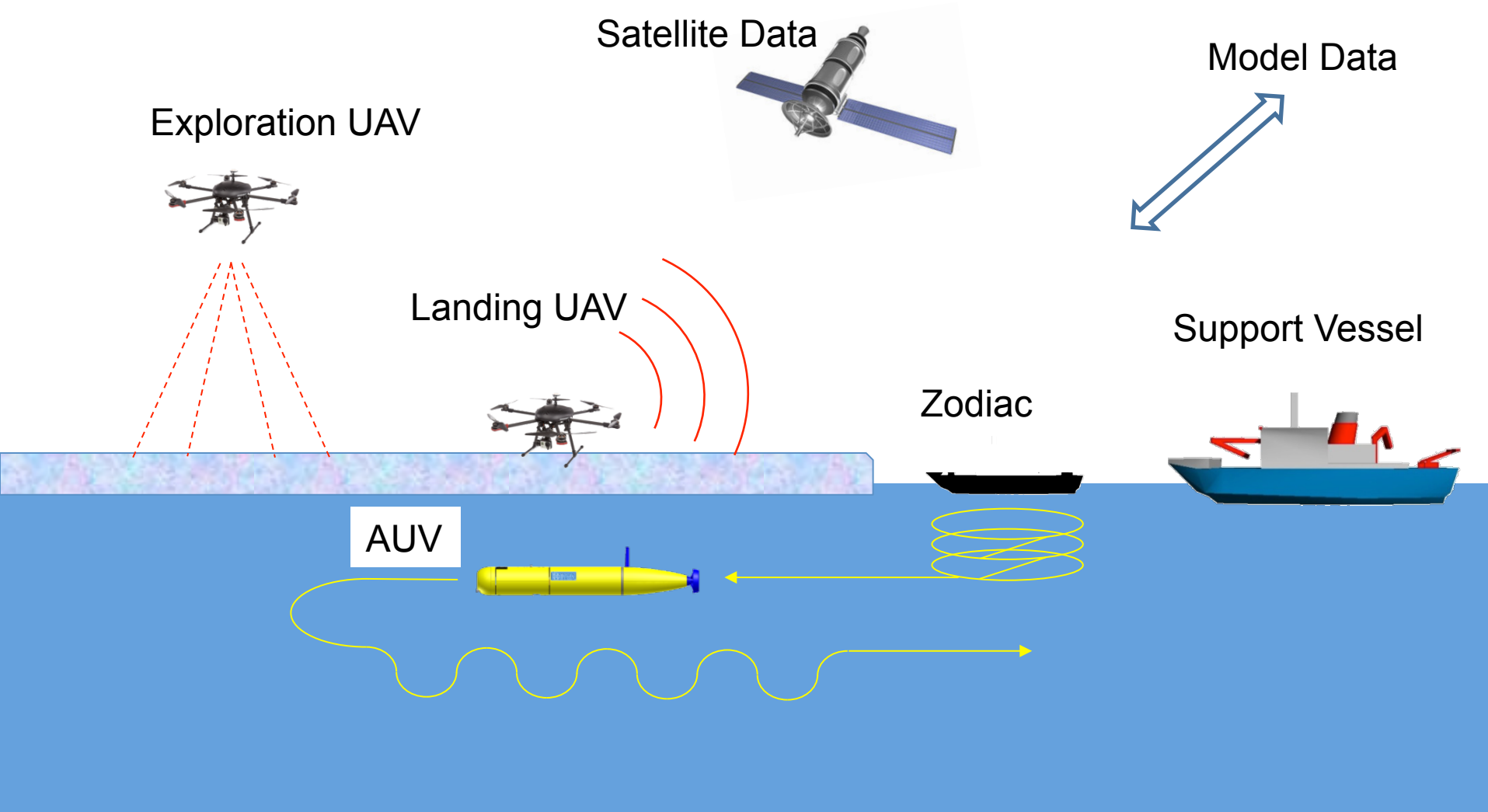




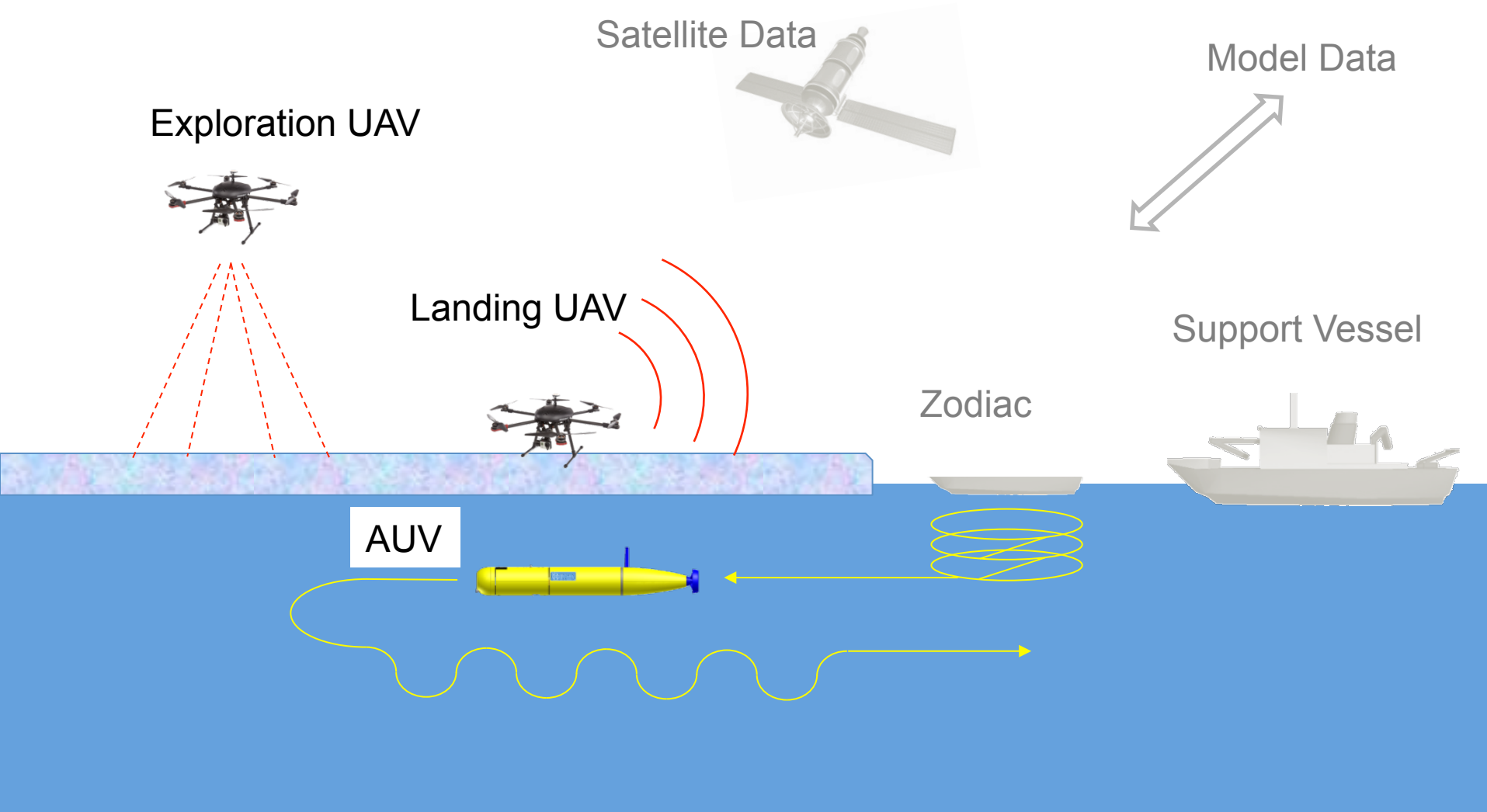
# Observing the Arctic with autonomous robots

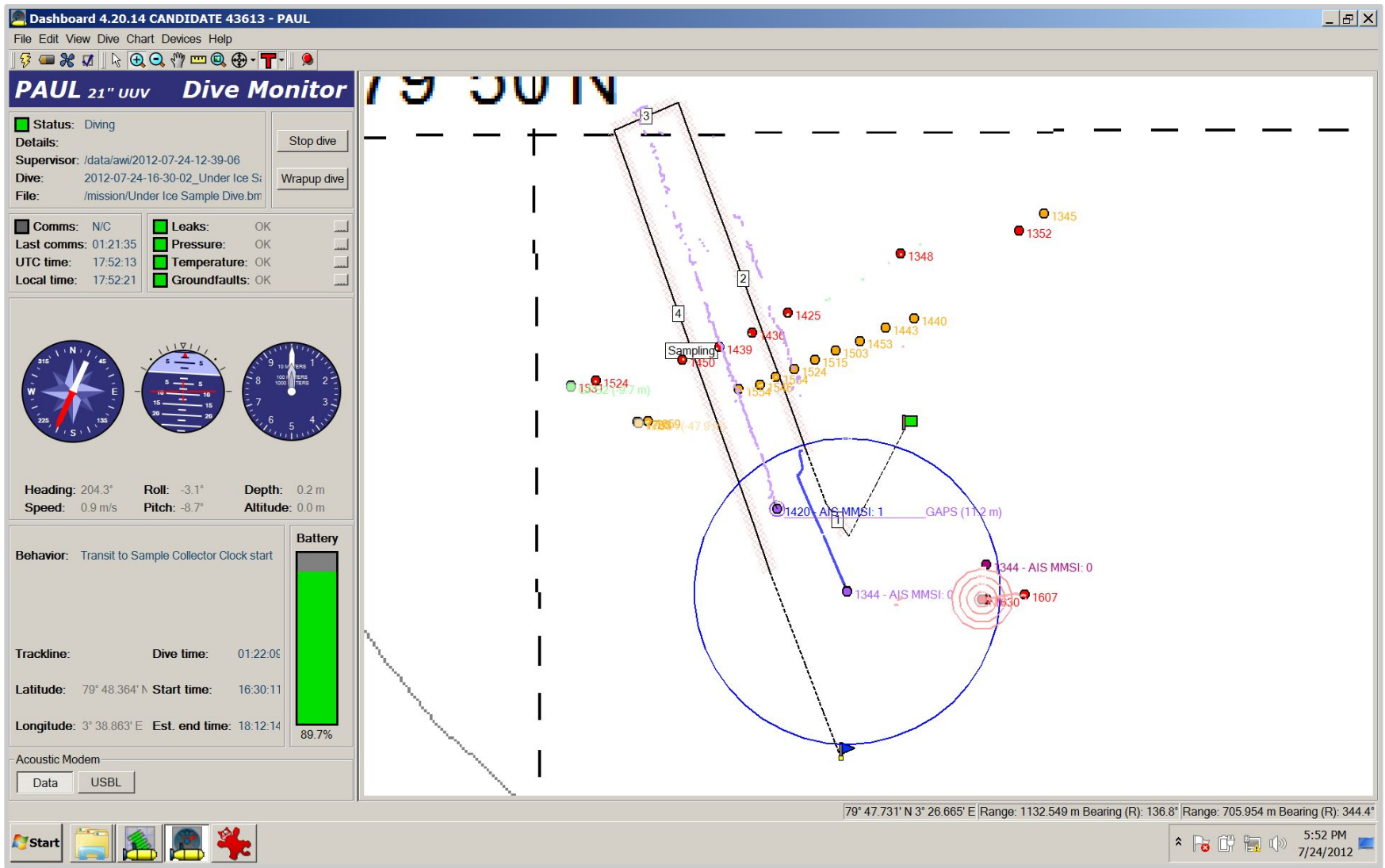
Sandra Tippenhauer<sup>1</sup>, Thorben Wulff<sup>1</sup>, Sascha Lehmenhecker<sup>1</sup>,  
Michael Strohmeier<sup>2</sup>, Tobias Mikschl<sup>2</sup>, Sergio Montenegro<sup>2</sup>

1) Alfred-Wegener-Institute, Bremerhaven, Germany  
2) Universität Würzburg, Germany

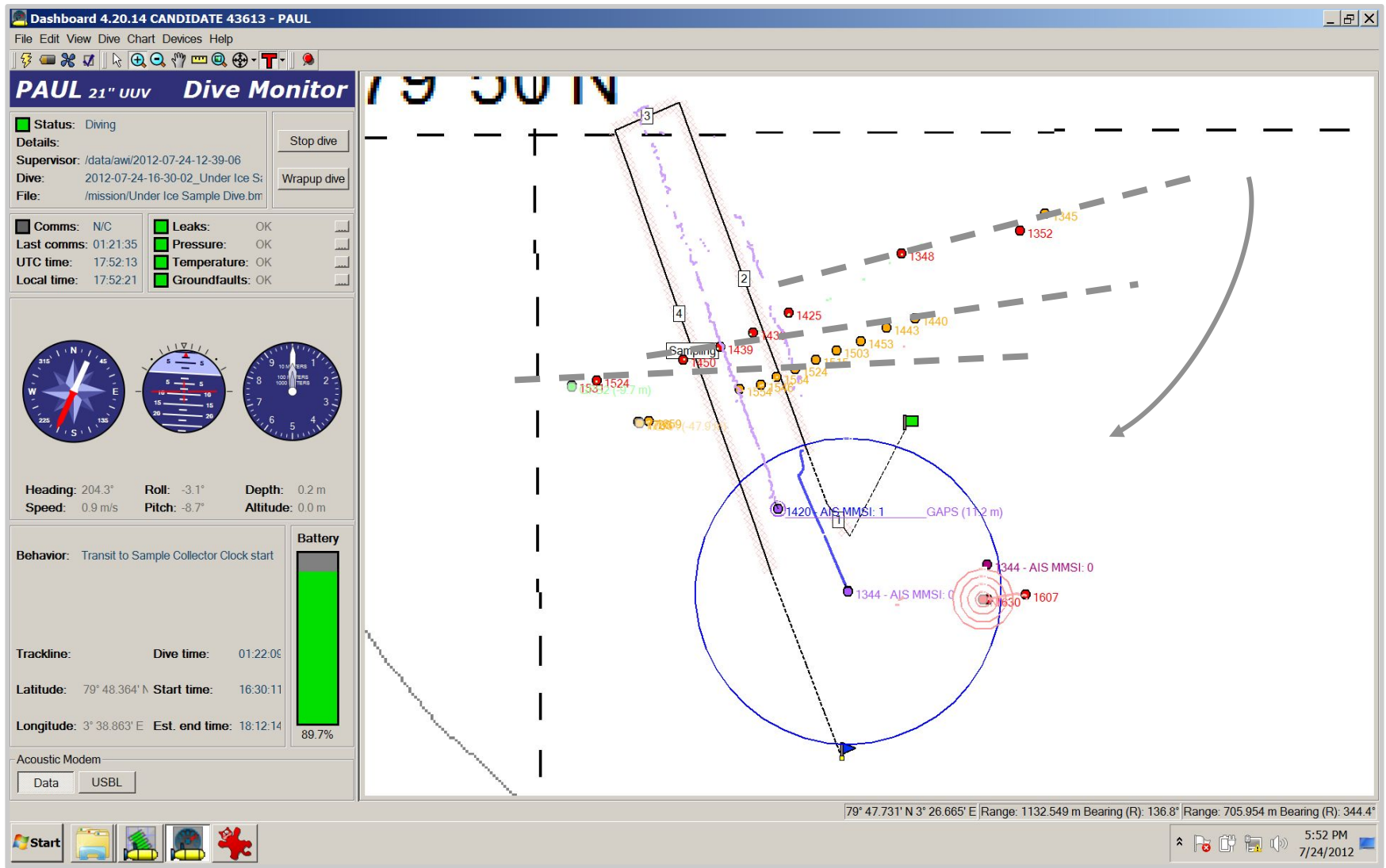




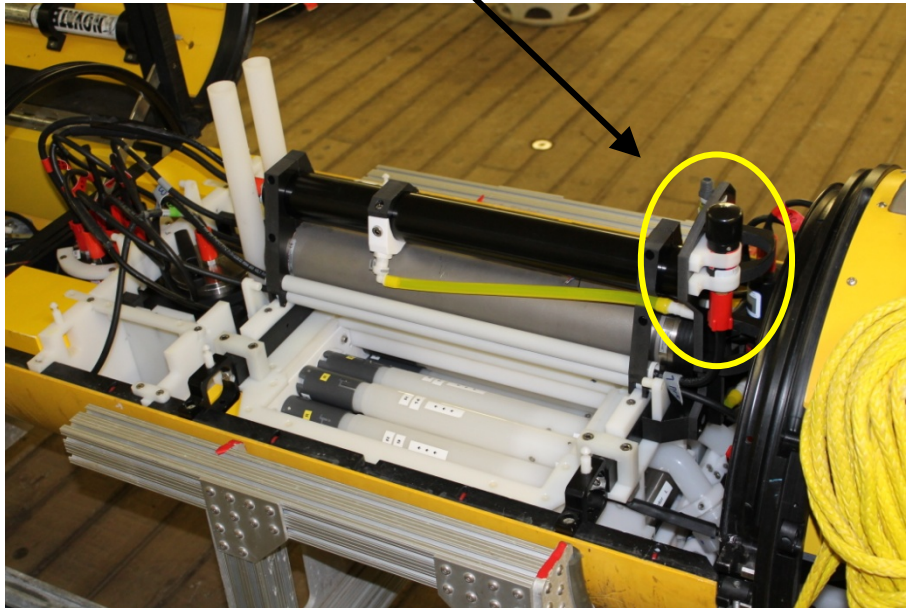








## Light (PAR) measurements...



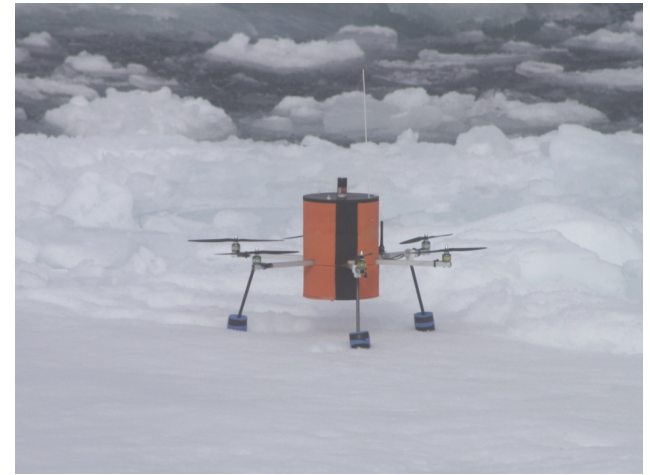


# Tracking the ice 2011 to 2017



2011

2012



2015

2017

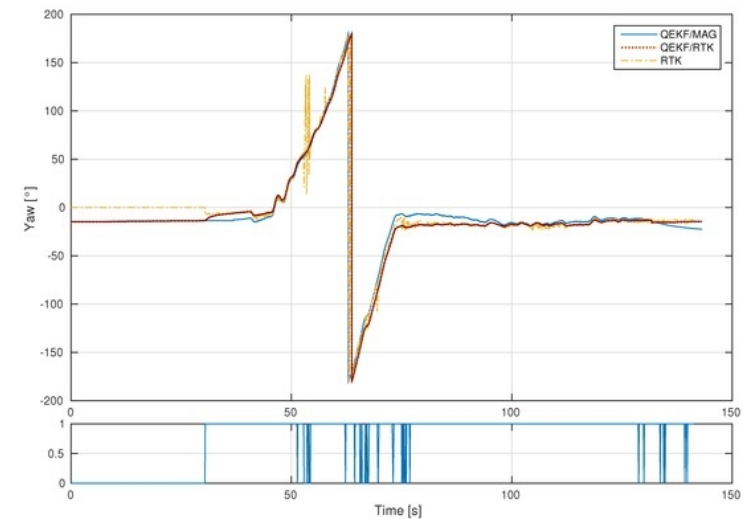
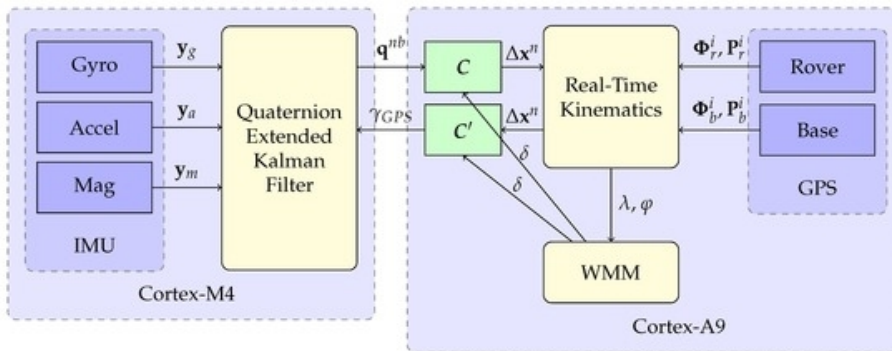






# GPS-IMU Coupling

- In flight evaluation of coupled GPS-IMU attitude determination

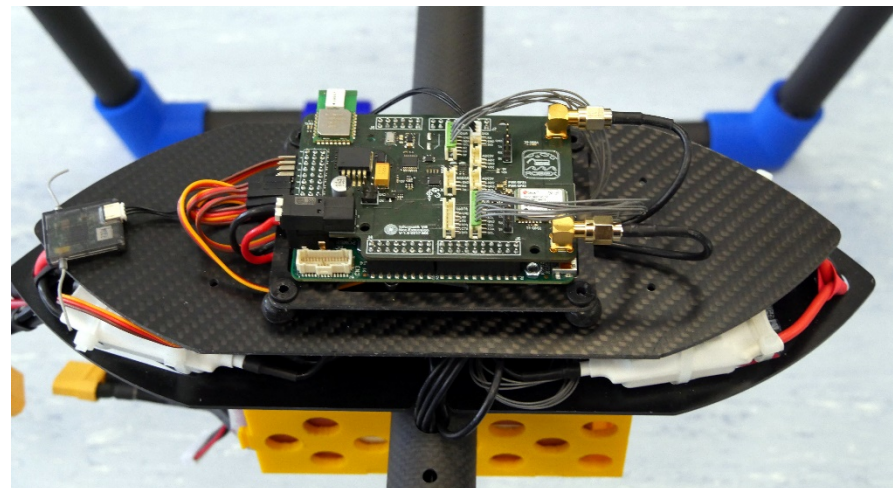
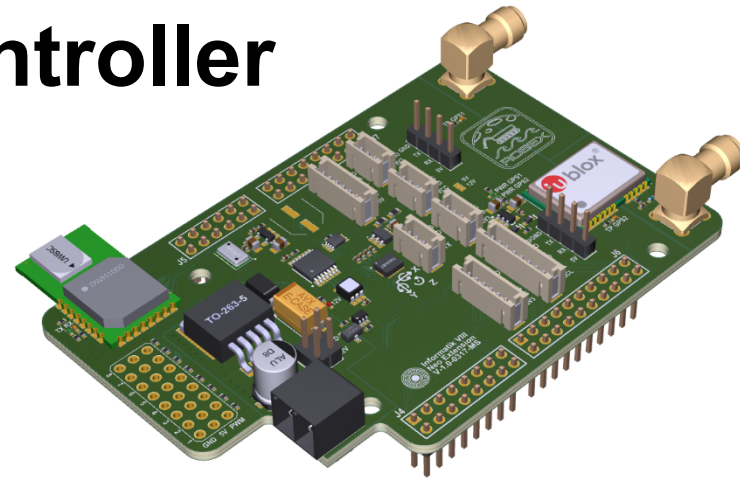


- Strohmeier, M.; Montenegro, S.: Coupled GPS/MEMS IMU Attitude Determination of Small UAVs with COTS. *Electronics* **2017**, 6, 15.

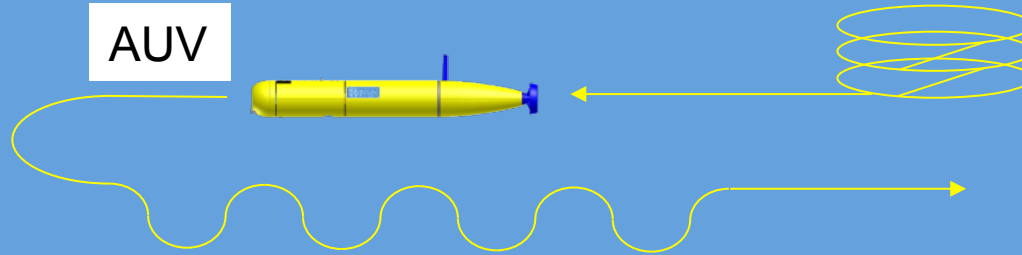


# Integrated Flight Controller

- IMU
- Two L1 GPS Receivers
- DC/DC Converter
- Barometer
- Ultra-Wideband Modul
- Power Monitor
- Payload Interfaces





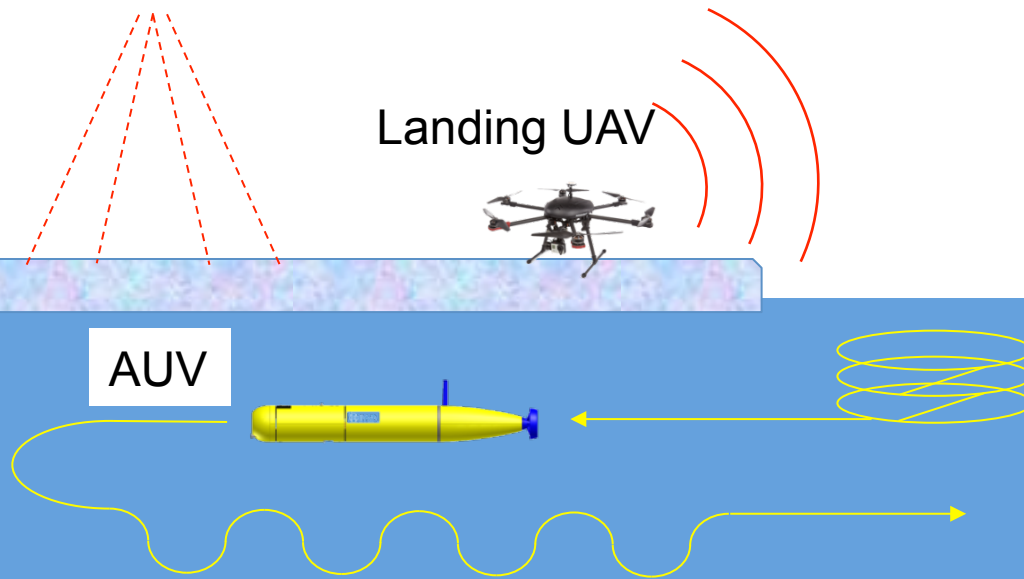


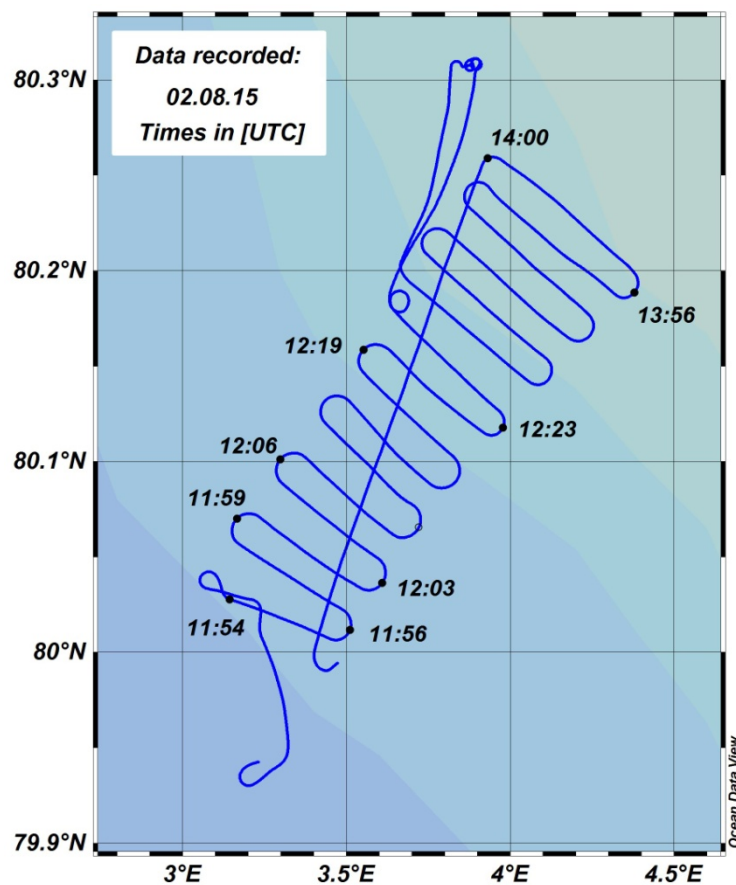


Landing UAV

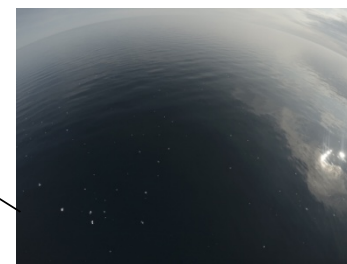
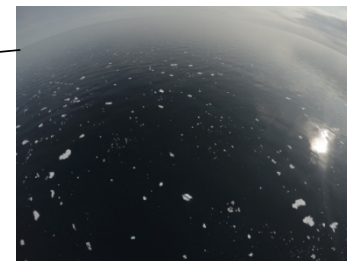
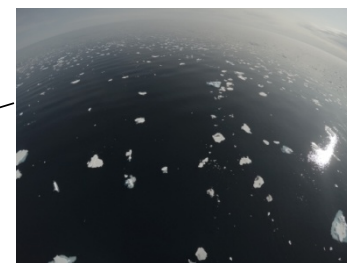
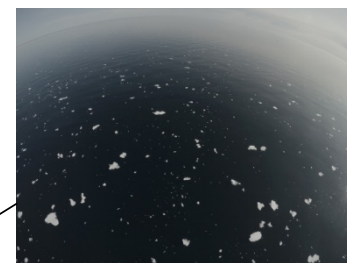
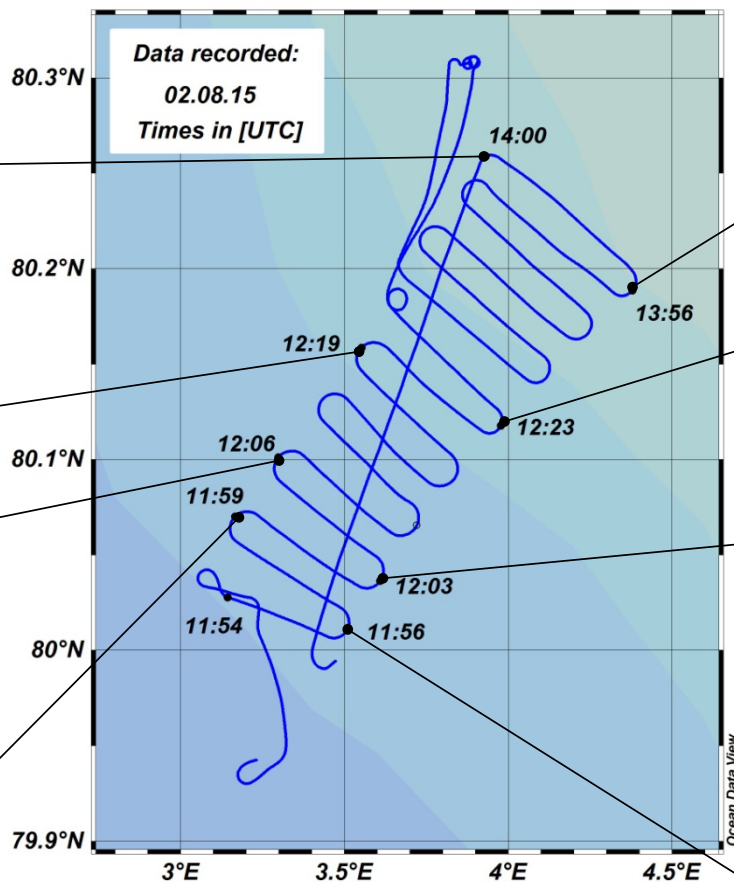
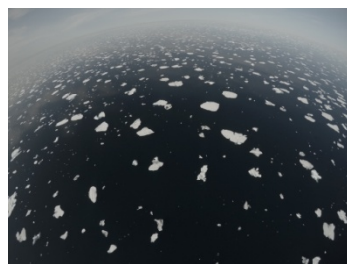
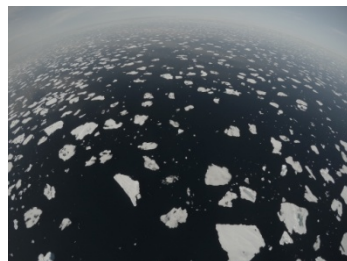
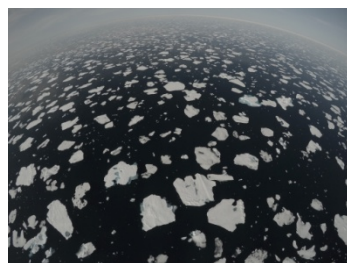
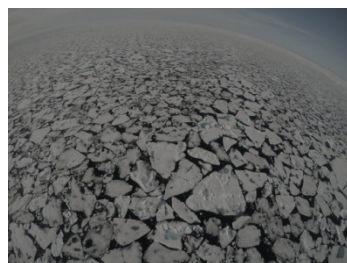


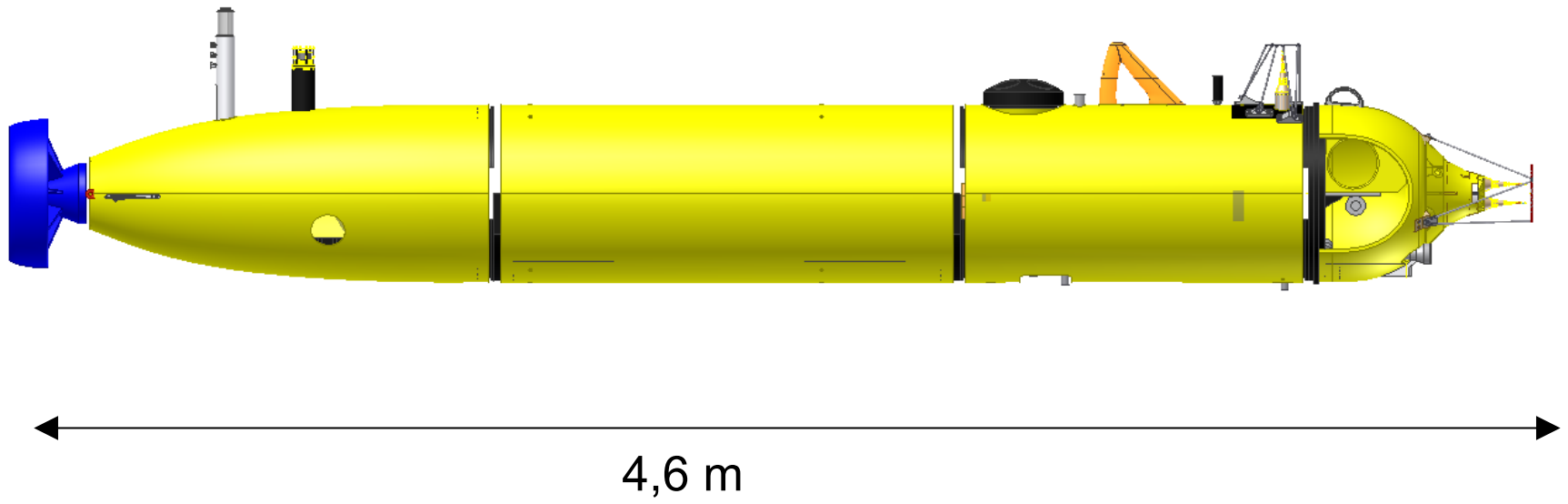
AUV

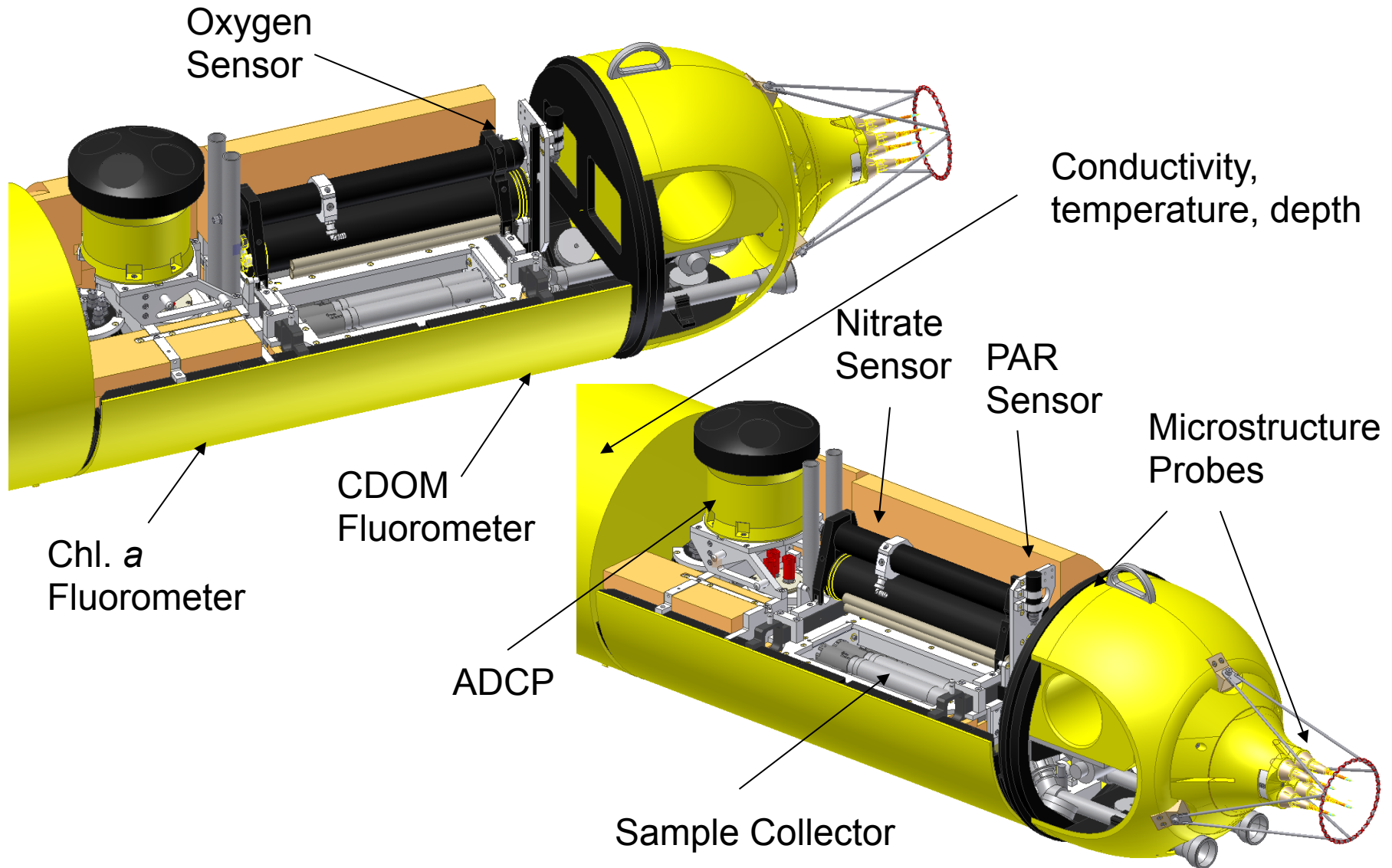




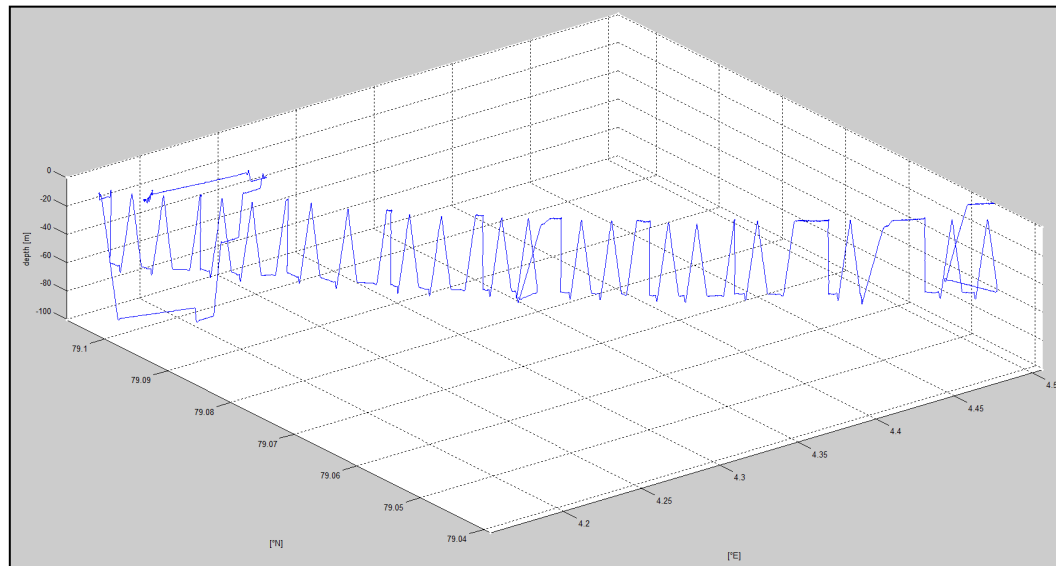
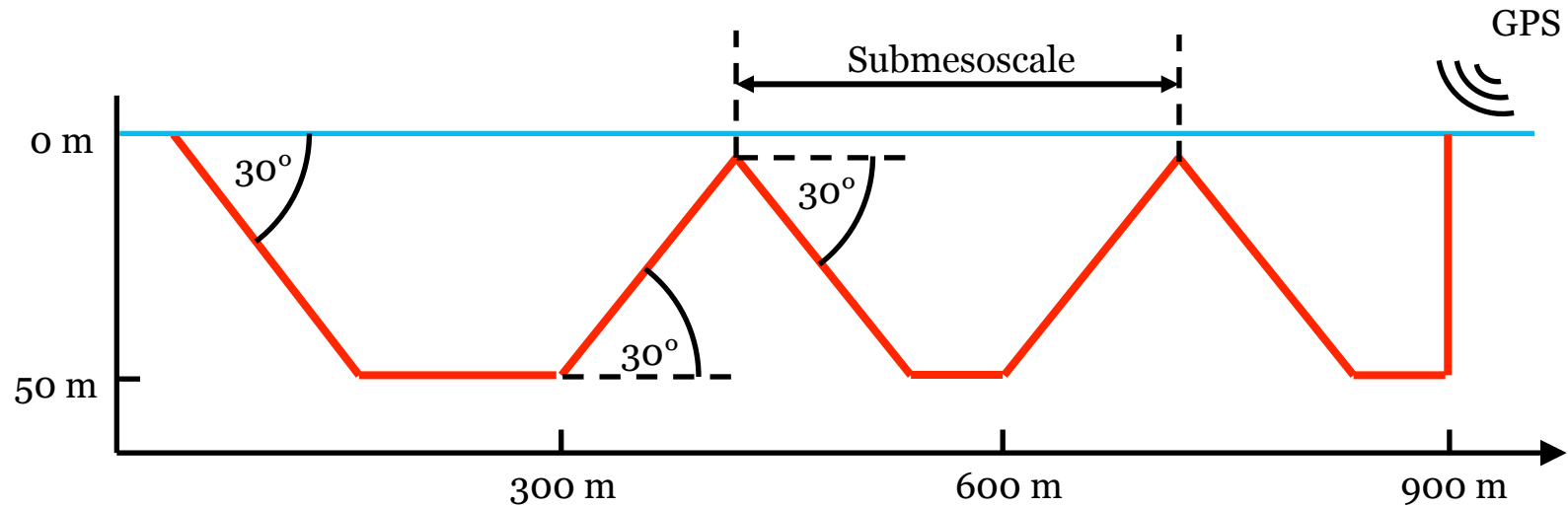








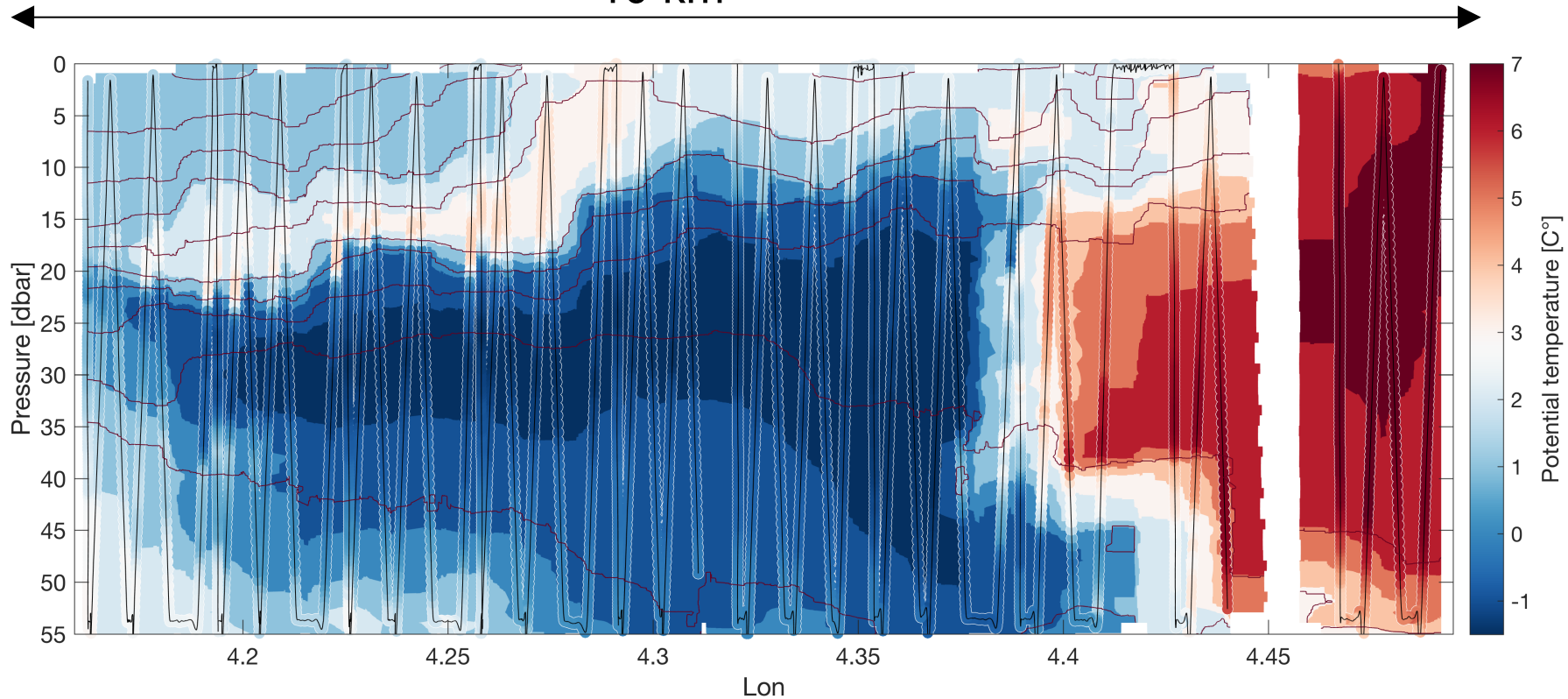


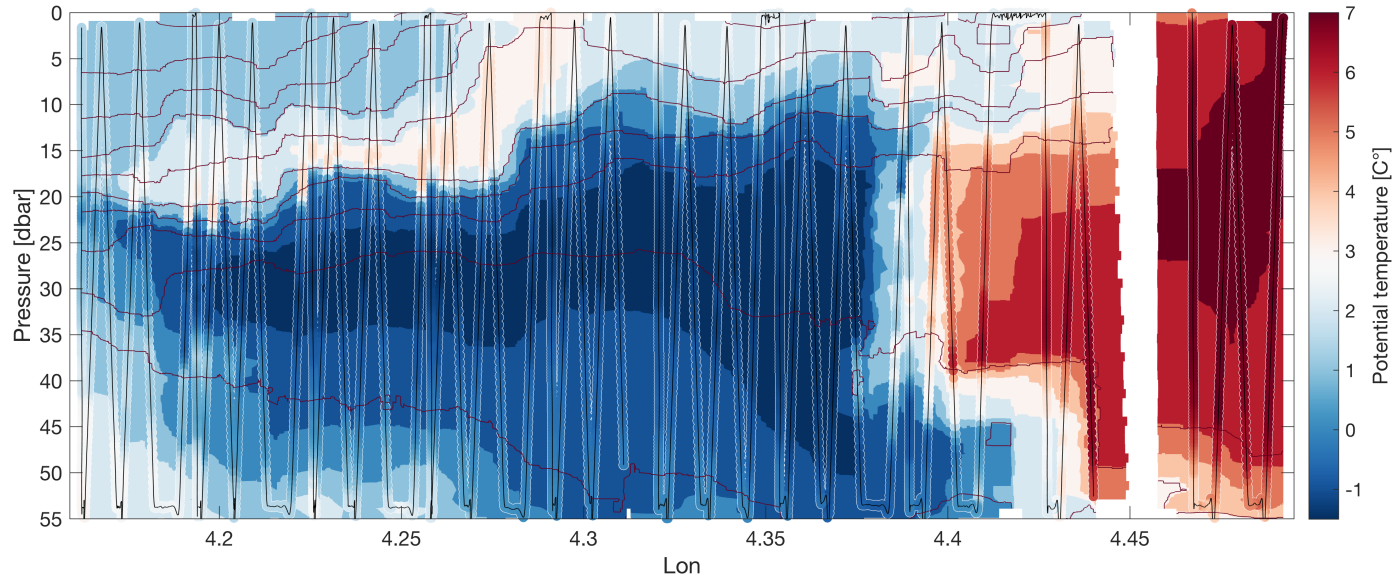


# Fram Strait

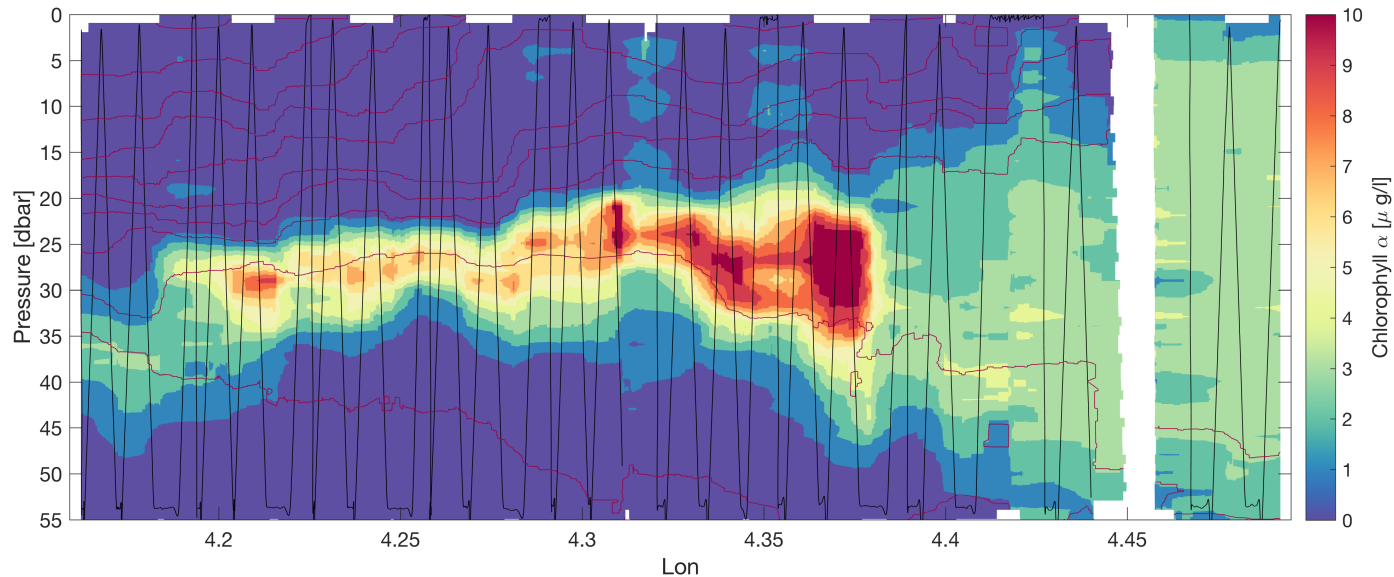
## Temperature

~ 10 km



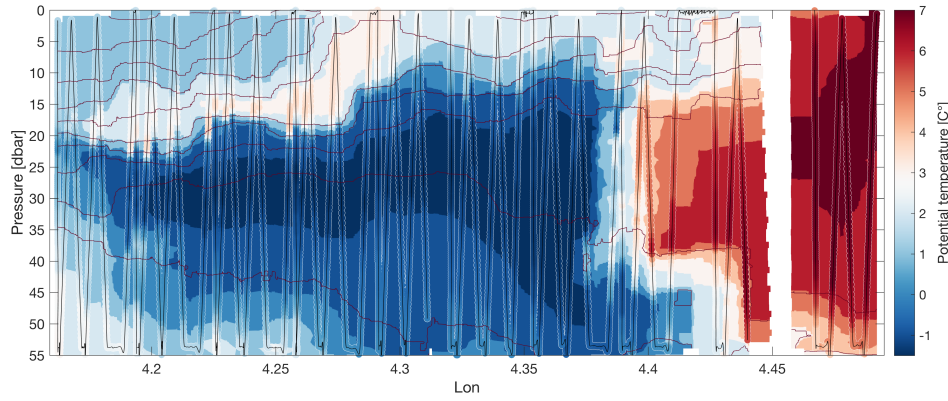


Temperature

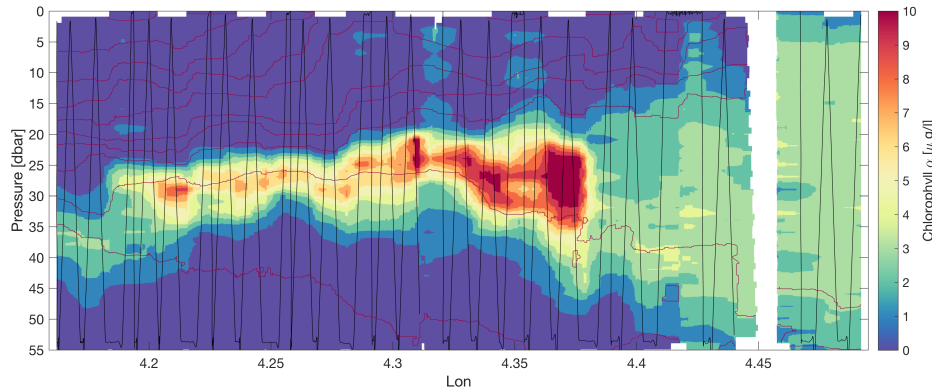


Chlorophyll  $a$  as  
a proxy for  
phytoplankton





Temperature



Chlorophyll a as  
a proxy for  
phytoplankton

Poster X4.23 today 17:30-19

## AUV based study on physical and ecological processes at fronts

Sandra Tippenhauer, Thorben Wulff, and Wilken-John von Appen



# Summary and Outlook

- Concept for autonomous flight operations in high latitudes
- Different platforms to capture dynamic processes
- (Integrated) sensor network

# Summary and Outlook

- Concept for autonomous flight operations in high latitudes
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Thank you





