09

Total currents > 0.3 knots

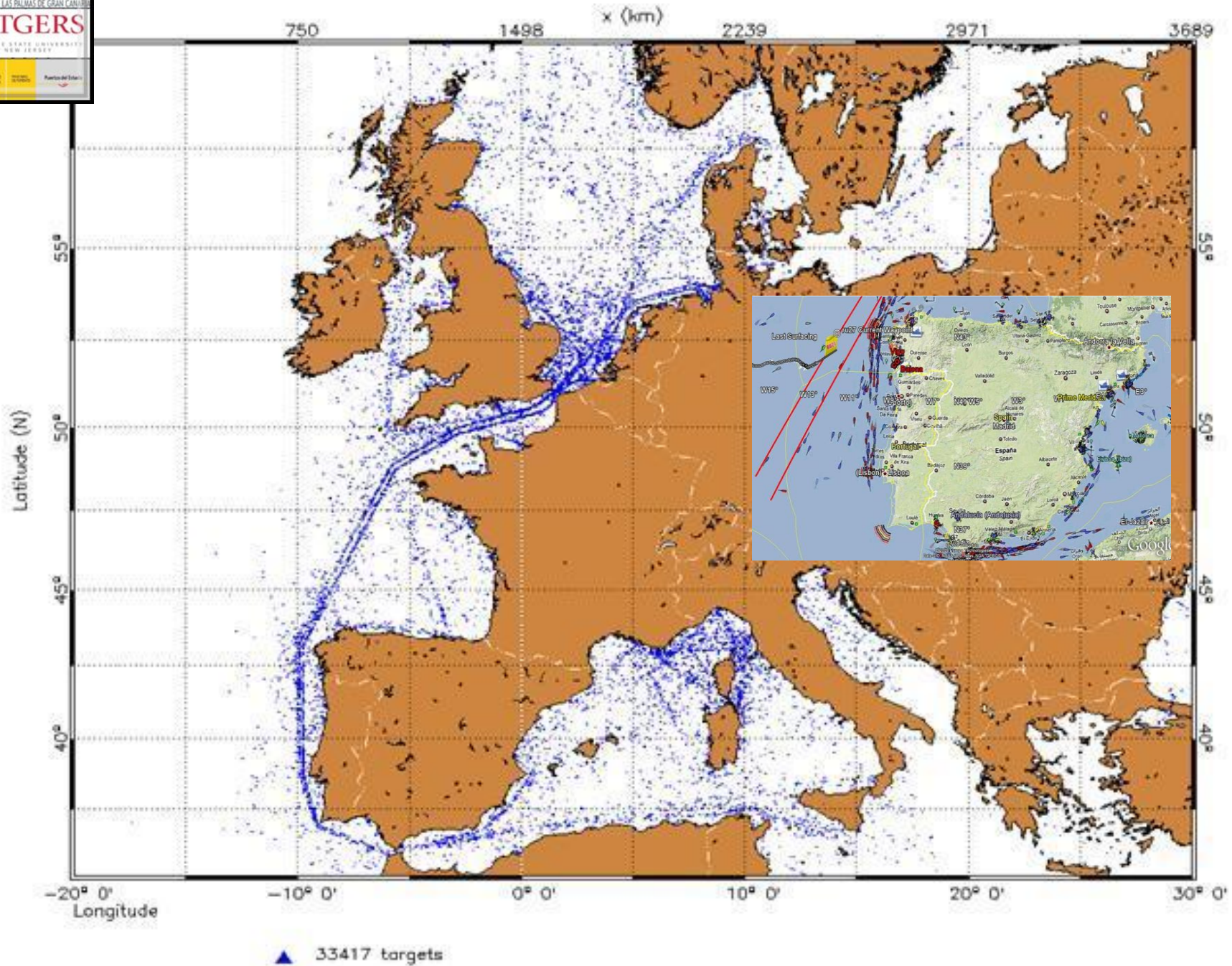
Therm < 30 m

SSHa Gradient > 1.5 cm/nm

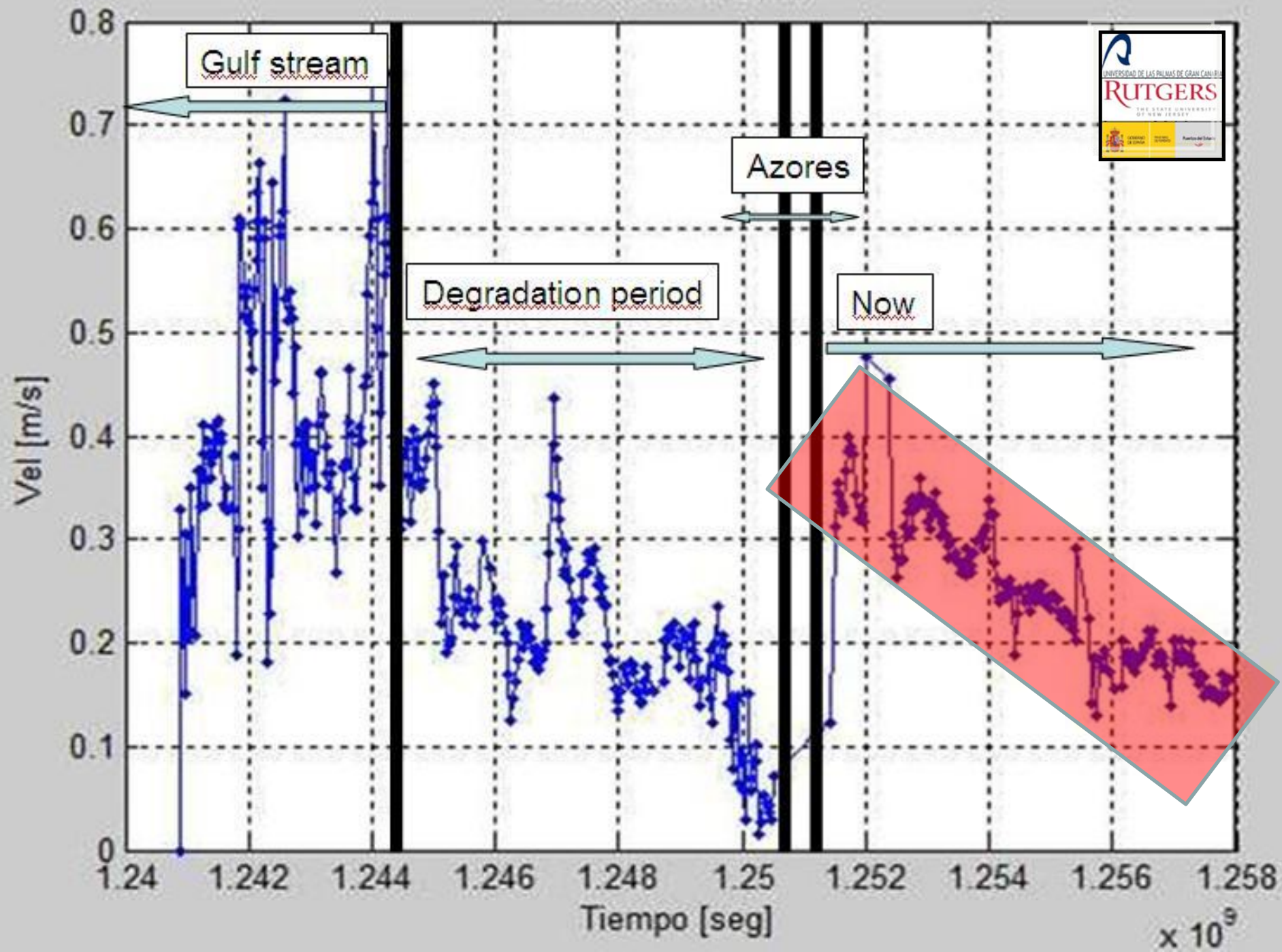
14th November 2009, 7274 km
8.05 am. Saturday
Scarlet flies spaniards waters



Ship detection over Europe using ENVISAT ASAR Wide Swath products



Velocidades Glider



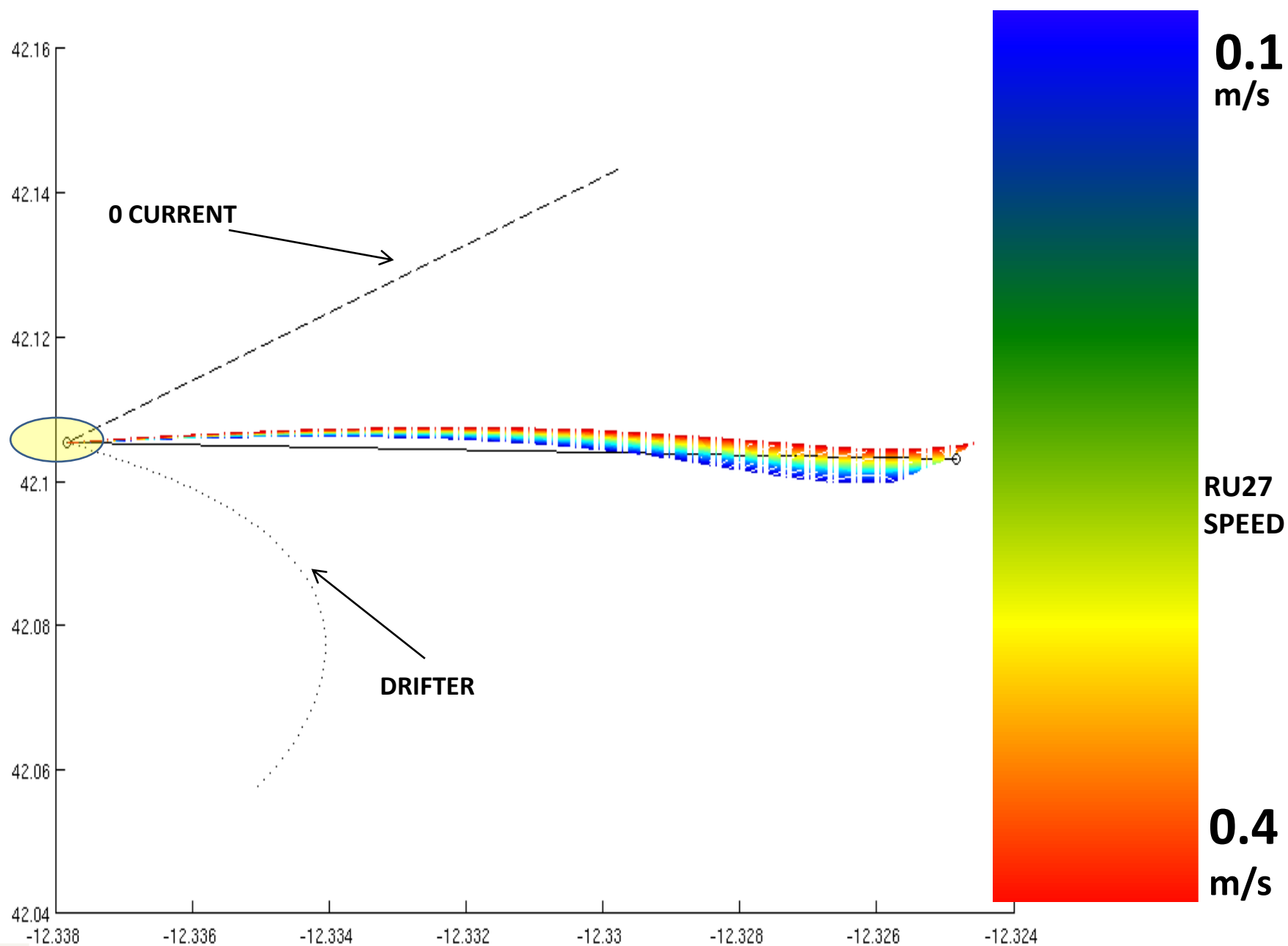
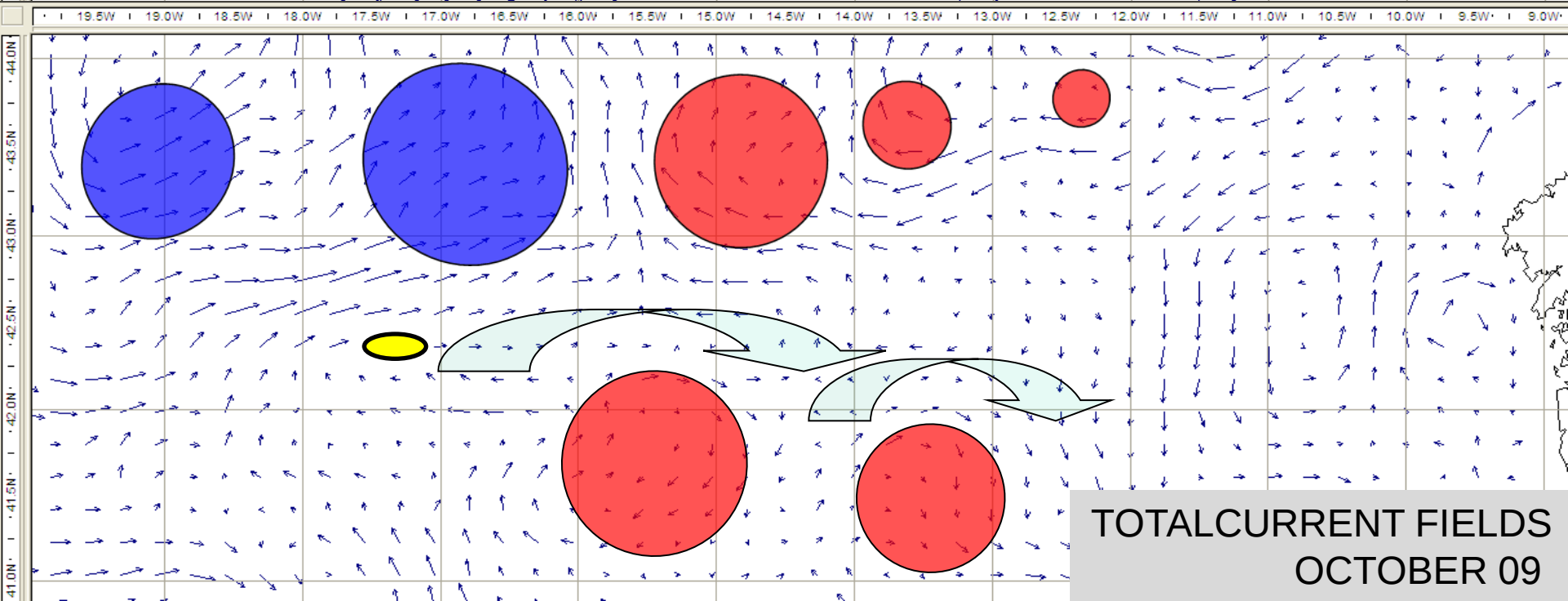
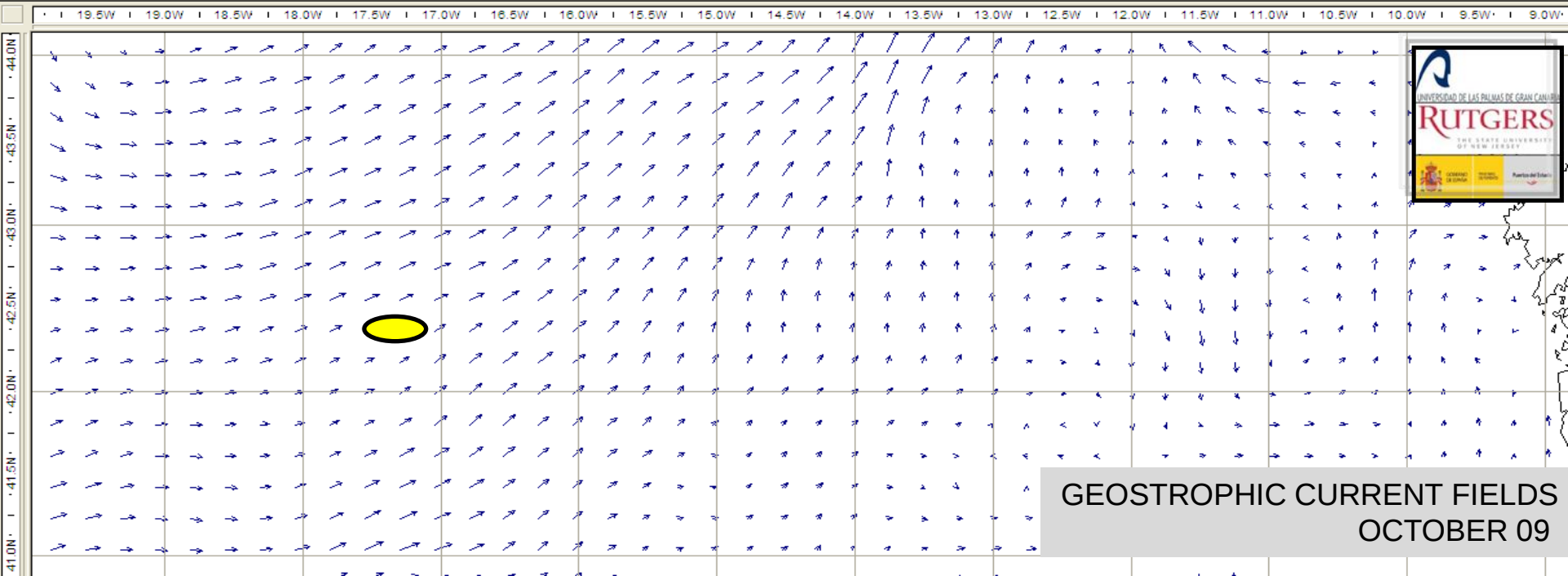
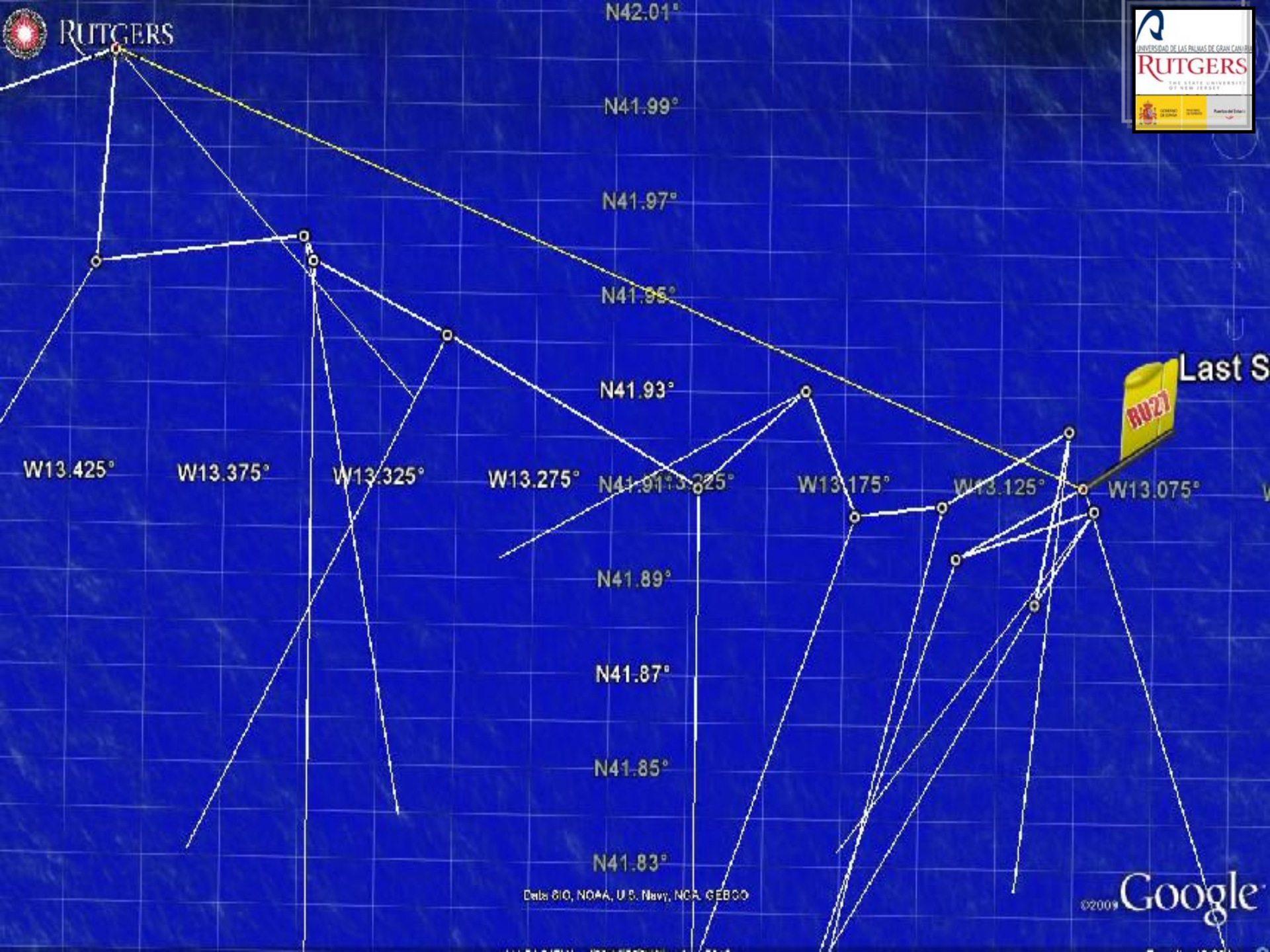


FIGURE 3. PINZON HEADING ERROR DIAGNOSTIC.

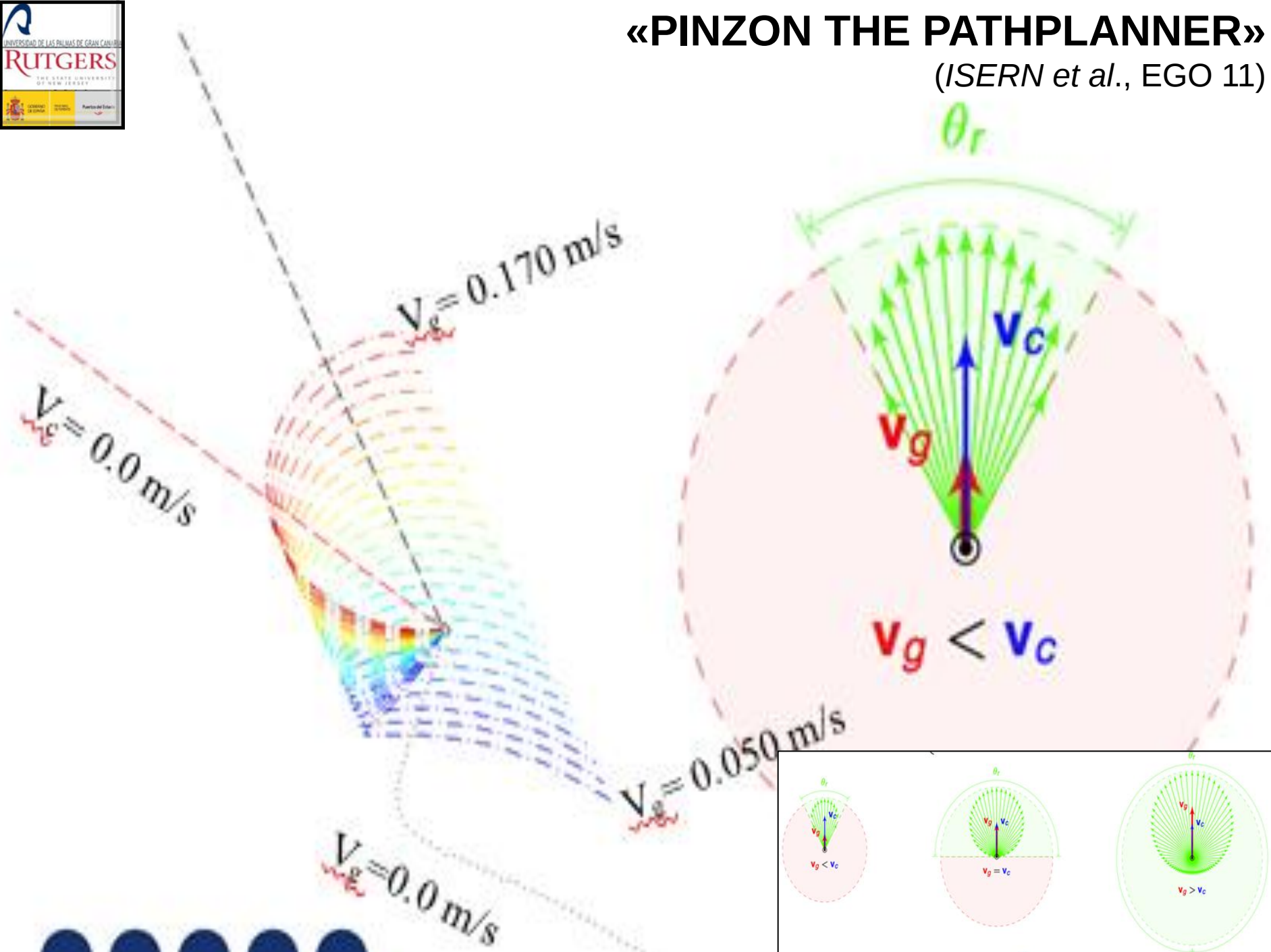




Data: BIO, NOAA, U.S. Navy, NGA, GEBCO

Digitized by Google

«PINZON THE PATHPLANNER» (ISERN et al., EGO 11)



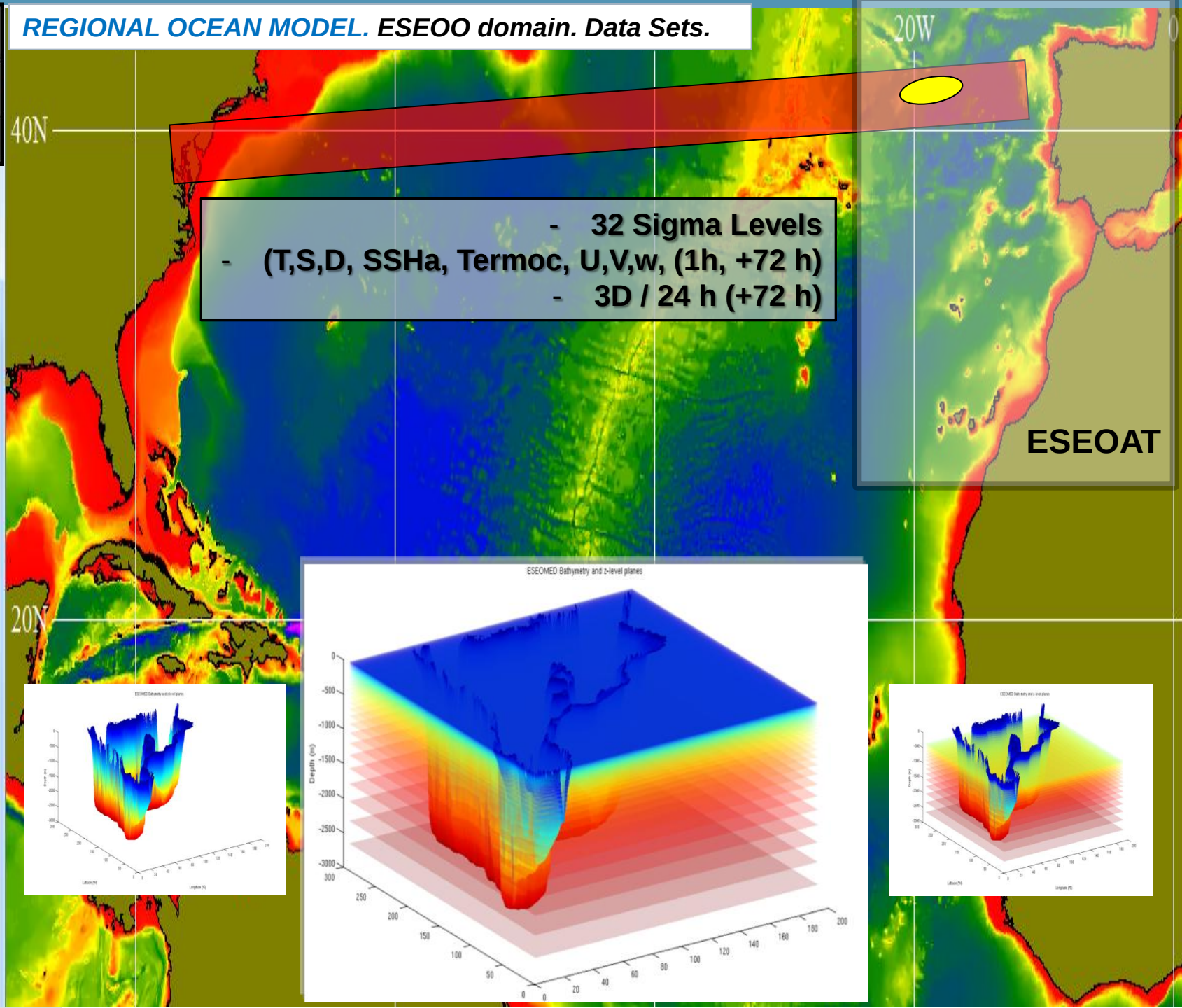
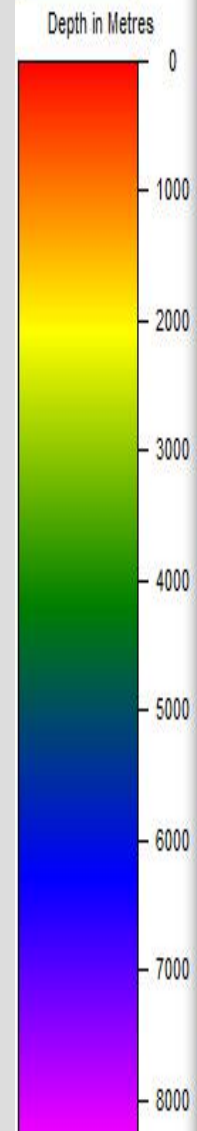
El tiempo total necesario para recorrer la trayectoria resultante es de 13 días 15 horas 41 minutos y 48.5 segundos, siendo la trayectoria de mínimo tiempo para el caso de test.

La distancia de la trayectoria resultante es de 217.835321km.

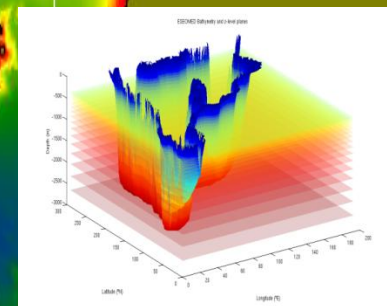
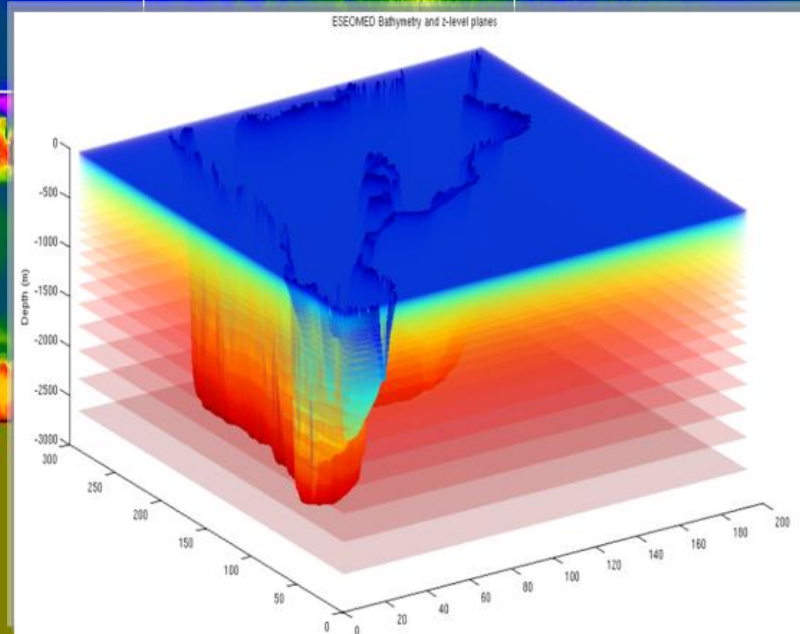
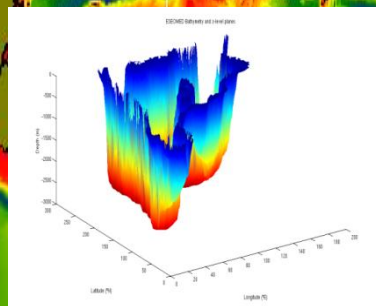
La velocidad efectiva (curso) media que consigue alcanzar el glider es de 0.197988m/s, lo cual proporciona una eficiencia de aproximadamente el 200% respecto a la velocidad del glider (0.1m/s). Esto indica que la trayectoria obtenida aprovecha adecuadamente las corrientes. No obstante, dependiendo del caso de test, no siempre interesará ir rápido, sino ir por el camino más corto. De hecho, lo que se busca es el camino de mínimo tiempo (=distancia/velocidad).

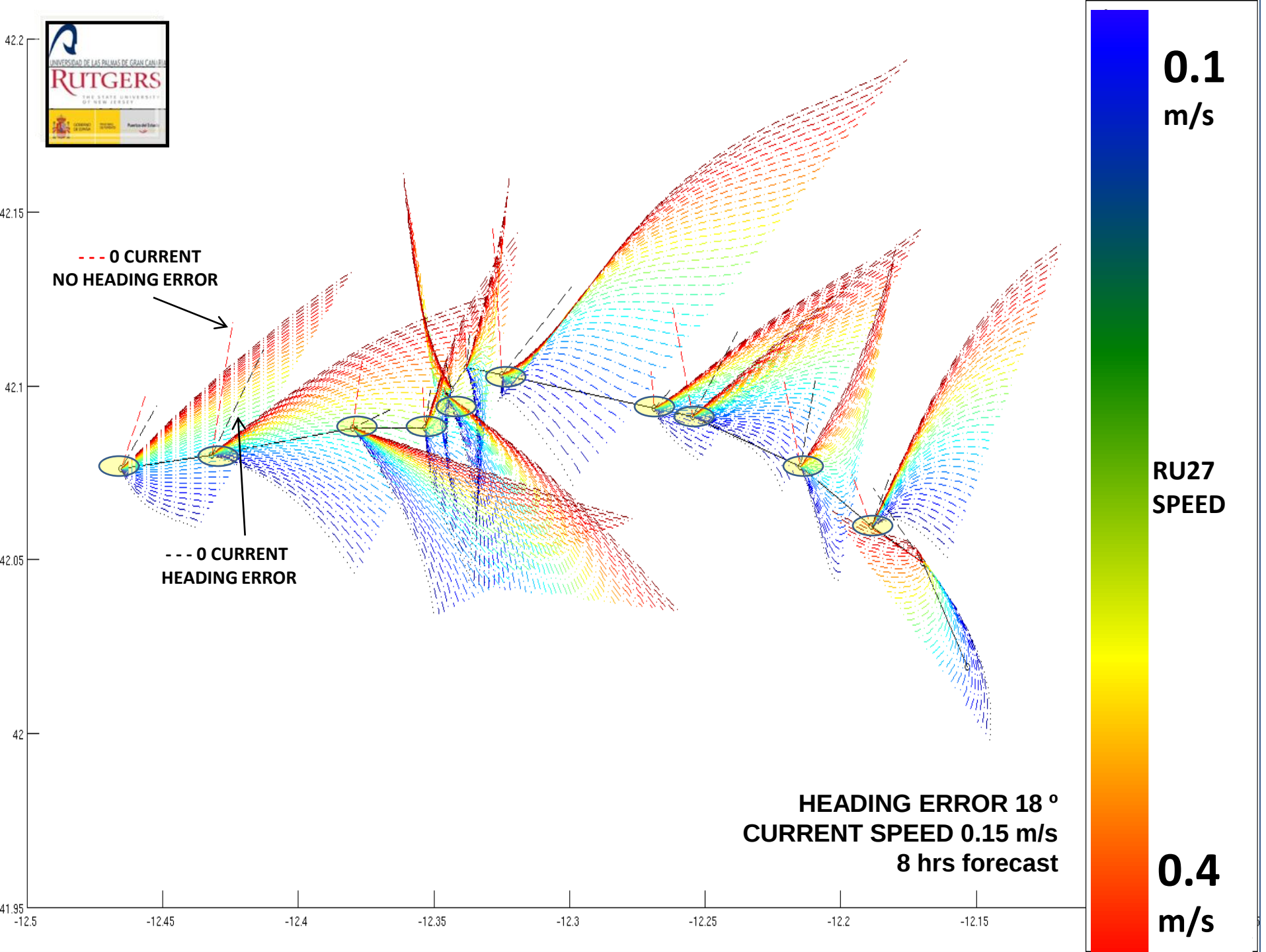
NUMBERS !!!

Waypoint	Course speed (m/s)	Course (°N)	Bearing (°N)
1	0.230	90.000	46.830
2	0.233	90.000	60.667
3	0.229	90.000	72.438
4	0.108	44.502	334.041
5	0.167	44.490	13.290
6	0.181	44.474	35.141
7	0.145	0.000	327.133
8	0.150	0.000	322.262
9	0.144	0.000	312.488
10	0.219	44.516	40.180
11	0.239	44.404	24.608
12	0.257	44.386	12.655
13	0.272	44.372	5.997



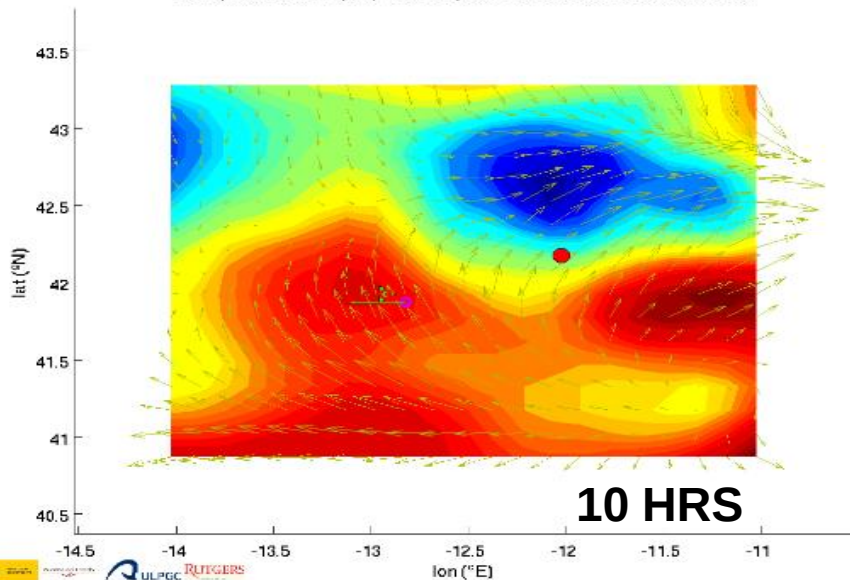
- 32 Sigma Levels
- (T,S,D, SSHa, Termoc, U,V,w, (1h, +72 h)
- 3D / 24 h (+72 h)



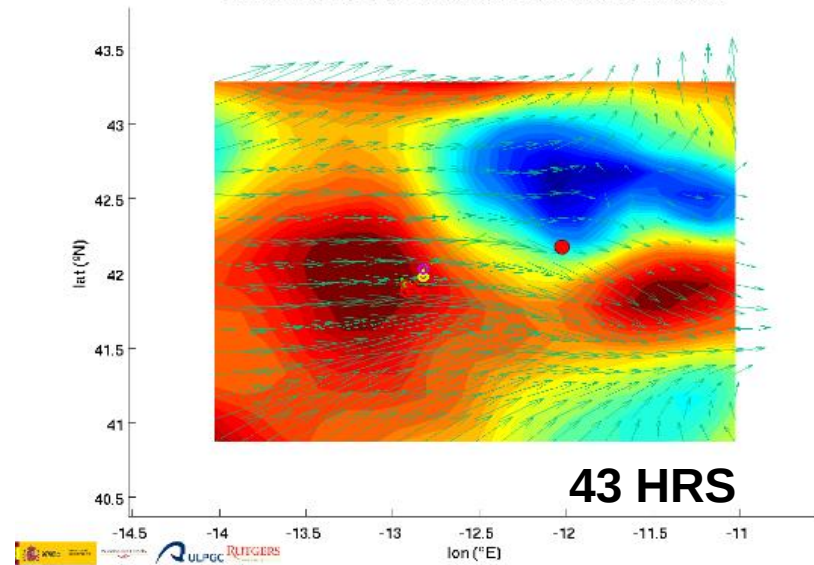


VIDEO

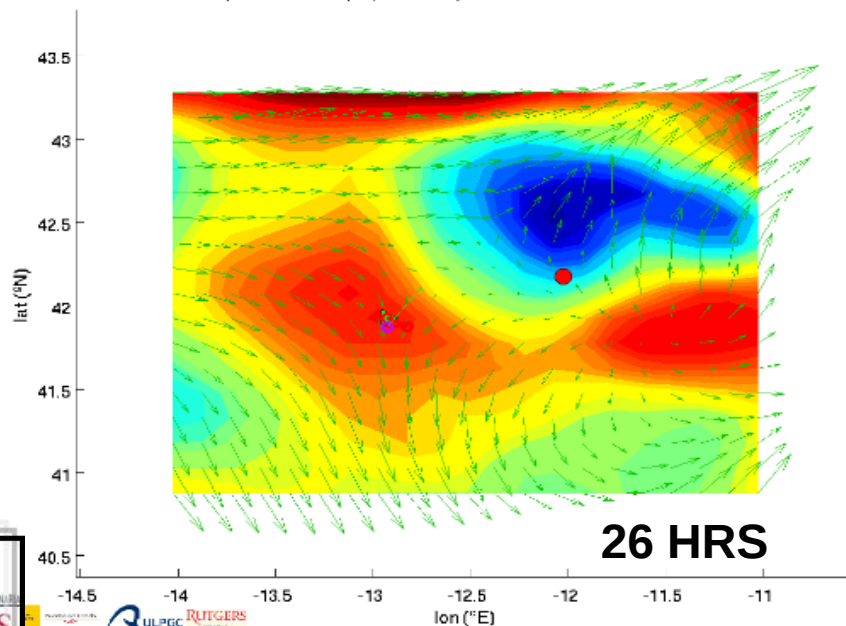
Path plan 20091124 (AN) - Glider speed = 0.150m/s, t = 0d 18:00:00.000



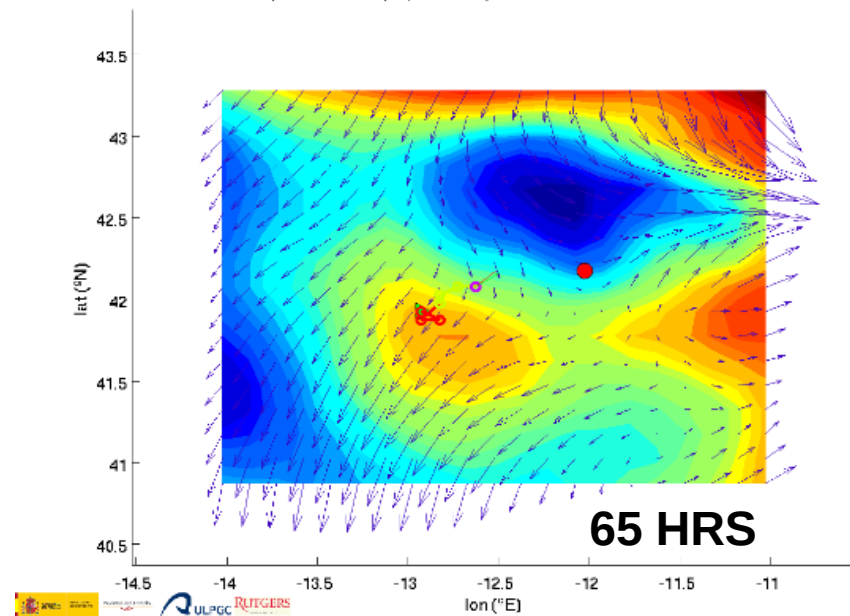
Path plan 20091124 (P1) - Glider speed = 0.150m/s, t = 1d 19:00:00.000



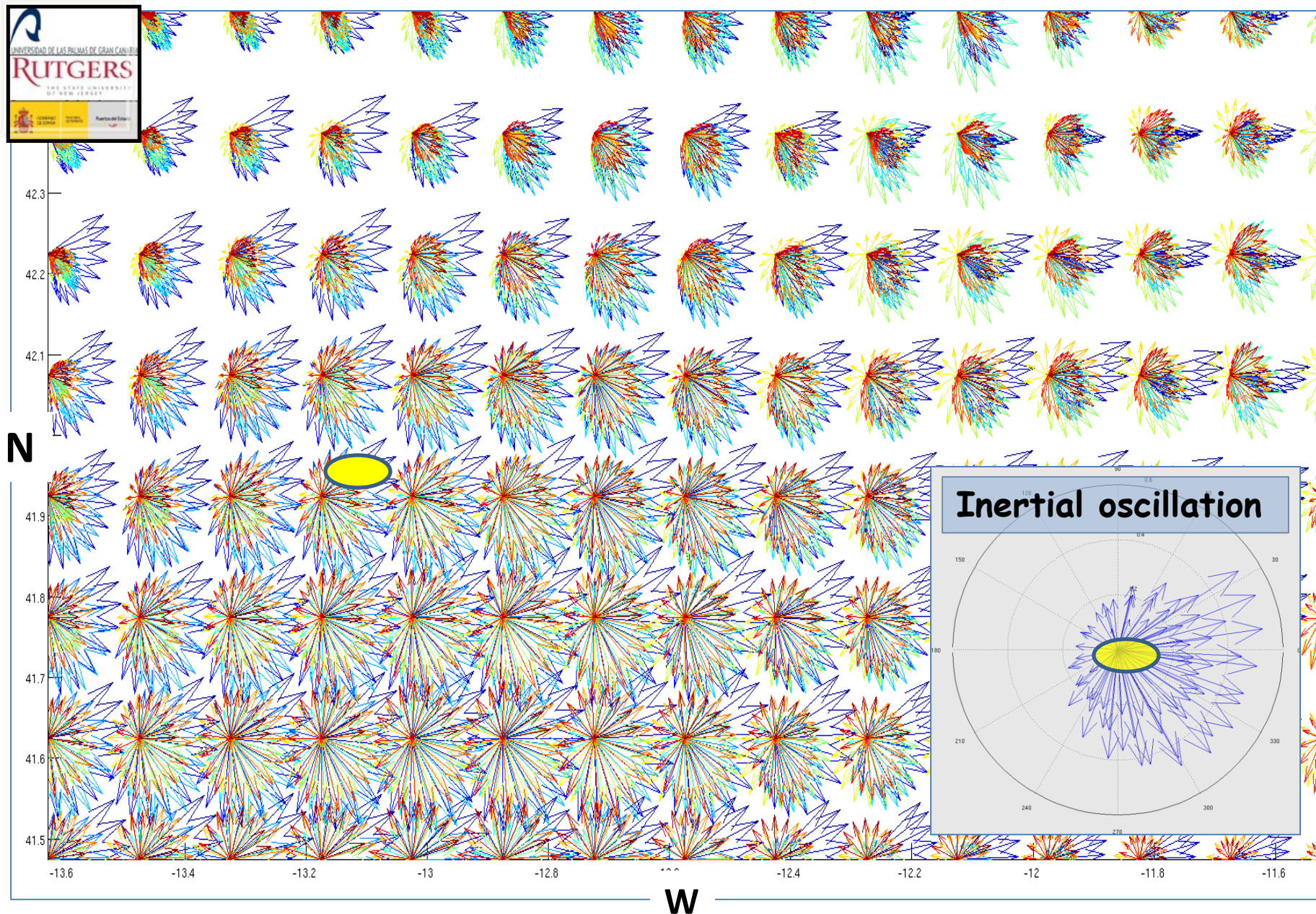
Path plan 20091124 (P1) - Glider speed = 0.150m/s, t = 1d 07:00:00.000



Path plan 20091124 (P2) - Glider speed = 0.150m/s, t = 2d 21:00:00.000

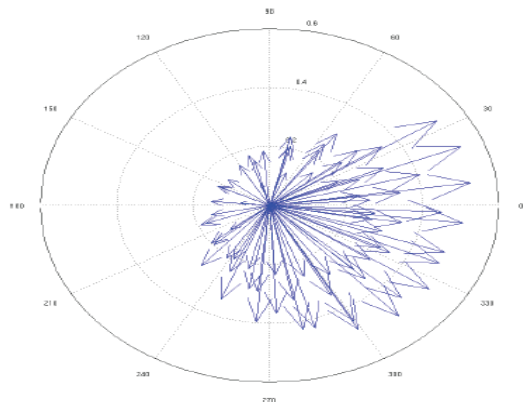


ESEOO SSHa. 24-27 NOV 2009

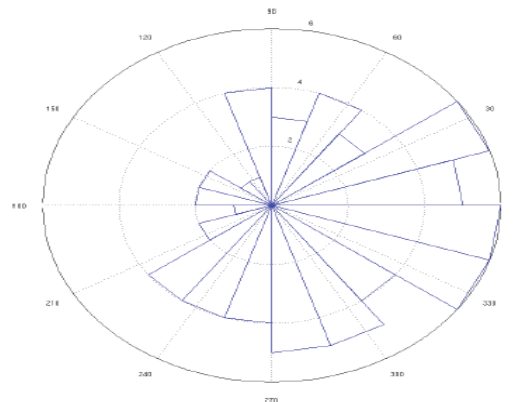


21 -23 Nov 2009. CURRENT FIELD USING HOURLY DATA FROM ESEOO ON THE RIGHT THE COMPASS PLOT AT THE NE OF RU27 POSITION. (the 3 days in different colors)= (42N, 13W).

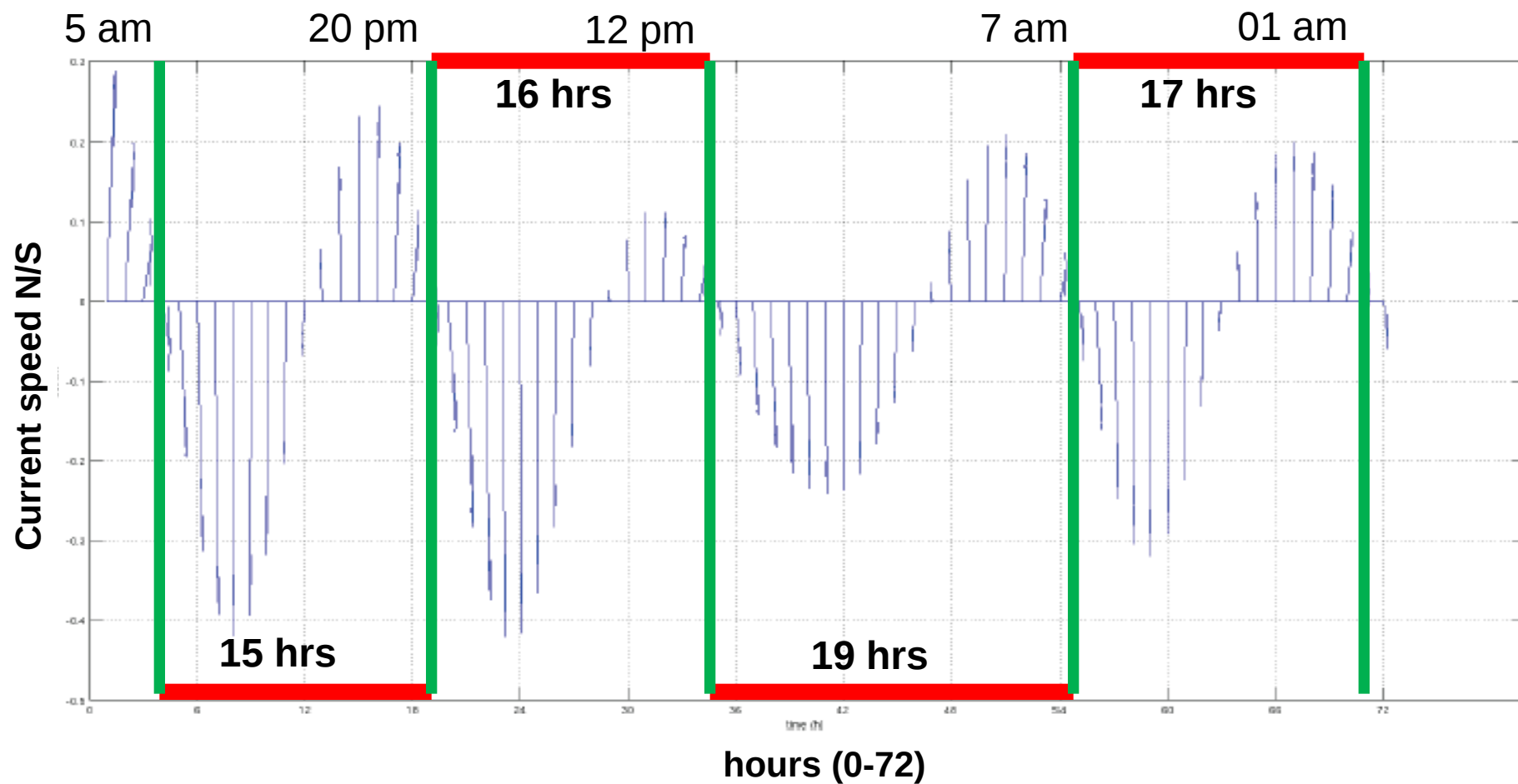
RU27
24-26 NOV 09
ESEOAT



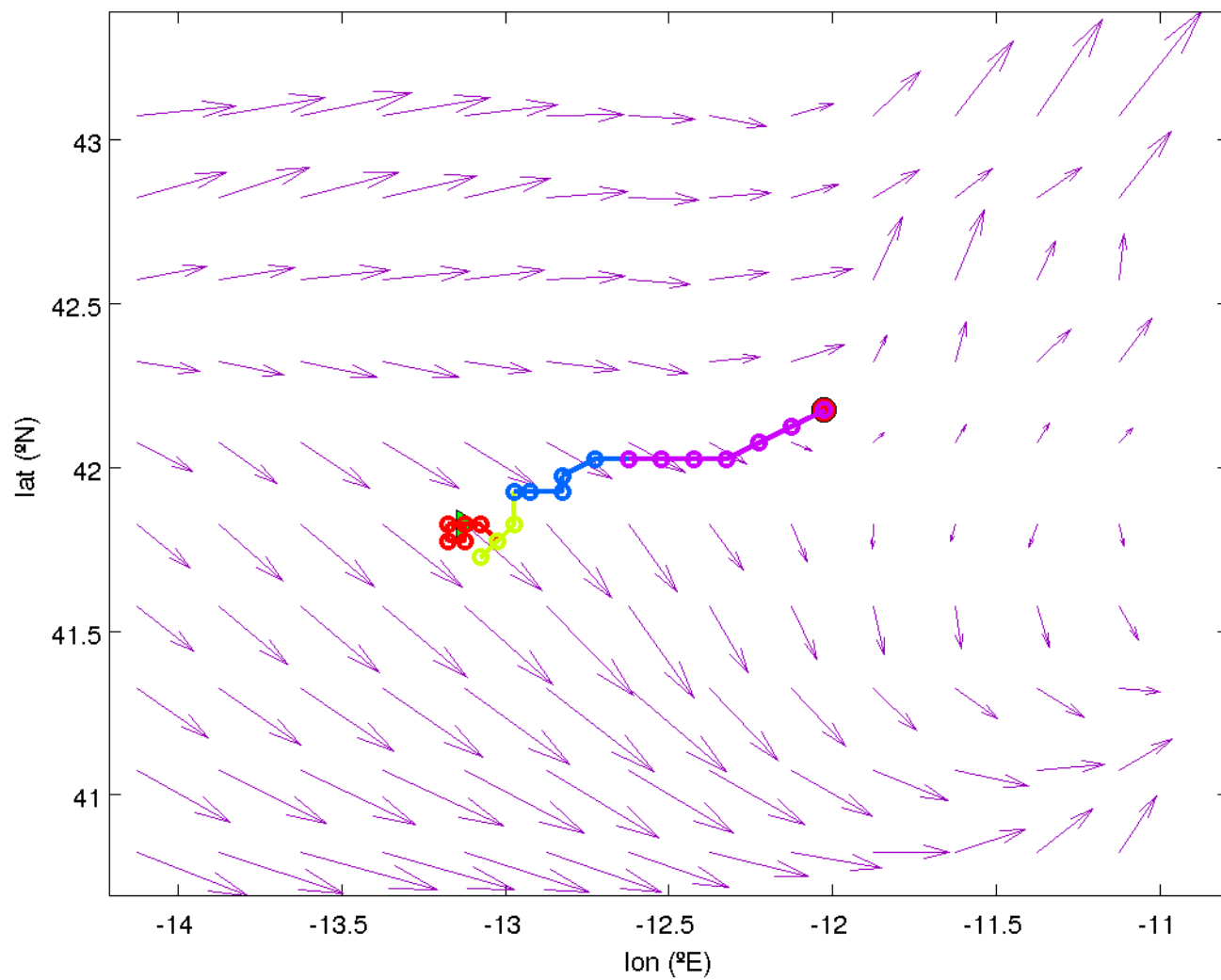
(c) Compass plot



(d) Rose plot



Path plan 20091122 (NP) - Glider speed = 0.150m/s, t = 7d 10:53:43.438



VIDEO

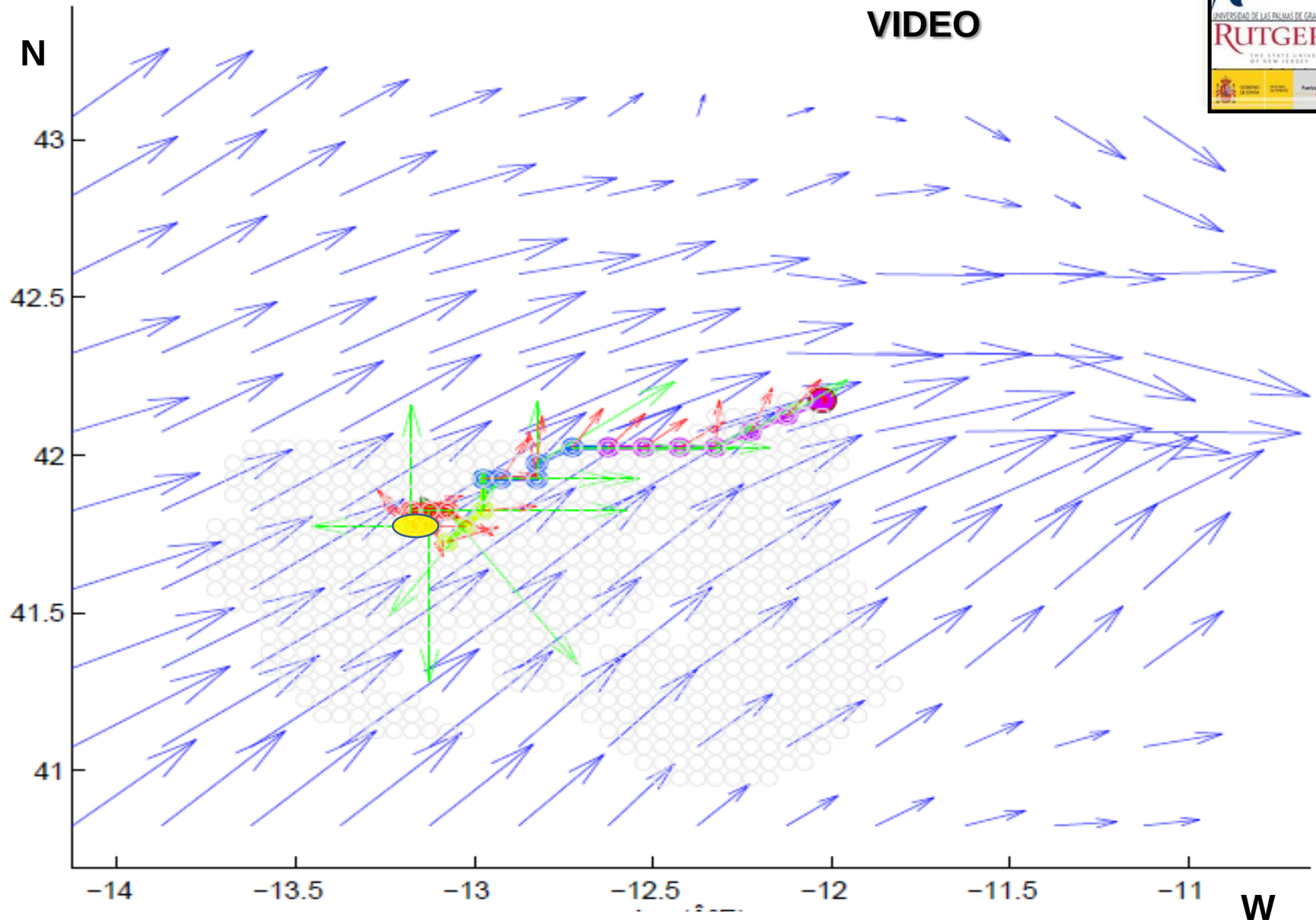


FIGURE 7. PINZON PATH PLAN ON 24 NOV 09 TO LEAVE THE INERTIAL OSCILLATION.

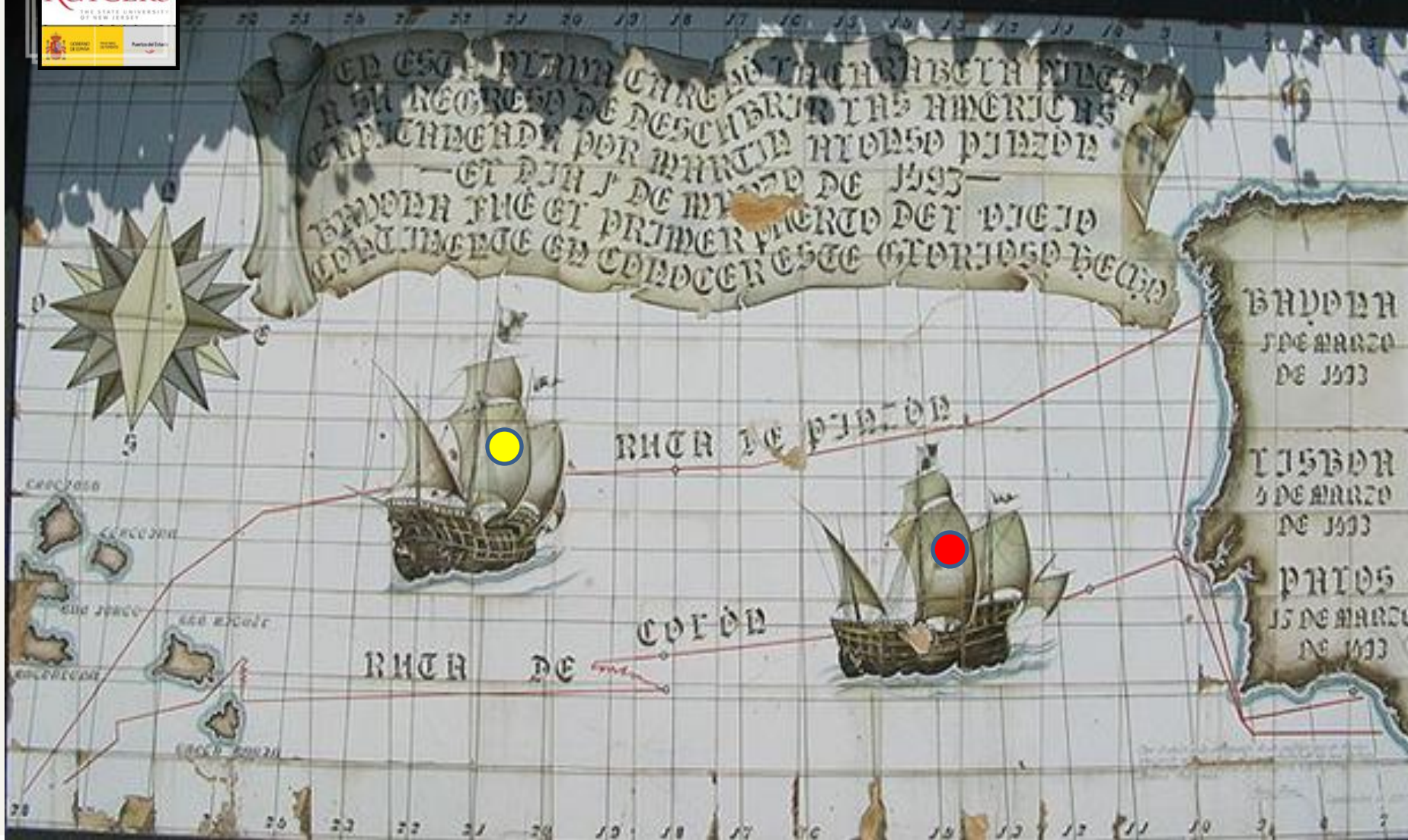


FIGURE 1. LA PINTA OF PINZON (●) AND LA NIÑA OF COLUMBUS (●) FROM MID FEBRUARY TO MID MARCH OF 1493. PICTURE EXPOSED ON THE BAIONA TOWN.



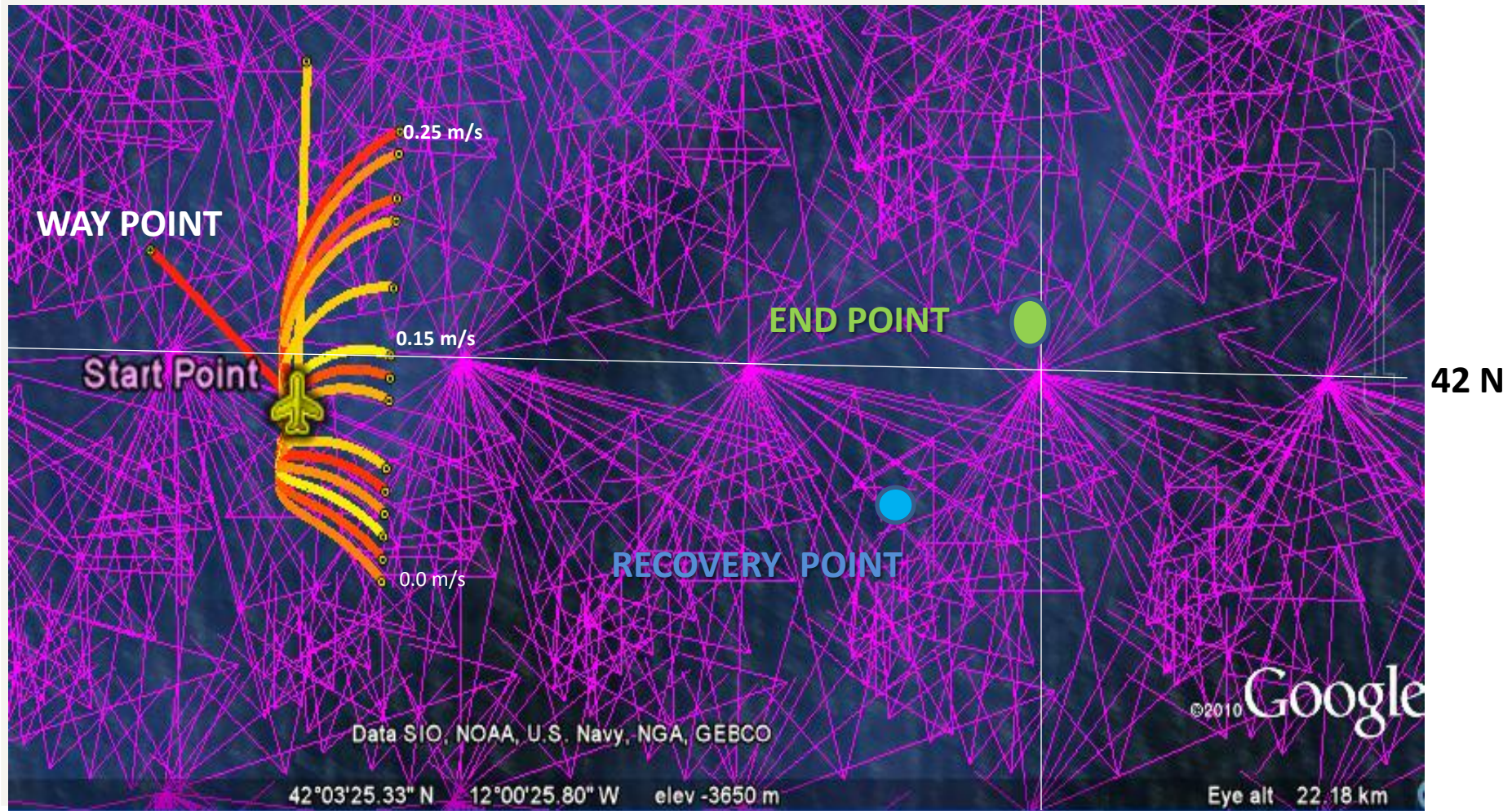
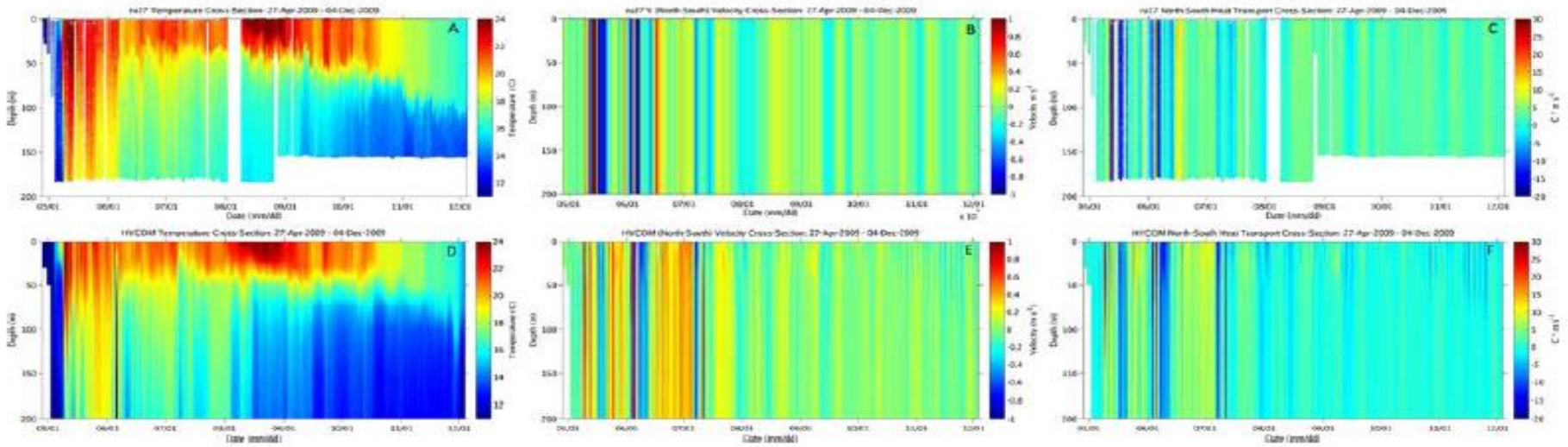


FIGURE 8. 3 DECEMBER 2009. CURRENT FIELD MOVIE ON GOOGLE earth, USING HOURLY DATA FROM *ESEO* FOR THE WHOLE DAY. IT REPRESENTS THE PINZON FORECAST BEFORE THE RECOVERING FOR DIFFERENT GLIDER SPEEDS. SCARLET WAS RECOVERED AT 41.58 N, 12.03 W, FIVE NAUTIC MILES SW FROM PREVIOUS END POINT ON 4 DECEMBER 2009 (9:04 am).



FIGURE 5

Comparison of measured (Glider RU27; A, B, C) and modeled (HyCOM; D, E, F) trans-Atlantic cross sections of temperature (A, D), north-south component of the current (B, E) and north-south component of the heat transport (C, F) along the track shown in Figure 4.

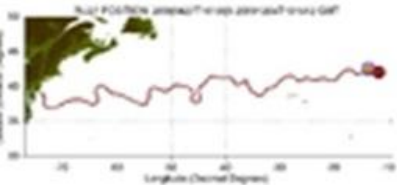


Selected Transect: RU27: 2009/04/27 15:18 - 2009/12/04 00:14 GMT

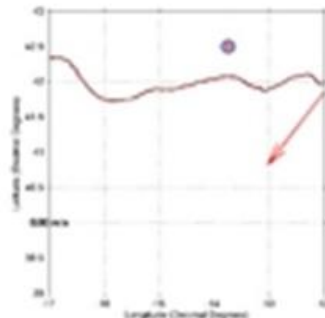
Transect:

Select Transect

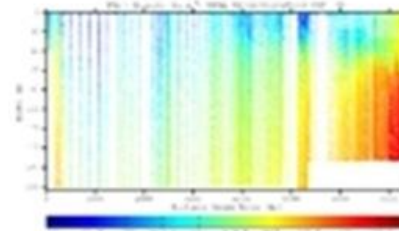
Deployment
Map (89Kb)



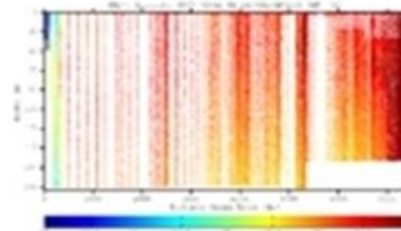
Depth-Averaged Currents
Map (78Kb)



Density
Cross Section (217Kb)

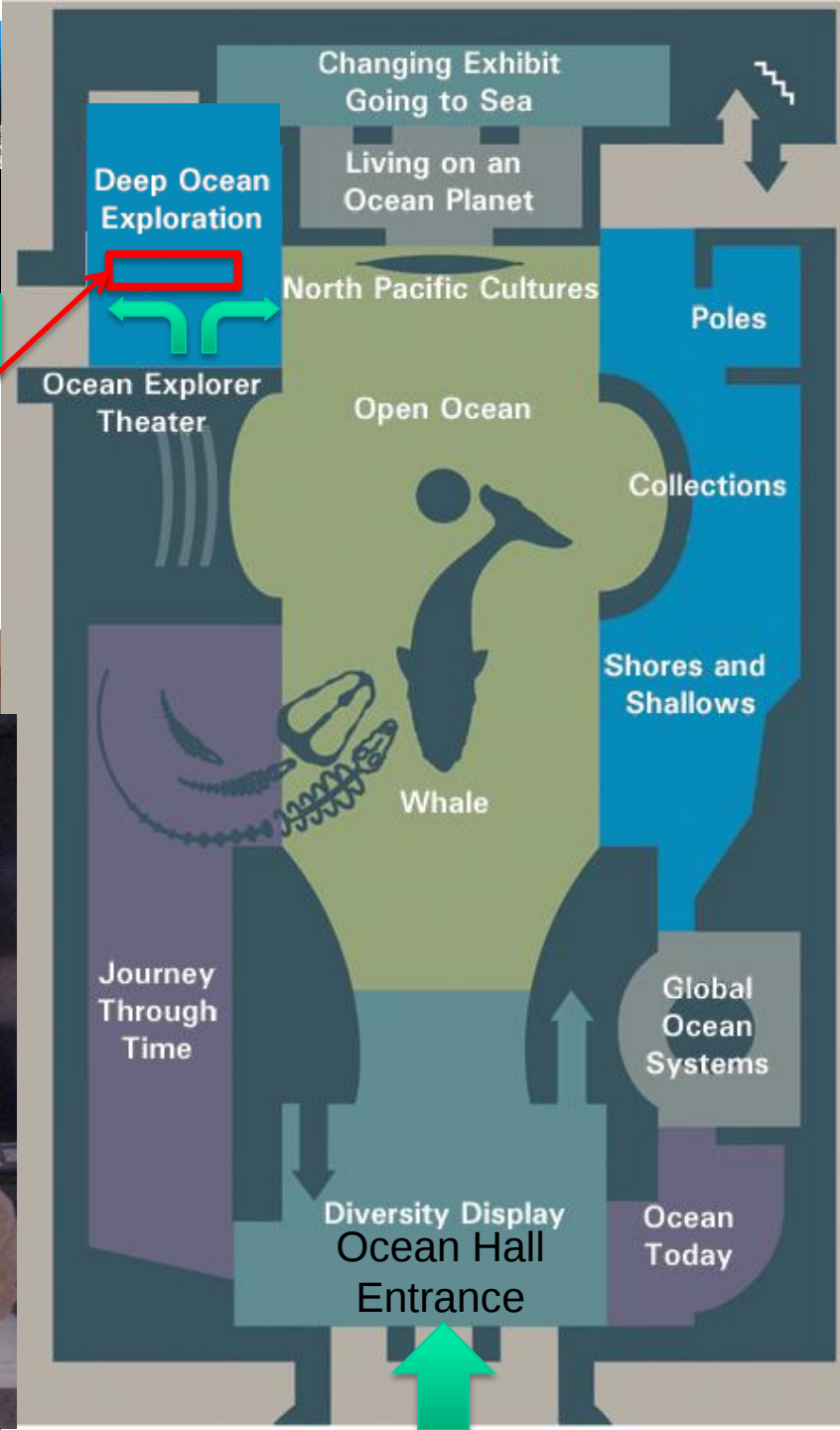
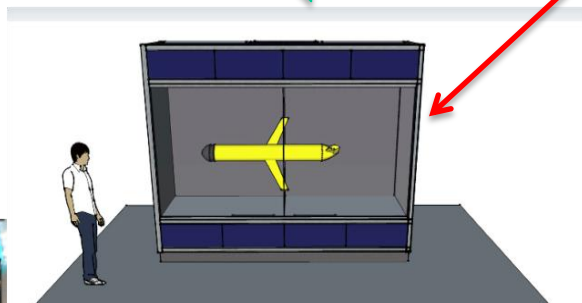


Salinity
Cross Section (235Kb)





Hall of human Origins





<http://rucool.marine.rutgers.edu/atlantic/index.html>

Force, wind, sea and honor all