



Slocum Gliders

Advancing our Understanding of the Oceans



Teledyne Webb Research



Moored Sound Sources

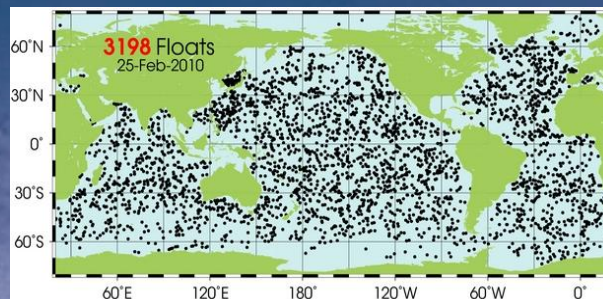
- RAFOS for acoustic tracking of drifters
- Swept Frequency for acoustic tomography



Copyright Itrera & IFM Kiel

Floats APEX

- Drift with ocean currents while profiling down to 1500M depth



Gliders Slocum Glider

- Autonomous Underwater Vehicles (AUVs) which “fly” through the ocean using buoyancy changes and wings



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Teledyne Marine Platforms



Buoyancy Driven Gliders
Buoyancy Driven Floats
Hybrid Gliders



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Remotely Operated Vehicles
Deep Tow Survey Vehicles

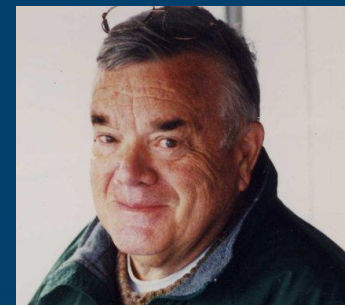
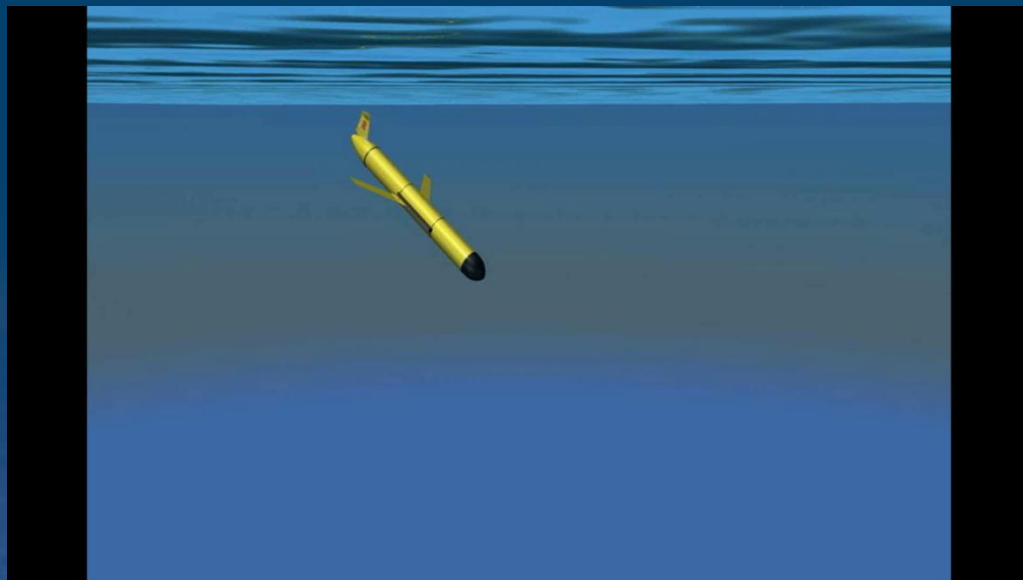


Gavia Defense AUV
Gavia Offshore AUV
Gavia Scientific AUV



Slocum Mission

"We have found, over the years, that the payoff in increase of knowledge often is greatest the more unconventional the idea, especially when it conflicts with collective wisdom."



Doug Webb



Henry Stommel

Henry Stommel, The SLOCUM Mission, 1989



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Hybrid Glider Development



Hybrid glider tests Holyrood, Newfoundland, Canada
February 2011



Hybrid glider test configuration
February 2011

Additional sensors installed:

- Microstrain IMU
- Roll, pitch, yaw @10Hz
- Coulomb counter



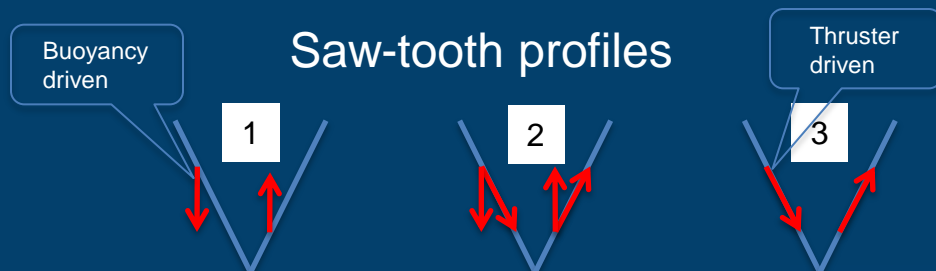
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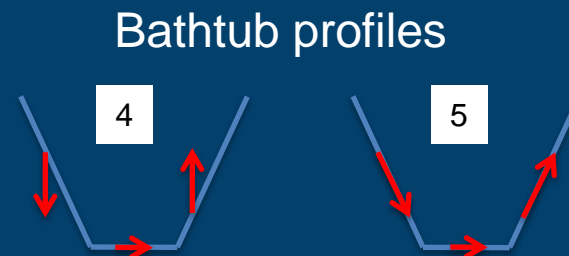
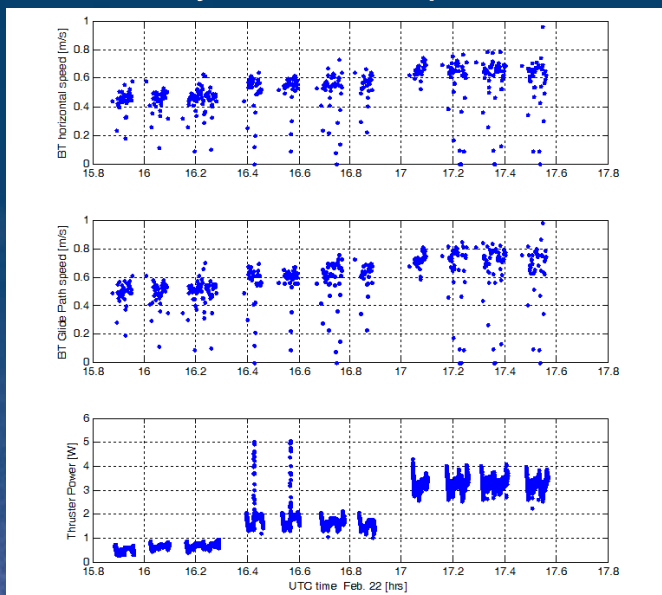


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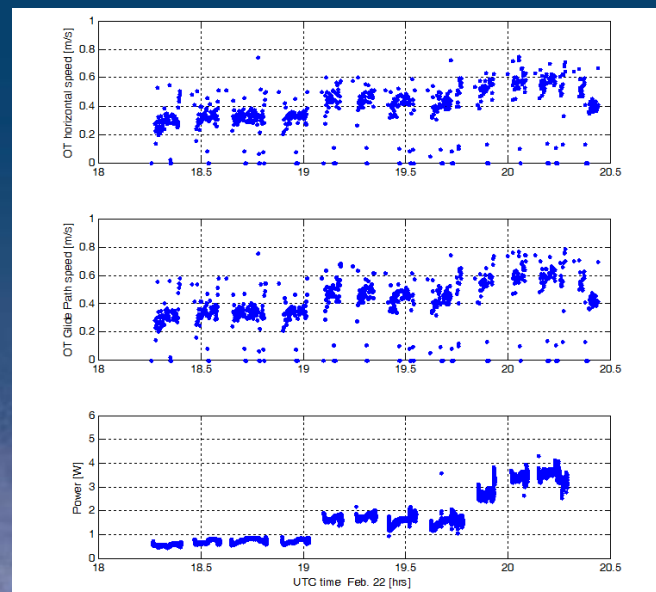
Thruster Integration



Preliminary results for profile 2

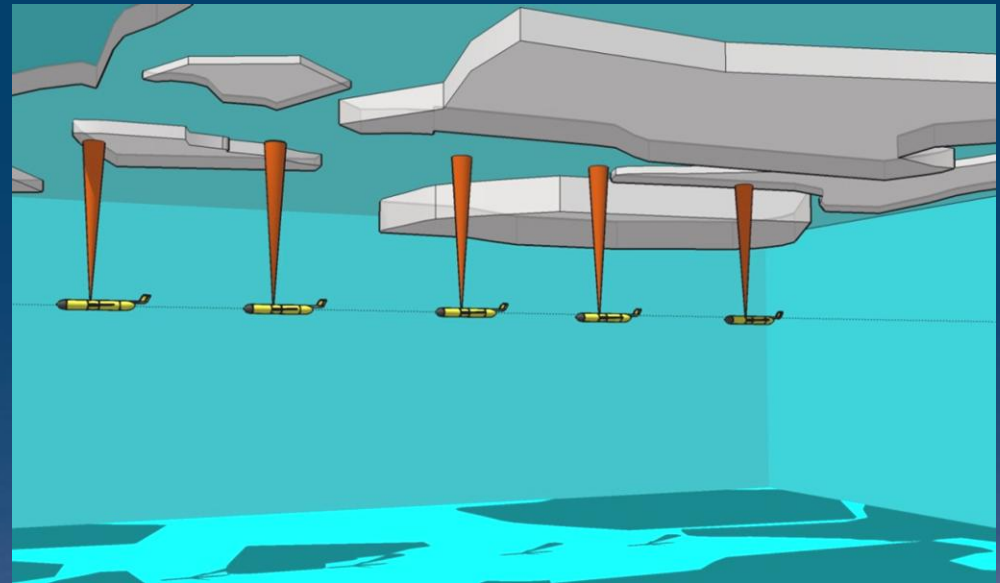


Preliminary results for profile 3



Hybrid Glider Development

- Why put another propulsion device onto a Glider?
 - Horizontal flight
 - Higher speeds
 - Underwater docking



Hybrid Glider flying potential ice profiling mission. [RB]

Reference: Brian Claus, Ralf Bachmayer, Christopher D. Williams, Memorial University, Newfoundland and Labrador, Canada, **AUV 2010**, Monterey, CA



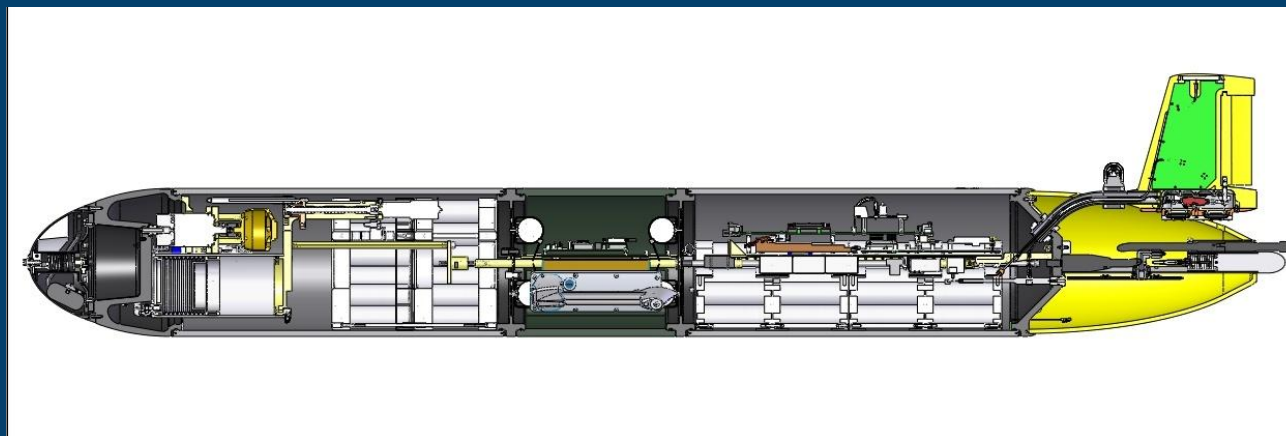
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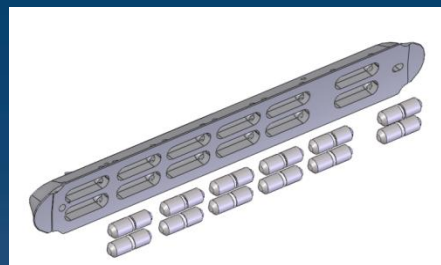


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Slocum G2 – A Vehicle for Science



- 1000m Rated
- Modular Architecture
- Multiple Energy Types
- Robust Design



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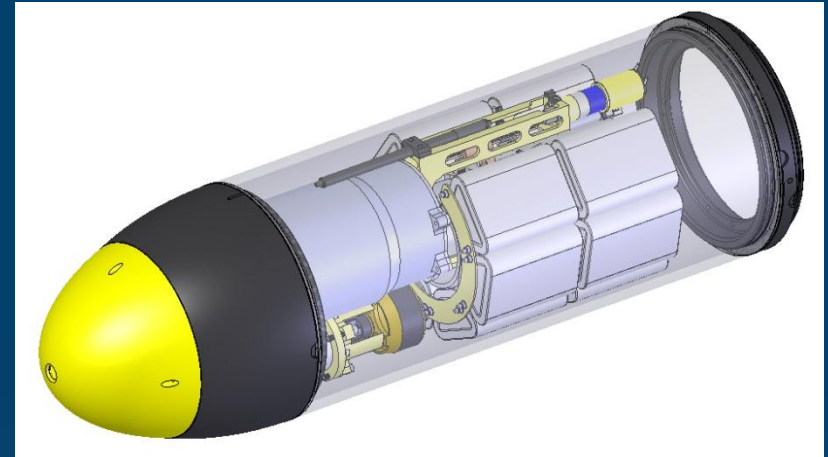
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Unified Pump

- Greater Displacement
- Reduced Maintenance Interval
- Self De-Gassing
- Reduced Hydraulic Paths
- Adaptable Pump Efficiency
- High Range Valve Flow Control



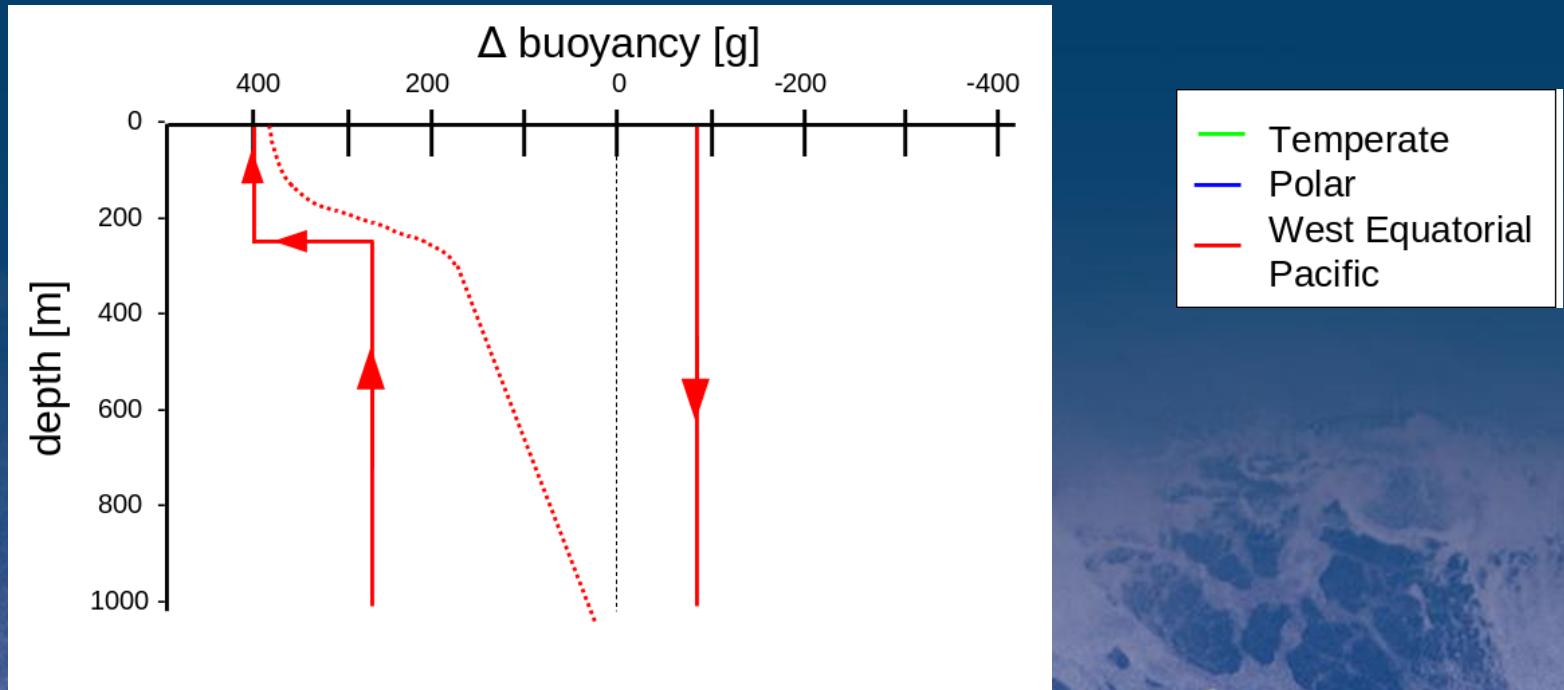
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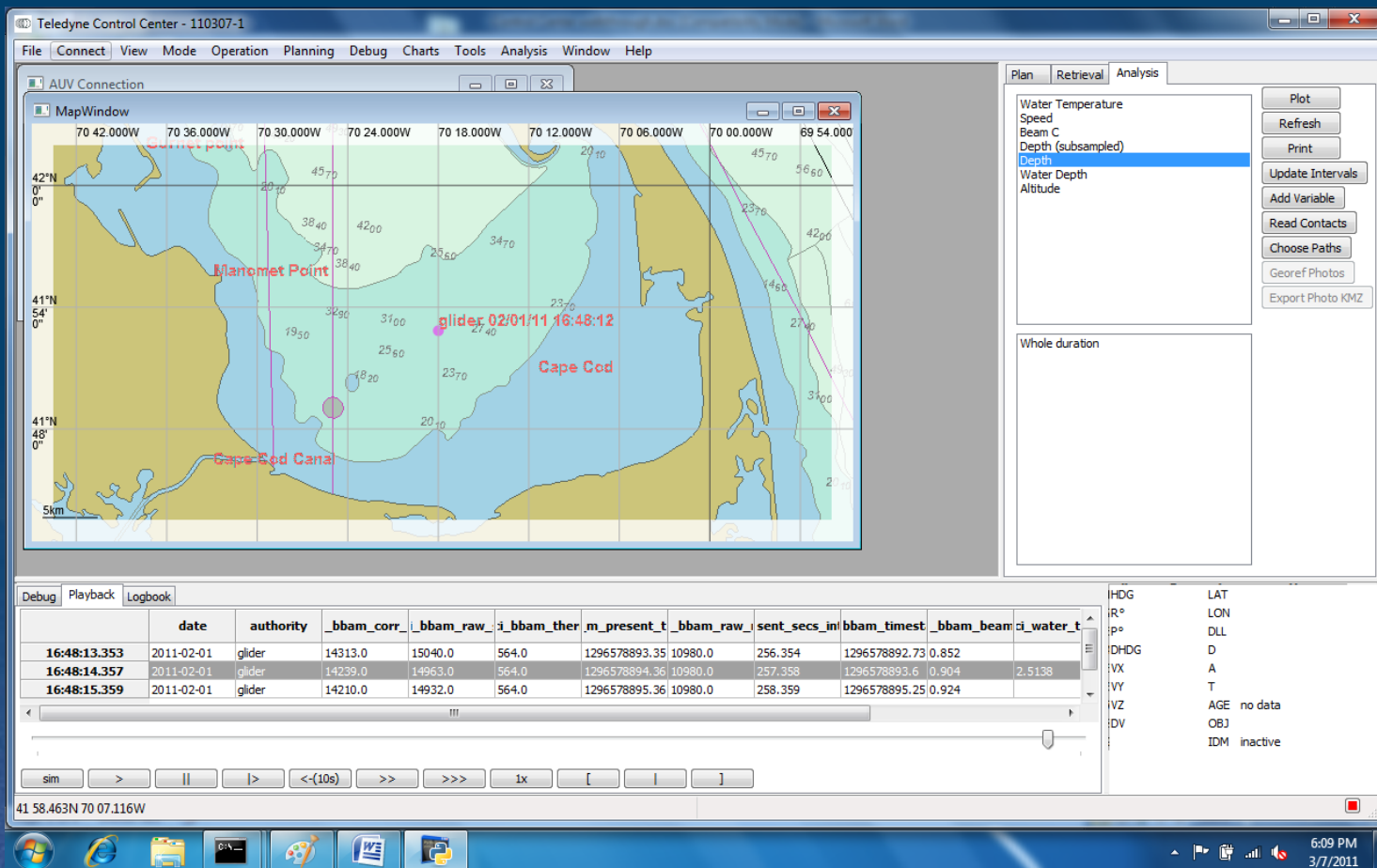
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Auto-ballast and Speed Control

- Maintain a minimum vehicle speed
- Controlled ascent through low density/low buoyancy thermocline



Mission Planning Tools



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Sensor Packages

Acoustic Modem
ADCP
Altimeter
Bathyphotometer (bioluminescence)
Beam Attenuation Meter
Optical Backscatter
Optical Attenuation
Oxygen
Conductivity, Temperature, Depth
Fish Tracking
Fluorometer
Hydrophones
PAR sensor
Radiometer
Scattering Attenuation Meter
Spectrophotometer (red tide detection)
Turbulence



Modular 6 L Payload Bay
Nominally 3 – 6 kg air weight
Customized for a variety of acoustic,
optic and chemical sensors

Science Bays can be stacked or
stretched.



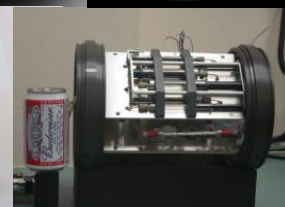
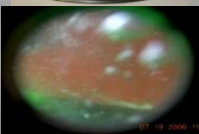
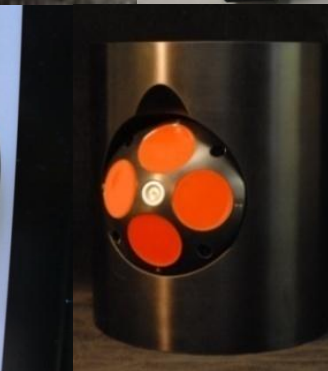
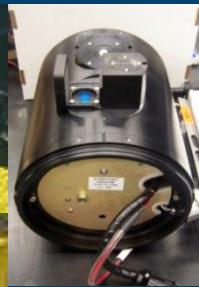
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Sensor Suites



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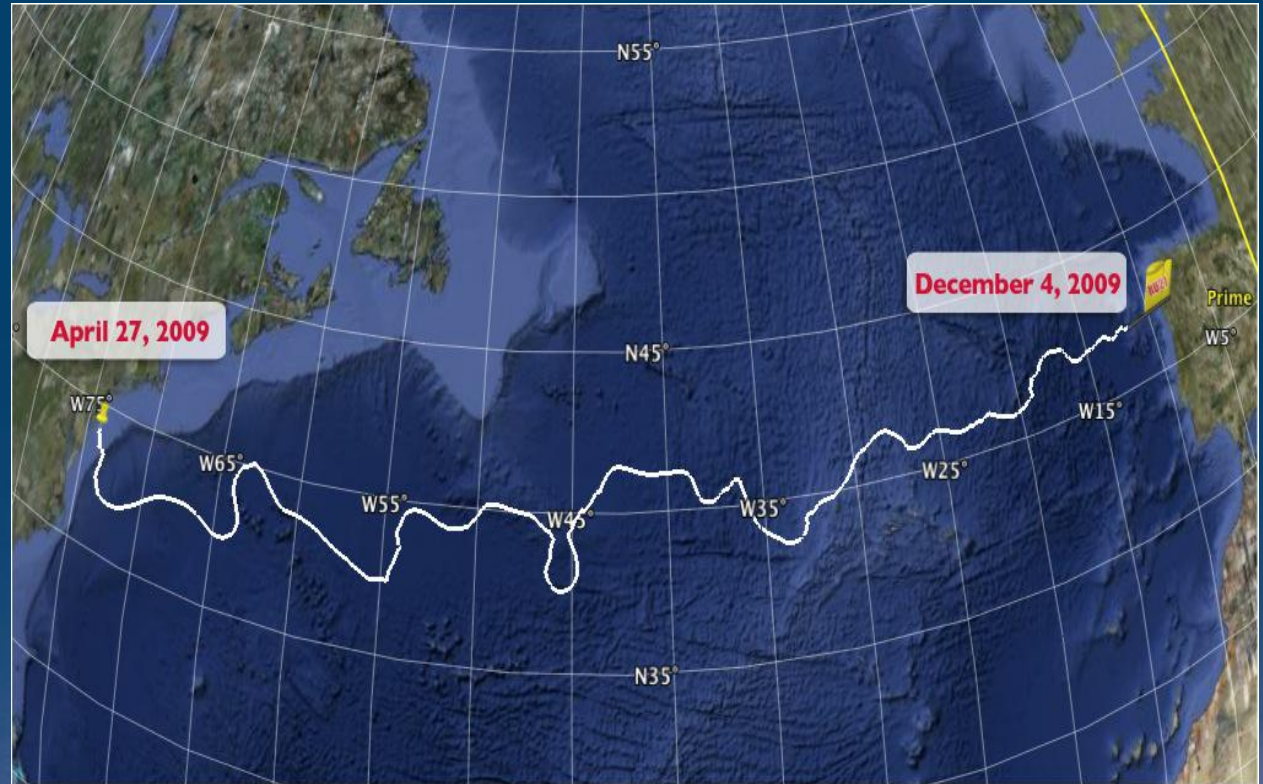


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RU27 NJ – Spain April – December 2009



221 Days
7,409 km



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Smithsonian Ocean Hall



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Deepwater Horizon Oil Spill

DeepWater Horizon Oil Spill
IOOS Response to BP Spill in the Gulf of Mexico

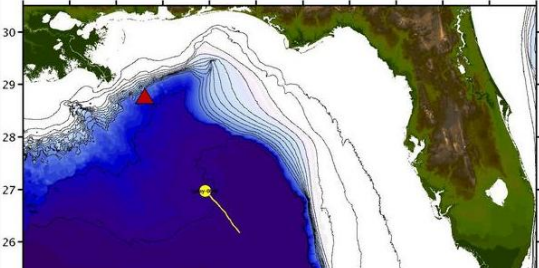
DeepWater Blog | Forecasts | Google Earth KMZs | IOOS Assets | Latest Media | Partners |

Welcome to Deepwater Horizon Oil Spill Portal
August 5th, 2010

 The Deepwater Horizon oil spill is a massive tragedy for the Gulf of Mexico that started on April 20, 2010. Currently a large community of partners are working together to mitigate/manage the response to the spill. As part of those efforts, our team, which includes partners from several federal agencies, companies, many universities and non-profits are developing a portal that will consolidate many data streams to help response efforts. This portal is a team effort and is open to all partners.
© Photo/Gerald Herbert



Real-time IOOS Glider Fleet Positions
Slocum Glider Imagery - Rutgers/USF/Mote; Seaglider Imagery and Dives - UW/APL; Spray Glider Imagery - SIQ/SCCOOS; Seaglider Imagery - NAVOCEANO
Click HERE to see Google Earth version of the same image (Google Earth browser plugin download required)
Tue Oct 5 22:00:20 UTC 2010



naturenews
Nature's ongoing coverage brings you the latest from the disaster zone.

Register and Contribute
• Register
• Log in

Blog
• DeepWater Blog (127)

Contributed Data Resources
• Google Earth KMZs (4)
• IOOS Assets (9)
• IOOS Assets: AUV (6)
• IOOS Assets: HF-Radar (2)
• IOOS Assets: Satellite (3)
• Forecasts (20)
• Forecast: Ocean (19)
• Forecast: Atmospheric (1)
• Latest Media (30)
• Partners (1)

DeepWater Links
• Unified Command Response Site
• GCOOS Response
• SECOORA Response
• NAVO Response
• Google Crisis Response
• ROFFS Ocean Forecasts
• NOAA Response Page
• MBARI Response Page

Glider	# Deployed	Tot Days	Tot Dist (km)
RU21	1	35	607
RU23	5	87	1582
UD 134	3	51	1111.5
Bass	3	31	552
Waldo	4	74	1476
Sam	2	39	677
TOTALS:	18	317	6005.5

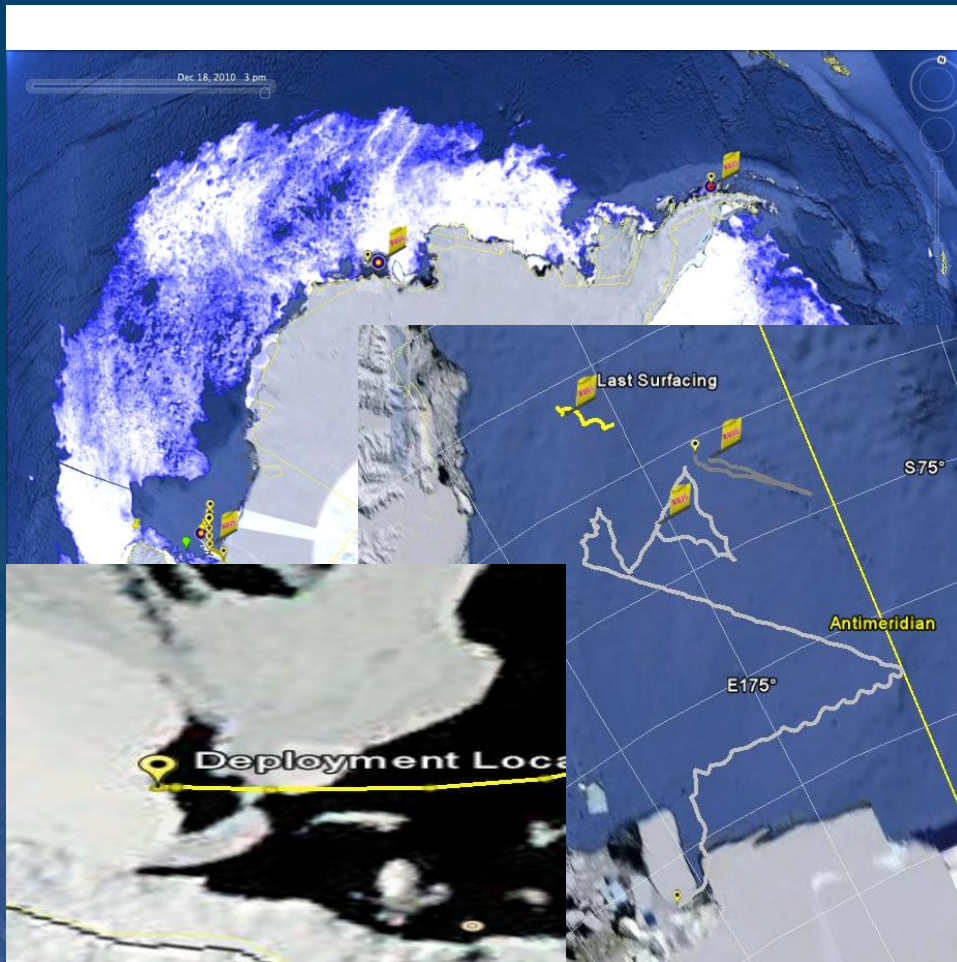


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Antarctic Deployments



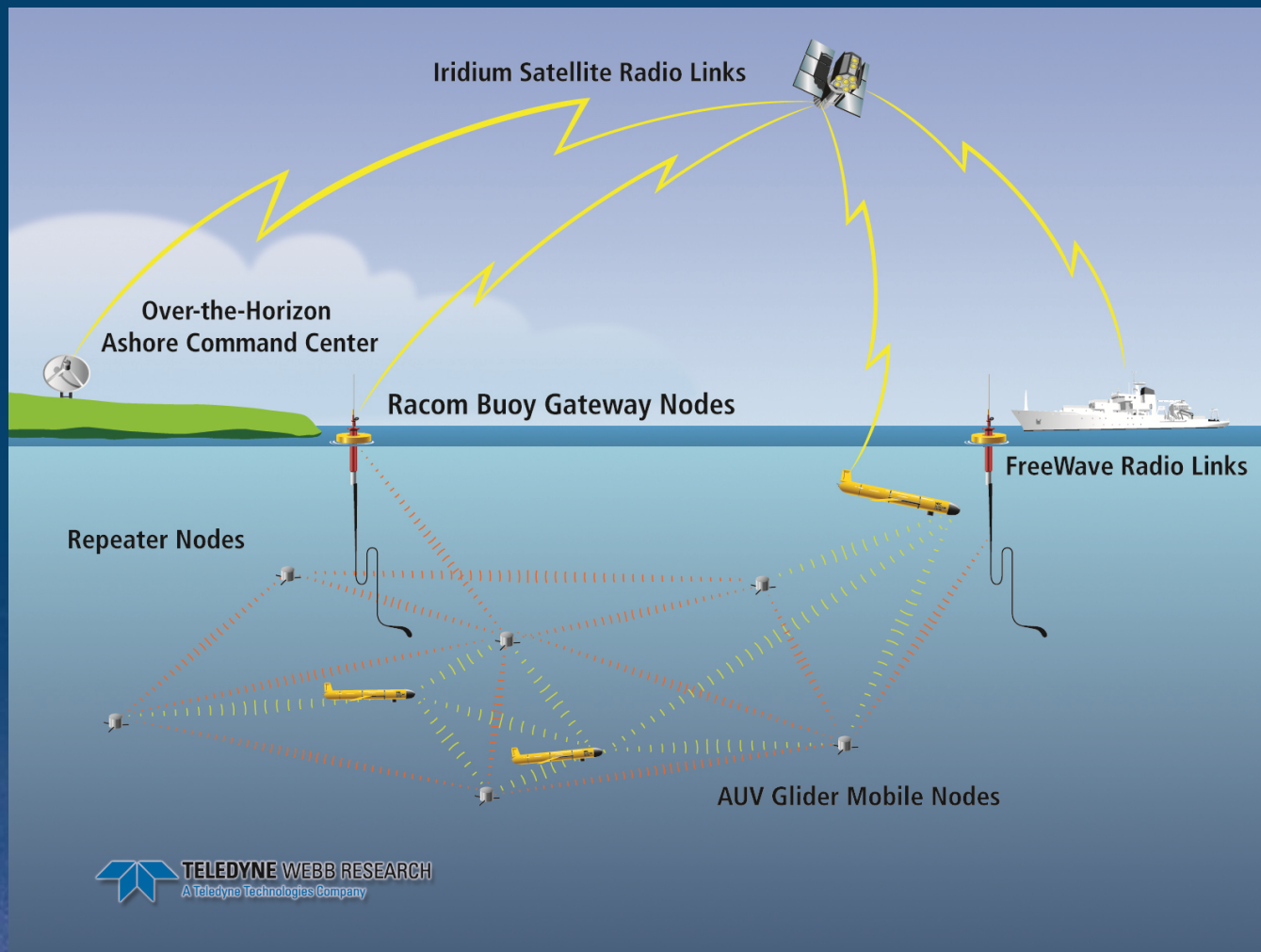
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Gateway Gliders



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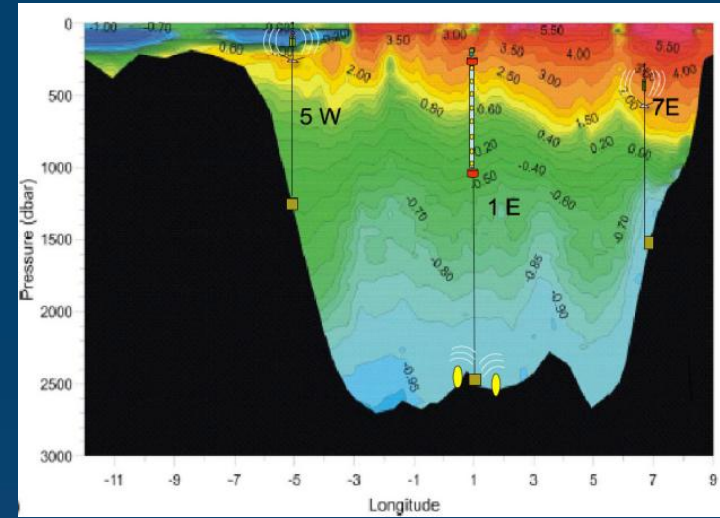
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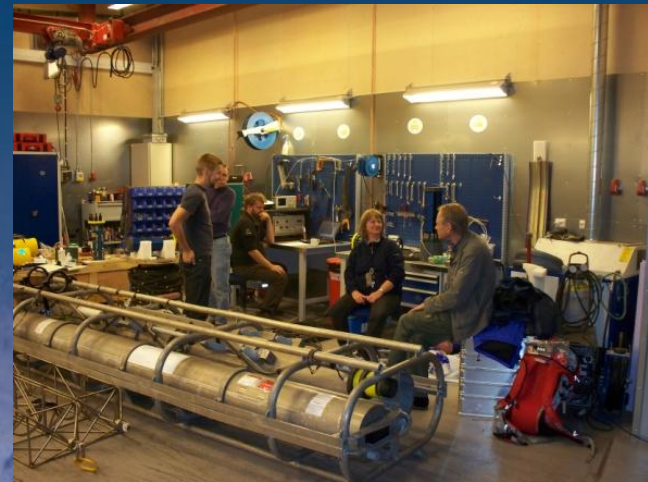
Under Ice Acoustics

The Arctic Acoustic Tomography



- Long-Range Navigation

Duda T.F., Morozov A.K., Howe B.M., Brown M.G.,
Speer K., Lazarevich P., Worcester P.F., Cornuelle
B.D. Evaluation of a Long-Range Joint Acoustic
Navigation / Thermometry System, *Proceedings of
Oceans 2006*.



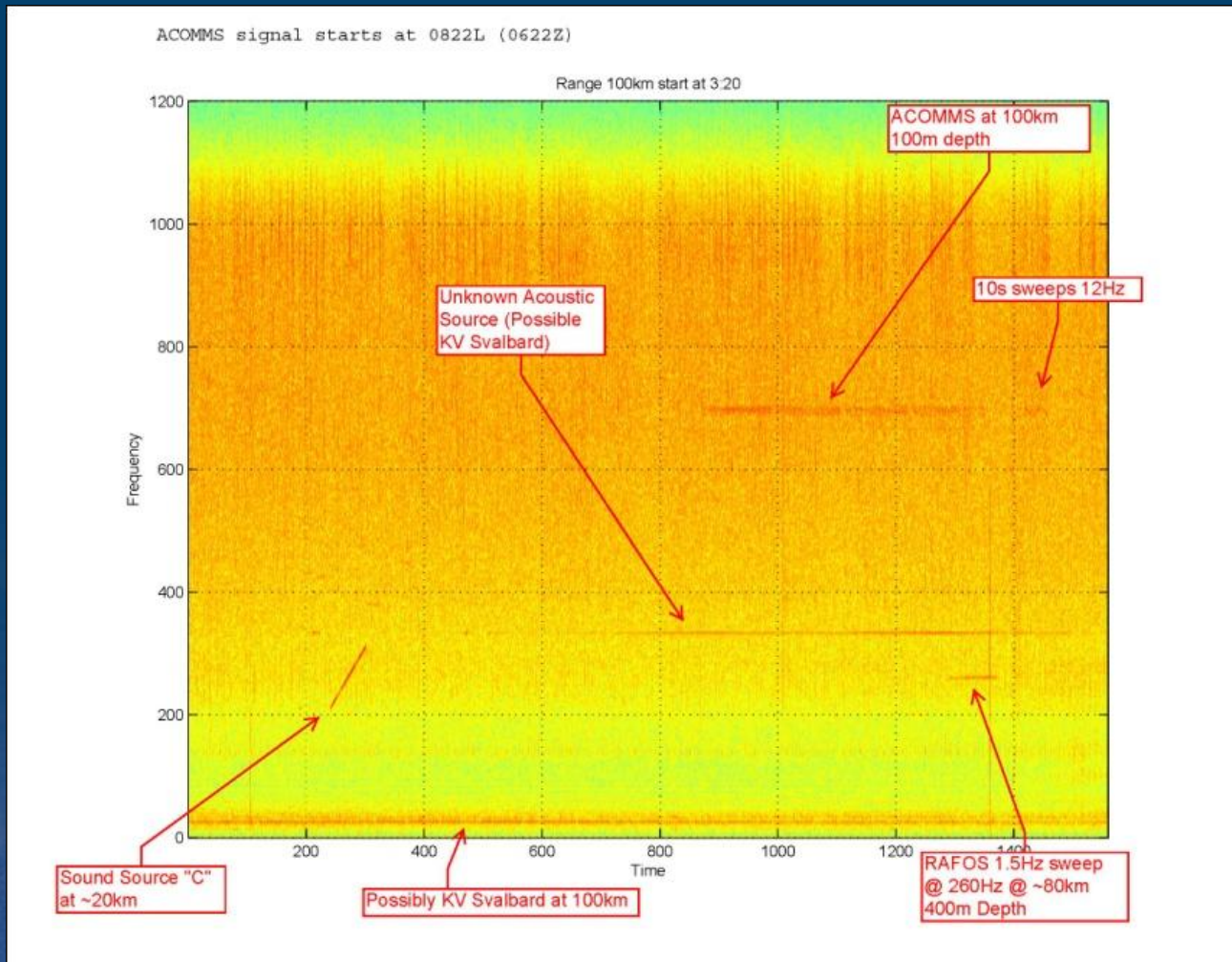
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Under Ice Navigation & Communication



- Glider Navigation and Long-Range Communications
 - 6 bpd
 - 694Hz



Reference:: L.Freitag and M.Stojanovic, "[Basin-Scale Acoustic Communication: A Feasibility Study Using Tomography M-Sequences](#)," in Proc. IEEE Oceans'01 Conference, Honolulu, HI, November 2001.



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Slocum Thermal Glider

Long range and high endurance

- Propulsion energy source:
Environmental (Thermal)
- Projected Endurance:
3 - 5 years
- Max. depth: 1200 m
- 56 Kg
- Operable in approximately 65% of the world's oceans



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Cook (Unit 151)

- Traveled 2650 km in 106 days
- Cook: 25 km/day
- Used 60 amp/hr out of 750 available



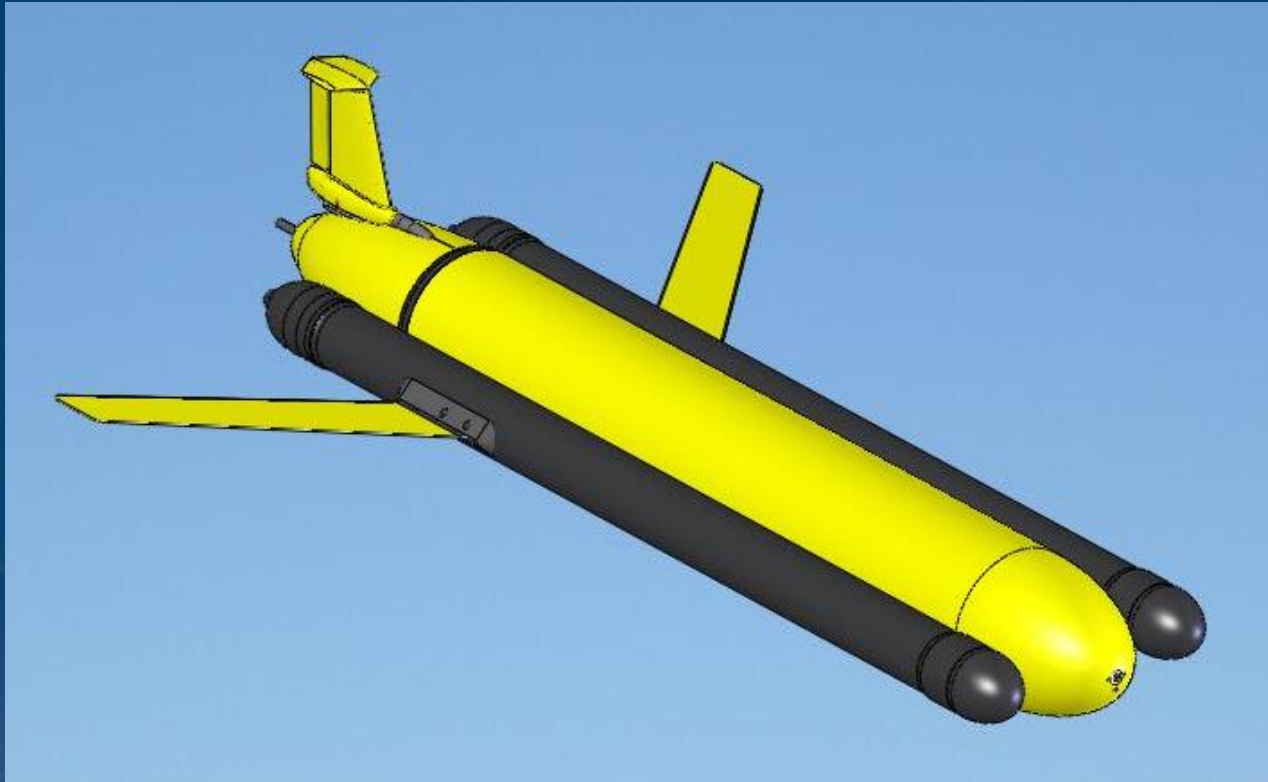
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Electrical Generation – Endurance to ?



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