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“Pushing the Boundaries: the First Time Use of an ARGO-Float in the Baltic Sea”

Argo Float Experiment in the Baltic Sea Summer/Fall 2012

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Acknowledgements: Tapani Stipa, Jari Helminen, Coast Guard of Pori & Turku Air Patrol Flight

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FMI and ARGO

- **FMI (Finnish Meteorological Institute) has had six floats in the Arctic Sea and two for the Baltic Sea.**

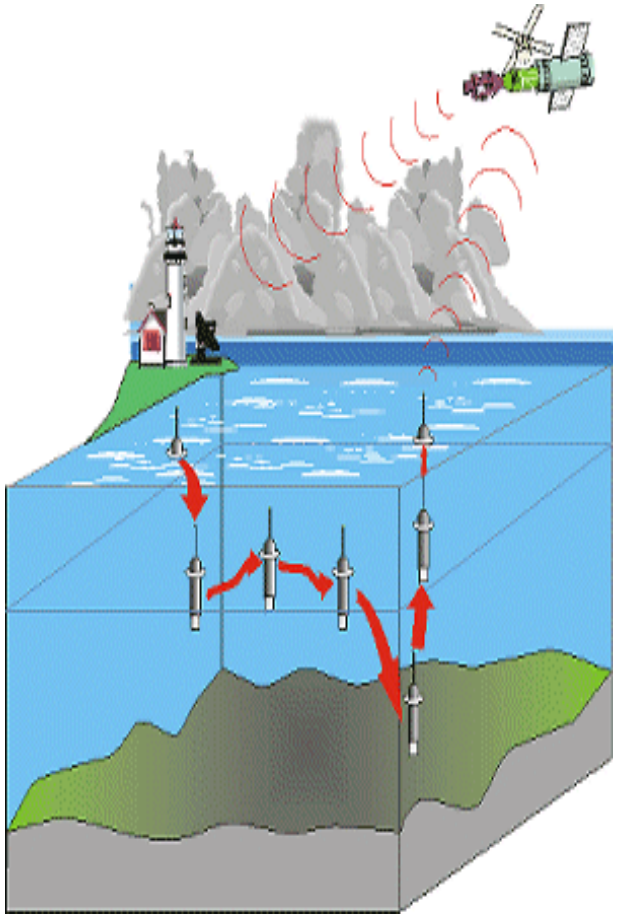
- **Four new floats will be added in 2013 – two for the Arctic Sea and two bio-optical floats for the Baltic Sea.**

- **Data collected is available through Coriolis web-site.**

http://www.coriolis.eu.org/

Baltic Argo Background

- **Three years ago FMI decided to test the suitability of ARGO-floats for the Baltic Sea.**
- **WHY? To get more data in an economical way from sea areas which were not visited so often by a research vessel.**
- **At that time there were no known ARGO-floats operating in a similar shallow and low salinity environment.**

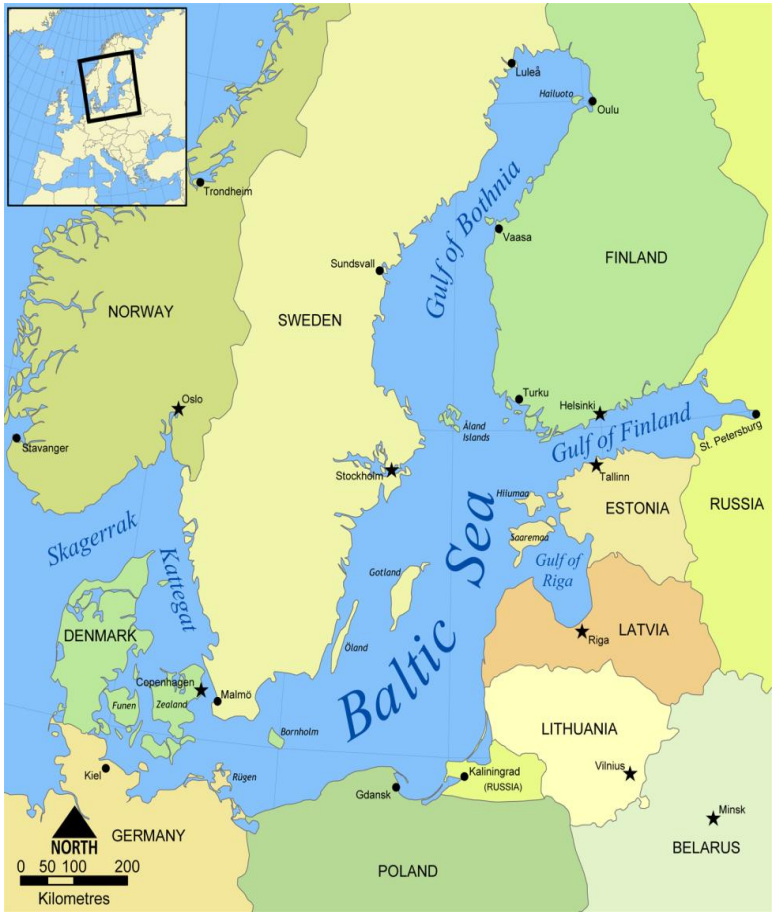


Operating Environment: The Baltic Sea

- **Low salinity**
- **Shallow – usually less than 100 m**
- **Heavy ship traffic**
- **High risk for bottom contact**

Thus, the float needs to:

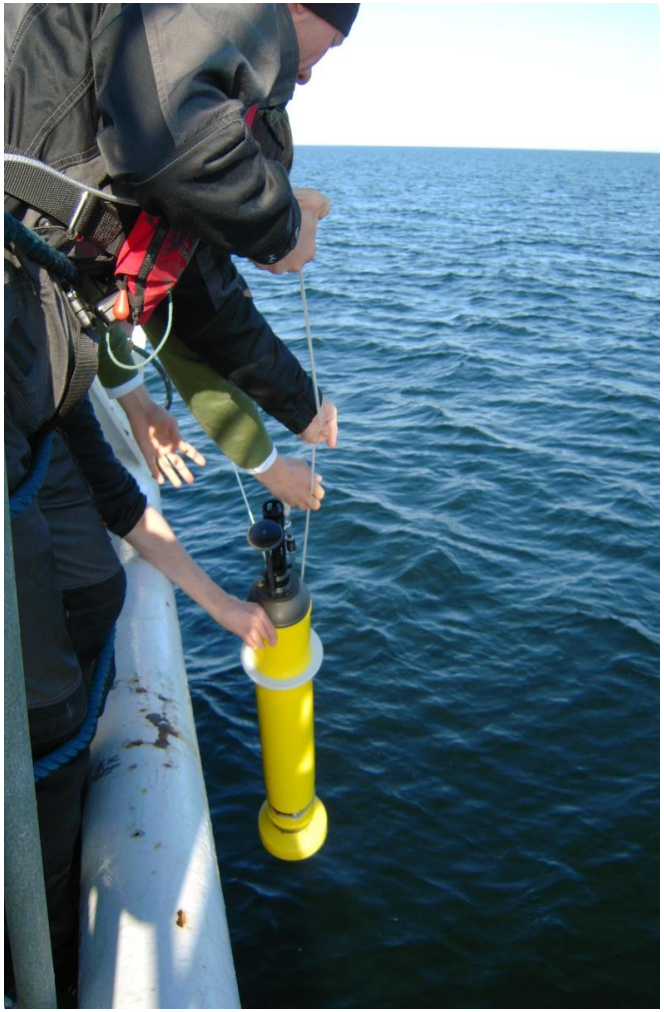
- **Perform short duration shallow dives**
- **Two way satellite connection necessary in order to control the float**



Map from Wikipedia

The Floats

- **Two APEX-floats were purchased at the end of 2010**
- **Balanced for low salinity environment**
- **Sensors SBE41 CP CTD**
- **2-way data telemetry via Iridium satellite to Rudics server at FMI**
- **Other float's firmware has been modified in a joint project with Aalto University**



Controlling the Float

First step: Two short duration test dives with external micro pressure logger (sample interval 15 sec).

- **Main control parameters:**
  - **Piston position**
  - **Target depth**
  - **Dive duration**
- **Points to remember:**
  - **Stay away from the bottom! If the bottom is muddy the float might get stuck...**
  - **Controlled diving in a shallow, well mixed water mass is challenging!**

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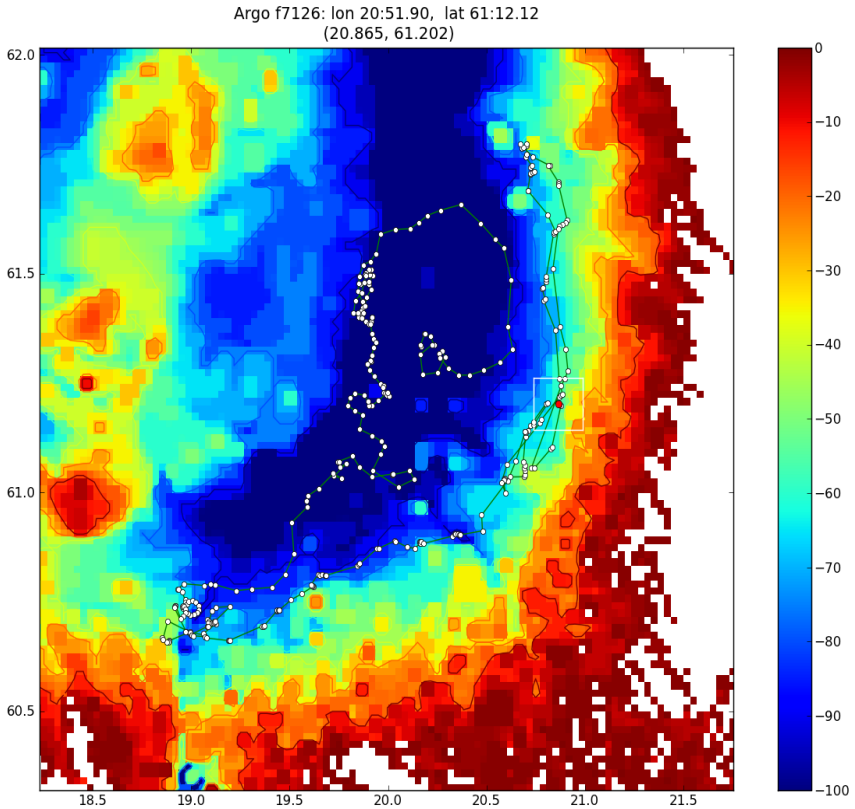
”APE1” Trajectory 17.5.-5.12.2012

- **Deployment:**

  Bothnian Sea 17.5.2012
- **Recovery:**

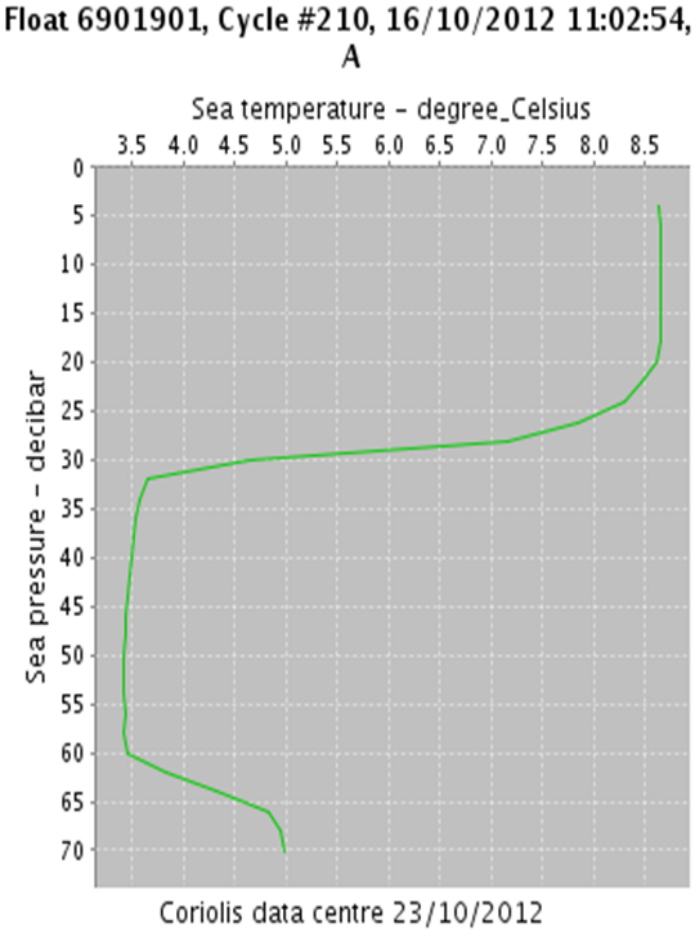
  5.12.2012

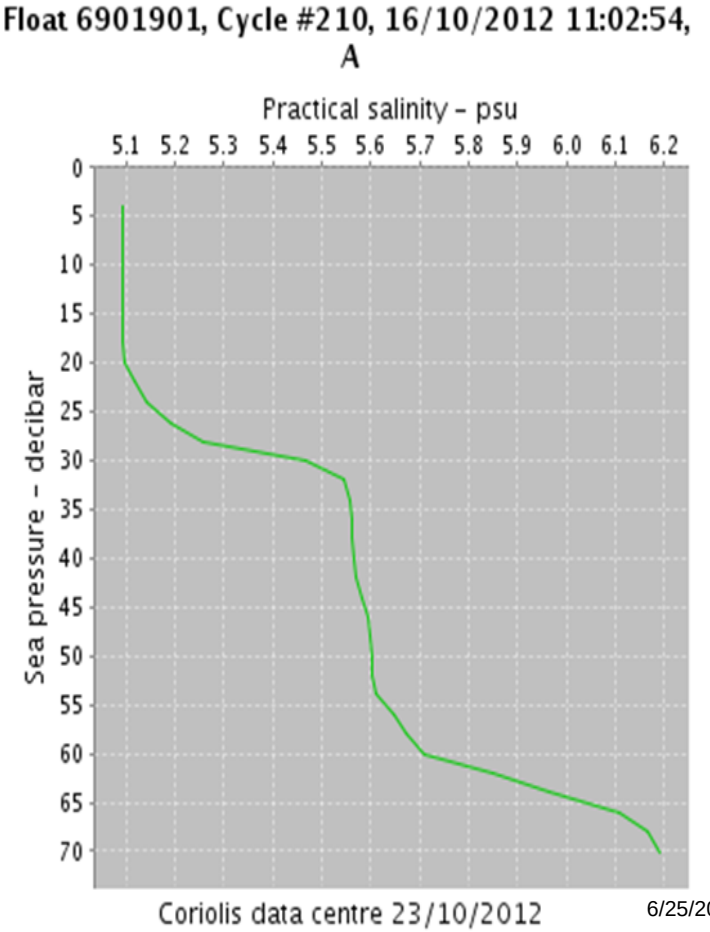
- **6 ½ month mission exceeded our expectations**
- **First drifting ARGO-float in the Baltic Sea**



Measurements

- **Over 200 daily temperature –salinity profiles measured**





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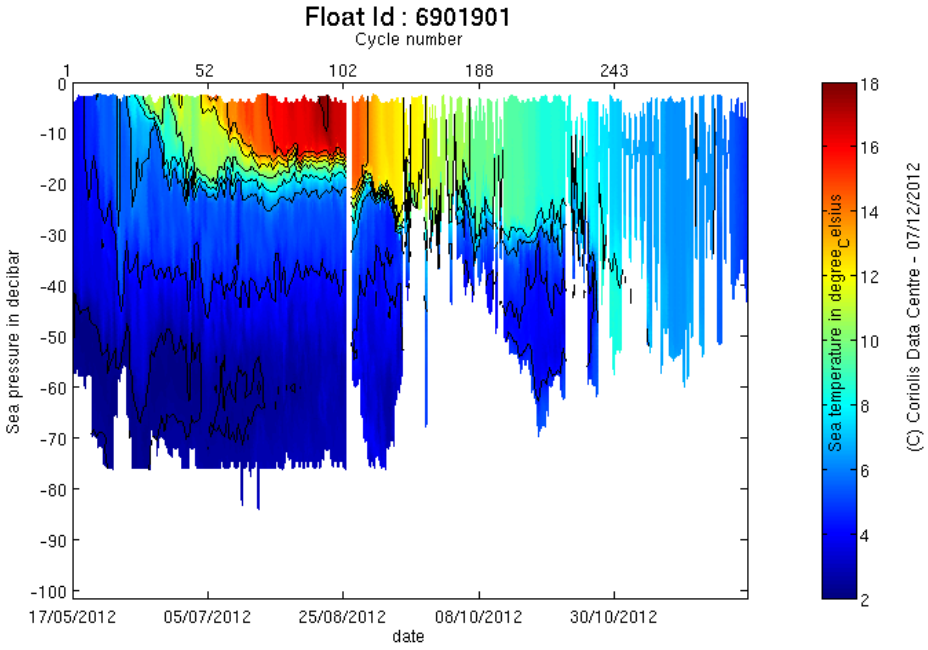
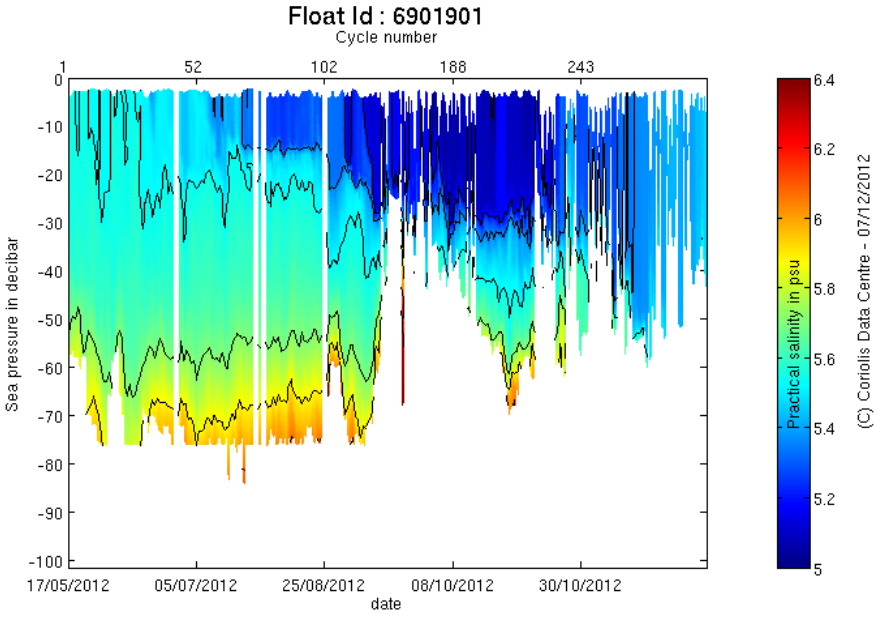
Temperature-Salinity Profiles 17.5.-5.12.2012

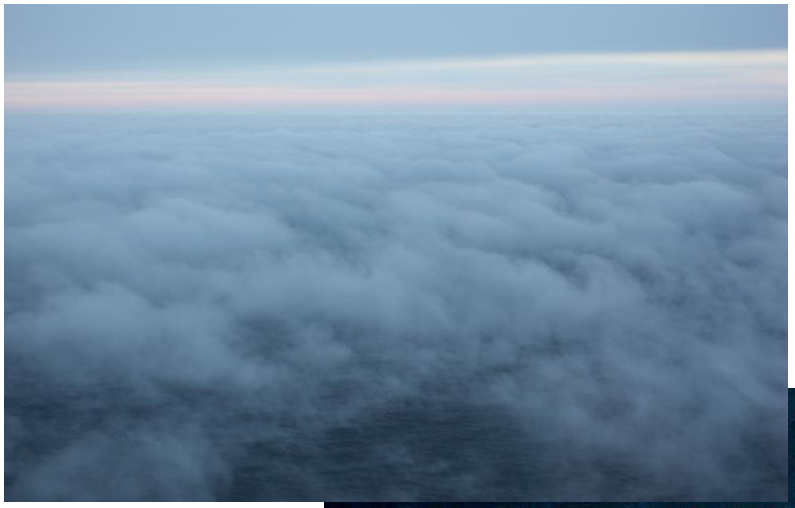


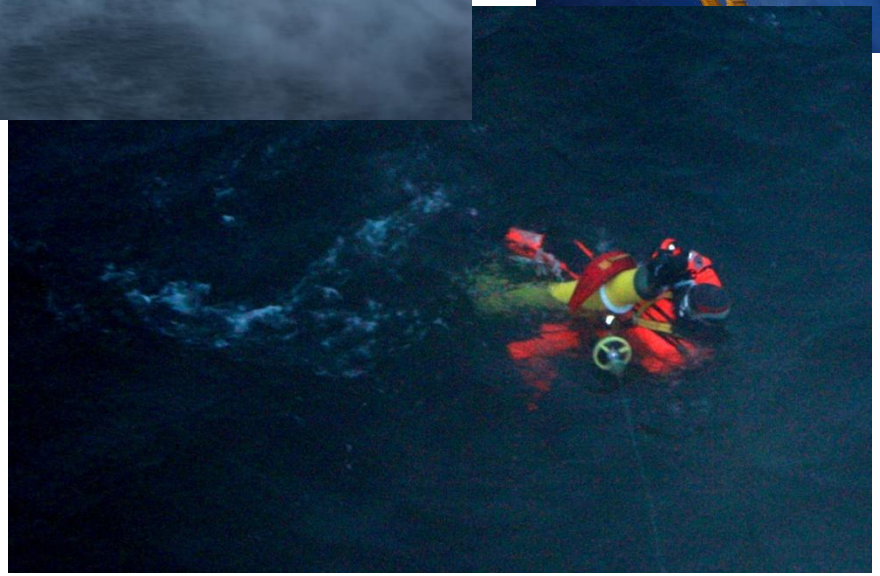
Temperature



Salinity

Helicopter Recovery 5.12.2012





Back in the office in great shape!

The float was perfectly clean - no biofouling at all.

What has been learned?

- **ARGO-floats are useful and valuable tools for monitoring the Baltic:**
  - Environmental monitoring
  - Model verification
  - Data assimilation
  - Specific measurement campaigns
- **Reliable Instrument**
- **Relatively cheap**
- **Operation requires almost daily operator involvement and active commanding of the floats.**

Future Plans

- **2 Apex-floats will be deployed to the Bothnian Sea this summer:**
  - One with firmware modified by Aalto University
    - Faster diving algorithm enabling the float to settle to the target dive depth quicker
  - One with oxygen + bio-optical sensors
- **One float with oxygen + bio-optical sensors will be deployed to the Gotland Basin (**large central basin in the Baltic Sea with anoxic (hydrogen sulfide) deep water).

In Conclusion

Shallow water diving with ARGO-float is possible and produces useful data.

Thank You!