AUV “PAUL” Polar Autonomous Underwater Laboratory

FRAM AWI

Revealing Physical and Ecological Dynamics at an Ice Edge – a Robotic Approach

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1 AWI

2 Julius-Maximilians-Universität Würzburg

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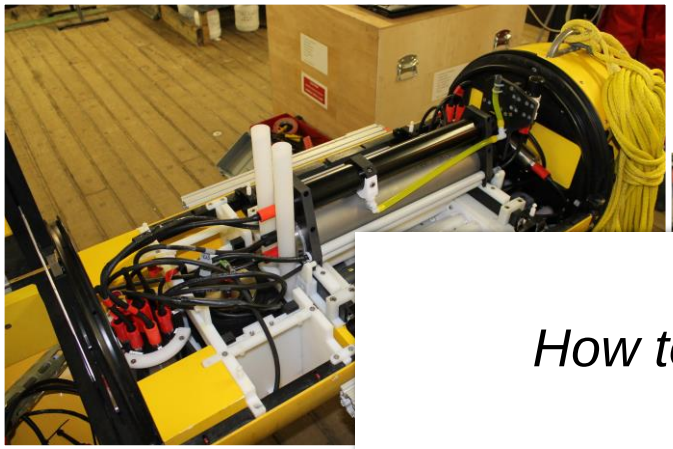
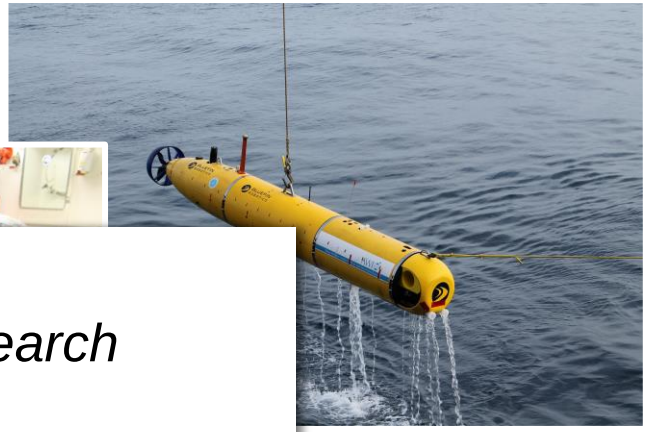
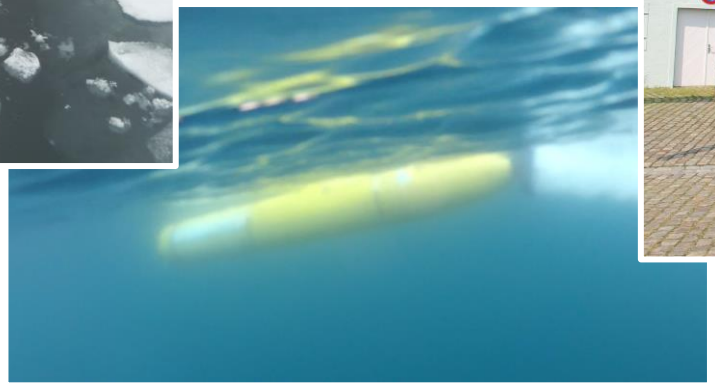




How to do ecological research

in a harsh environment

that features steep gradients.



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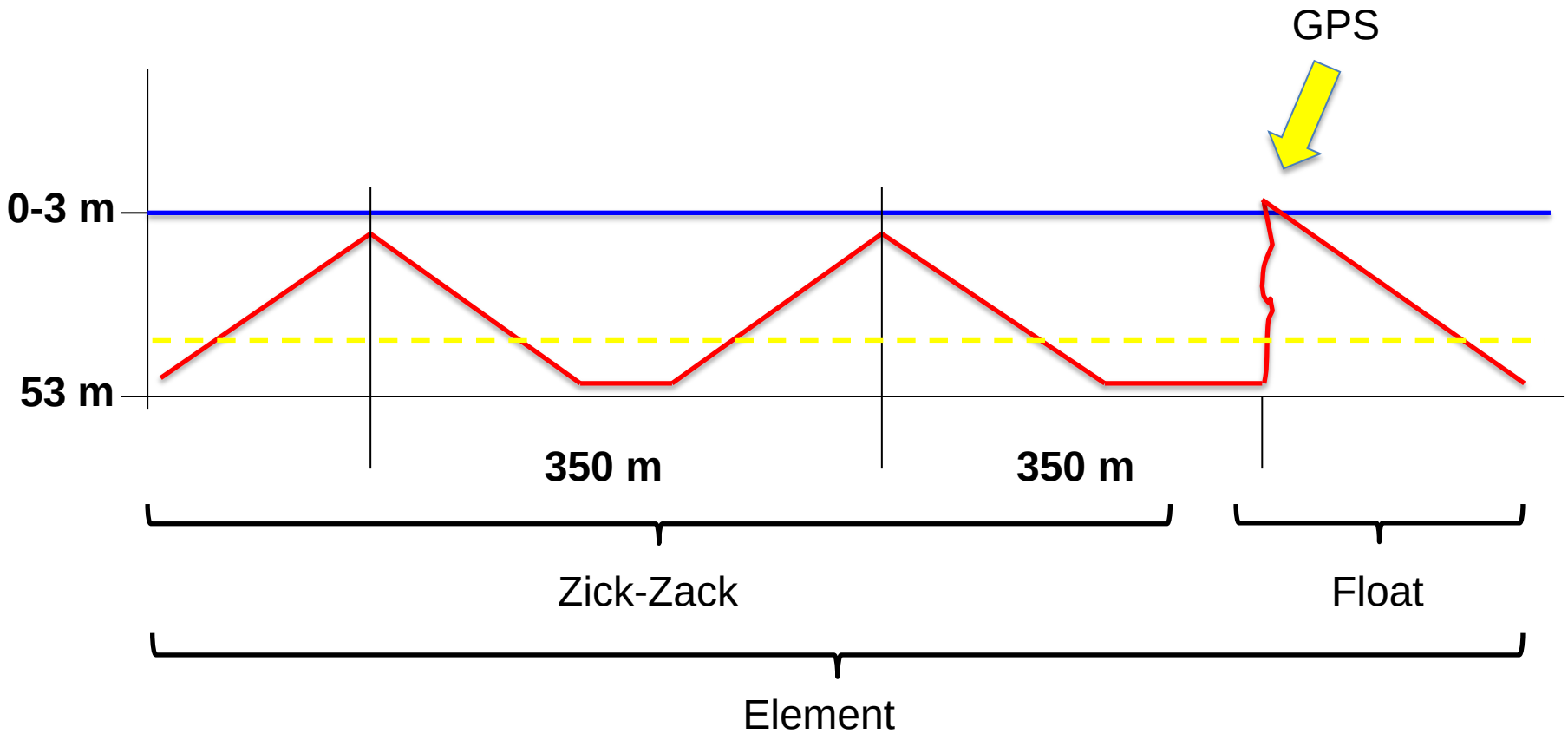

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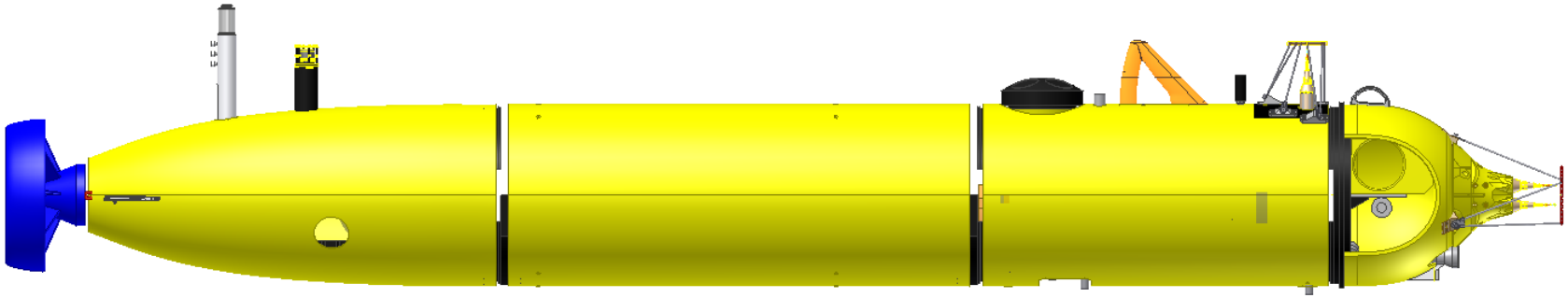

Tail sectior
Propulsion

on:

Nose:
Recovery

Weight:	500 kg	
Length:	4,5 m	
Depth Rating:	3.000 m	
Velocity:	3 – 7,5 km/h	(5 km/h)
Range:	+50 km	

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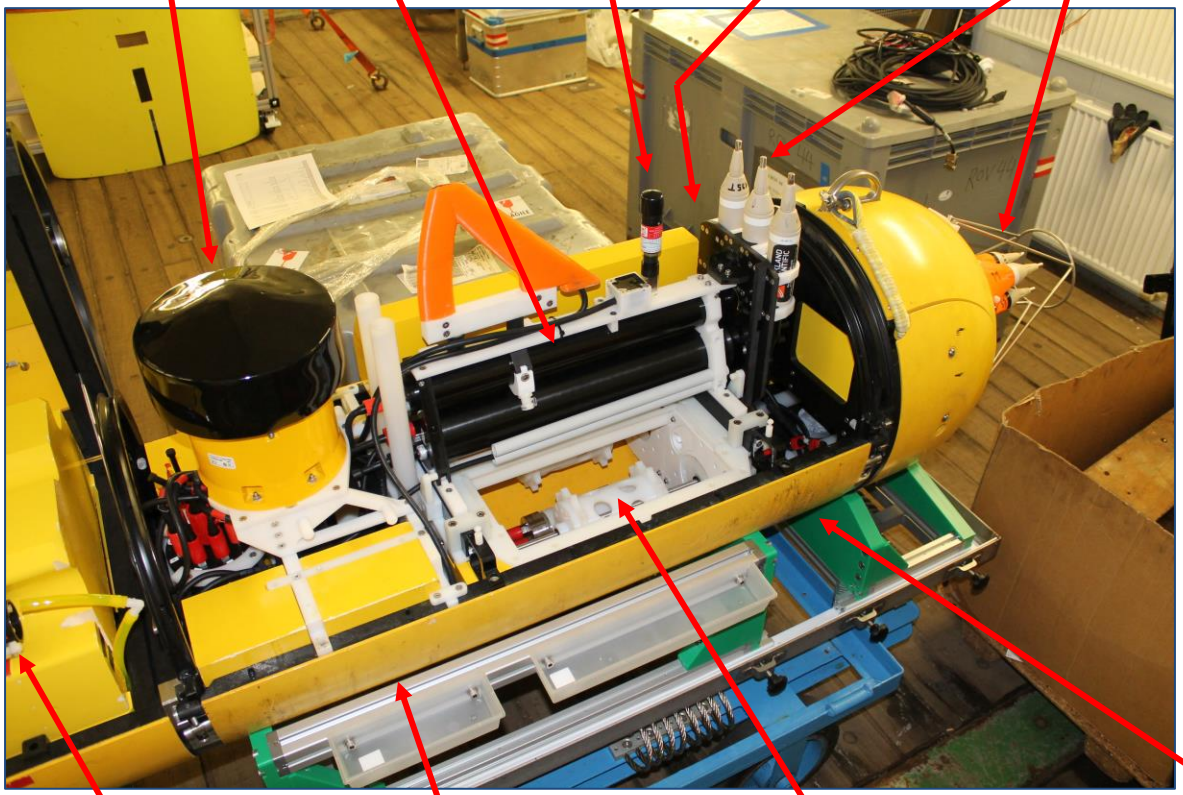
Biological

Chemical

Physical



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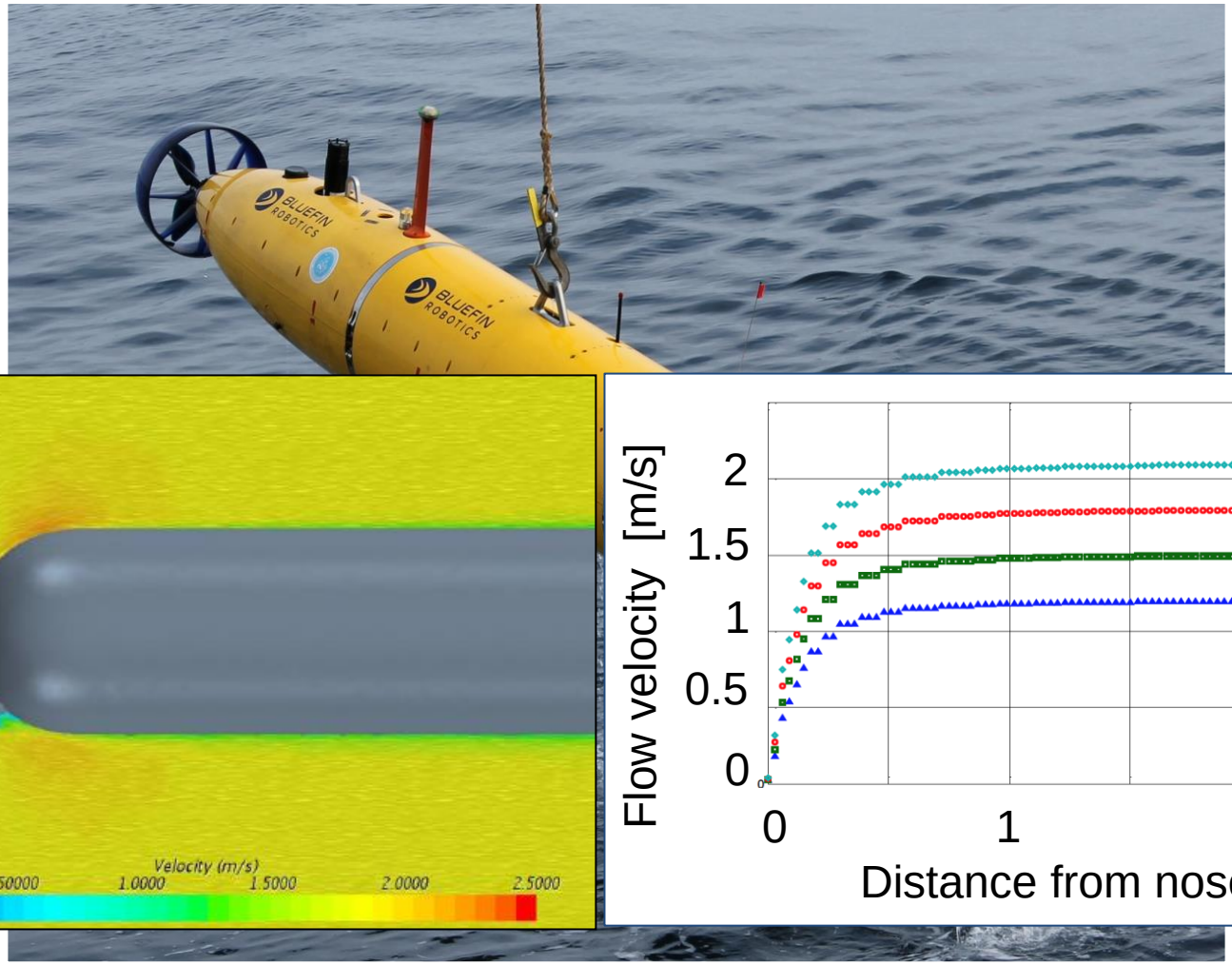

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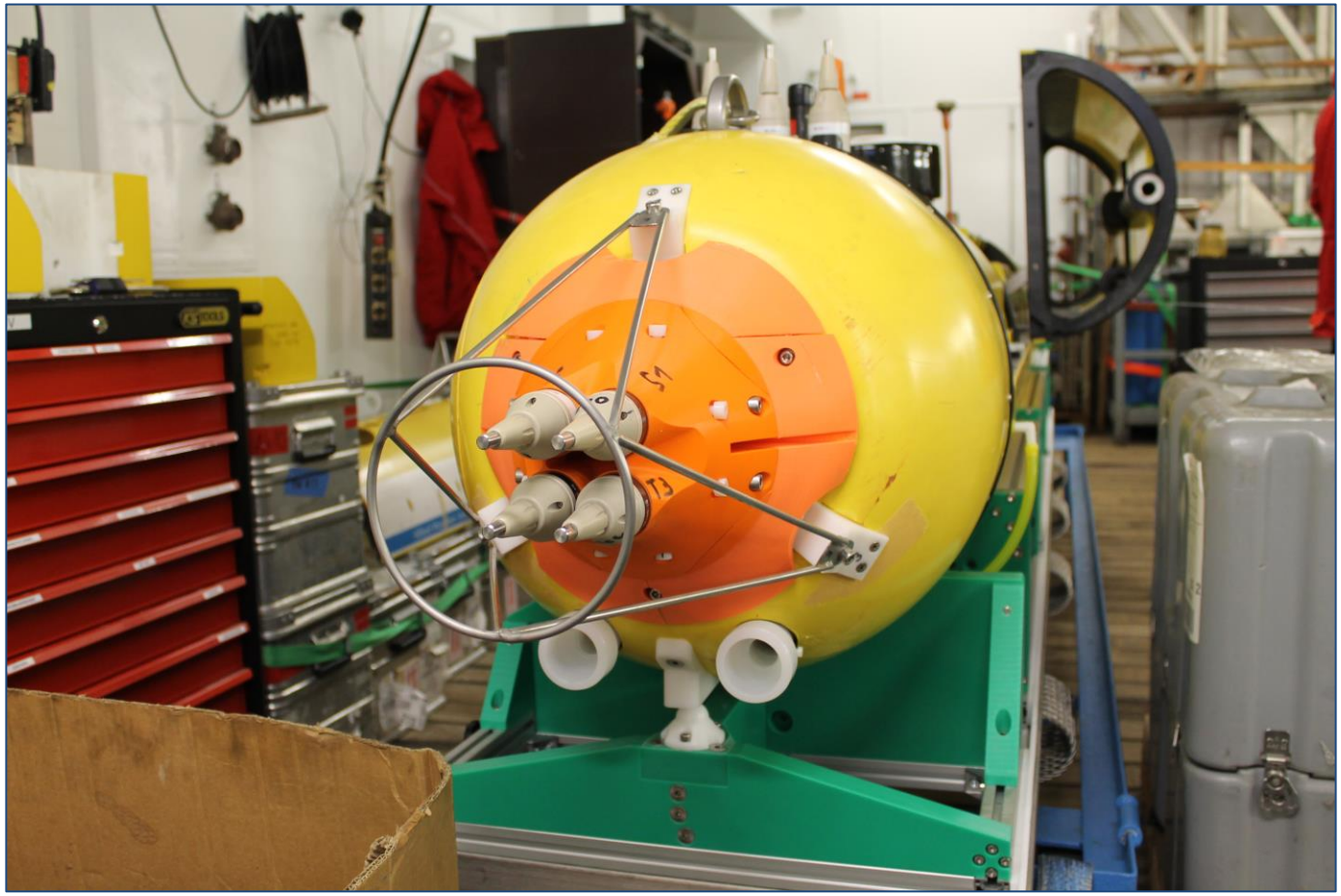

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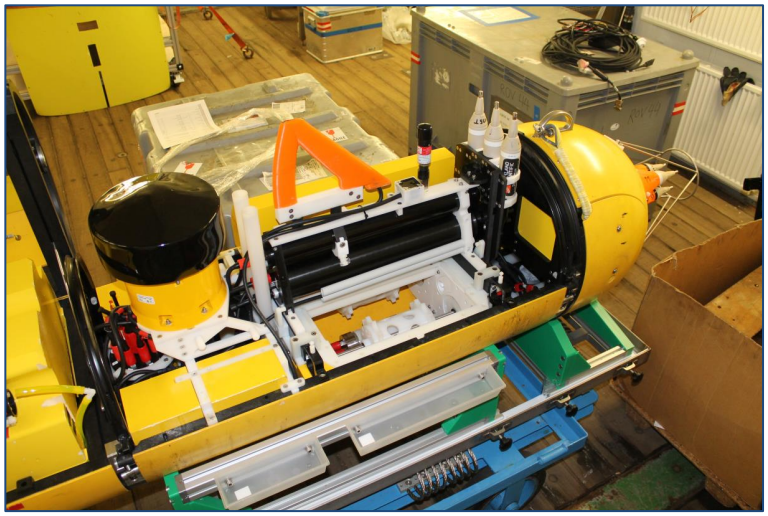
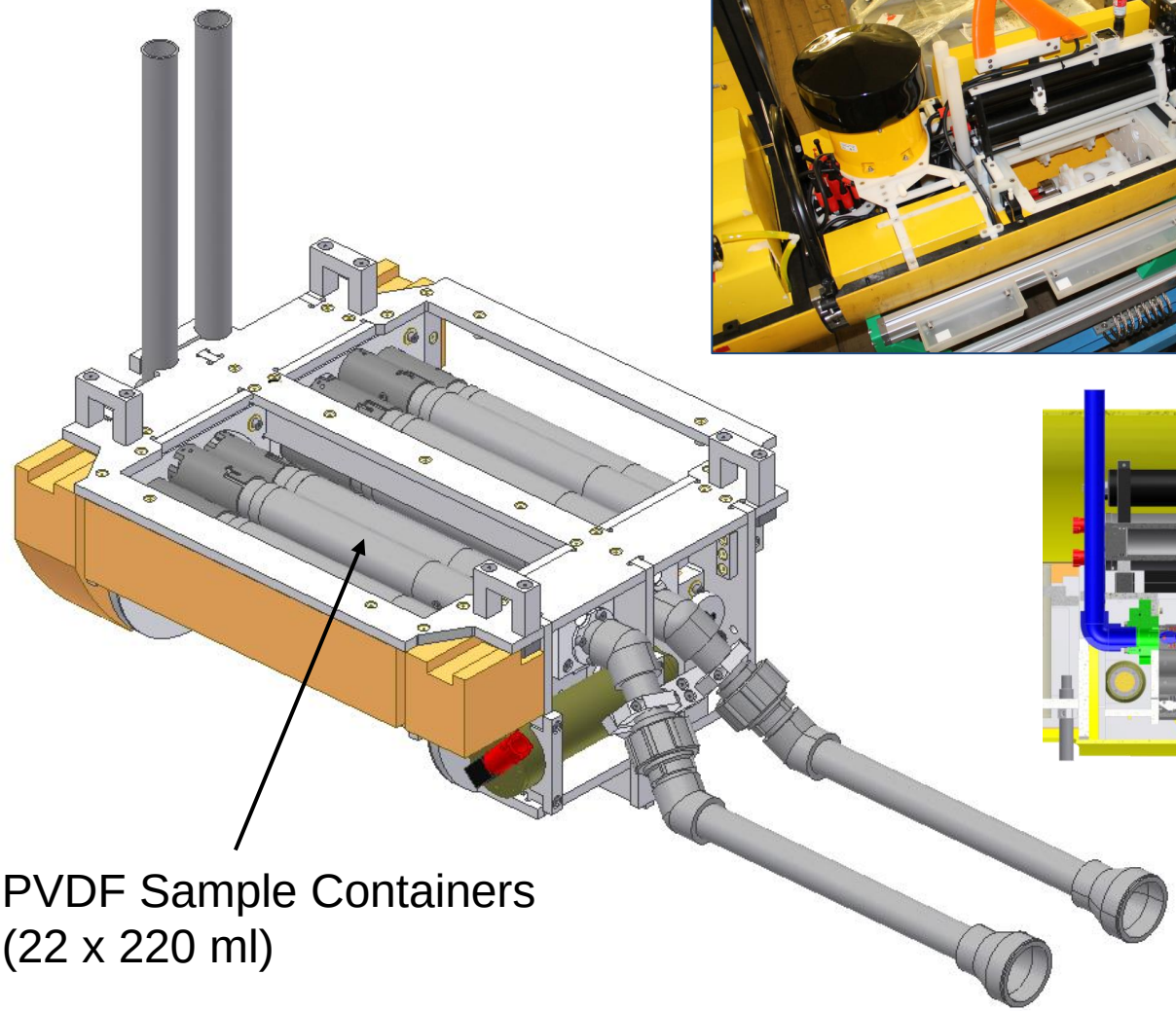
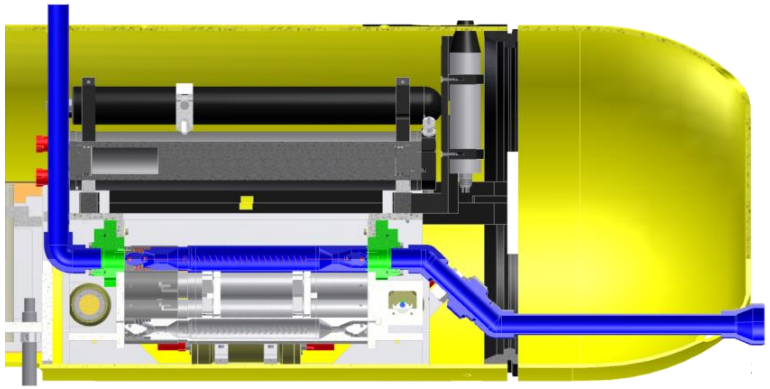




PVDF Sample Containers
(22 x 220 ml)



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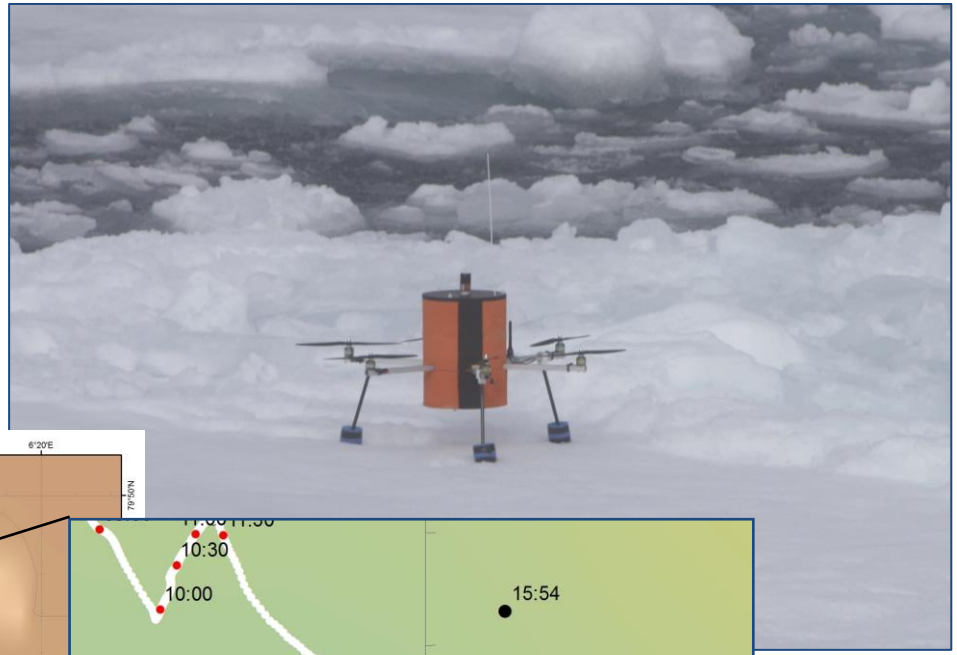
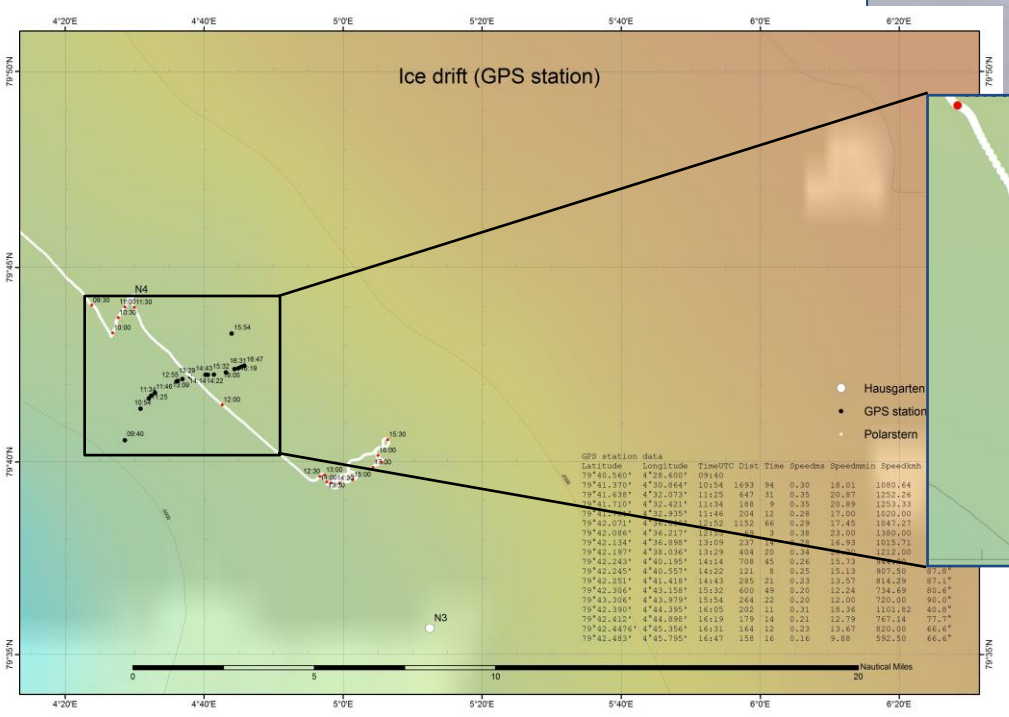
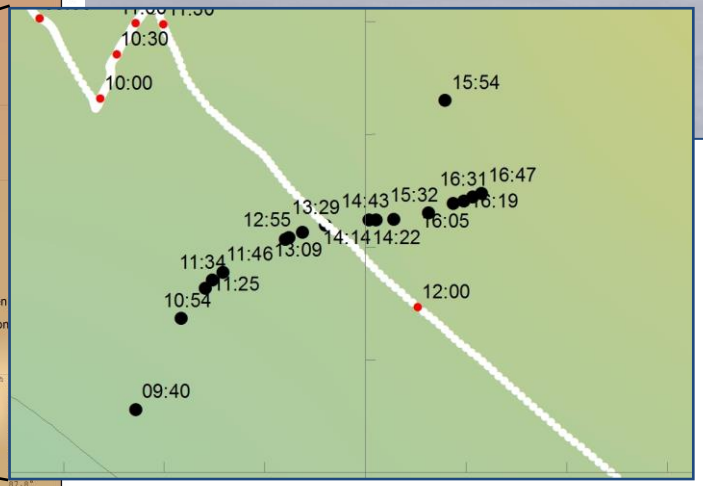
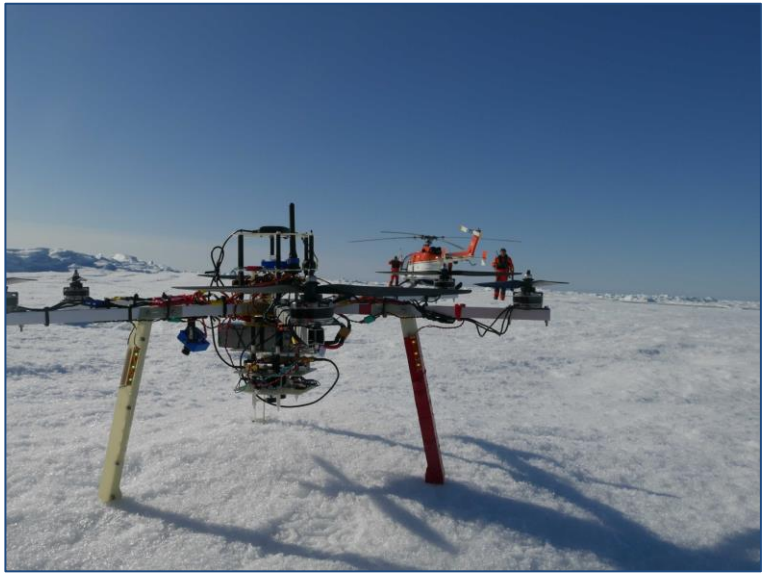
Polar UAVs




Ice drift (GPS station)
Hausgarten
GPS station
Polarstern
N4
N3
Nautical Miles
GPS station data


10:30
10:00
15:54
16:31
16:47
16:19
15:32
14:43
13:29
12:55
16:05
14:14
14:22
13:09
11:46
11:34
11:25
10:54
12:00
09:40

Polar UAVs



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ROBEX

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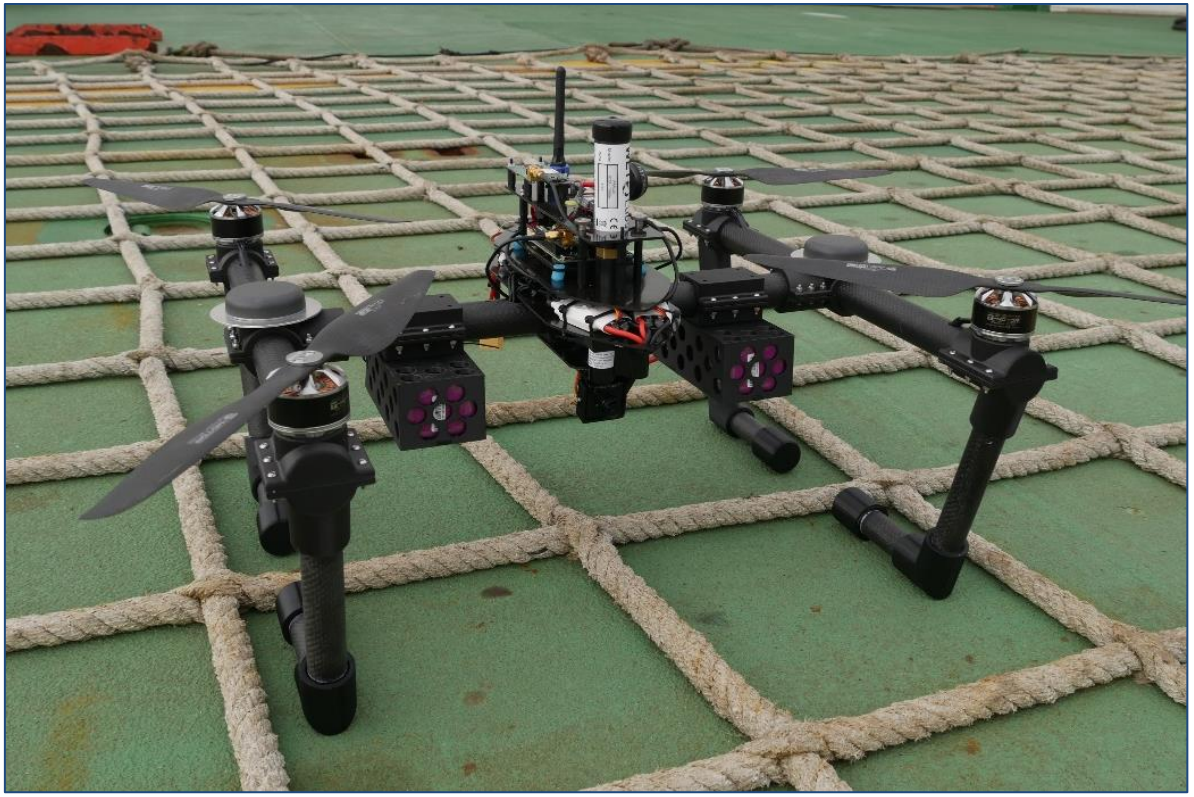

Polar UAVs

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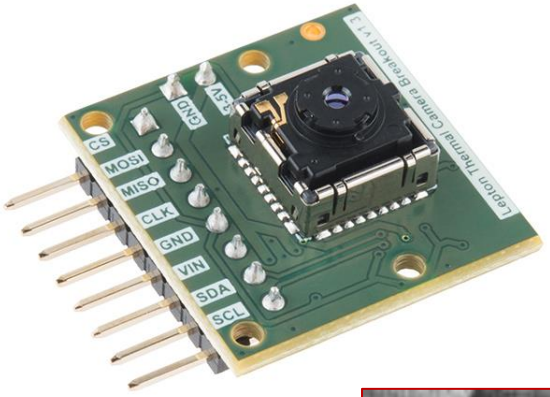
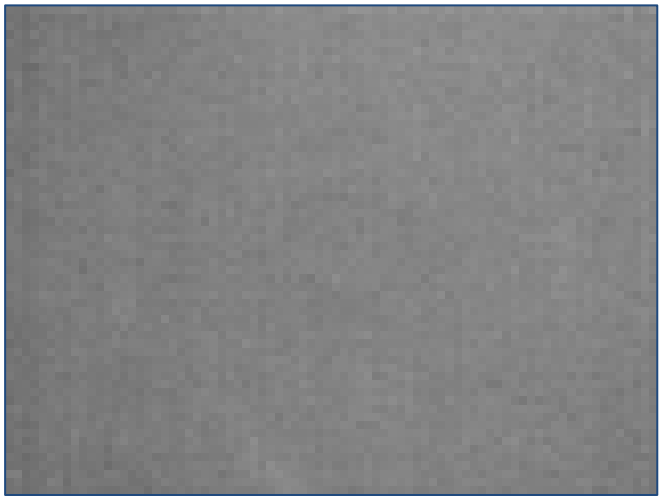
Polar UAVs

Thermal Image Sensor

- Goal: Automatic detection of ice shores
- Lepton FLIR
  - 80x60 Pixel
  - Approx. 5 Hz
  - Calibration range from -10°C to 65°C





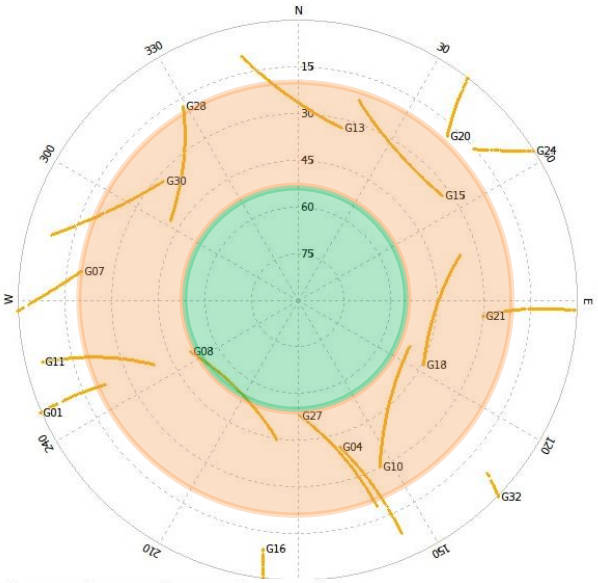
Conclusion:

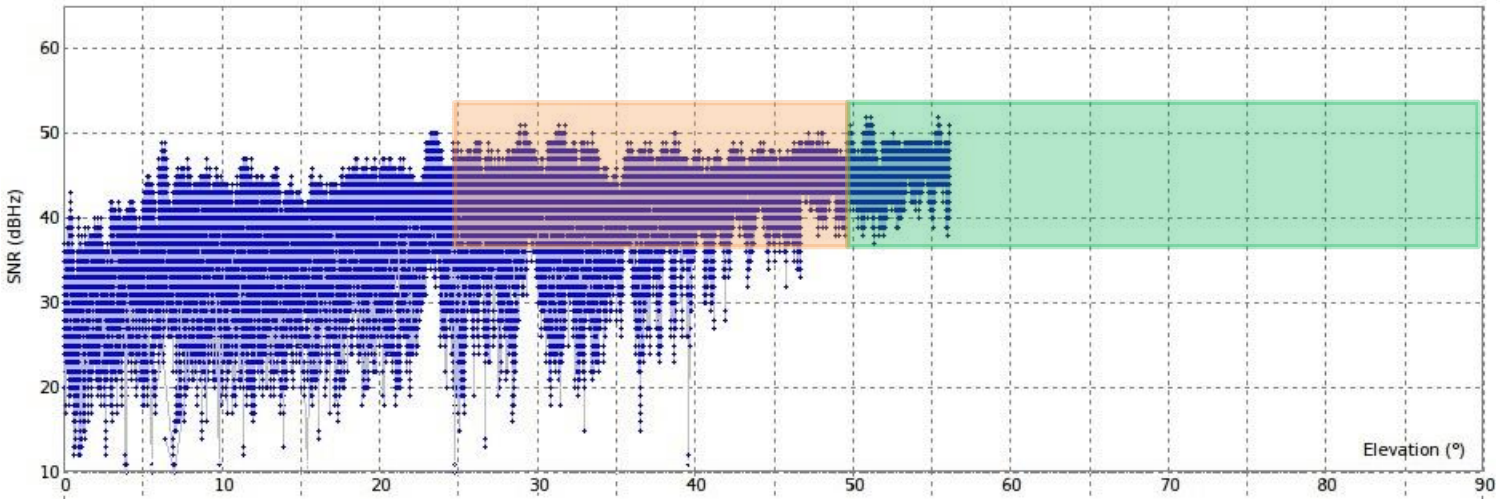
- AUVs are an ideal instrument to conduct high resolution water column studies
- The AUV is able to provide a comprehensive picture of the physical and ecological processes – but only on a small scale
- Flying drones can provide important environmental data, but they are not operational yet

Polar UAVs

DGPS at high latitudes

- Carrier-phase based attitude determination relies on good GPS signal quality
- Low satellite elevation at high latitudes
  → poor SNR + high multipath
- Signal reflections in ship vicinity





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