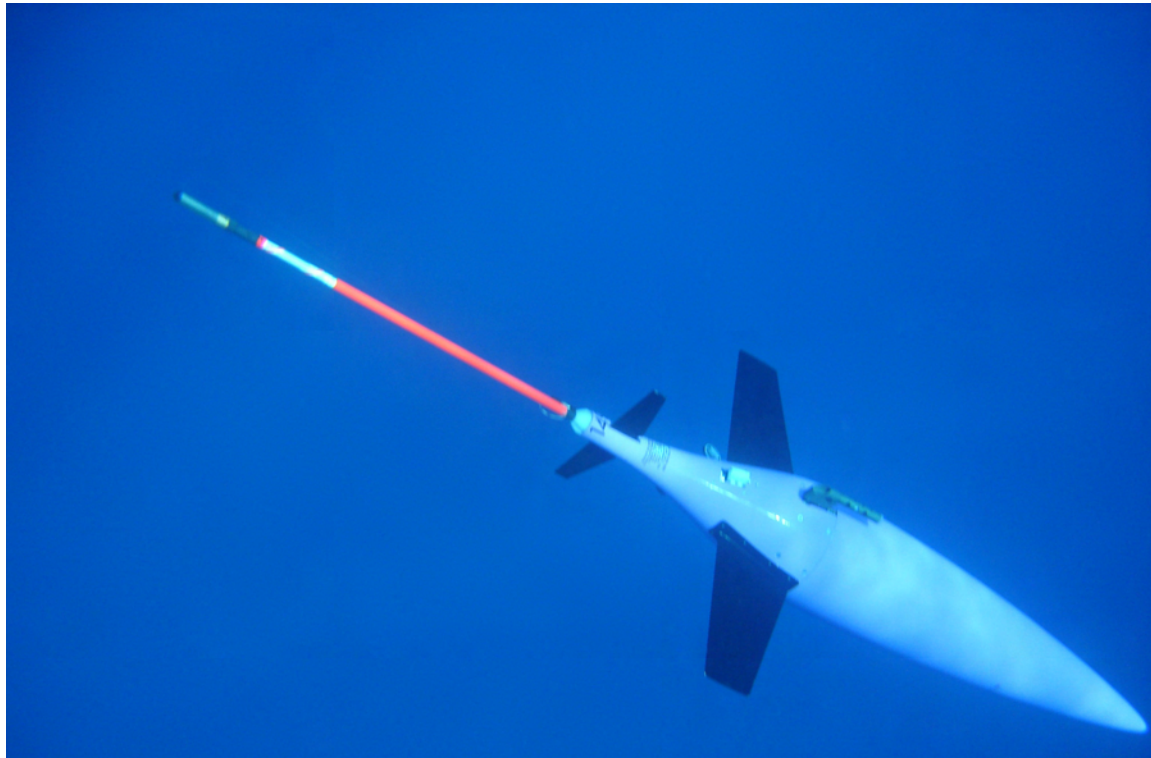


# ***Seagliders in the Eastern Mediterranean: Trials***

***Daniel Hayes<sup>1</sup>, Gregory Konnaris<sup>1</sup>, Angelos Hannides<sup>2</sup>,  
Pierre Testor<sup>3</sup>, Thierry Terre<sup>4</sup>***



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- 2. Dept. of Fisheries and Marine Research, Ministry of Agriculture***
- 3. LOCEAN-IPSL, Univ. of Pierre and Marie Curie***
- 4. IFREMER, LPO, Brest***

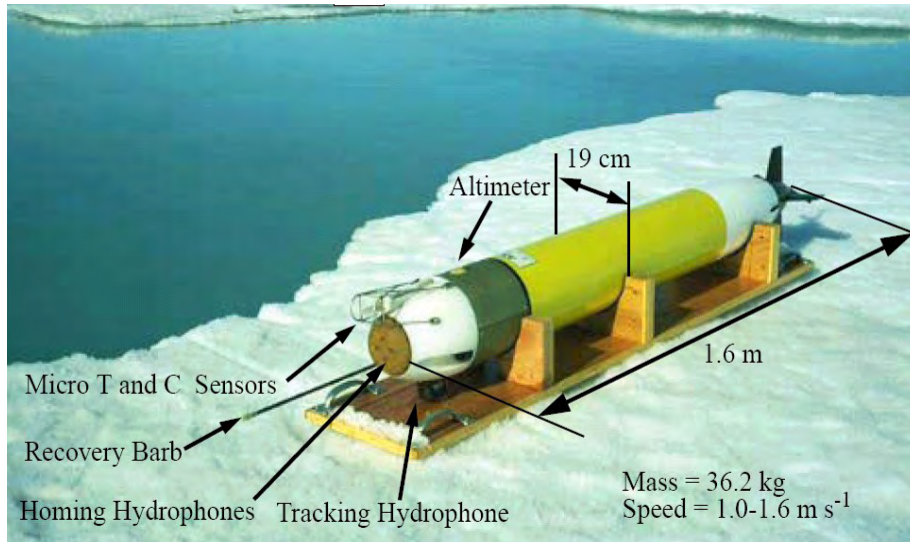


# Outline

- Gliders and Oceanography in Cyprus
  - Project plans and status
  - Trials: lessons and results



# My AUV experience



AMTV

-Measured mixing under Arctic sea ice



AUTOSUB

-Measured waves travelling through Antarctic sea ice



# Motivation

- Operational Oceanography: Near real time observations and forecasting
- Basic: research questions about circulation, mesoscale variability, biogeochemical processes
- Applied: improved forecasting and monitoring means a cleaner, safer sea (pollution and trajectory modeling, data for regulatory agencies)
- The best way forward considering capability and cost is gliders: infrastructure grant from national funding body

# Glider description

## Seaglider

- Battery-powered, buoyancy-driven
- 25-50 cm/s, 16-45° slope
- T,C,p,O<sub>2</sub>,Fl,OBS,currents
- surface transmit/receive for data and instructions every few hours.
- 1000 m dive capability

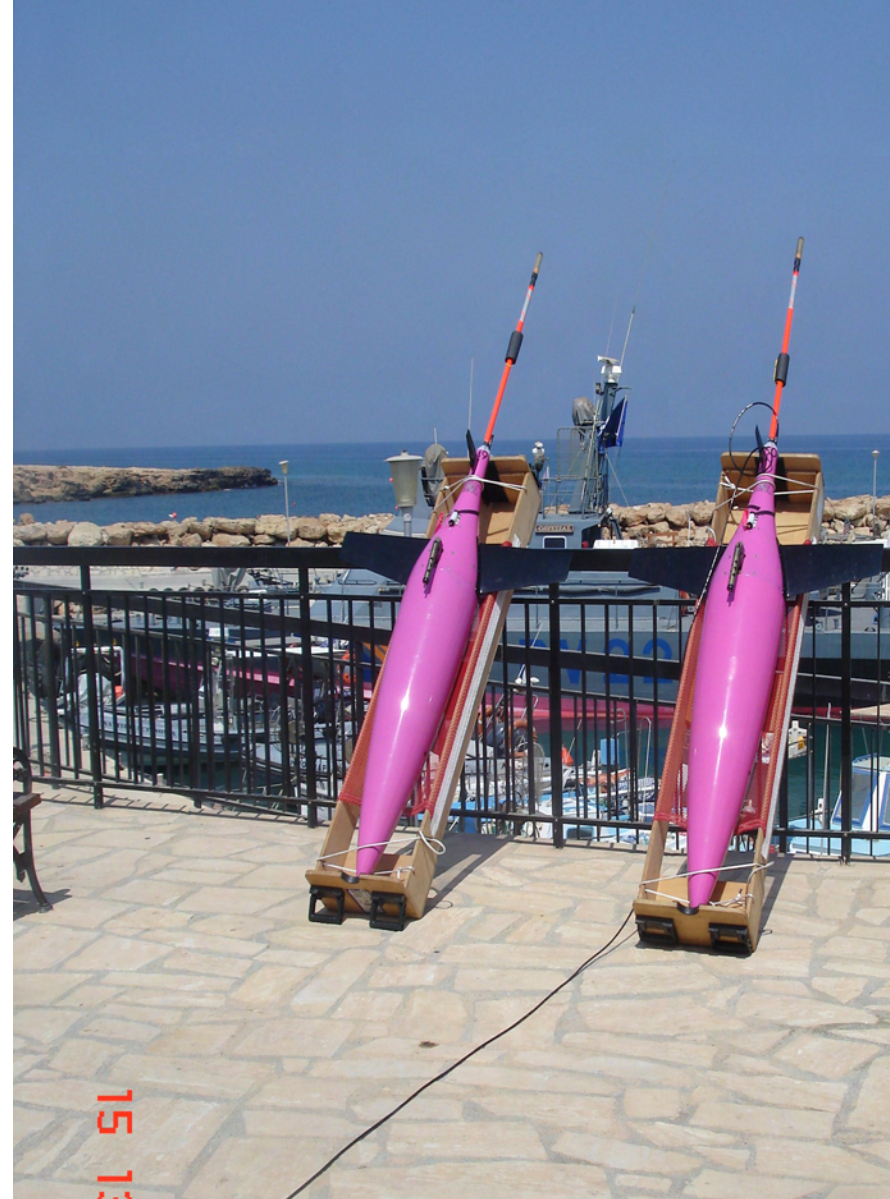


Photo: A. Hannides

# Seaglider description

- Low-drag fairing over hull of compressibility  $\sim$  seawater
- Lithium batteries,  $\sim$ 6 mo life (4600 km or 650 dives to 1km)
- Iridium satellite phone for data, instruction transfer
- Controlled with file exchange (commands, waypoints, configuration)

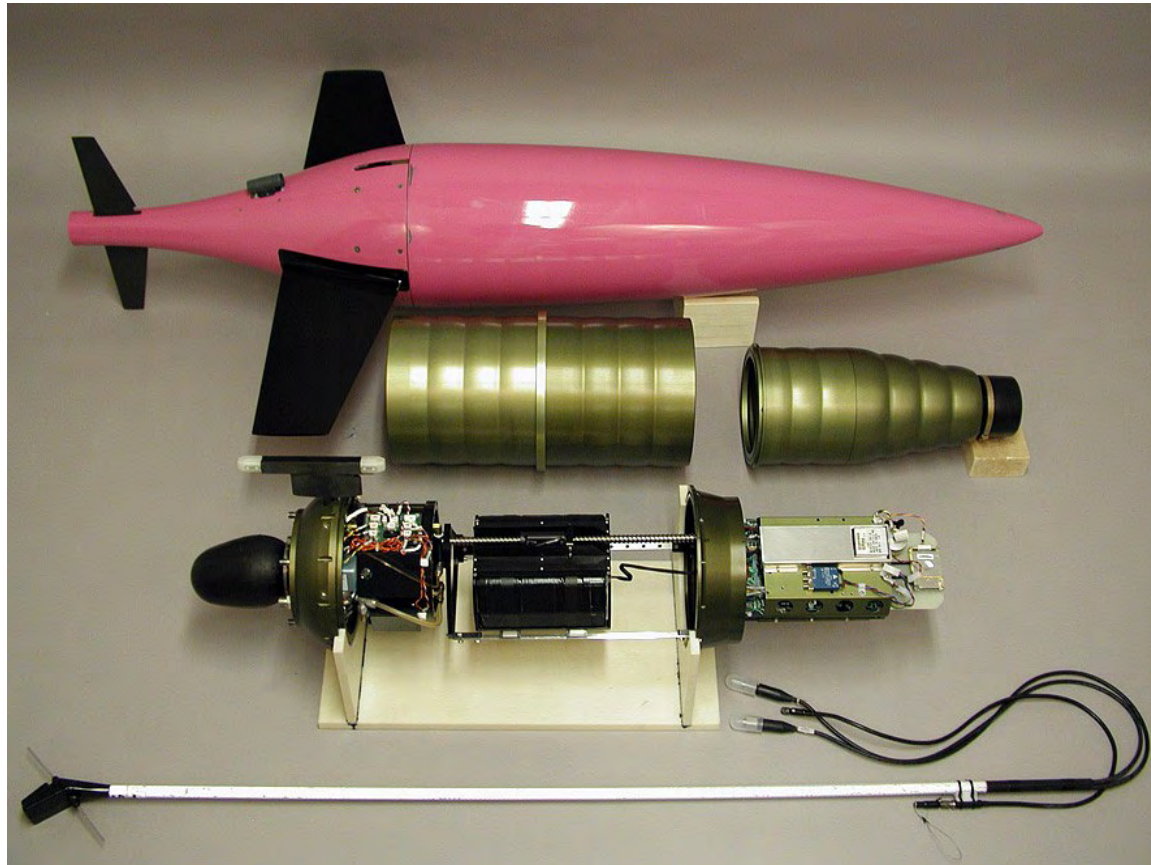
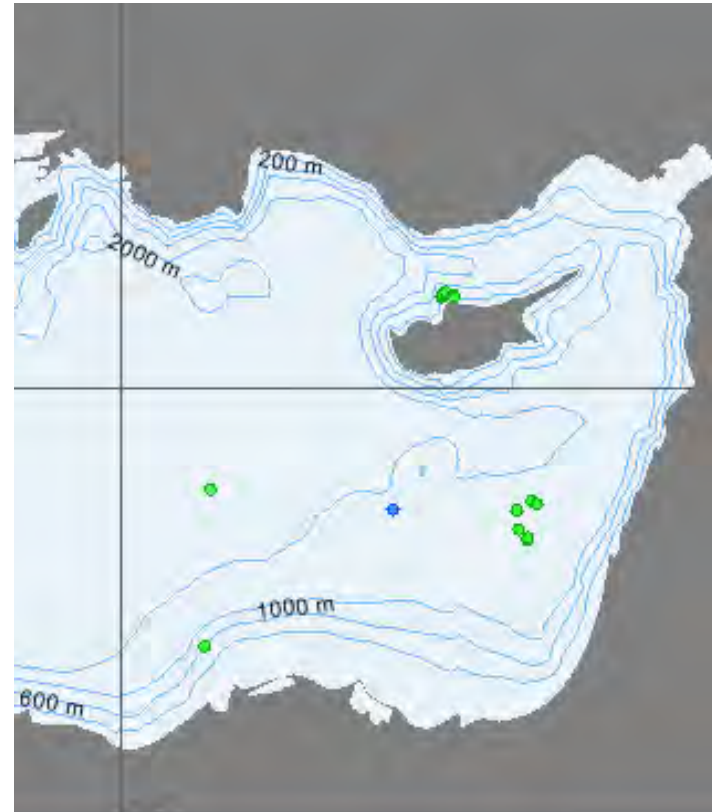


Photo: U of Washington

# Operational Use / Near Real Time

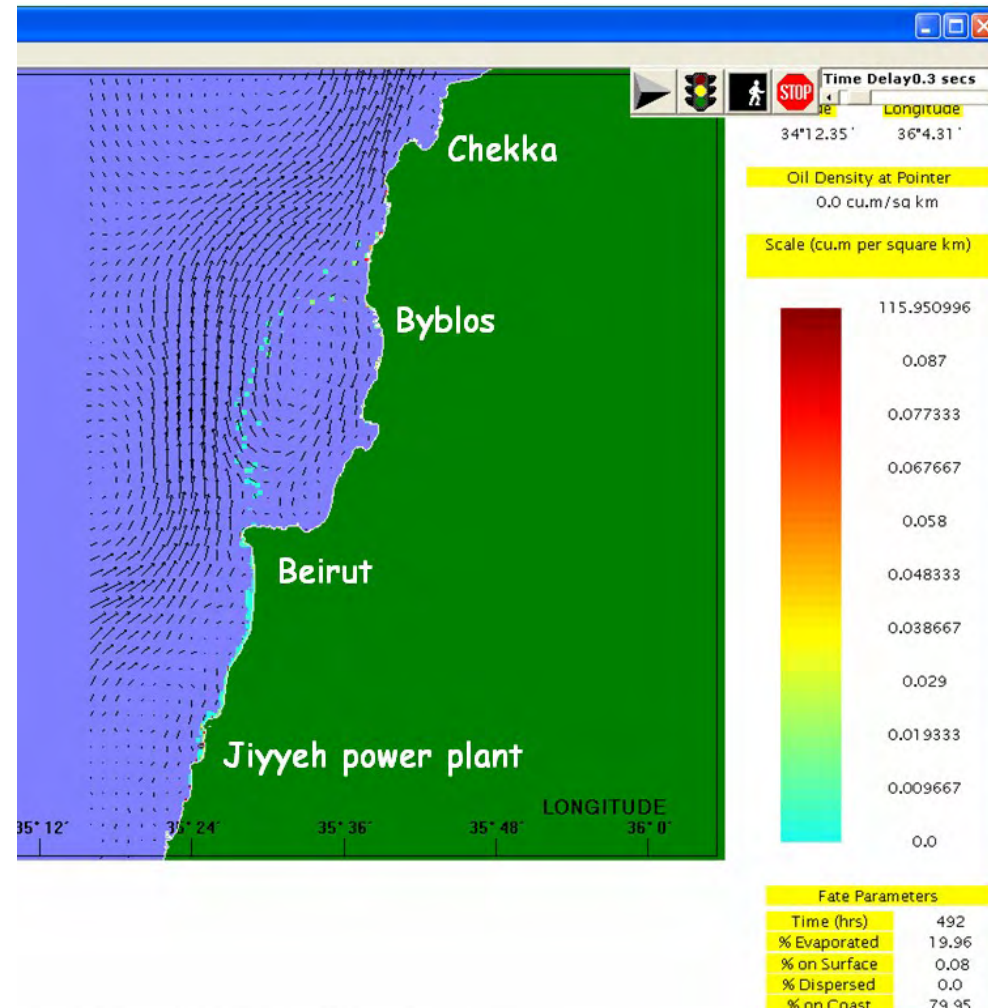
- Near real time subsurface data is sparse.
- 15 Argo float cycles and 1 XBT, 2 drifting buoys in the last 30 days east of 30°E.
- Not under user control
- Do not constrain meso-scale fields (10-50 km size features)





# Operational Use / Near Real Time

- Support operational forecasts:
  - Data assimilation
  - Drive drift models, oil spill fate models
  - Support search and rescue operations, coastal management
- Environmental monitoring:  
Inform authorities, business, and public



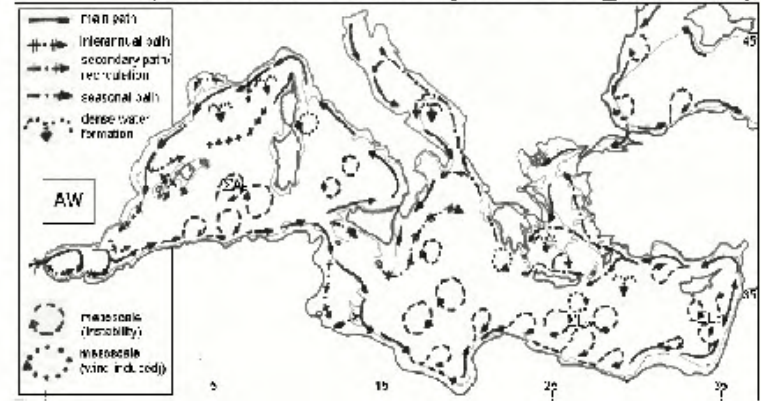


# Why do we want glider data?

## Basic Research

- High resolution data are hard to find.
- Costs of traditional methods large.
- Maps with arrows are still debated.

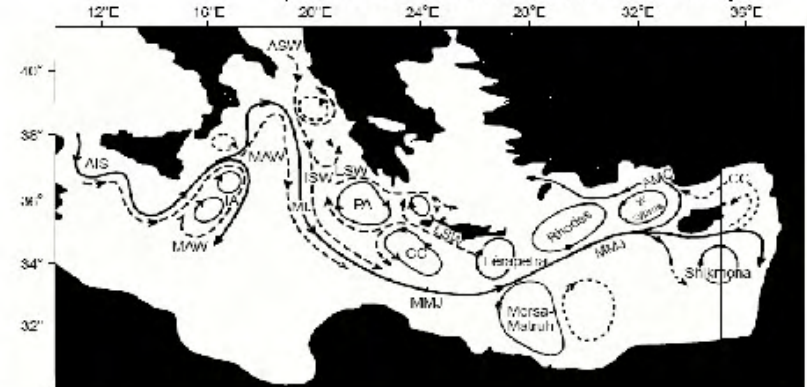
(from Millot et Taupier-Letage, 2005)



(from Pinardi et al., 2004)



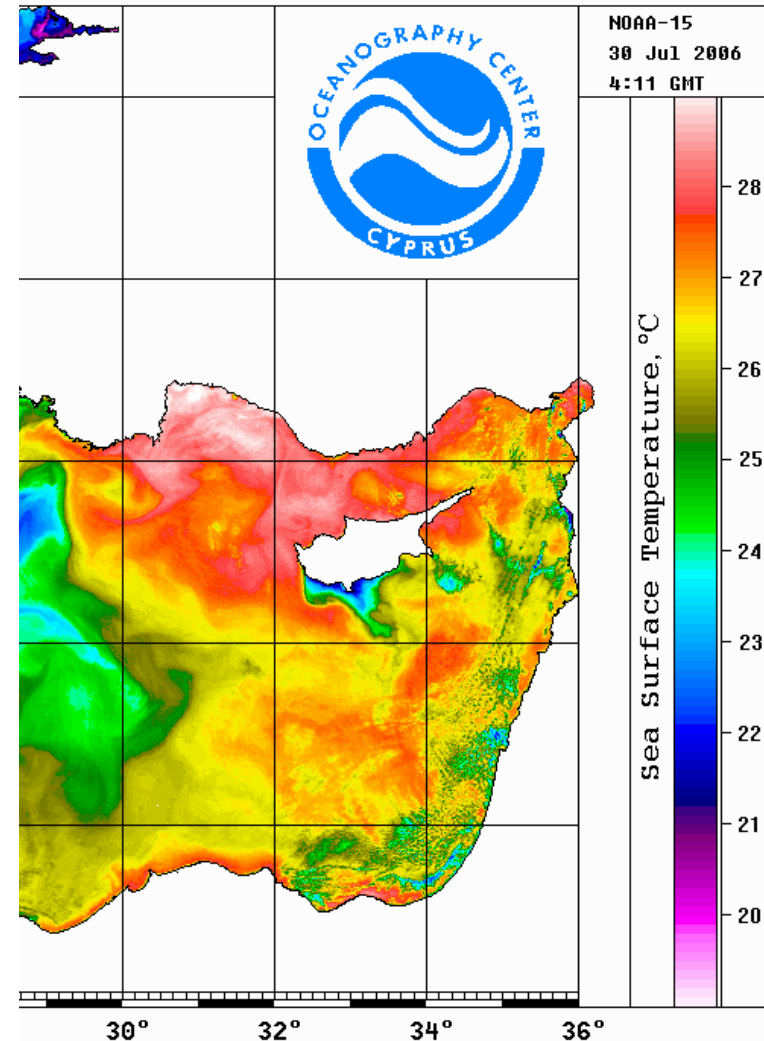
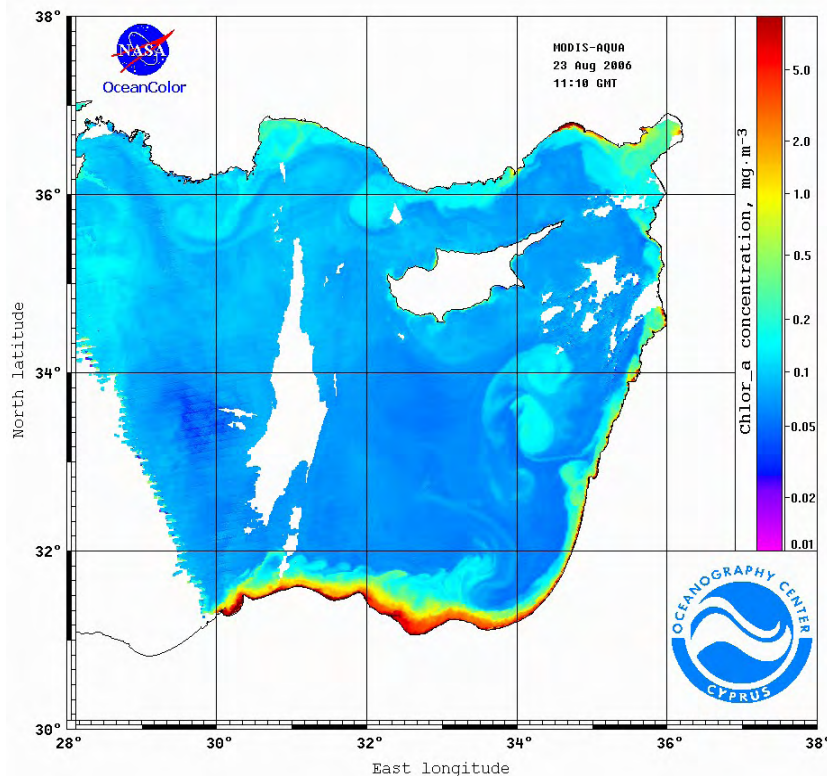
(from Robinson et al., 1992)



# Why do we want glider data?

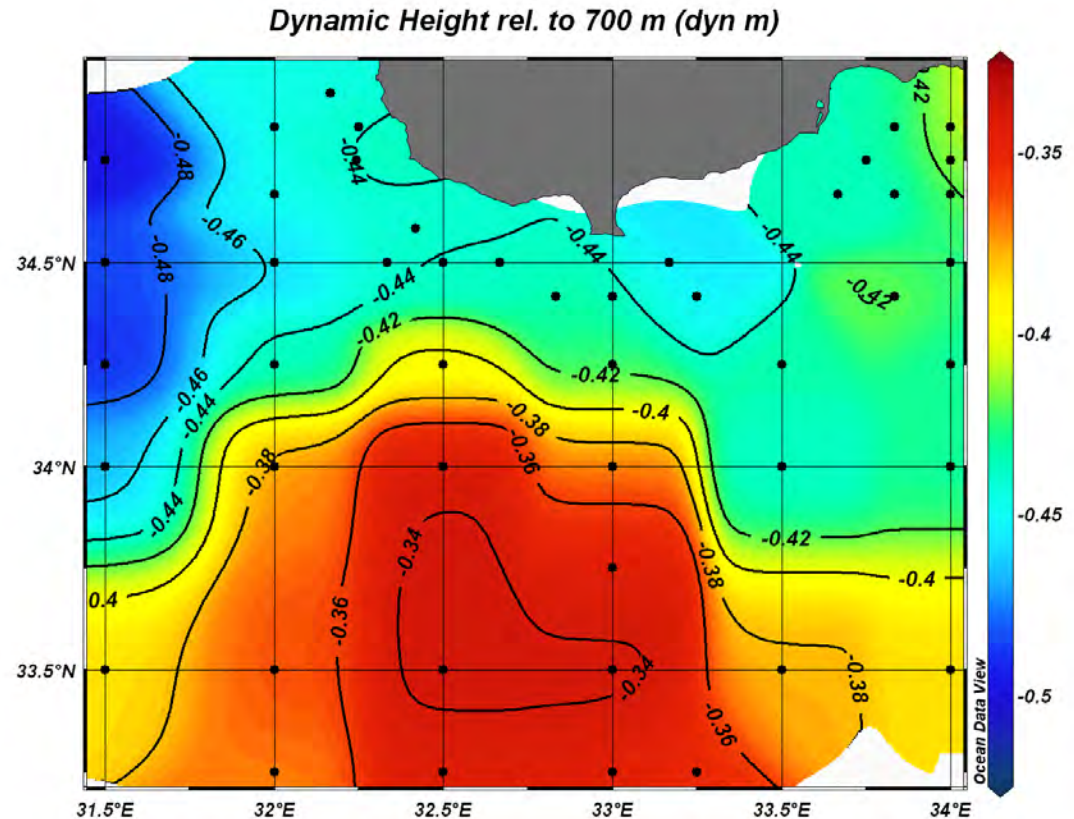
## Basic Research

- General circulation and thermohaline structure.
- Mesoscale structure and variability.
- Long-term monitoring.



# Hydrographic cruises

- CYBO-19, Sep. 2005
- 4 Water masses
- Atlantic water debated
- What is persistence or recurrence of features?
- Small-scale features?
- Coastal phenomena?





# What is planned?

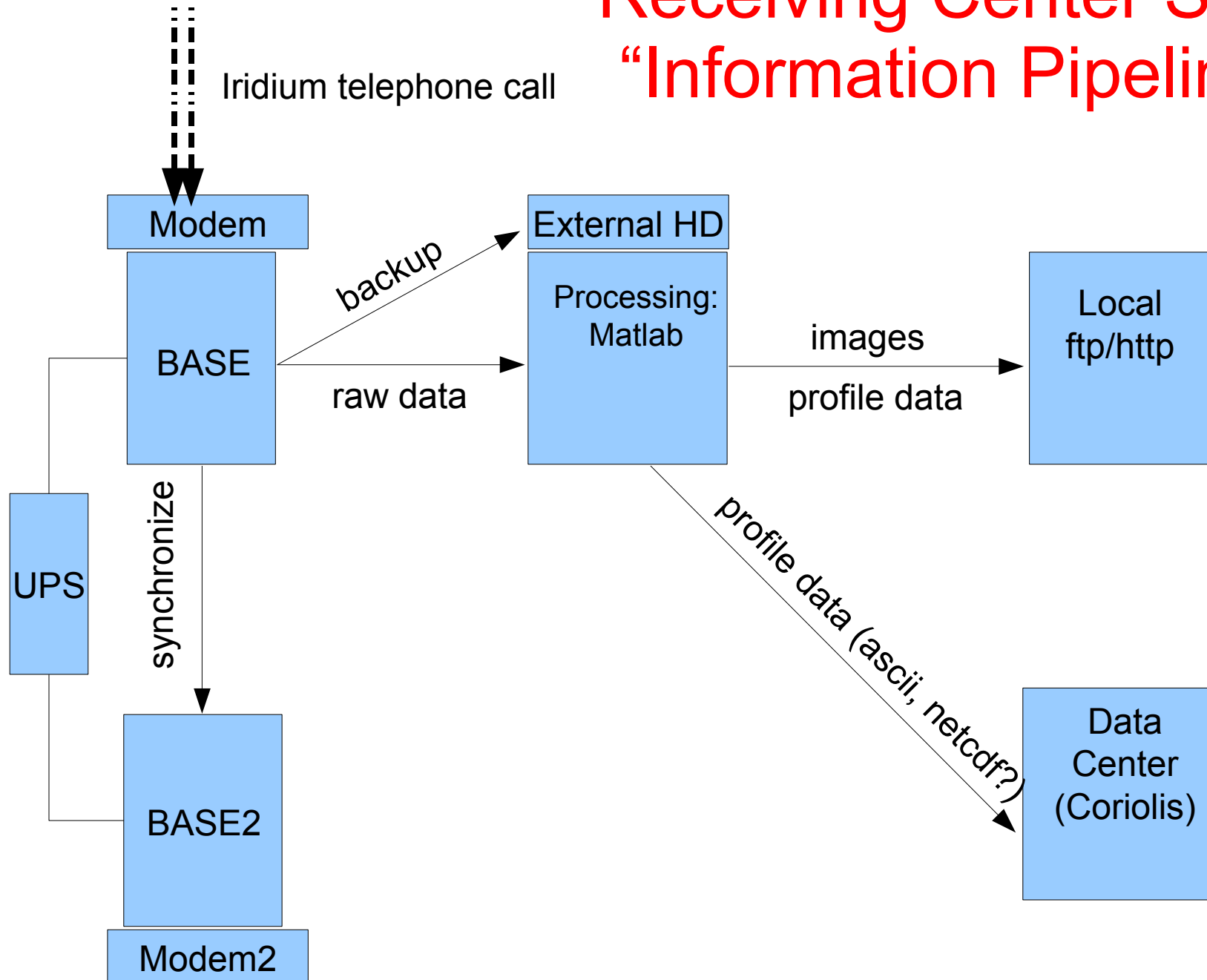
- 2 gliders
- 4 years of 3-month missions, 2000 km, 1000 m depth cycle every 5 km.
- Process studies and near coastal monitoring
- During down times and after project, will be available for other projects.

# Glider Trials

- Try your patience (tenders, shipping)
- Try your computer infrastructure and administration skills.
- Try your piloting skills.
- Try your glider.



# Receiving Center Set-up “Information Pipelines”





# Sea Trials Set-up

- Local agency partner supplies boat and office (but internet restricted)
- Close to deep water, currents not favorable
- Check comms, ballast, underwater acoustics, GPS
- Pilot lessons:
  - Must have scripts for backup, rsync, move data, plot data ready
  - Procedure laid out in writing beforehand
  - Navigational chart and Google maps ready



Photo: P. Testor

# Sea Trials 18 Sep 2008

http://maps.google.com/

Most Visited Getting Started Latest Headlines

Search Take Action! Message [0 new] Online Tools News and Action Alerts Donate My Stats 79 °F

Web Images Maps News Shopping Gmail more

daniel.r.hayes@gmail.com | My Profile | Help | My Account | Sign out

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Get Directions My Maps

Created by me

- ☐ CYPRUS GLIDER MISSIONS 22-23 OCTOBER 2008
- ☒ CYPRUS GLIDER MISSIONS 18 SEPTEMBER 2008
- ☐ GLIDER-2
- ☐ Untitled
- ☐ CYCO-4

Created by others

- ☐ Cyco 4

[Collaborate](#) [Edit](#)

**CYPRUS GLIDER MISSIONS 18 SEPTEMBER 2008**

2 views - Public  
Created on Sep 18 - Updated 3 days ago  
By Dan  
[Rate this map](#) - [Write a comment](#)

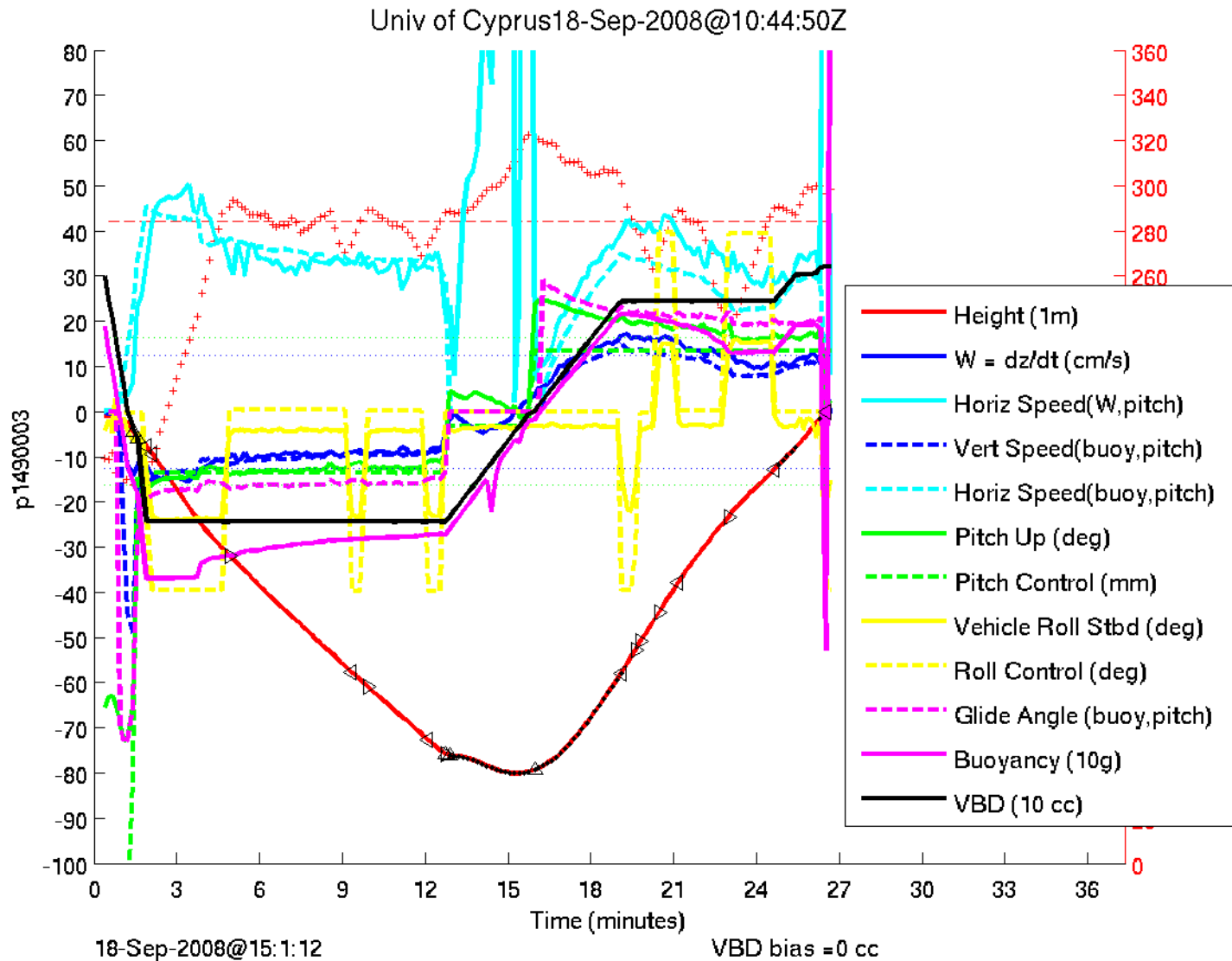
- [35.037983, 34.036600](#)  
+35° 2' 16.74", +34° 2' 11.76" Base Office. Used for
- [35.02.855, 34.02.775](#)  
PARALIMNI-1
- [35.042950, 34.052250](#)  
PARALIMNI-2
- [35.02.581, 34.04.565](#)  
PARALIMNI-3
- [35.02.371, 34.04.724](#)  
PARALIMNI-4
- [35.02.542, 34.04.511](#)  
Dive 8 finishing point
- [35.02.387, 34.04.691](#)  
Dive 7 finishing point
- [35.02.452, 34.04.525](#)

2000 ft  
600 m

©2008 Google - Imagery ©2008 DigitalGlobe, Cnes/Spot Image, GeoEye, Map data ©2008 Tele Atlas - [Terms of Use](#)

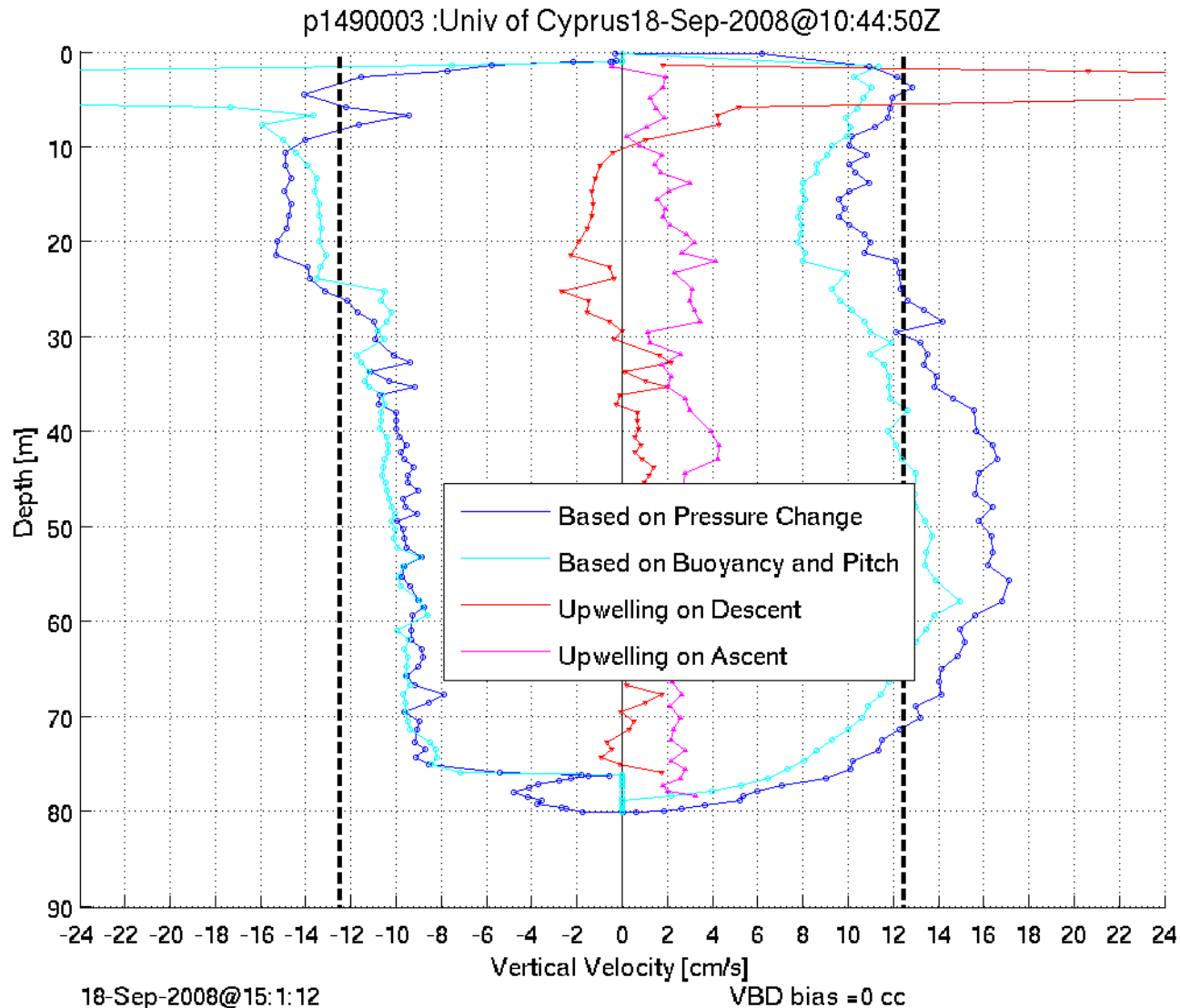
javascript:void(0)

# Sea Trials: Trimming



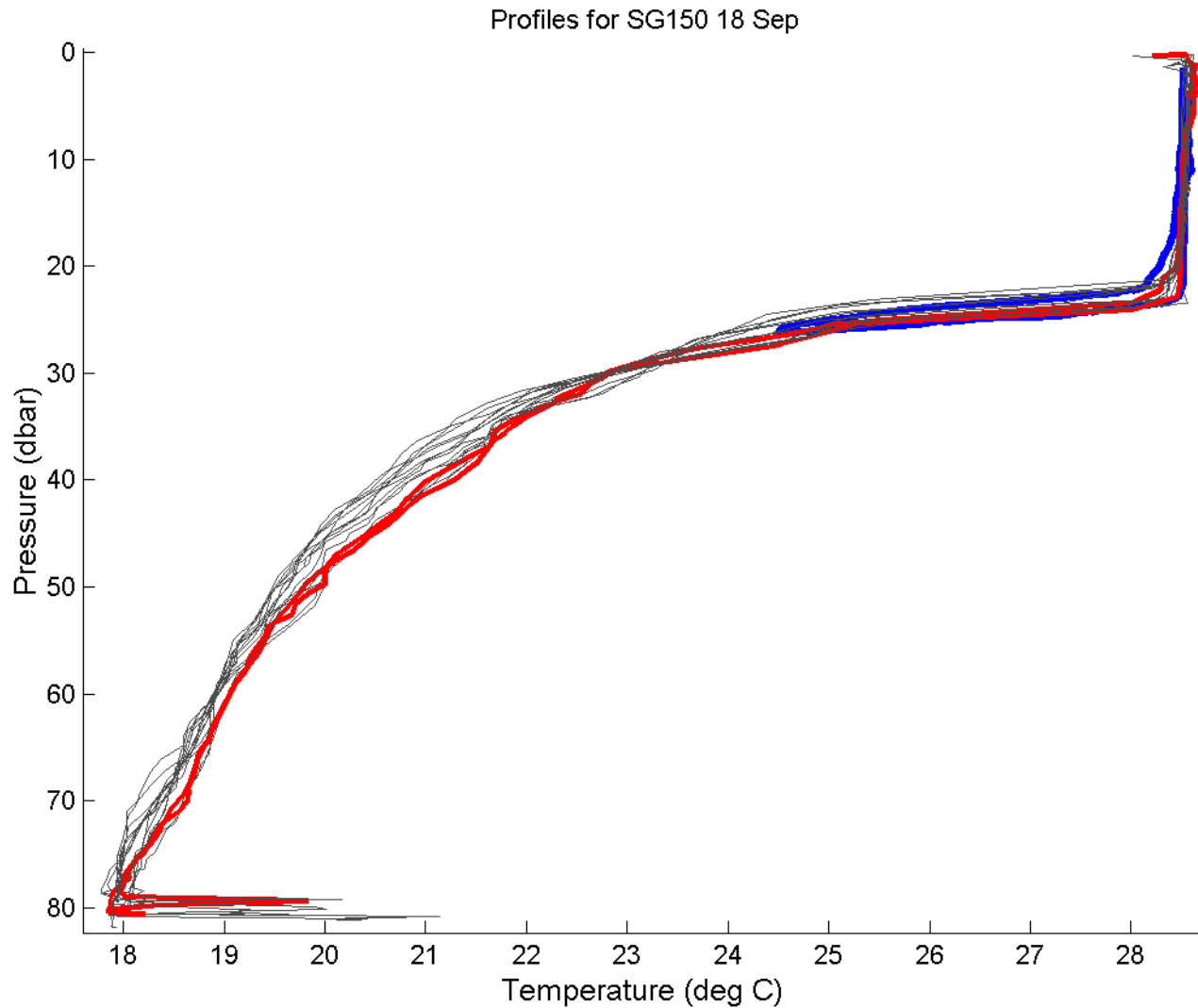


# Sea Trials: Results



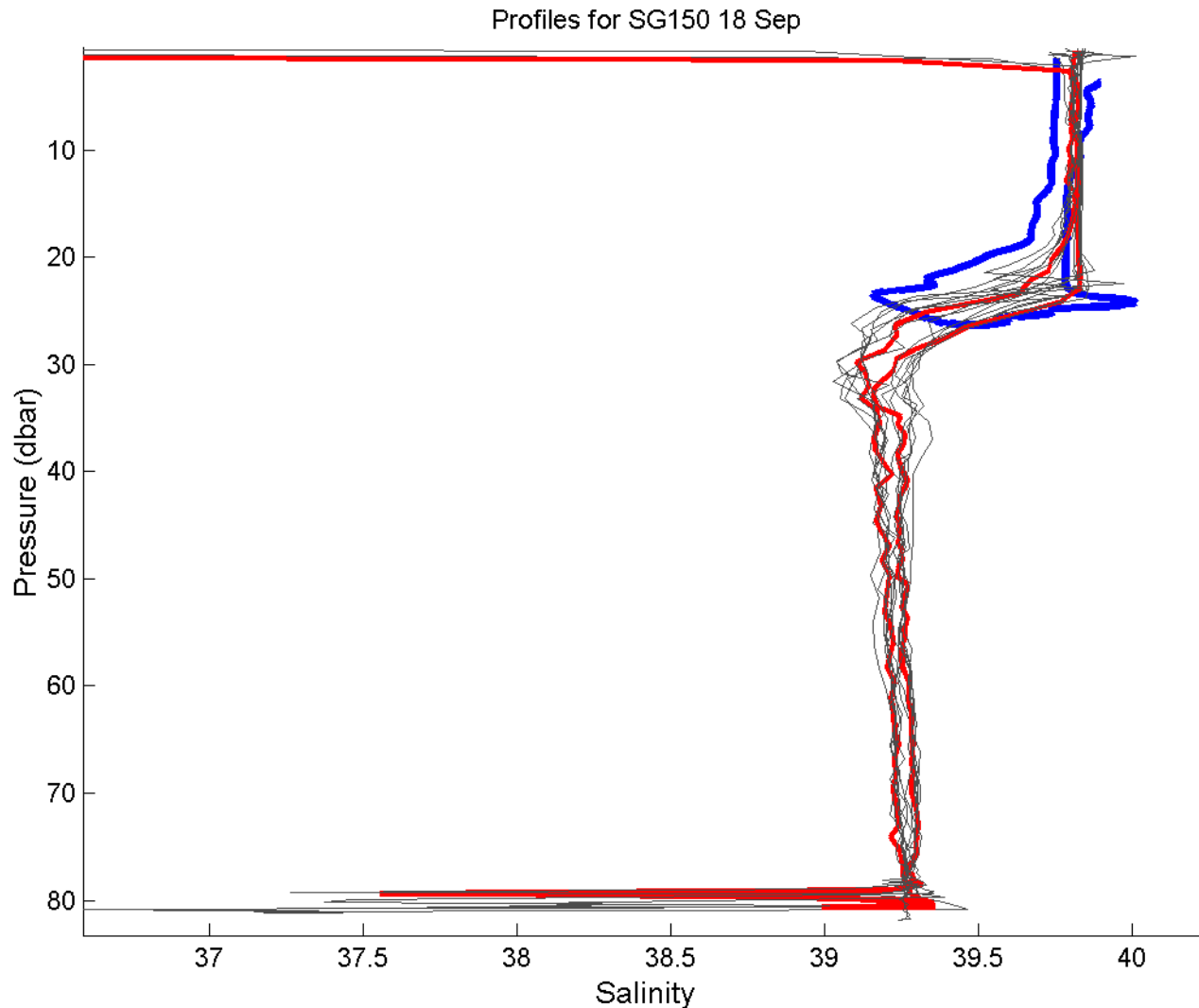
- Vertical velocity close to desired, modeled well. Needs trim for buoyancy center.

# Sea Trials: Results



- Temperature profiles agree well with SBE 19+ (blue)

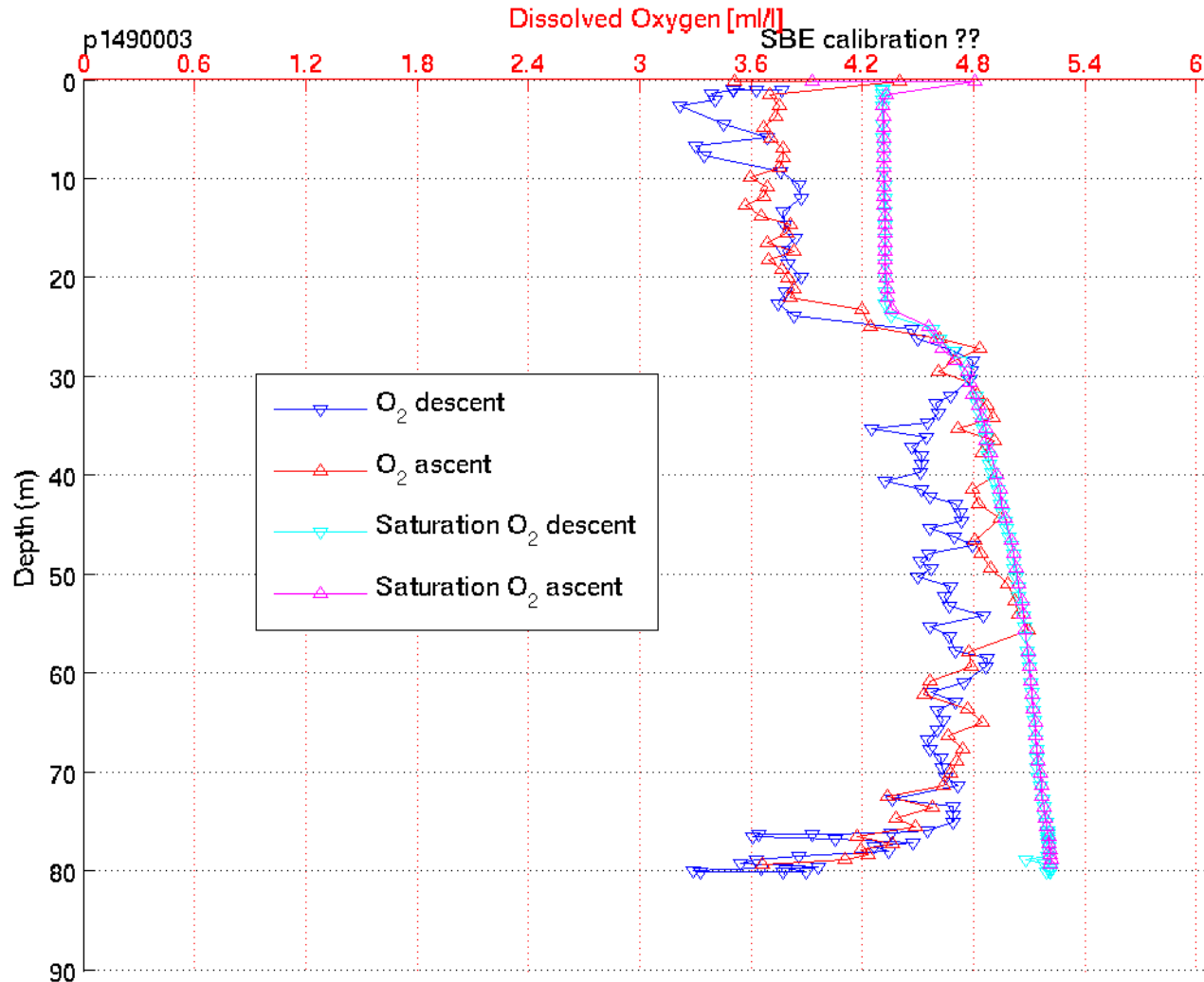
# Sea Trials: Results



- Salinity profiles consistent, but with spikes. As realistic as SBE 19+. How to implement QC?



# Sea Trials: Results

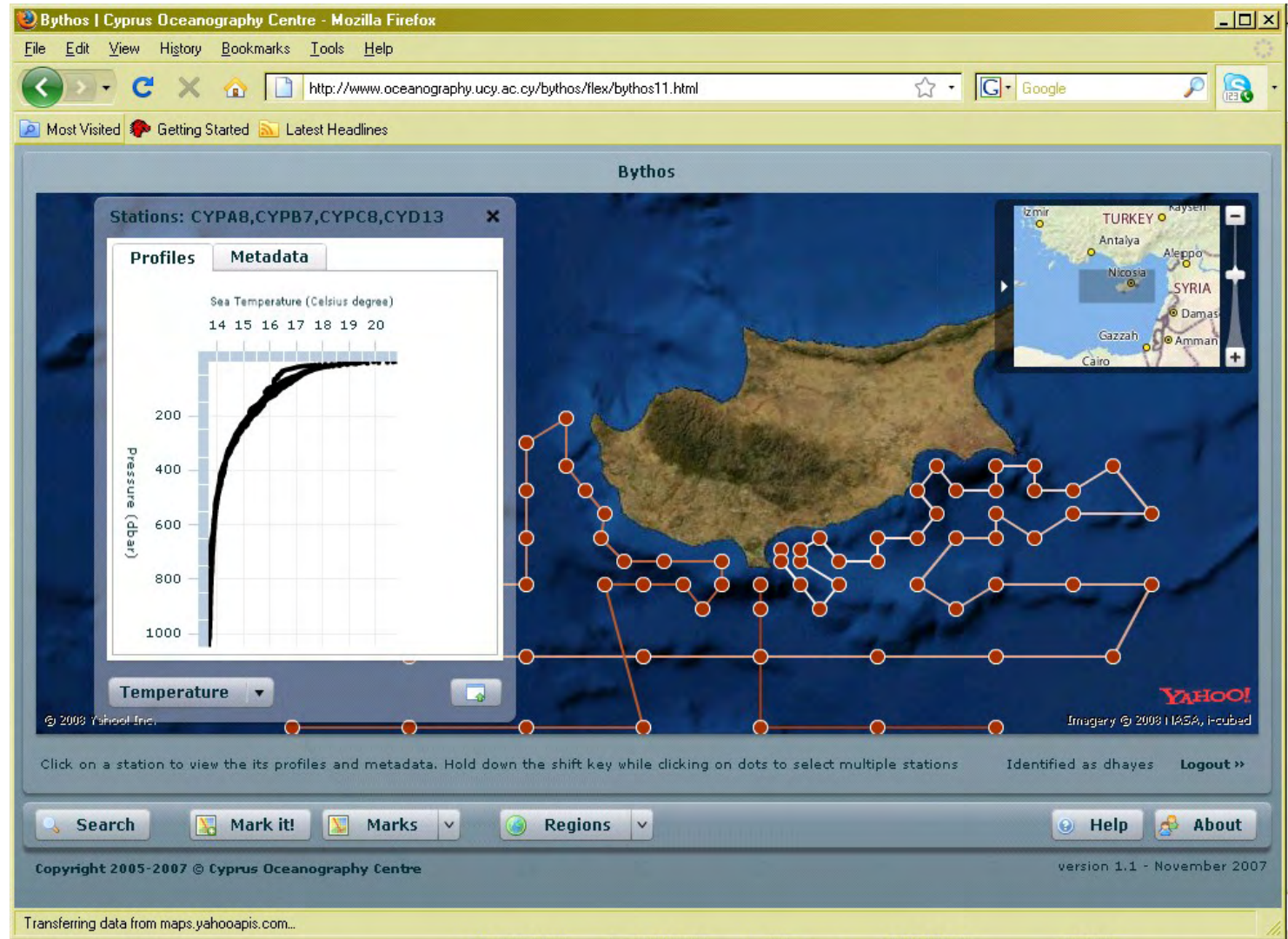


18-Sep-2008@15:1:12

Univ of Cyprus18-Sep-2008@10:44:50Z

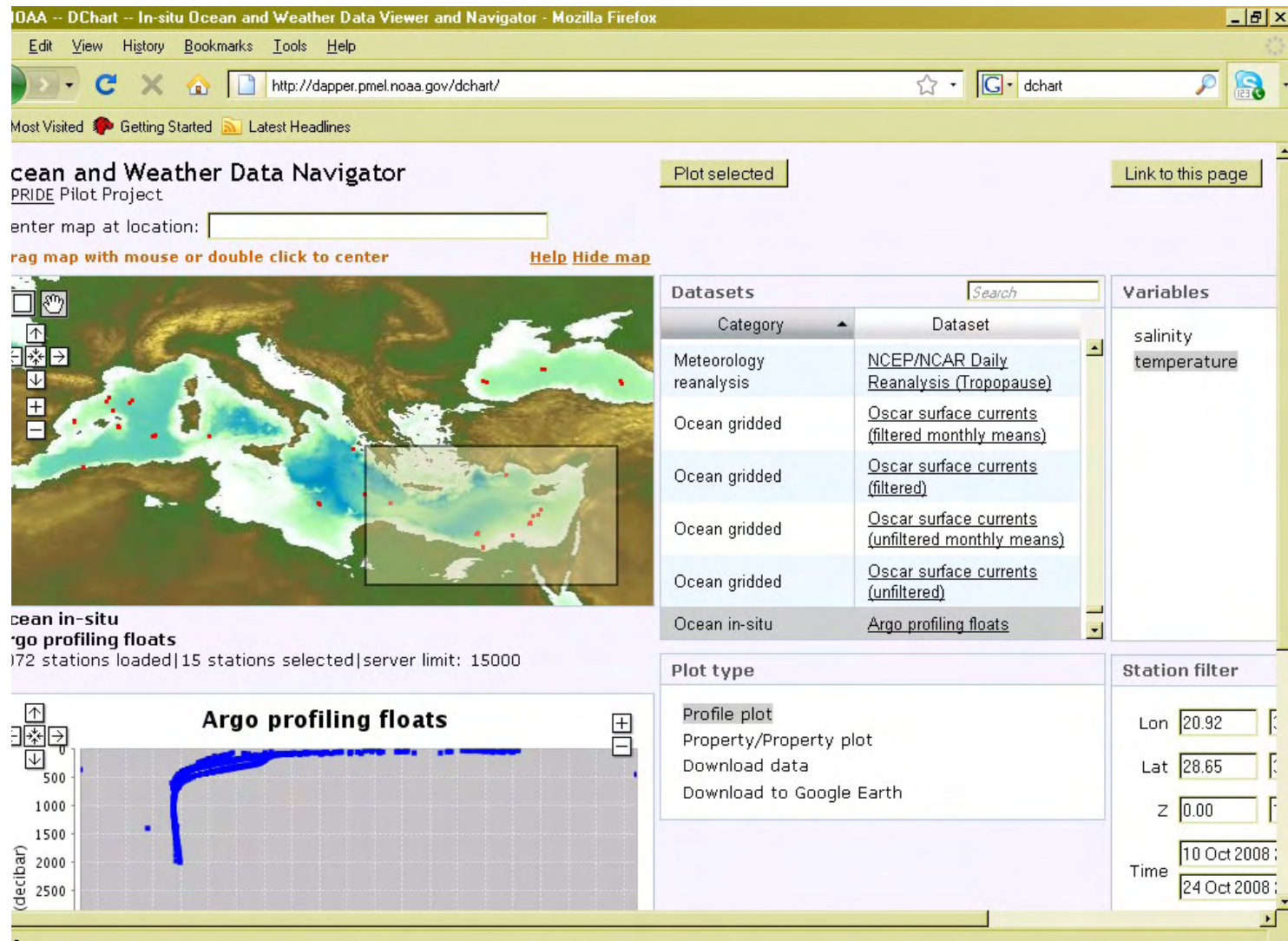
- Oxygen realistic, possible benthic boundary layer?

# Data Visualization



- A quick way to access and visualize for anyone: OC-UCY Bythos
- Medatlas or ODV format required

# Data Visualization



- A quick way to access and visualize for anyone: Dchart/Dapper?
- Netcdf format required



# Conclusions

- Trials are probably the most critical and most challenging aspect.
- In our case, pilot and supporting infrastructure are on trial more than the gliders.
- Glider flight needs trimming.
- Local maintenance facilities.
- Sensor QC and intercomparisons.

