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Sustained Irish Sea Monitoring Using an Instrumented Ferry

By

Chris Balfour, John Howarth and

Terry Doyle

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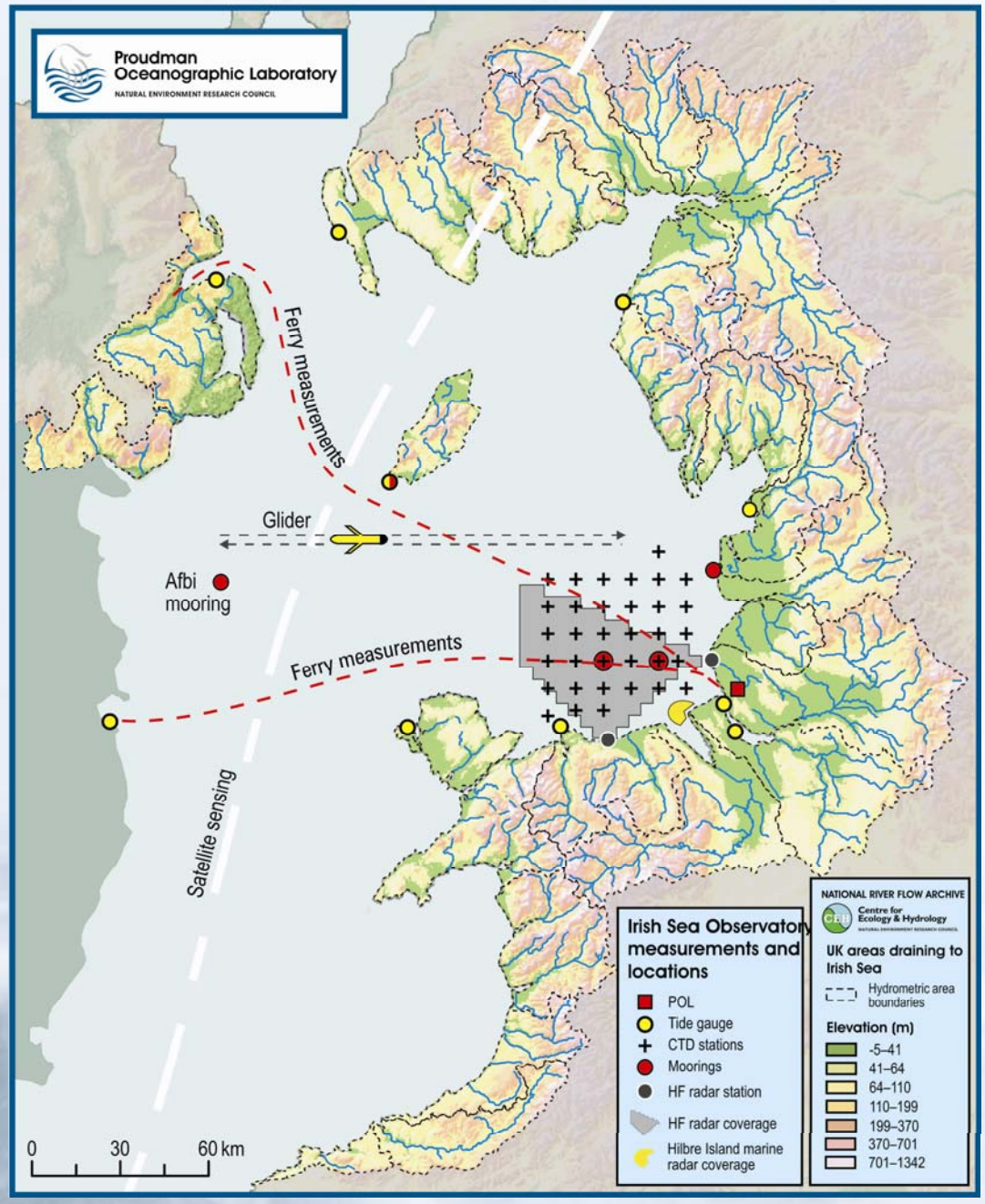

The POL Irish Sea Observatory

http://cobs.pol.ac.uk/

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- **A fleet of four roro cargo and passenger ferries**
- **Typical Dublin to Birkenhead sailing time of 7 hours**
- **180m long, ≥ 20 knots sailing speed**
- **2 sailings per day – Tuesday to Saturday**
- **Upwards of 70/120 cabins with capacity for several hundred passengers**

Norfolkline Irish Sea Ferries

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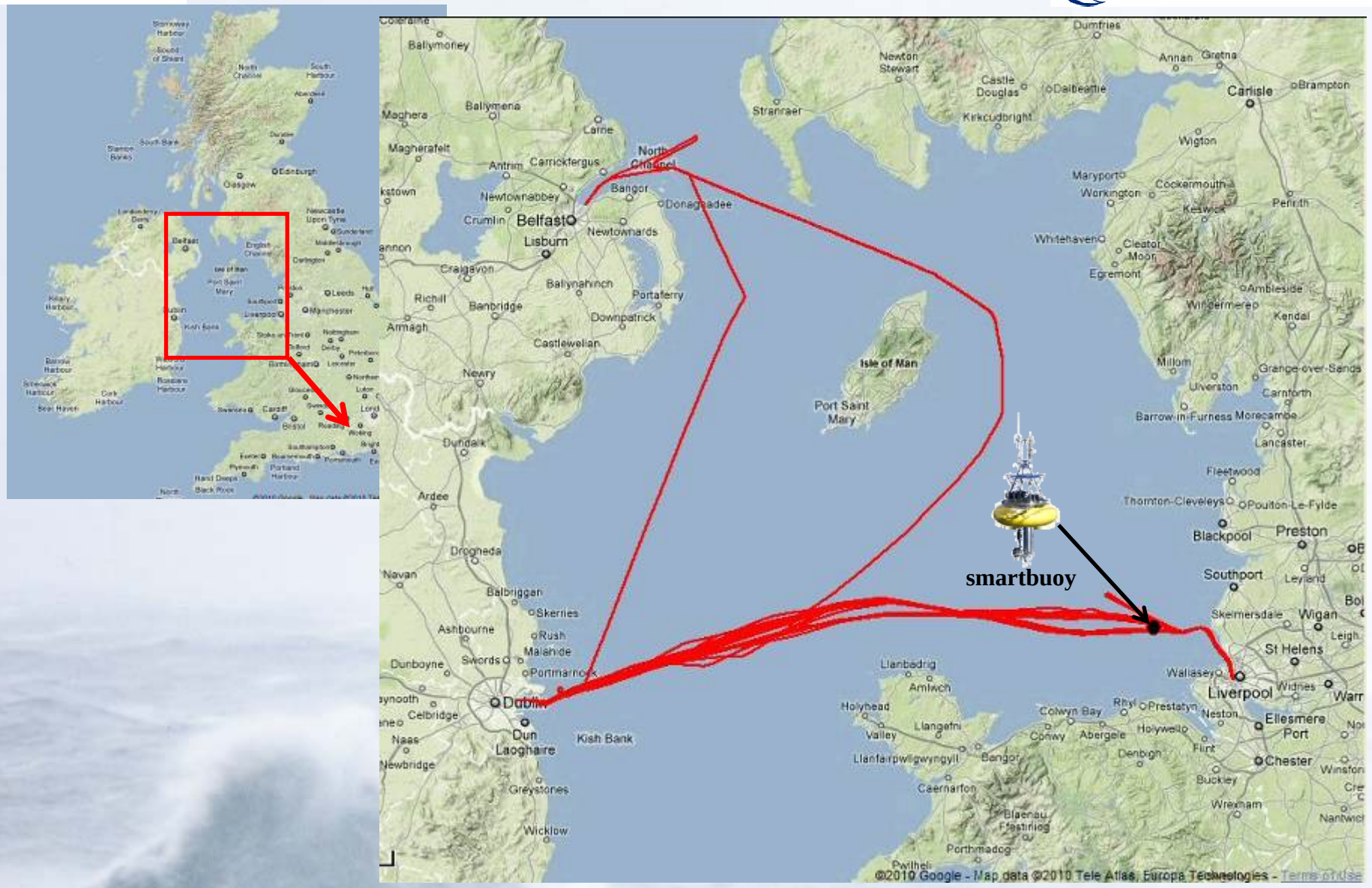

Liverpool Viking Irish Sea Sailings

December 09 to Jan 10

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- **Temperature** (FSI NXIC/Teledyne Citadel)
- **Salinity** (FSI NXIC/Teledyne Citadel)
- **Turbidity** (Seapoint OBS with wiper)
- **Chlorophyll-A** (Chelsea Minitracka)
- **Dissolved Oxygen** (Aanderaa Optode)

Recovered Instrumentation Frame

POL FerryBox Measured Parameters

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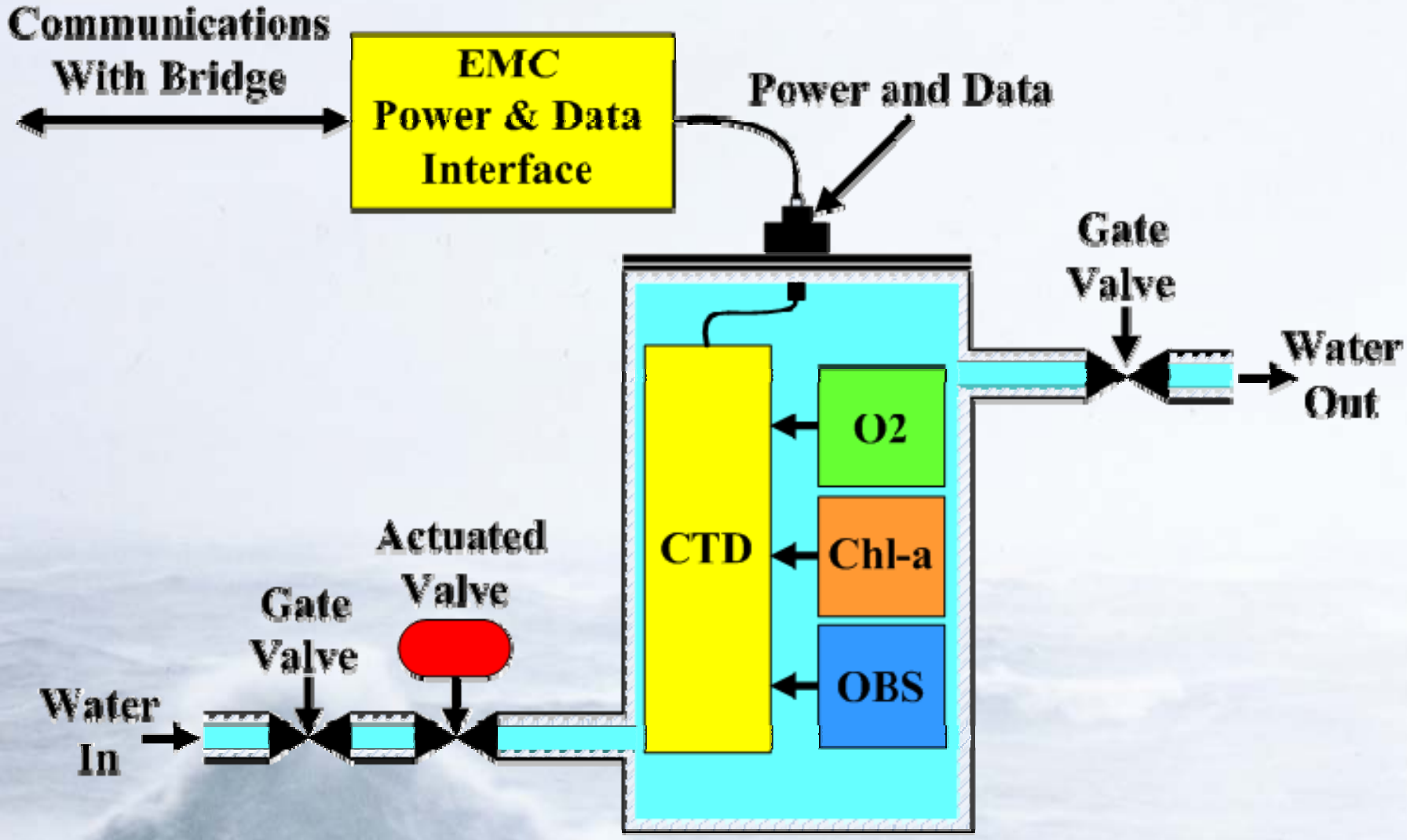

Engine Room Instrumentation

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Engine Room Instrumentation

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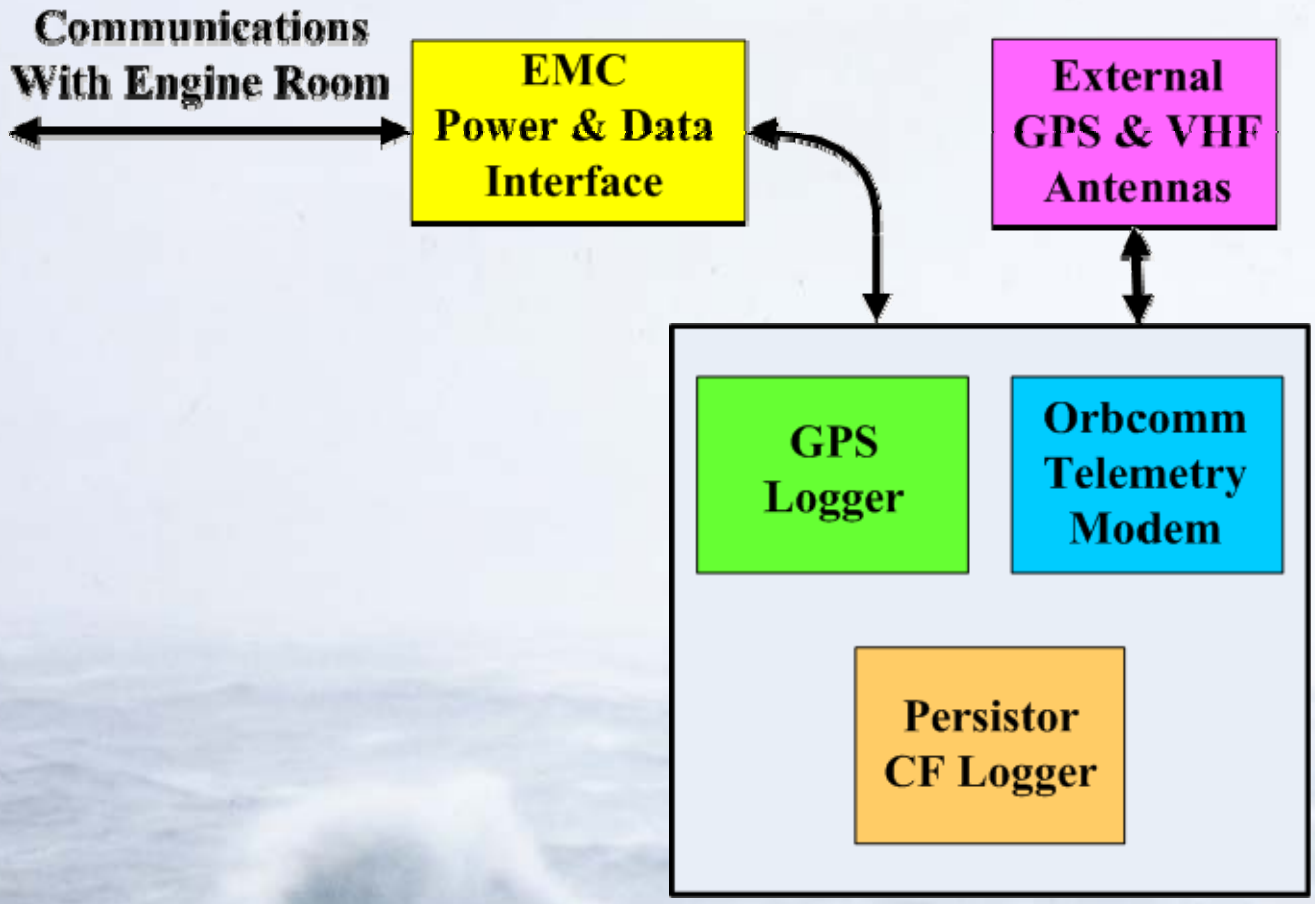

Bridge Instrumentation

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During deployment

- **Correlation with buoy based near surface measurements in the Liverpool Bay**

  (Temperature, Salinity, Chlorophyll-a, OBS and O_2)

Post Deployment

- **Salinity against precision reference**
- **PRT bench temperature probe check**
- **Point fluorescence calibration (drift) checks**
- **OBS turbidity measurement drift check using polymer bead standards**

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FerryBox Calibration Checks and Servicing

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Manufacturer	Parameter	Range	Resolution	Accuracy
Alec Electronics	Temperature	-5 to +45°C	0.001°C	±0.05
Seabird	Temperature	-5 to +35°C	0.0001°C	±0.005°C
FSI/Telydyne	Temperature	-2 to +32°C	0.0001°C	±0.002°C
Aanderaa (4120)	Temperature	-5 to +40°C	0.01°C	±0.1
Alec Electronics	Conductivity	0 to 60 mS/cm	0.003mS/cm	0.05mS/cm
Seabird	Conductivity	0 to 90 mS/cm	0.0005mS/cm	0.005mS/cm
FSI/Telydyne	Conductivity	0 to 90 mS/cm	0.0001 mS/cm	±0.002 mS/cm
Aanderaa (4120)	Conductivity	0 to 75 mS/cm	0.002mS/cm	±0.5 mS/cm

CT Sensor Trials

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Sensor Trials

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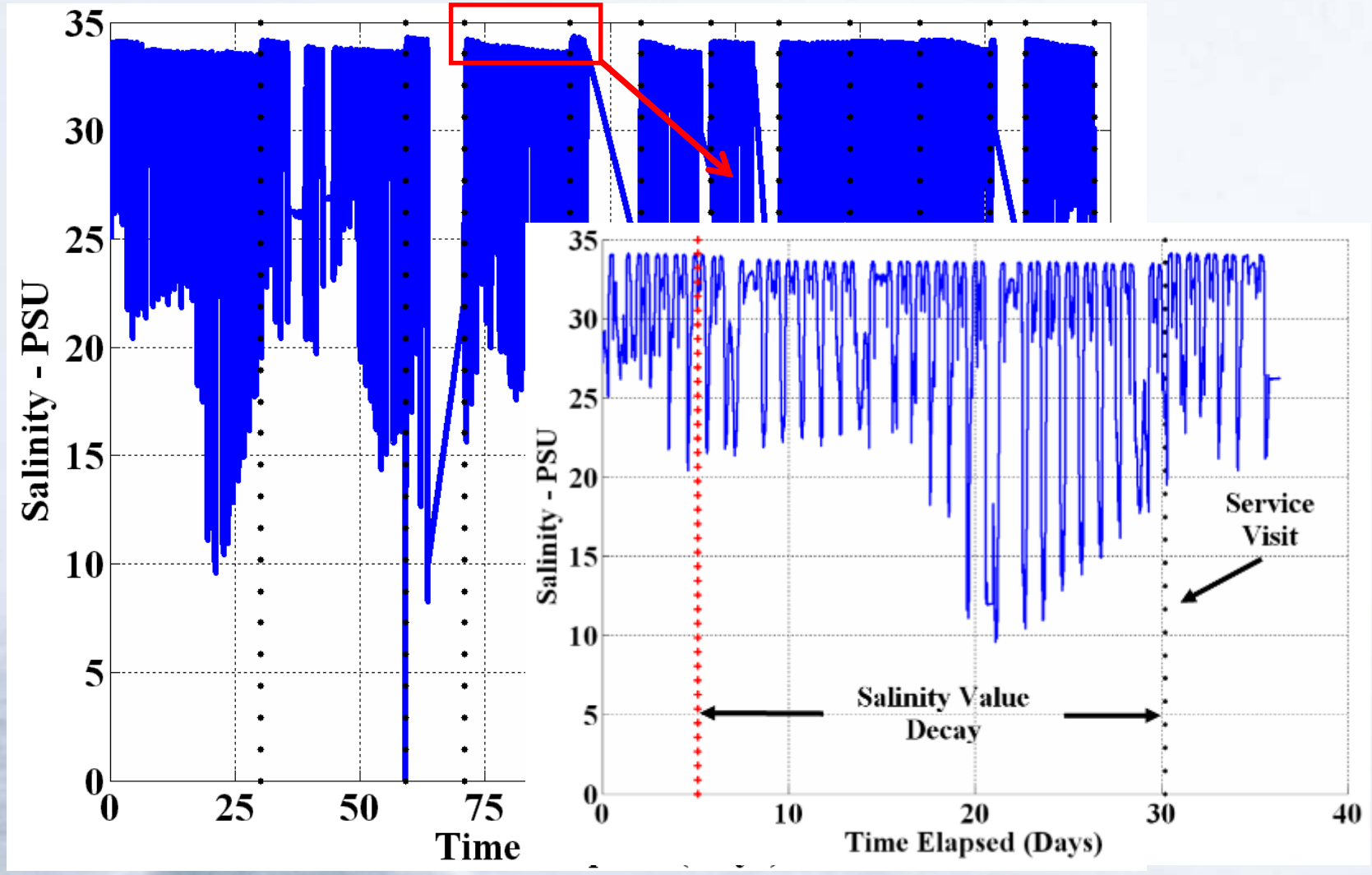

Salinity Measurement Improvements

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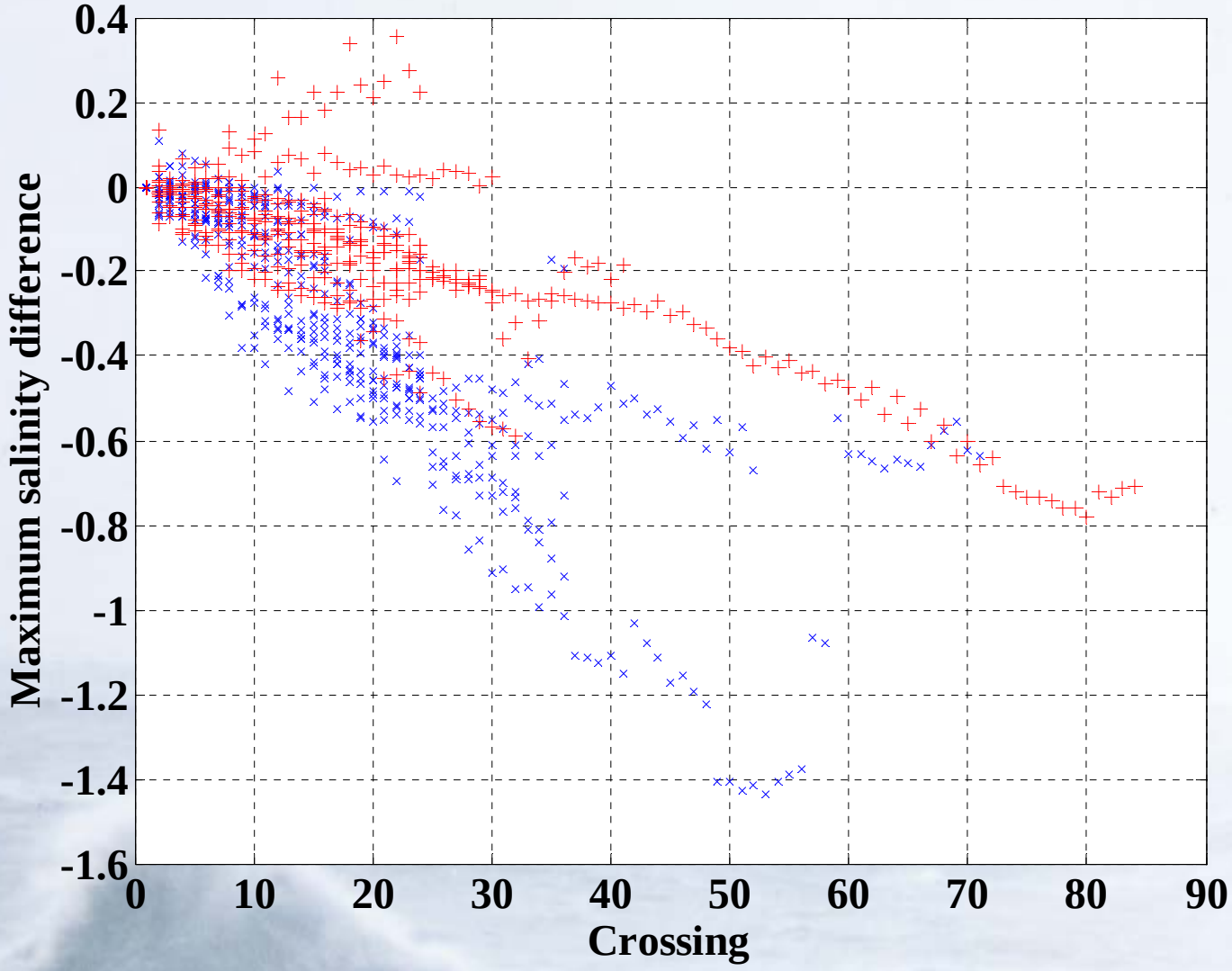

Salinity Measurement Improvements

Average salinity change without valve = 0.019 PSU, with valve = 0.009 PSU

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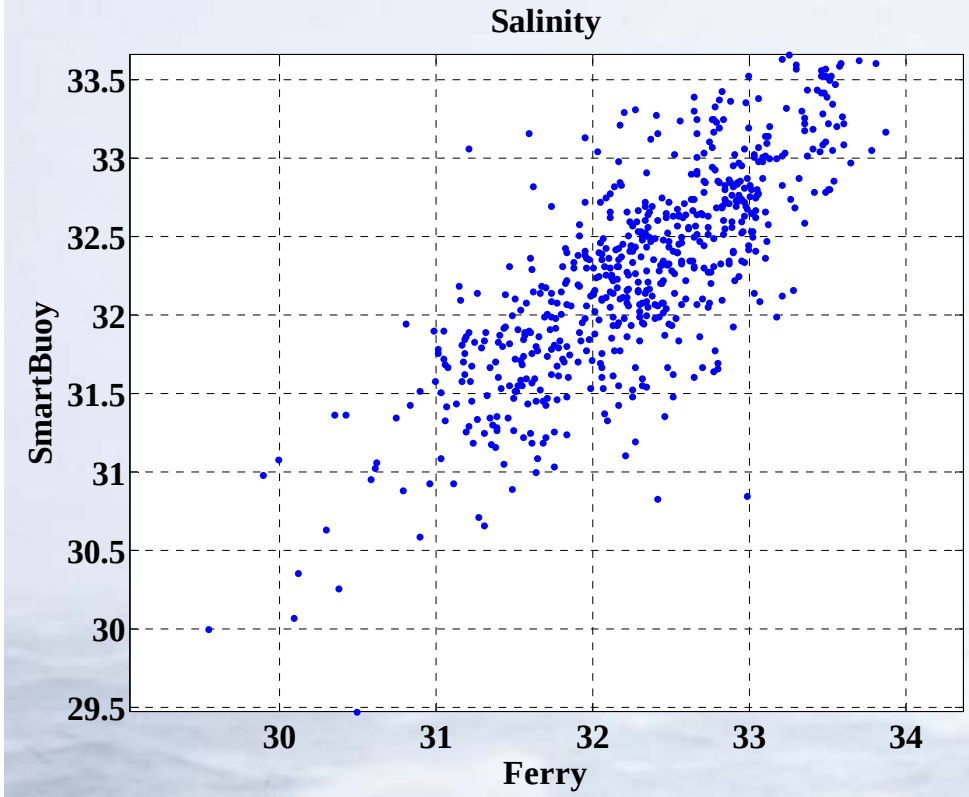

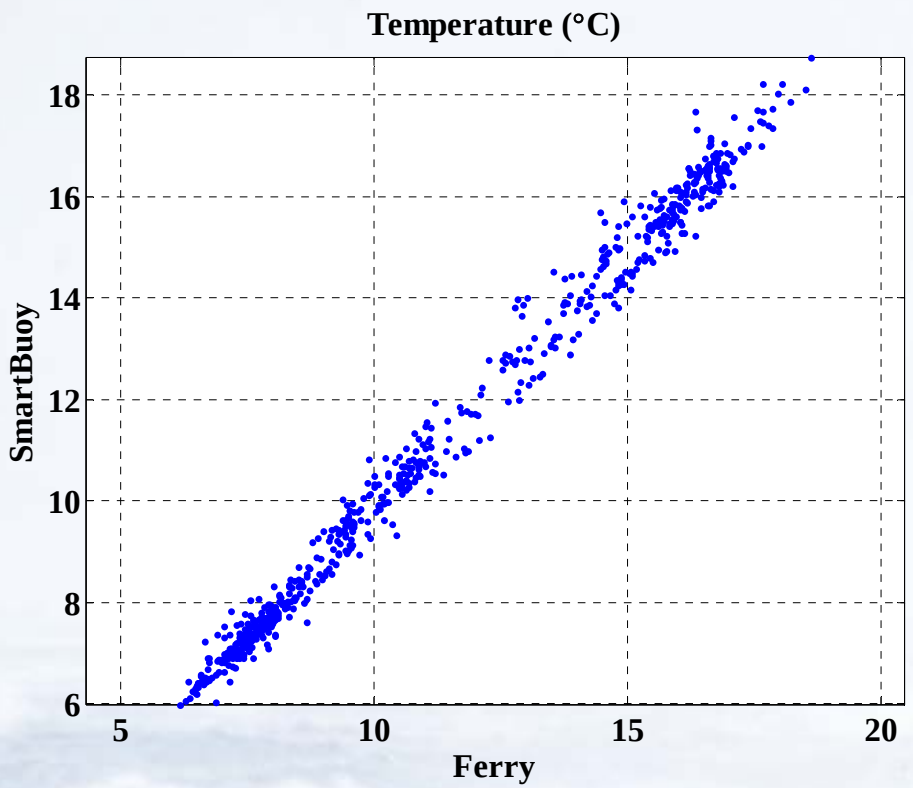

Salinity Measurement Improvements

Sal: n= 617, r=0.78, mean diff = 0.0 std = 0.46

Temp: n= 692, r= 0.997, mean difference = 0.15, std = 0.35

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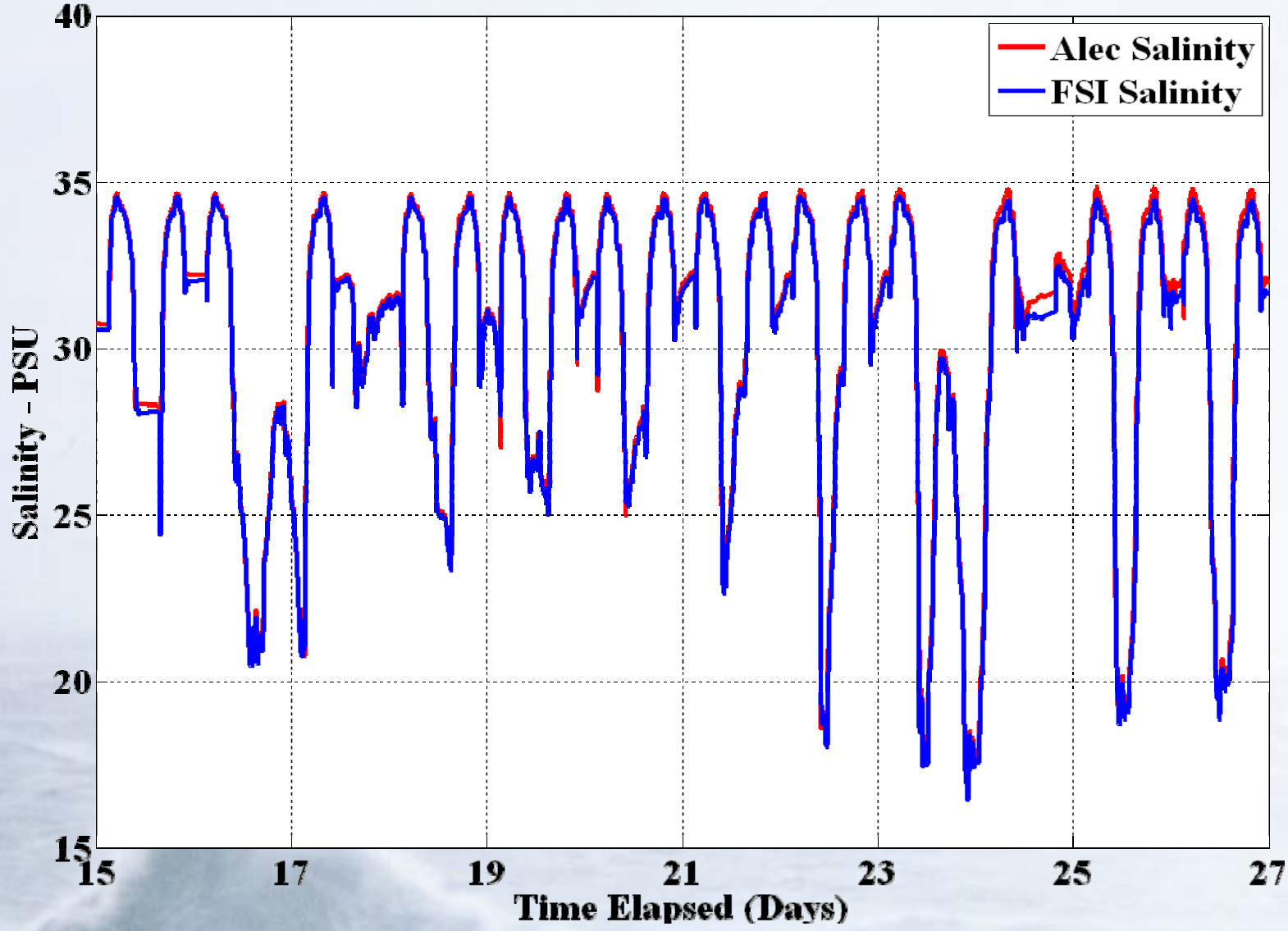

Salinity Measurement Comparison

Deployment from 7th Feb 2010 to 7th March 2010

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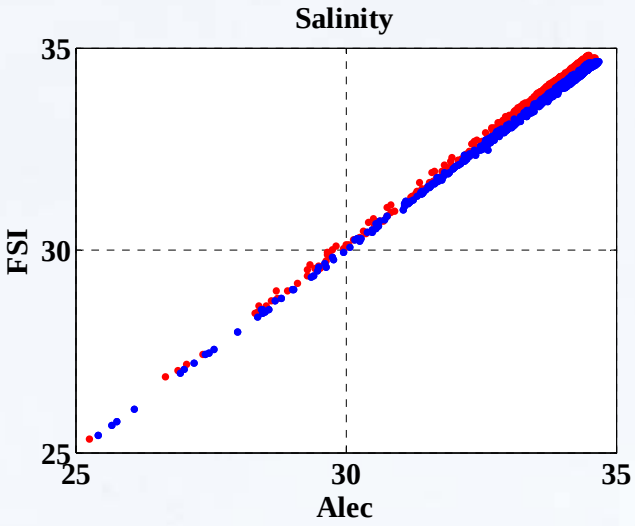

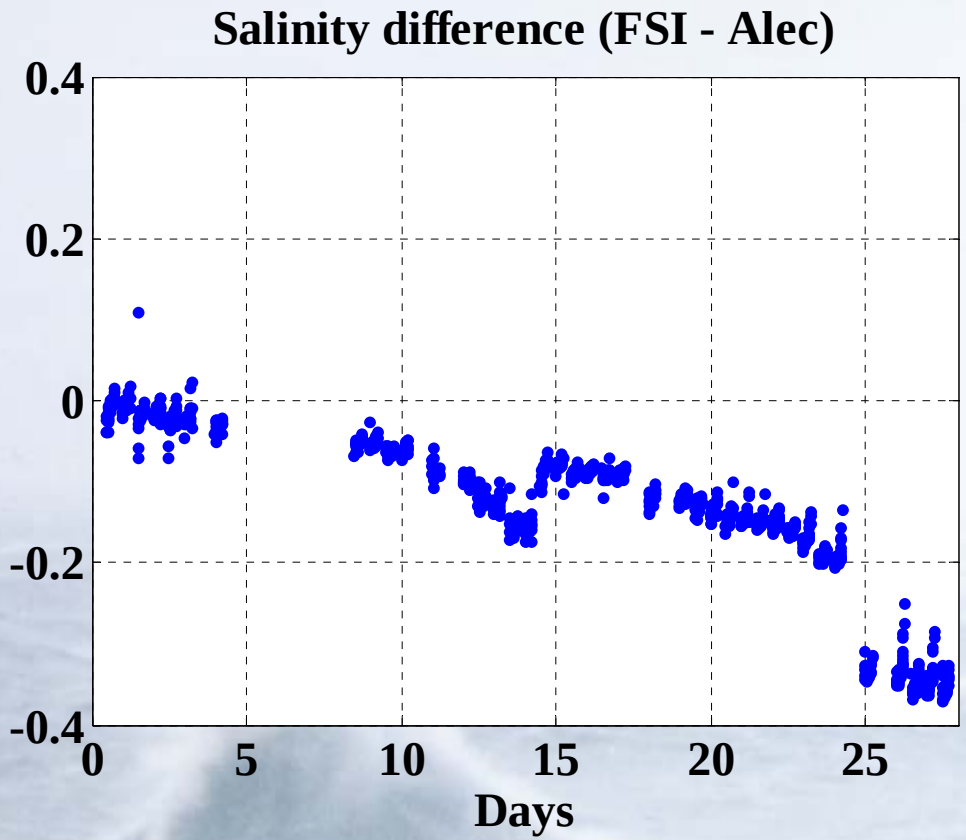

Salinity Measurement Comparison

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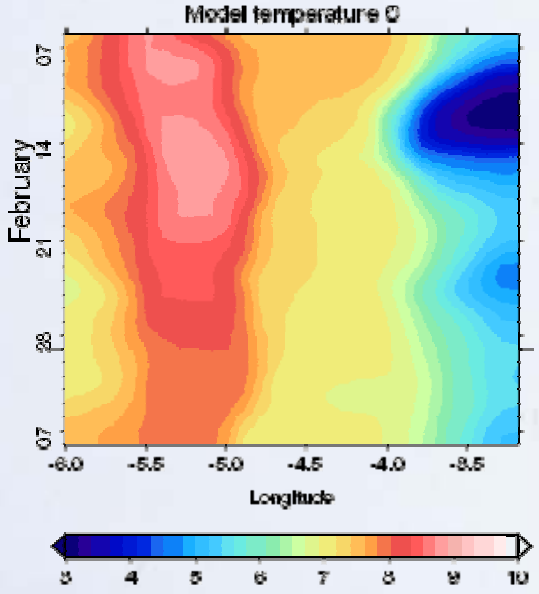

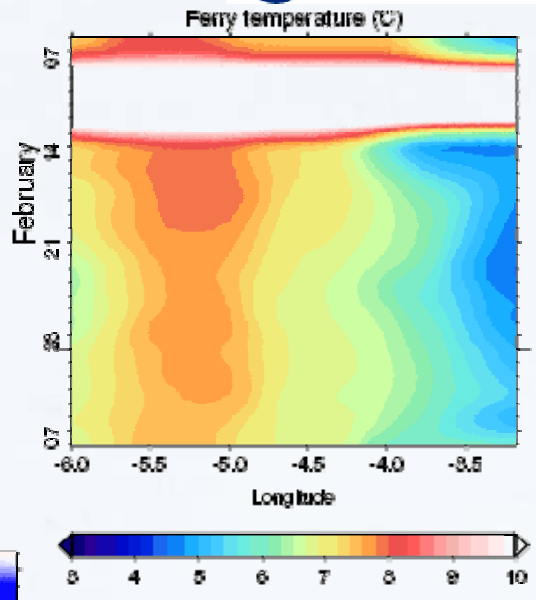

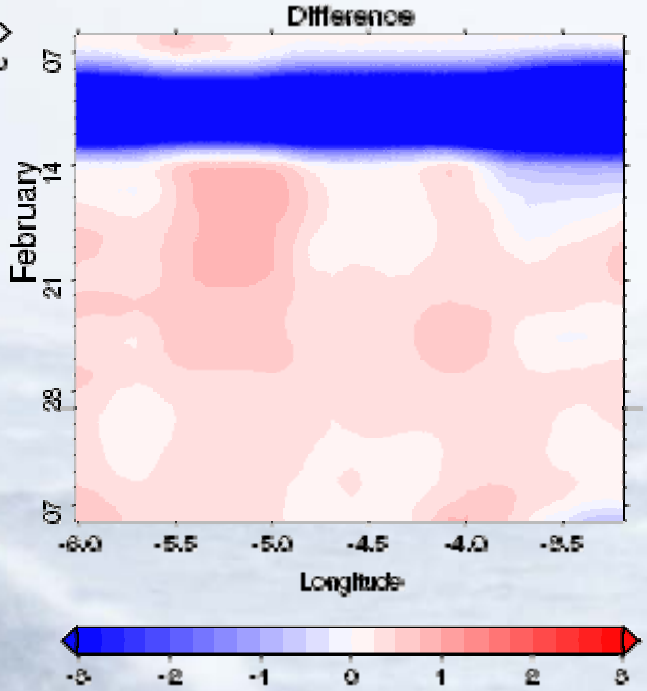

POLCOMS Model Validation – Temperature

7th February to 7th March 2010

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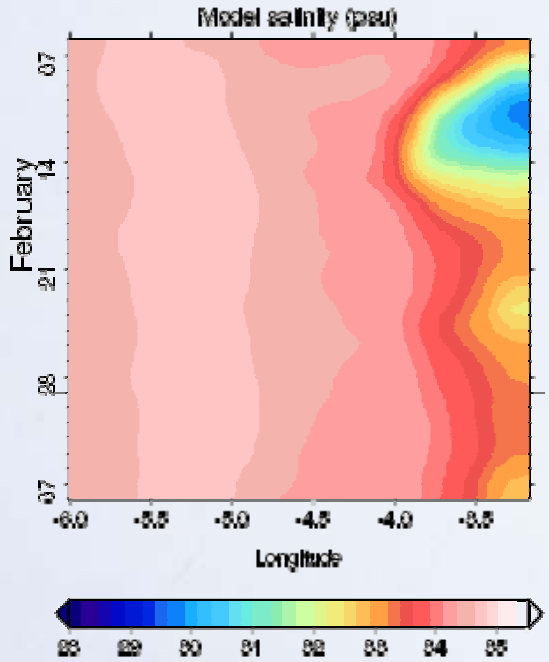

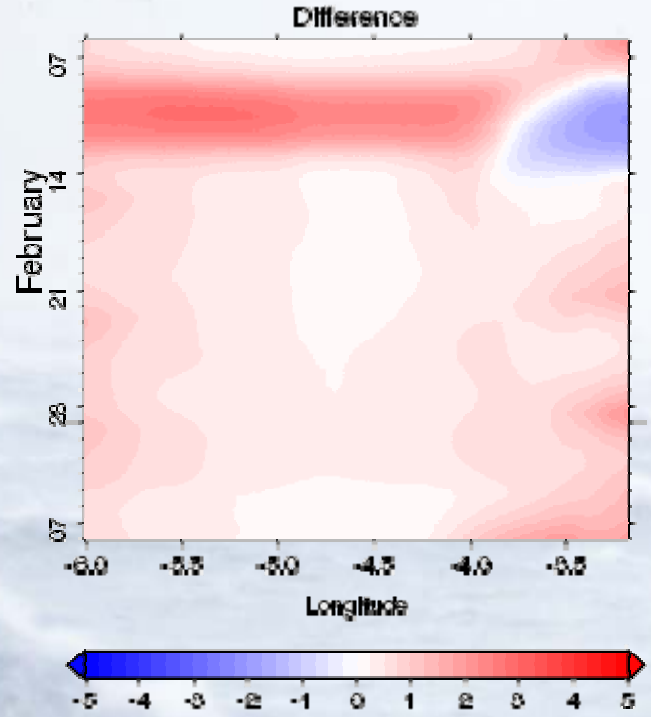

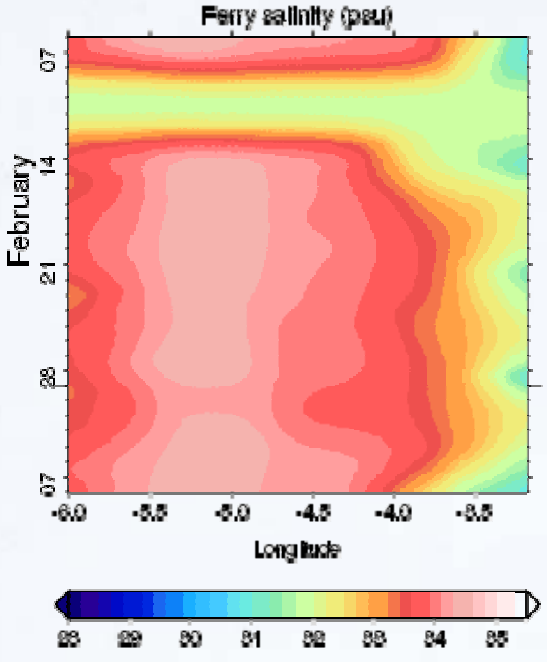

POLCOMS Model Validation – Salinity

7th February to 7th March 2010

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Progress Since 2008 FerryBox Meeting

- Continued CT sensor trials
- Upgraded bridge and engine room electronics
- Improved Orbcomm near real time telemetry
- Installation of water flow control valve
- Procurement of instrumentation for a second ferry (Birkenhead to Belfast)

Future Project Development Work

- In house fabrication of improved chamber design

- CTG Unilux fluorometers with hydrowipers for Chlorophyll-a

- Waypoint based water sampling and analysis

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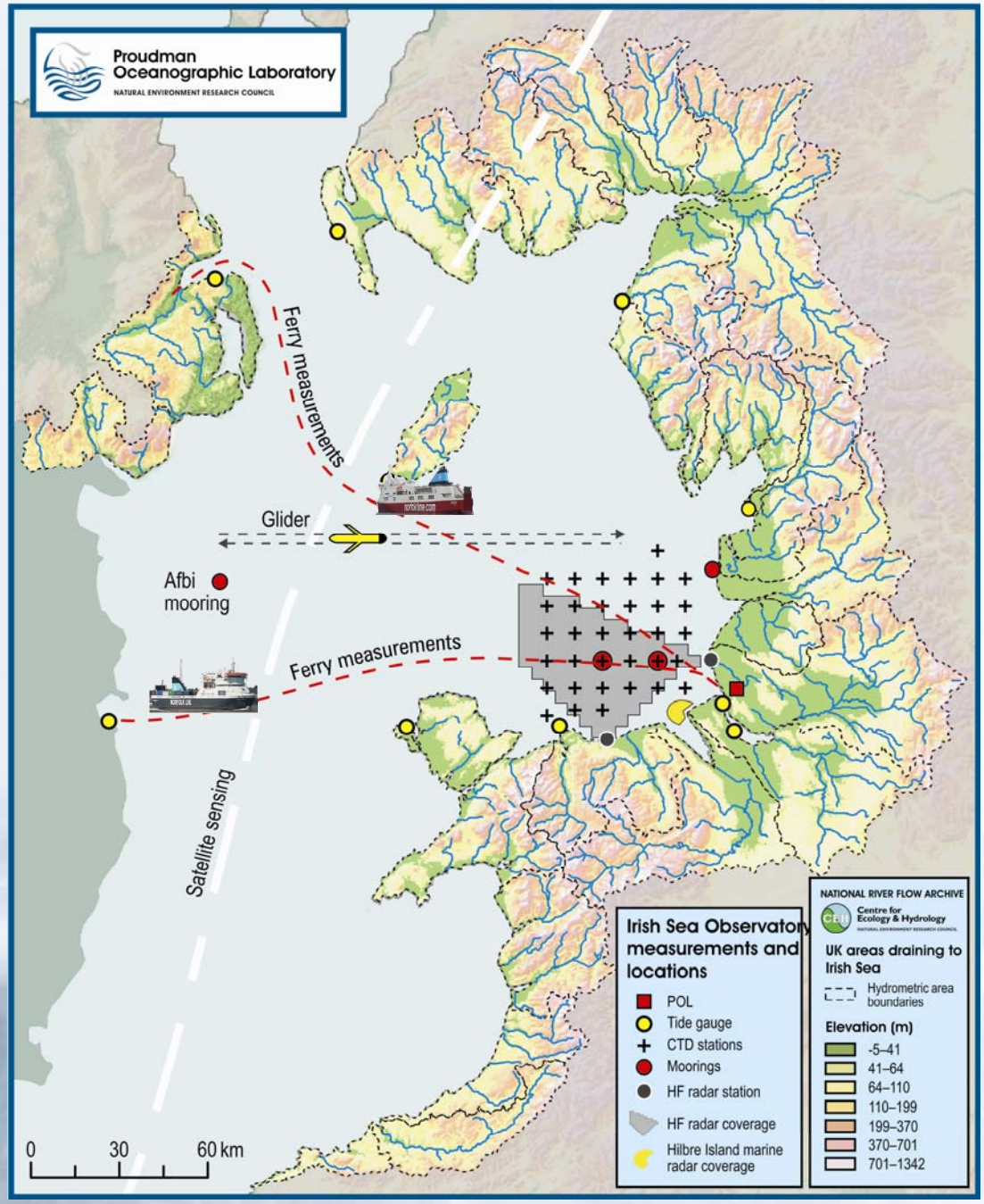

Dual FerryBox Measurements

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Thank you for your attention

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