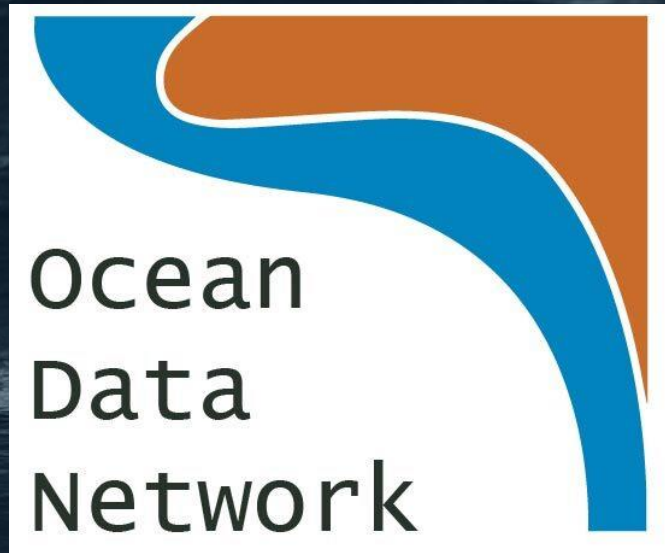


OS Eval TT Meeting



&



Twin startups dedicated to enabling and advancing collaborative ocean observation with the fishing industry

www.berringdatacollective.com (Denmark)

www.oceandata.net (USA)

cooper@berringdatacollective.com

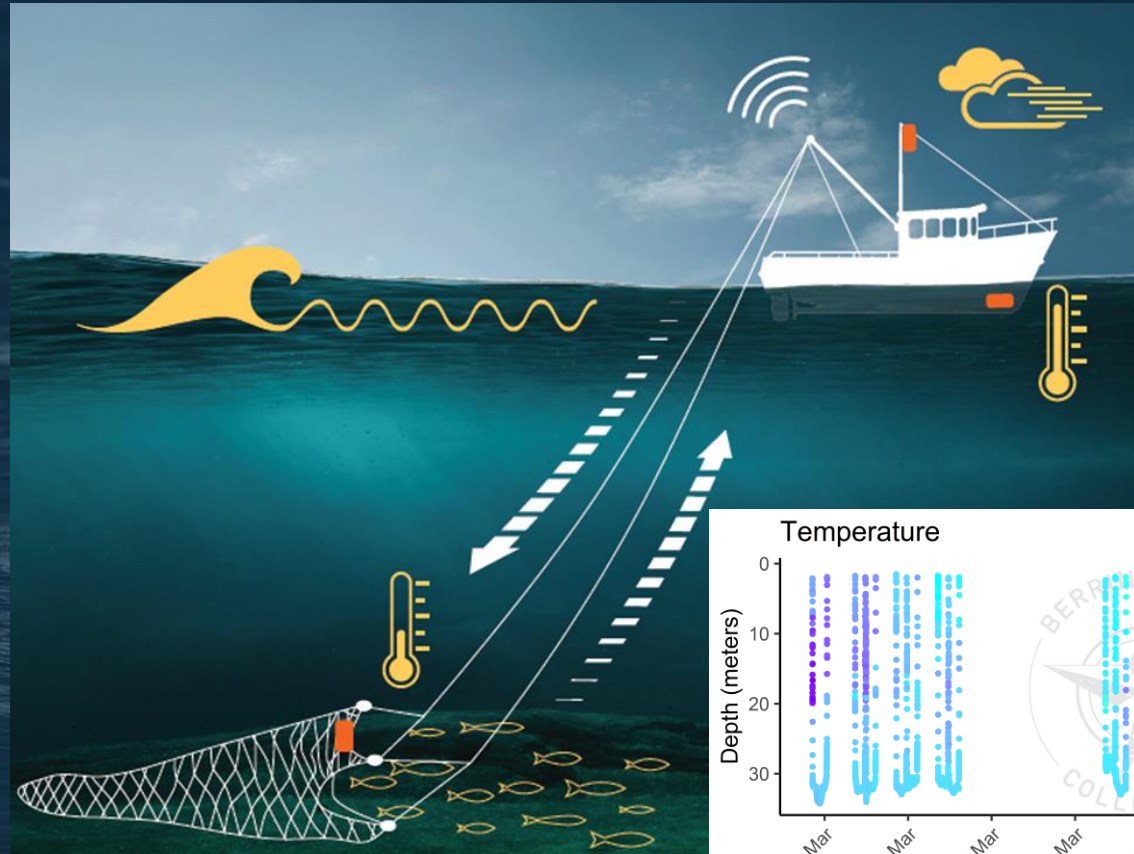


Fishing for Data

Fishing gears provide a ride down and back up during normal fishing operations. IoT sensors measure water column profiles.

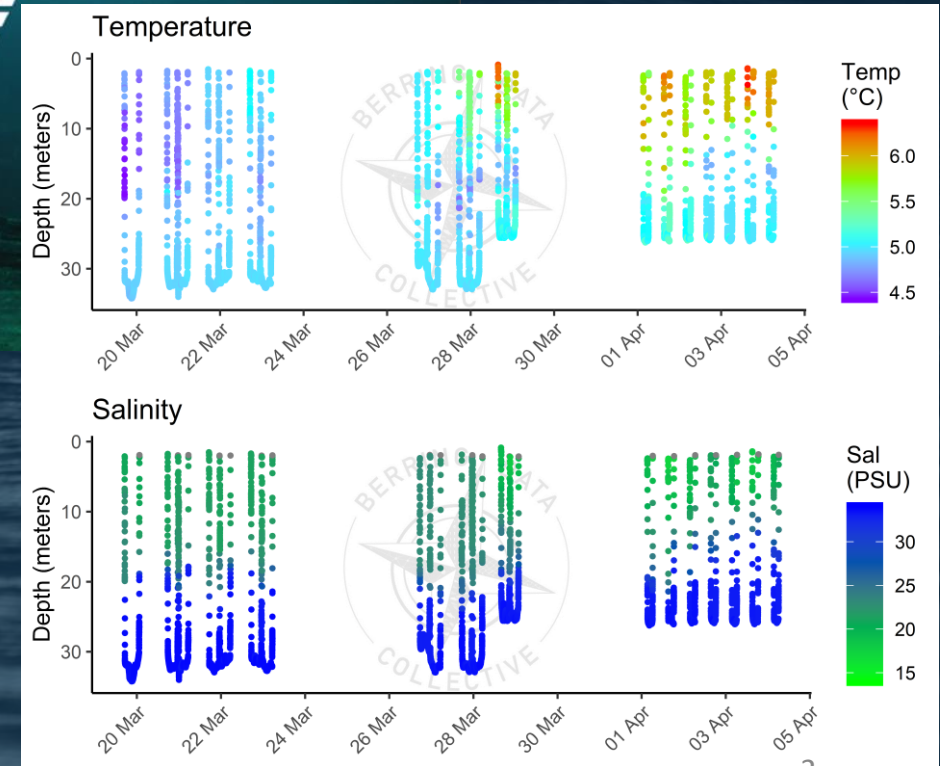
As the net surfaces, data is transmitted in real time to our database and then onto data users.

Subsurface is the unique data collection capability of F/Vs when compared to other Ships Of Opportunity (SOOP); however, lots of other opportunities for co-located EOVs and ECVs.

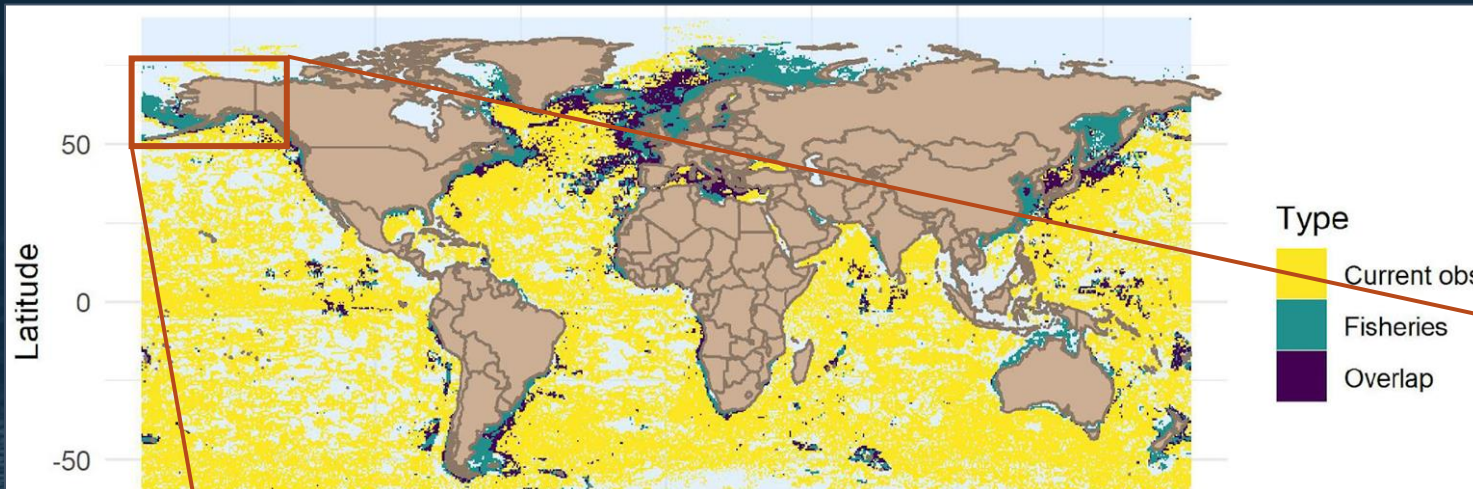


EOVs and ECVs:

- CTD profiles (Temp Salinity)
- Air temperature
- Humidity & dewpoint
- Atmospheric Pressure
- Wind Velocity
- Current profiles (ADCP)
- Sea Surface Temp
- Dissolved Oxygen
- Bottom Turbidity
- ...

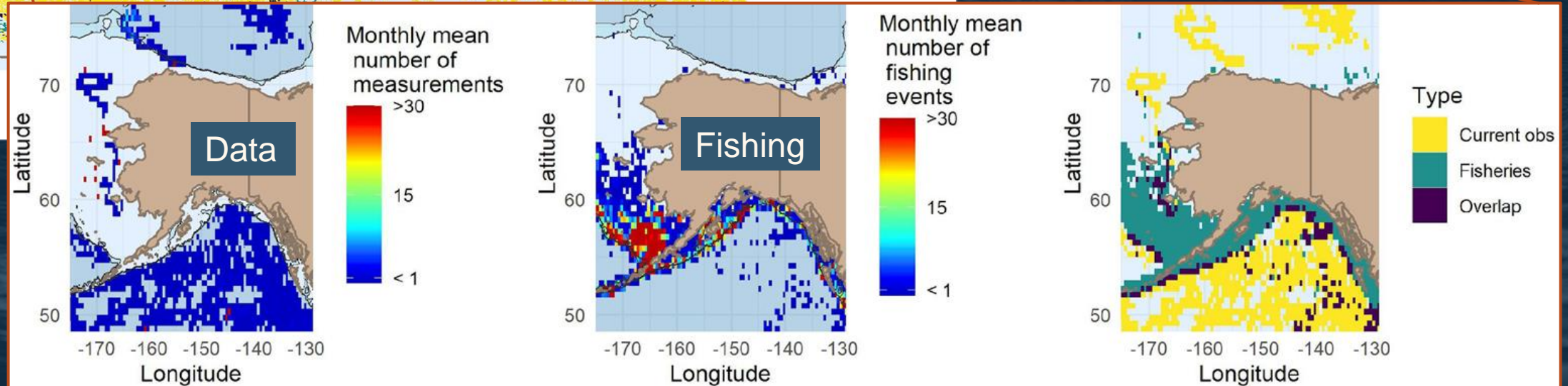


Why does this matter?



Fishing lines up precisely with coastal and shelf-sea gaps in sub-surface data coverage.

Relative gaps created by tremendous success of Argo.



Van Vranken, C. H., Vastenhou, B. M. J., Manning, J. P., Plet-Hansen, K. S., Jakoboski, J., Gorringer, P., & Martinelli, M. (2020). Fishing gear as a data collection platform: Opportunities to fill spatial and temporal gaps in operational sub-surface observation networks. *Frontiers in Marine Science*, 7, 864.

Diversity of Sensors and Vessels



Zebra Tech Moana
Profiling Temperature
& Depth sensor with
protective housing

There is an incredible diversity in the millions of fishing vessels at sea every day. We can instrument the majority of vessels from subsistence fishers to factory trawlers.

Many larger vessels already have high quality sensors that produce valuable data. (Equivalent to SST and surface-met instrumentation that feeds into GTS via SOOP/VOS program from cargo ships)



Inuit longline fishing
NKE (CTD and TD)
Uummannaq
Greenland



70m pelagic
trawler,
Existing onboard
Instrumentation
North Sea

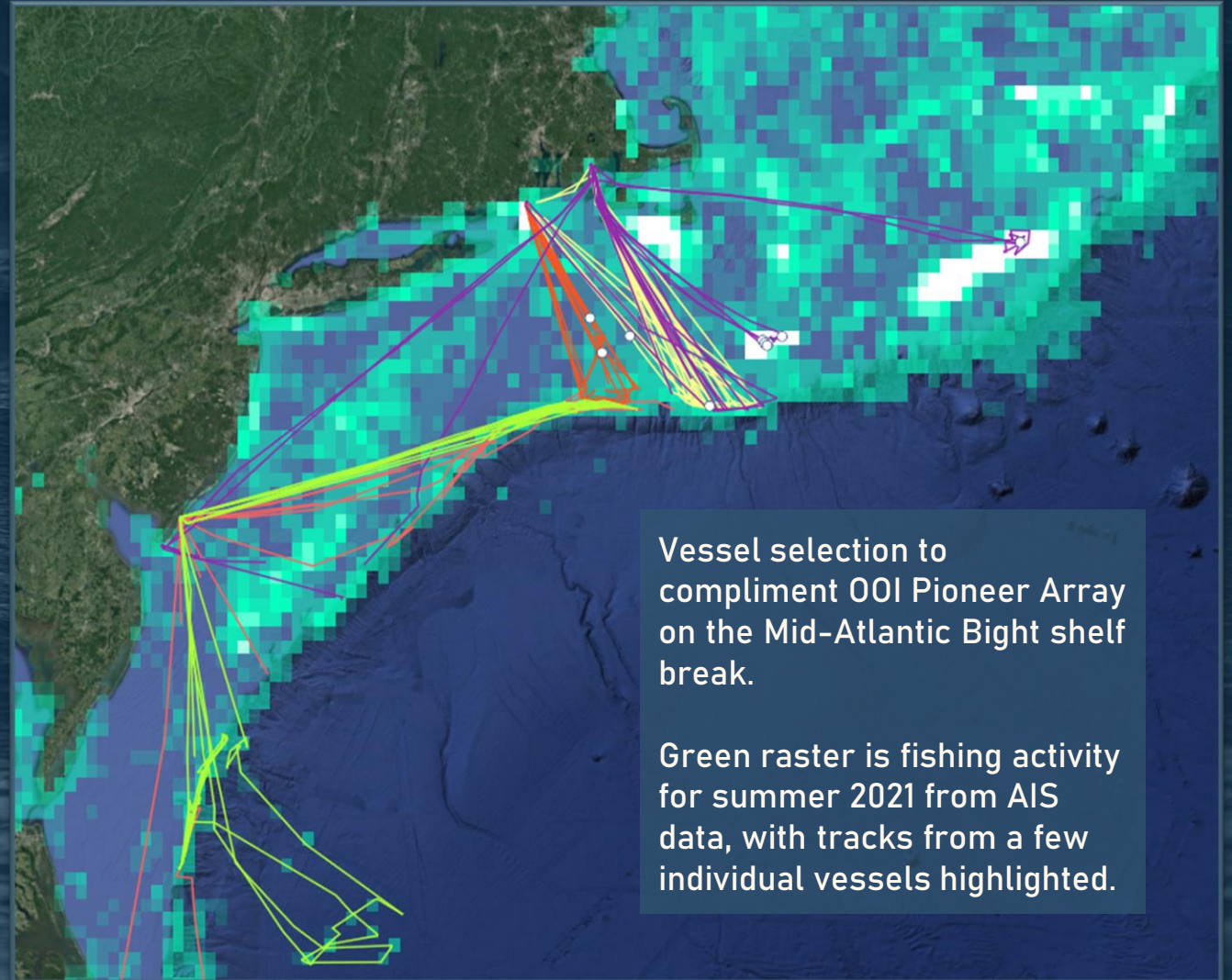
Targeted deployments

We find fisheries to meet the spatial and temporal requirements of data users and then supply the sensors and deck systems that are right for those vessels and data quality specifications.

Targeted deployments to compliment existing networks and established technologies.

Feed directly into OSSE simulation type analyses?

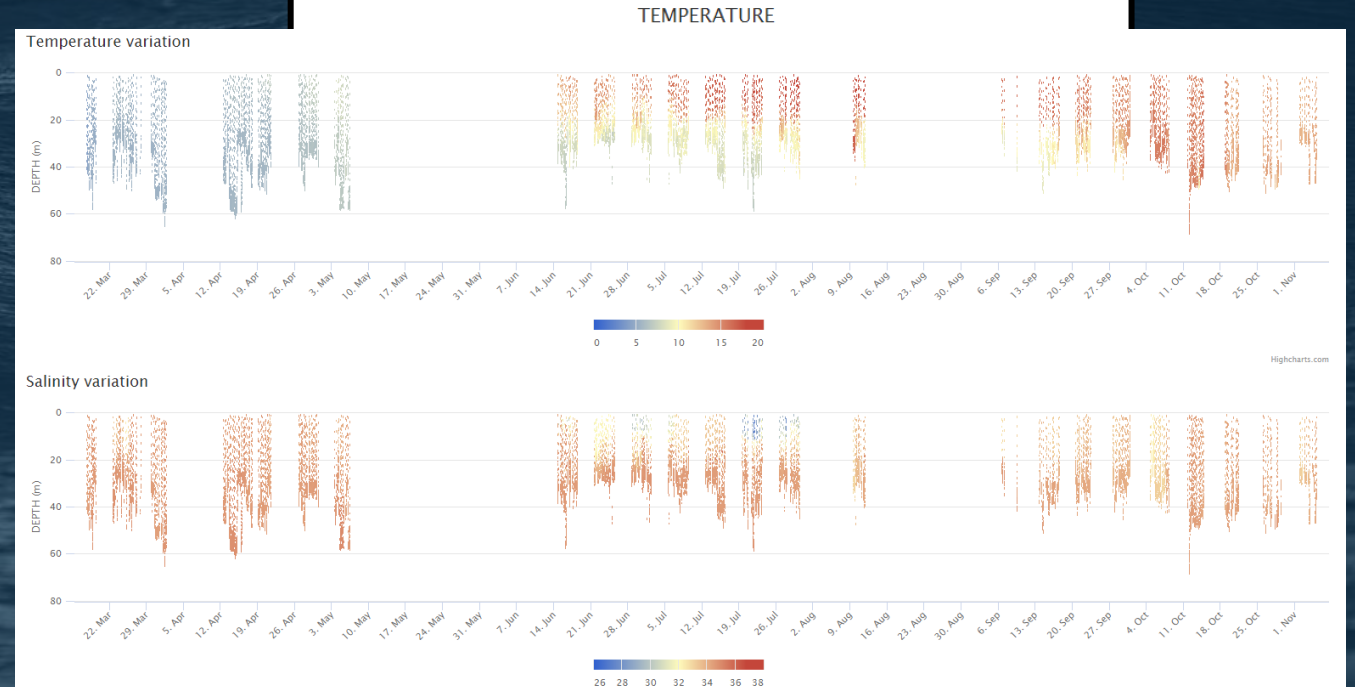
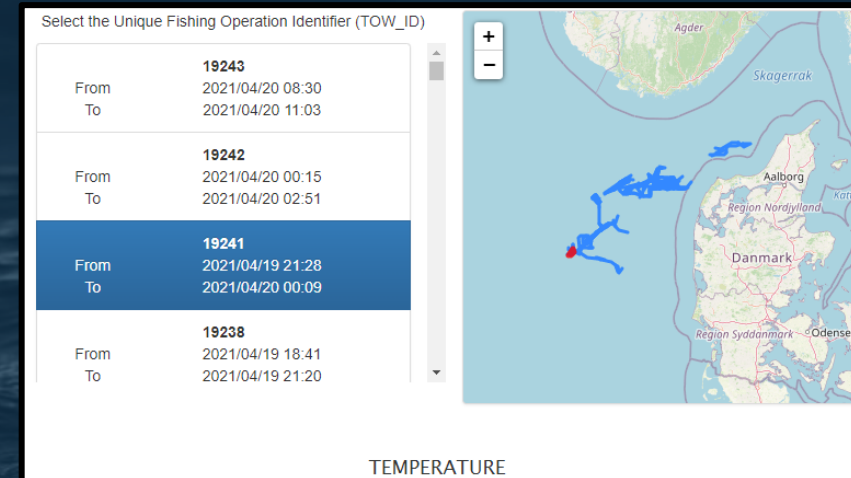
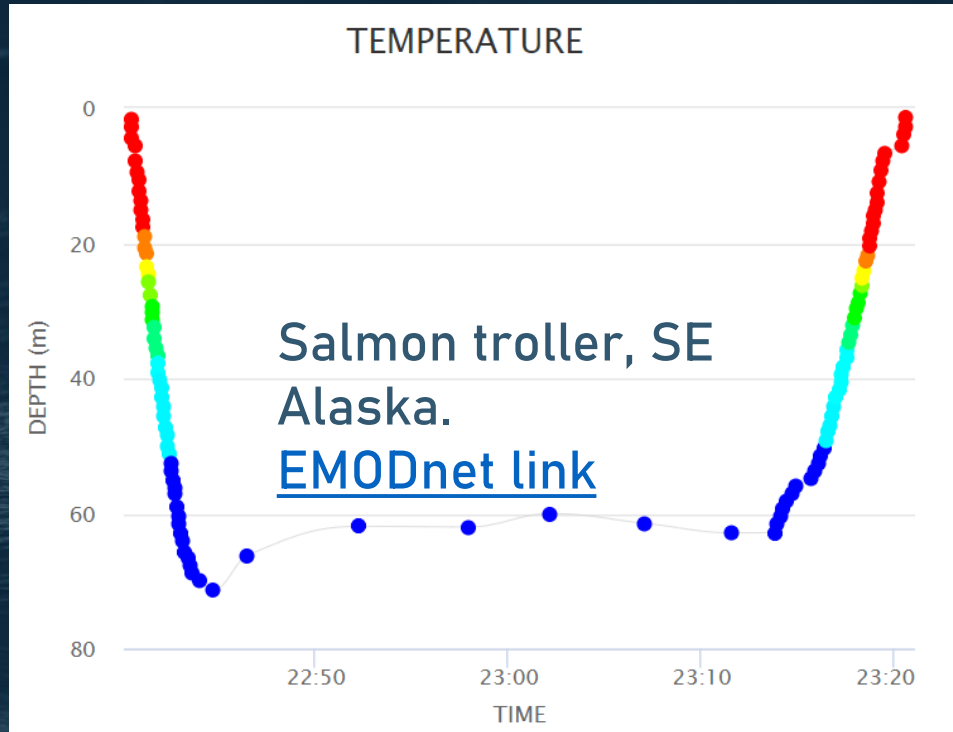
Also examples of structured sampling paying fishers to do CTD casts in specific areas: ([Gawarkiewicz & Mercer, 2019](#))



Vessel selection to compliment OOI Pioneer Array on the Mid-Atlantic Bight shelf break.

Green raster is fishing activity for summer 2021 from AIS data, with tracks from a few individual vessels highlighted.

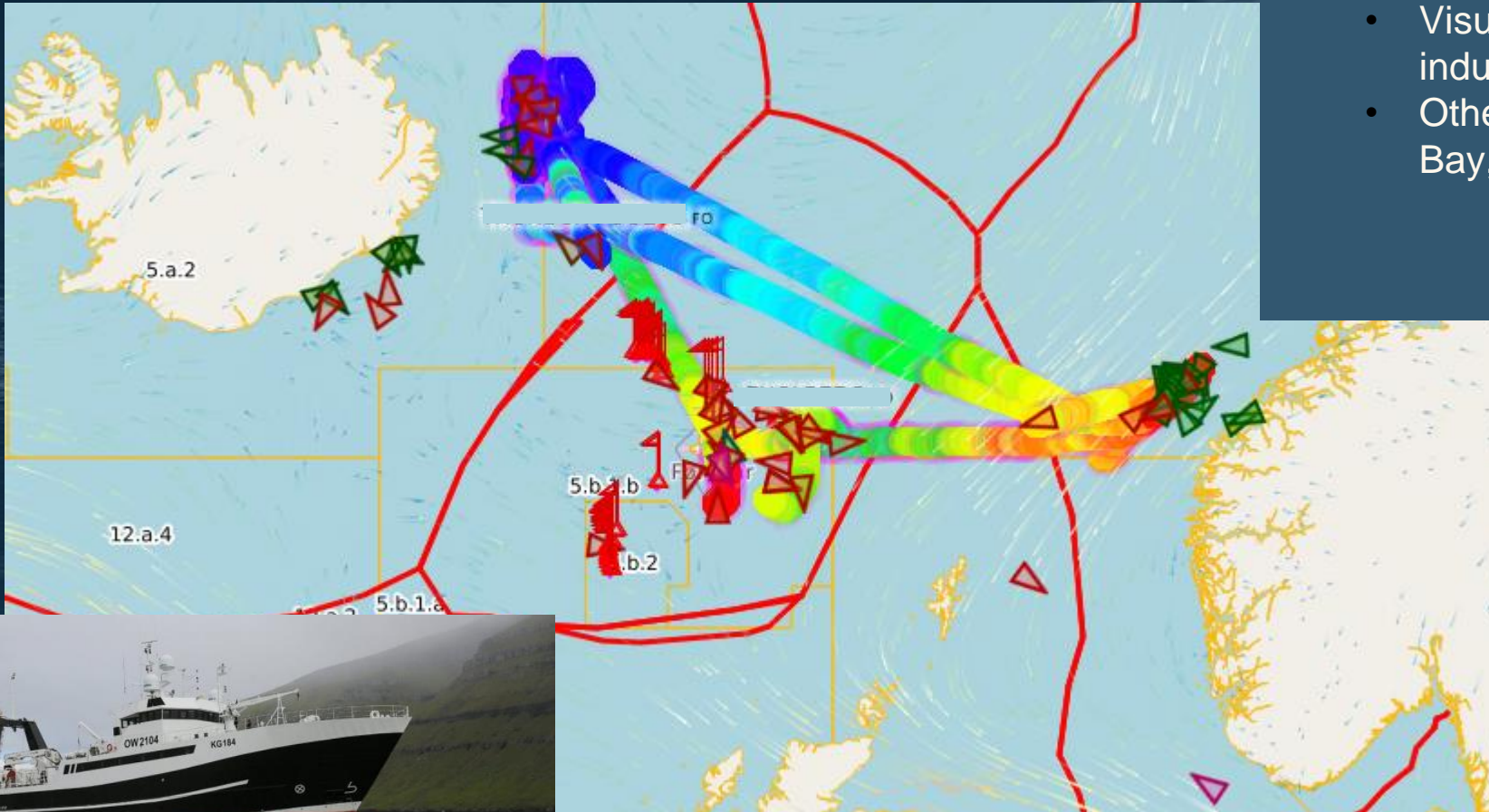
Data examples



Existing network example

Fleet of 15 large Faroese vessels:

- SST, subsurface, and surface met
- Visualization and data sharing by industry
- Other networks in Benguela, Baffin Bay, North Sea, and others



Existing network example: ADCP



Same Faroe Islands fleet as previous slide: Comparison to local current model. Data processing and management not yet mature

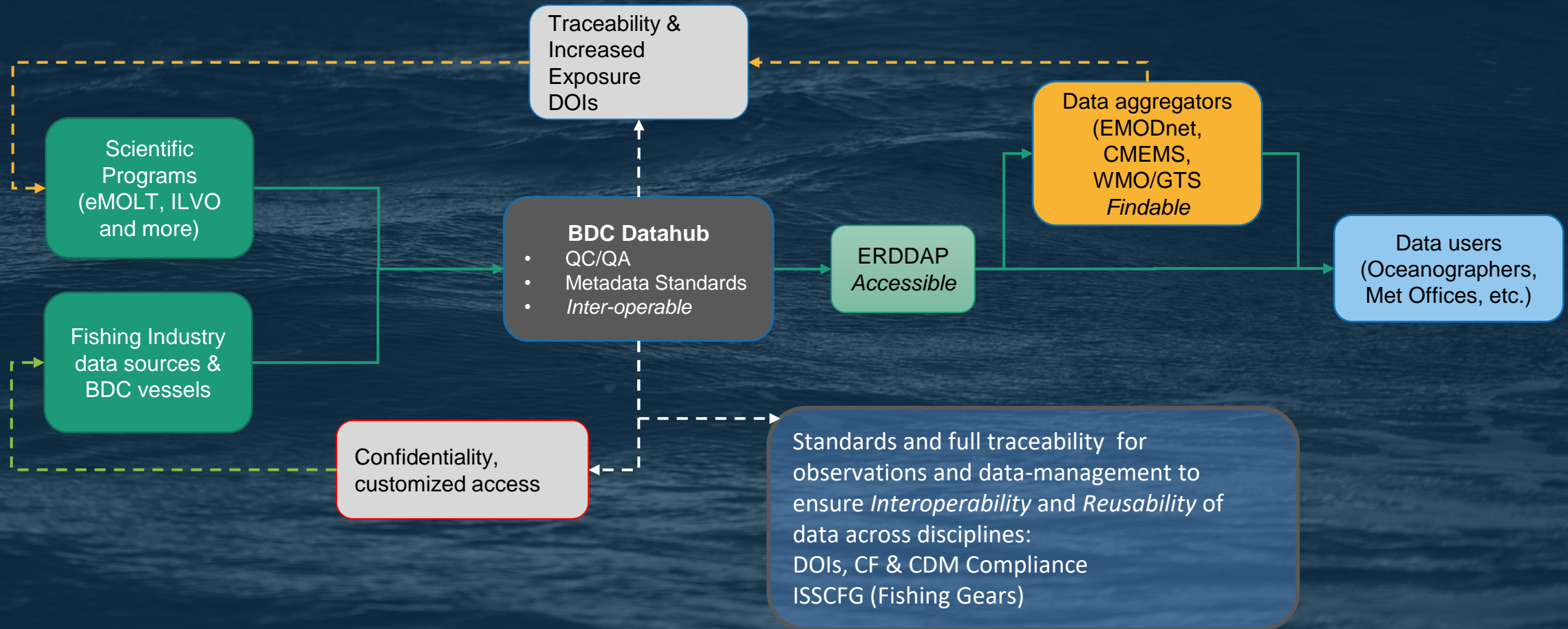


<Good model match
Poor model match>

Many medium and large vessels already have ADCPS: Tremendous potential

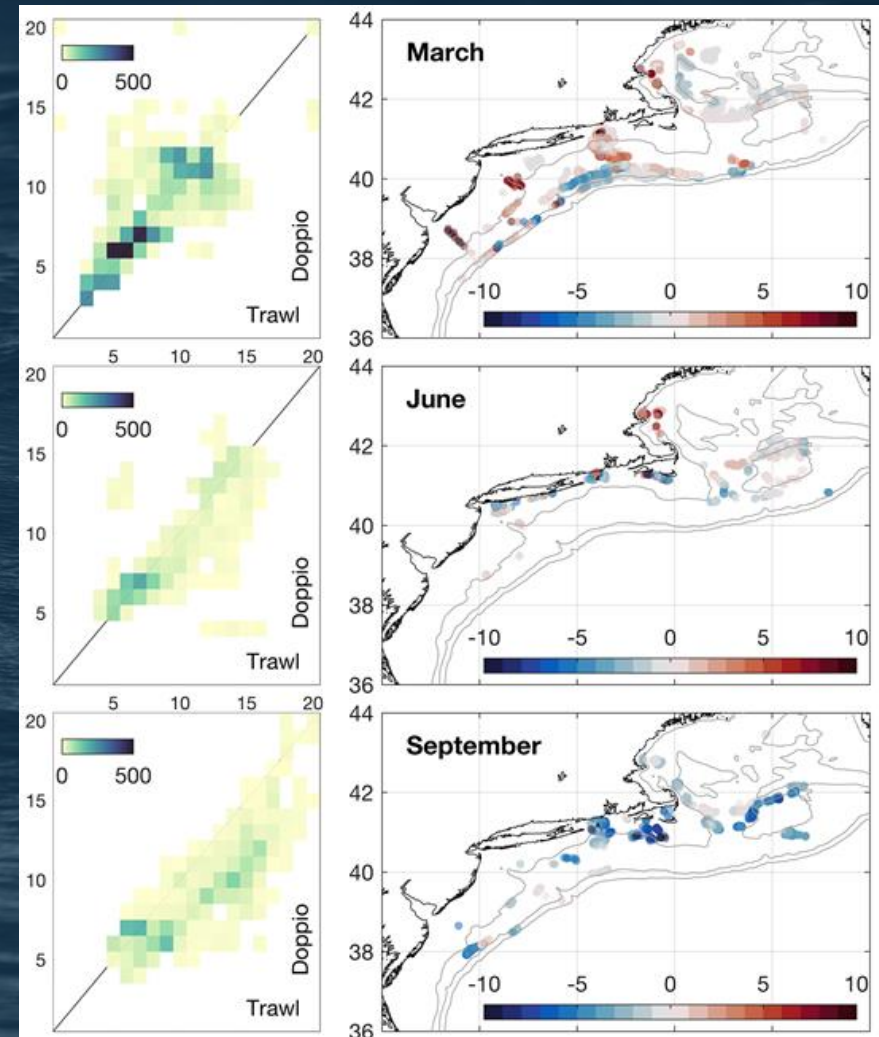
FAIR data flow:

Balancing the needs of both science and industry.
Translating the diversity of fishing activities into
standardized and interoperable data streams.



Data use examples

- New operational models in New Zealand with Moana project, building towards 300 vessels fishing for temperature profiles.
- Kyushu University (Japan) special model for fishing that assimilates CTD and ADCP data from fishermen
- USA eMOLT Operational assimilated into Doppio ROM.
- Fisheries Science: eMOLT temperatures are used in lobster stock assessment to correct for changes in catchability. (Burton Shank)
- *“OSEs were conducted to evaluate real observations and they show that the FOS network improves the analysis significantly, especially during the stratification season. RMS of temperature errors are reduced by about 44% and 36% in the upper and lower layers respectively.”-Aydoğdu et al., 2016*



Finer scale patterns

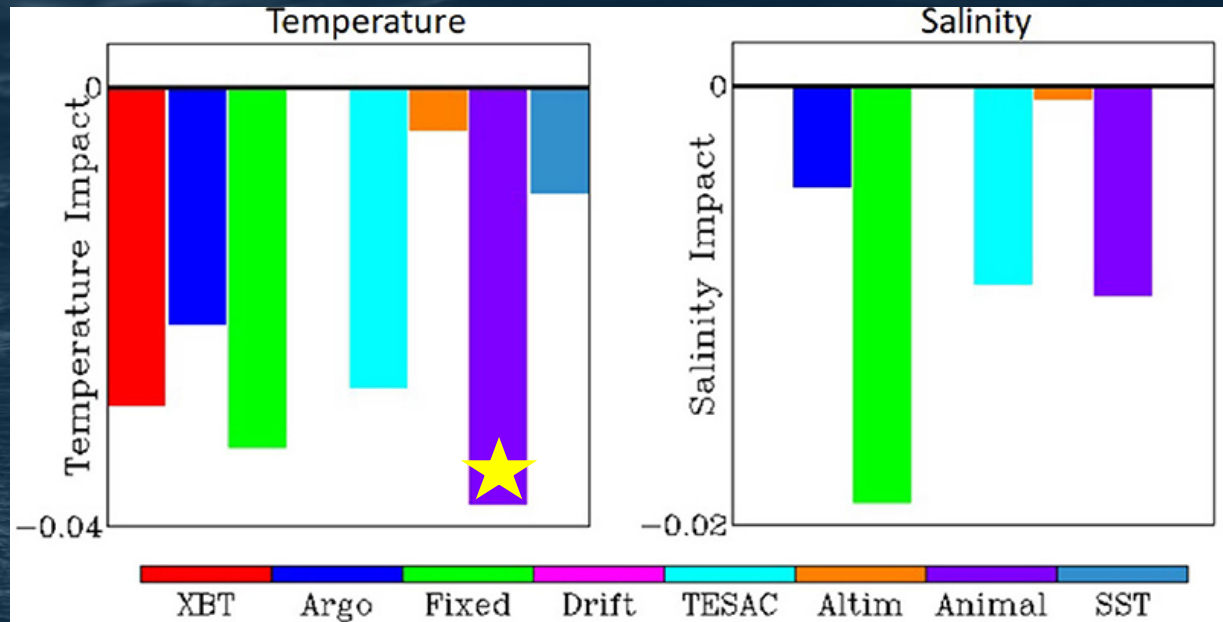
Frontal mixing zones, shelf-breaks, upwelling, river plumes and other dynamic ocean features form the basis for the most productive ecosystems.

These productive ecosystems are the best fishing grounds, but also among the most difficult to accurately model.

Drifting platforms get swept away from these dynamic regions. Does this mean that fishing would have an outside impact on model performance?

Same productive ecosystems drive distribution of AniBOS measurements > Figure

Anecdotally, we frequently observe sharp changes in our data. Whether fishing and AniBOS pulls data collection to regions of highest impact is a question I'm interested in pursuing further...

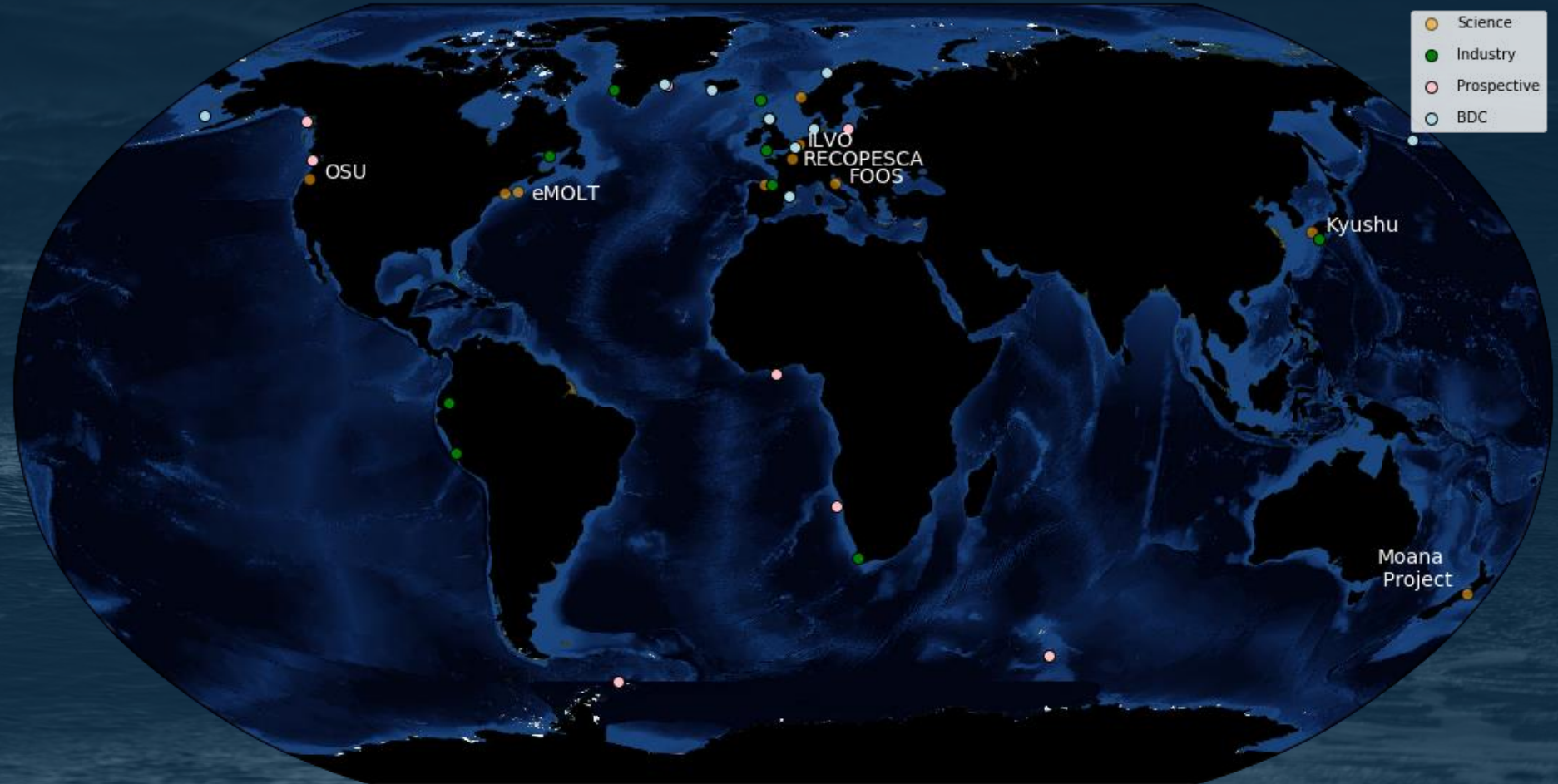


FSOI for different observing system components on a per-observation basis in the Atlantic Basin. Animal observations have the largest decrease in Temperature error. Animal salinity measurements are not reliable.

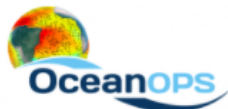
Fujii et al., (2019). Observing System Evaluation Based on Ocean Data Assimilation and Prediction Systems: On-Going Challenges and a Future Vision for Designing and Supporting Ocean Observational Networks. <https://doi.org/10.3389/fmars.2019.00417>

Moving forwards

- Expanding the emerging global community
- Increasing to more EOVs & ECVs
- Series of workshops as part of next EMODnet Phase
- Targeted deployments to fill data gaps
- UN Decade Project?



Partners



Summary

- Co-located and cost-effective subsurface-surface-meteorological data streams.
- Gravitates towards shelf-breaks, frontal mixing zones, ice edges; complementarity with free floating and autonomous platforms.
- Operational data flows and modeling usage for sub-surface components.
- Both low hanging fruit in existing networks and targeted future deployments.

Future directions

- We want F/V data included in future OS-Eval and SynObs work.
- Explore the potential added value of co-located data streams with OS-Eval, with a view towards future coupled ocean-atmosphere models.
- Collaboration if we do a UN Decade Project.
- Evaluate if F/V data is the right solution for future Observation Network Designs.

Thank you!