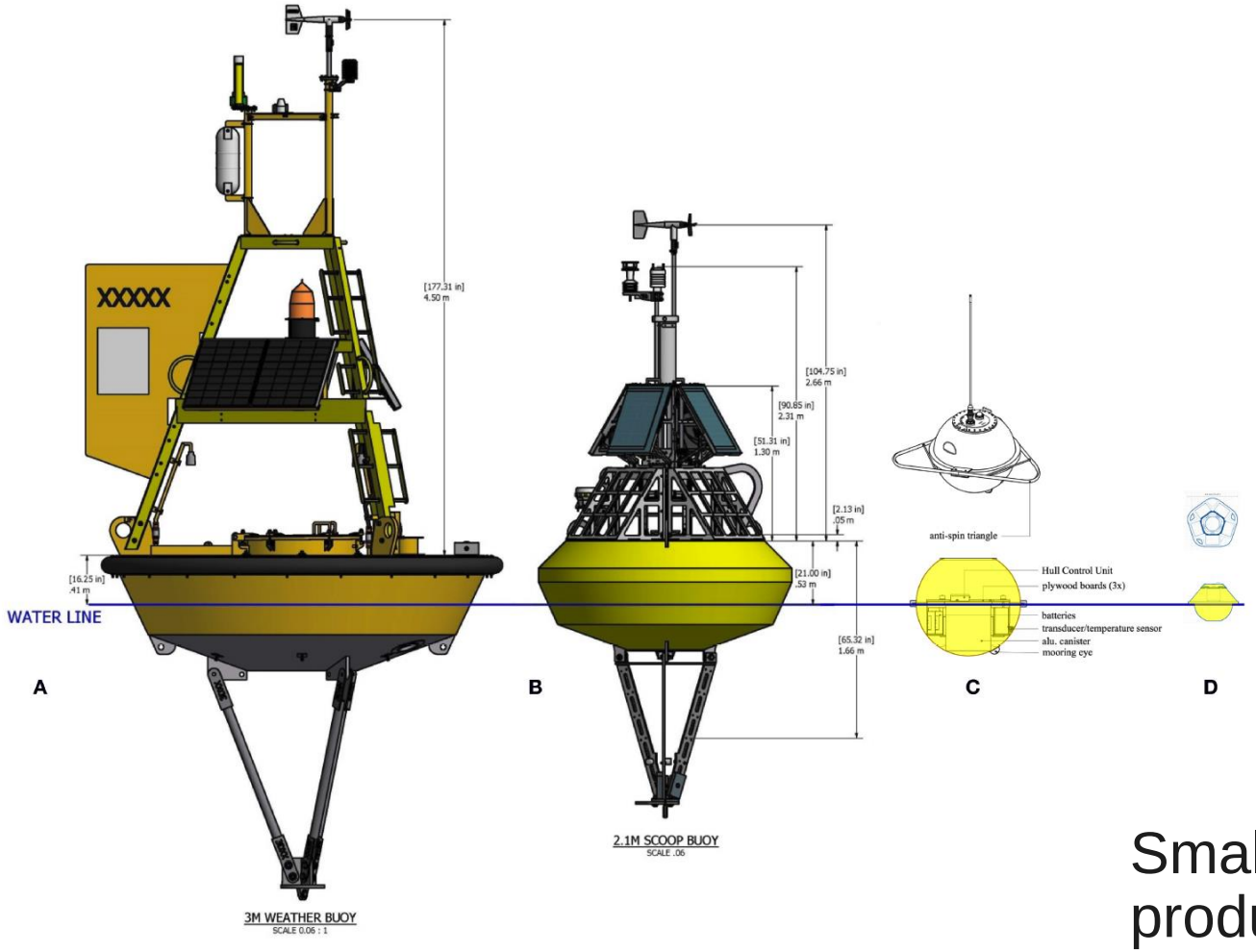
Innovations in low-cost metocean buoys for aerial deployments

P.B. Smit and T.T. Janssen (and many others)

Ocean instruments are often highly capable, but complex, large, and consequently costly to operate.

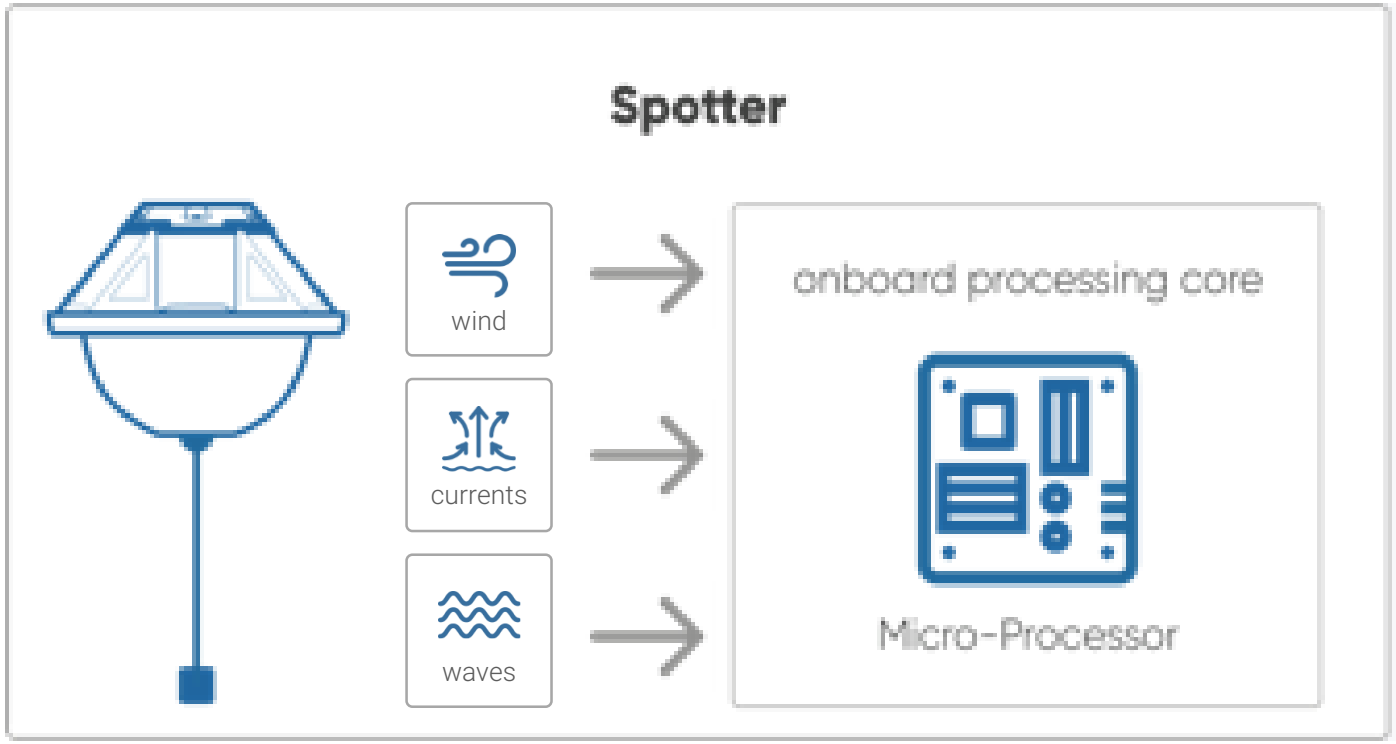


Small, easy to deploy, mass producible and low cost instruments allow for rapid and large scale deployment

Observing Sea States
Ardhuin et al., 2019

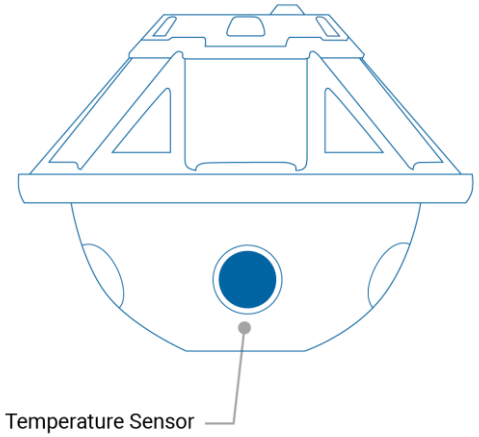
Spotter

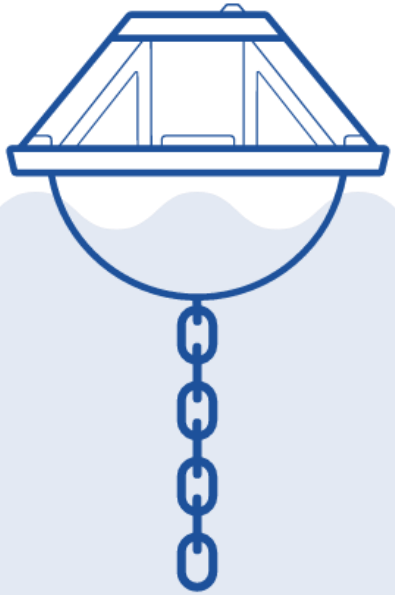
a two-way connected, compact weather buoy. Designed for usability and agility.



Focus on expanding capabilities…

Wind estimate, SST observations external interface…

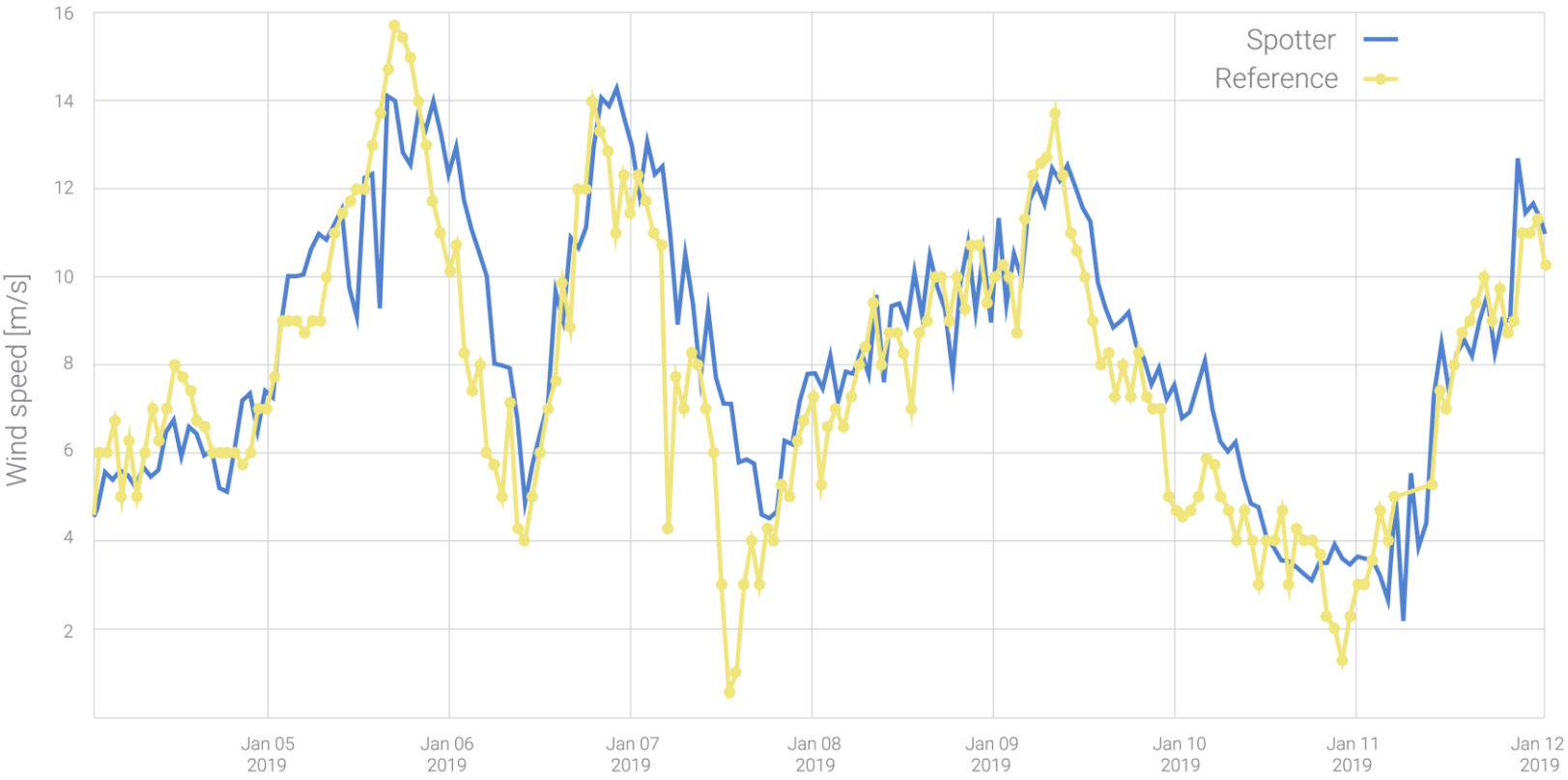


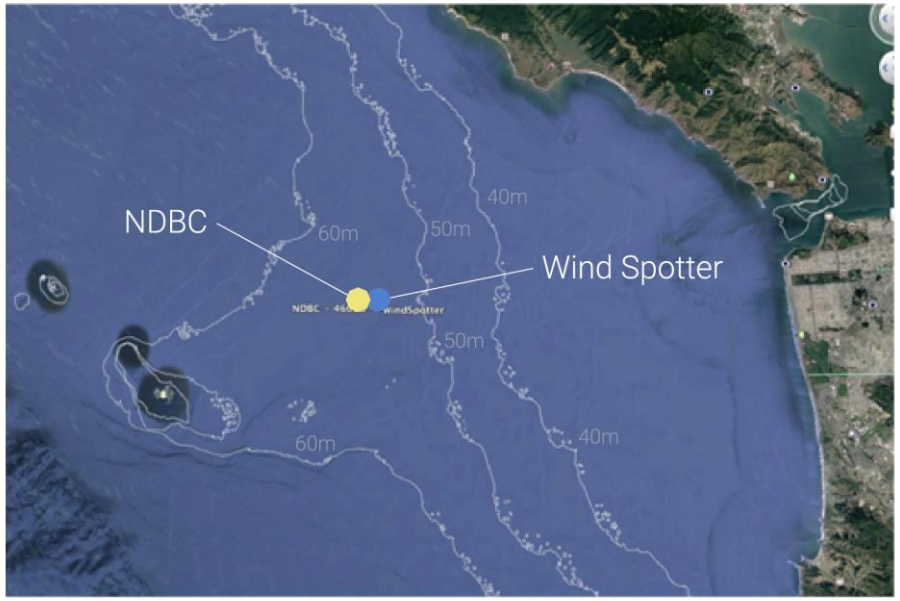


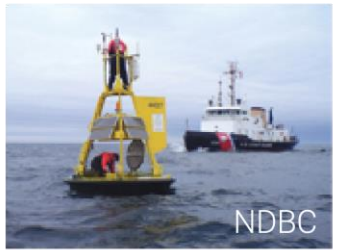
…without compromising on platform characteristics

Affordable, easy to deploy, easy to use, easy to produce.

Waves as proxy for wind



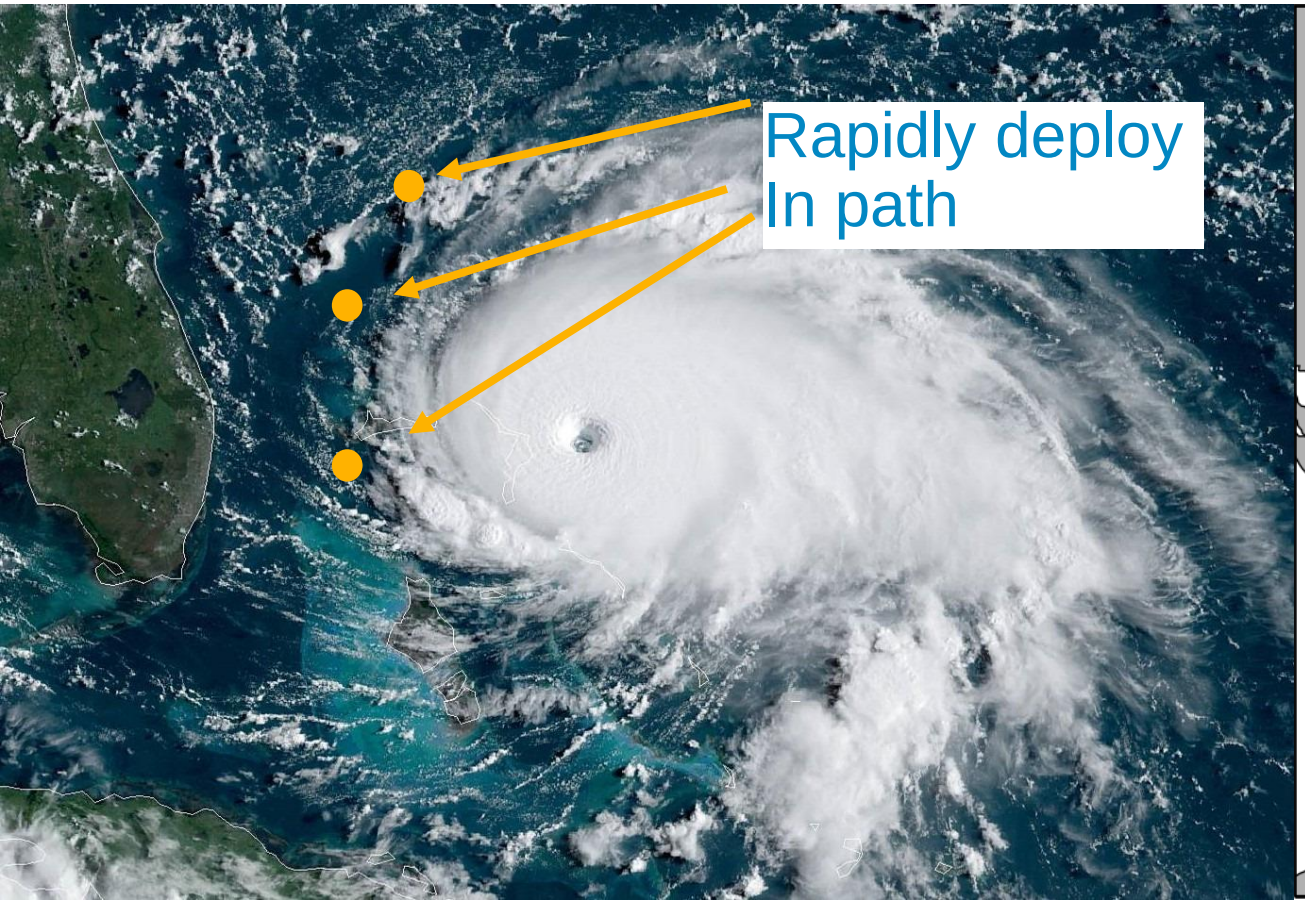




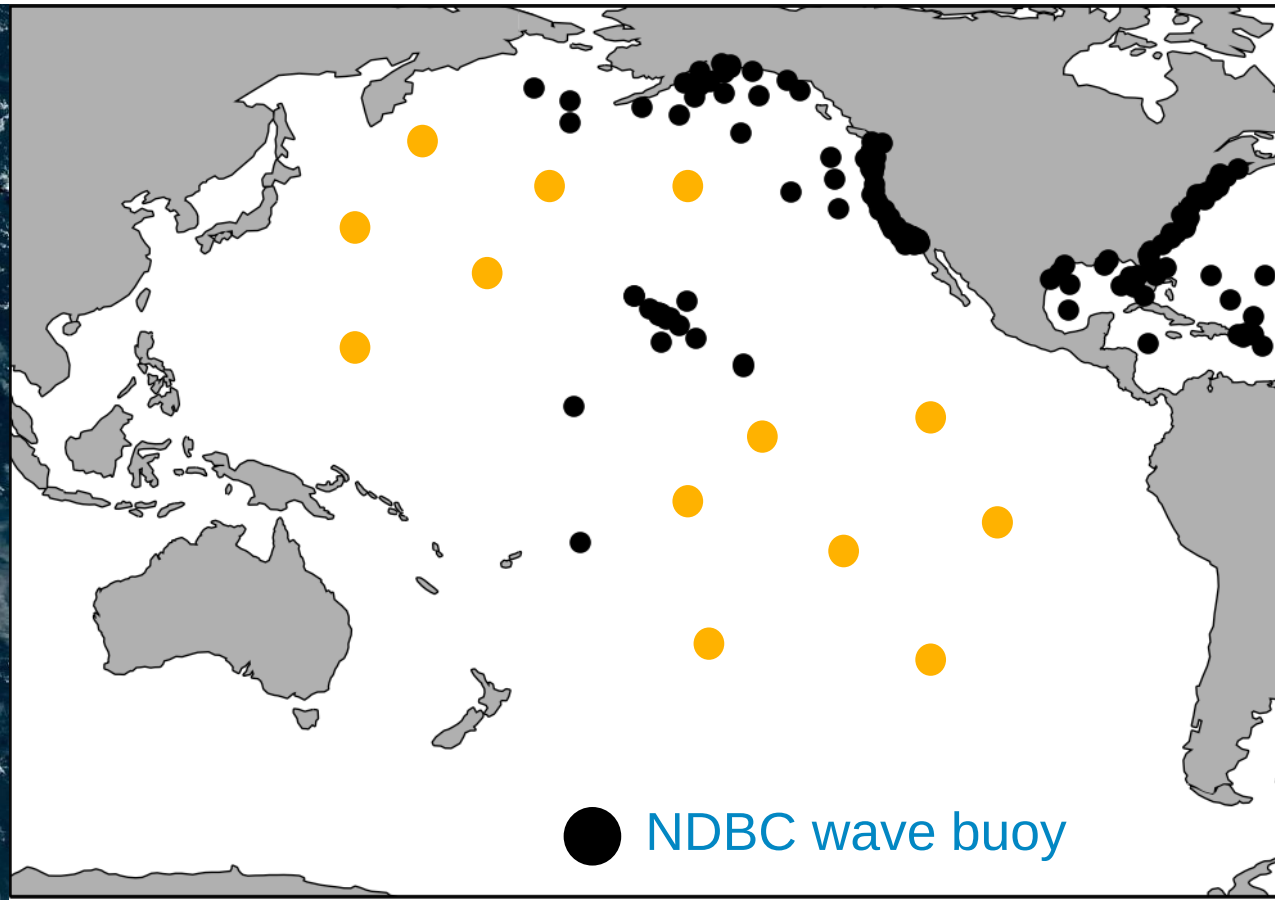
(Based on equilibrium range)

Phillips 1985; Thomson et al., 2013; Voermans et al. (under review)

Flexible Deployment

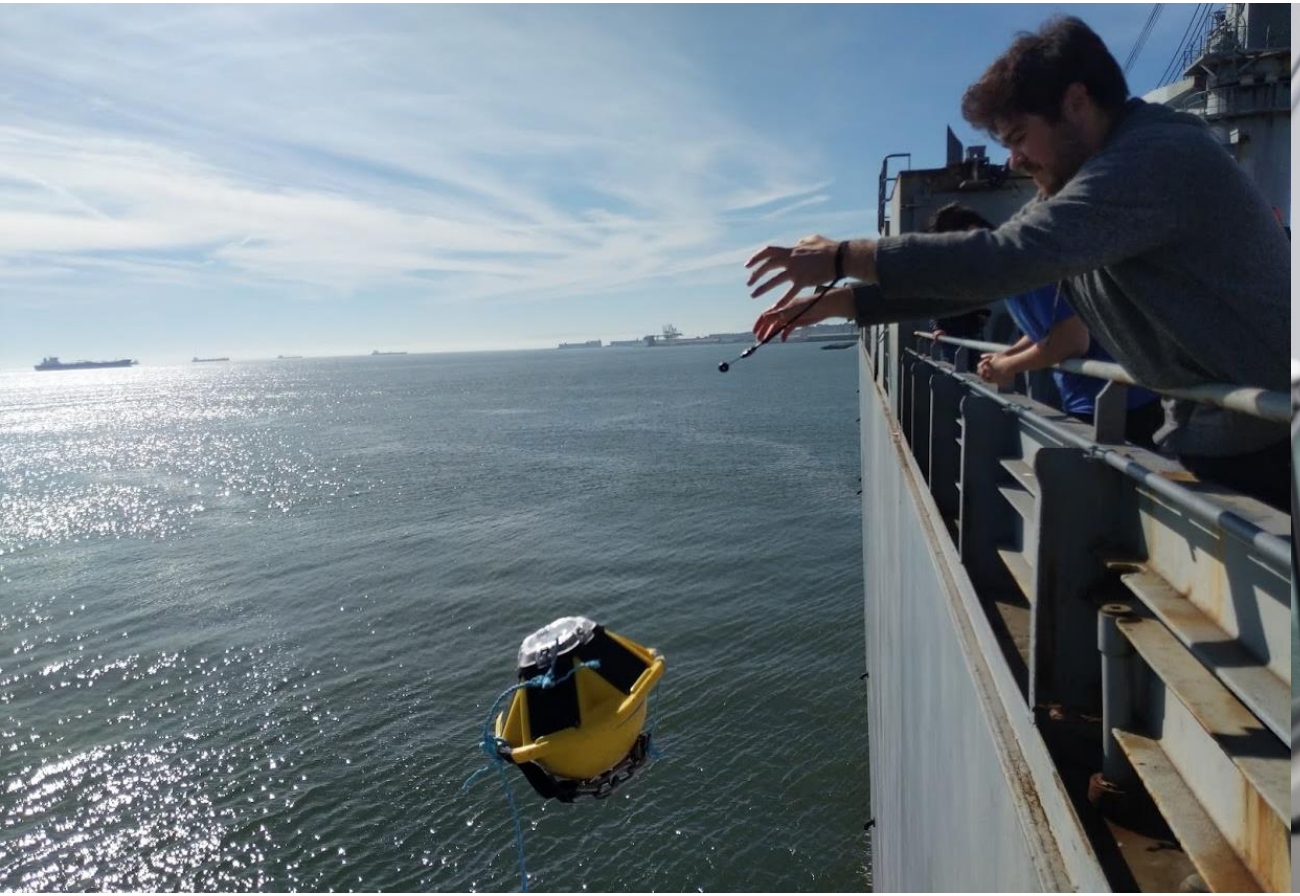


Rapidly developing weather systems require flexible deployment options



Moored assets mostly concentrated along coasts. Free floating networks are feasible.

Deployment should be as simple as tossing it overboard….



…from a ship or a plane.

Deployment:

- Large scale deployments
  Low cost, easy to manufacture, easy to deploy
- Environmentally friendly
  Biodegradable materials
- Fast descent, but robust
  Avoid large drifts, impact resistant

Hardening system: Drop Testing

Drop testing

Middle deck

Captains deck

mv cape horn

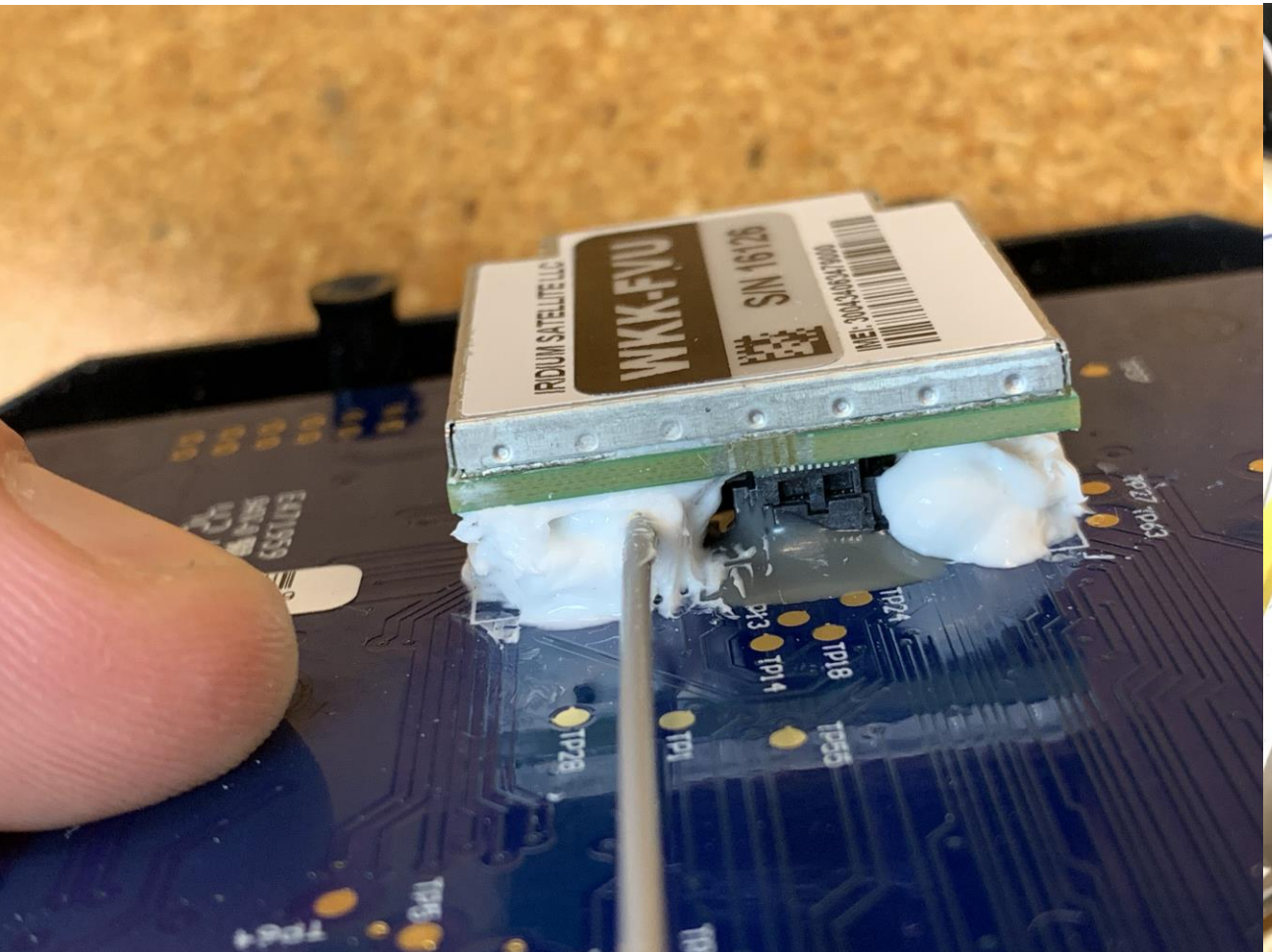
15m

Spotter

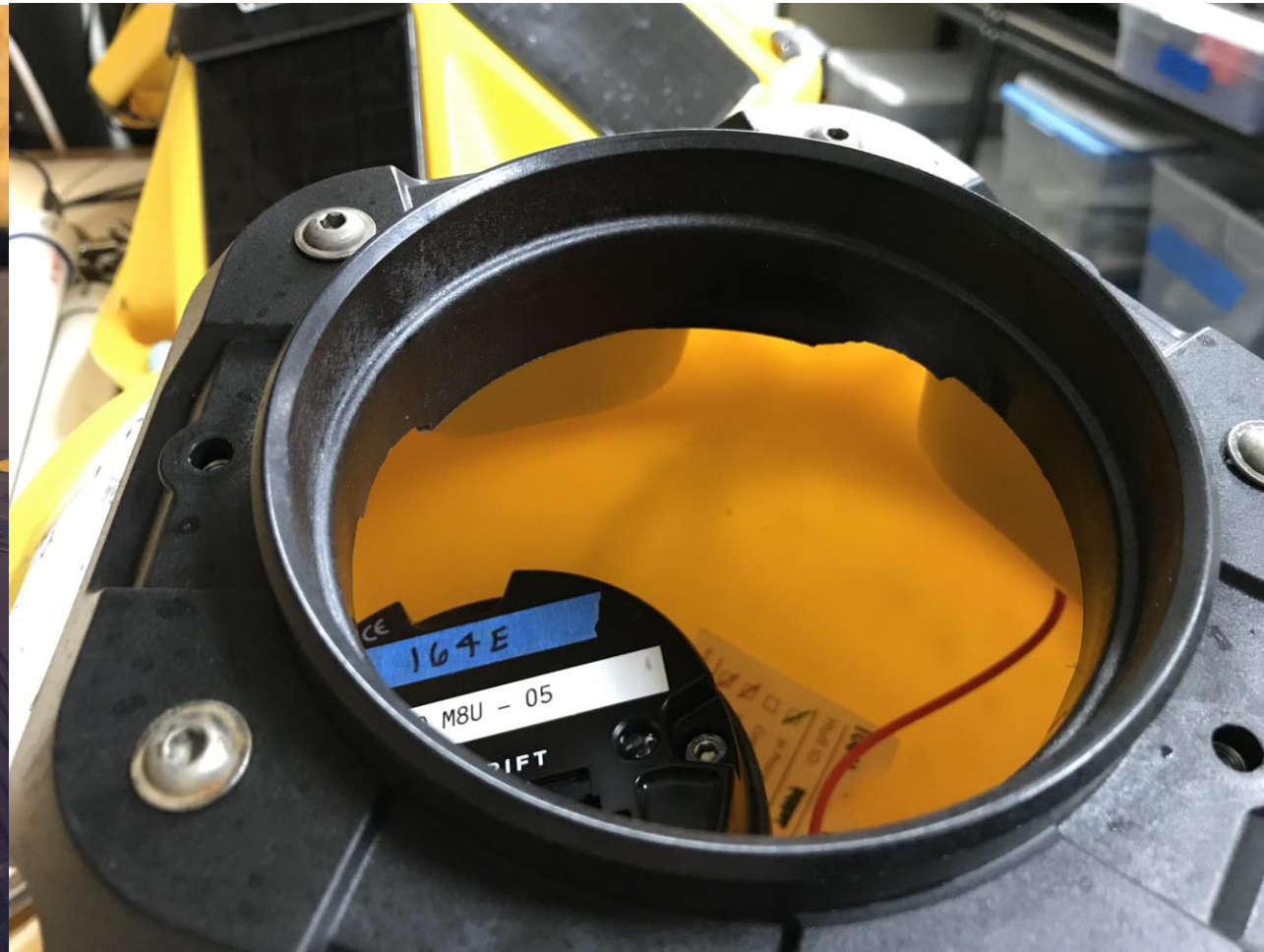
35m

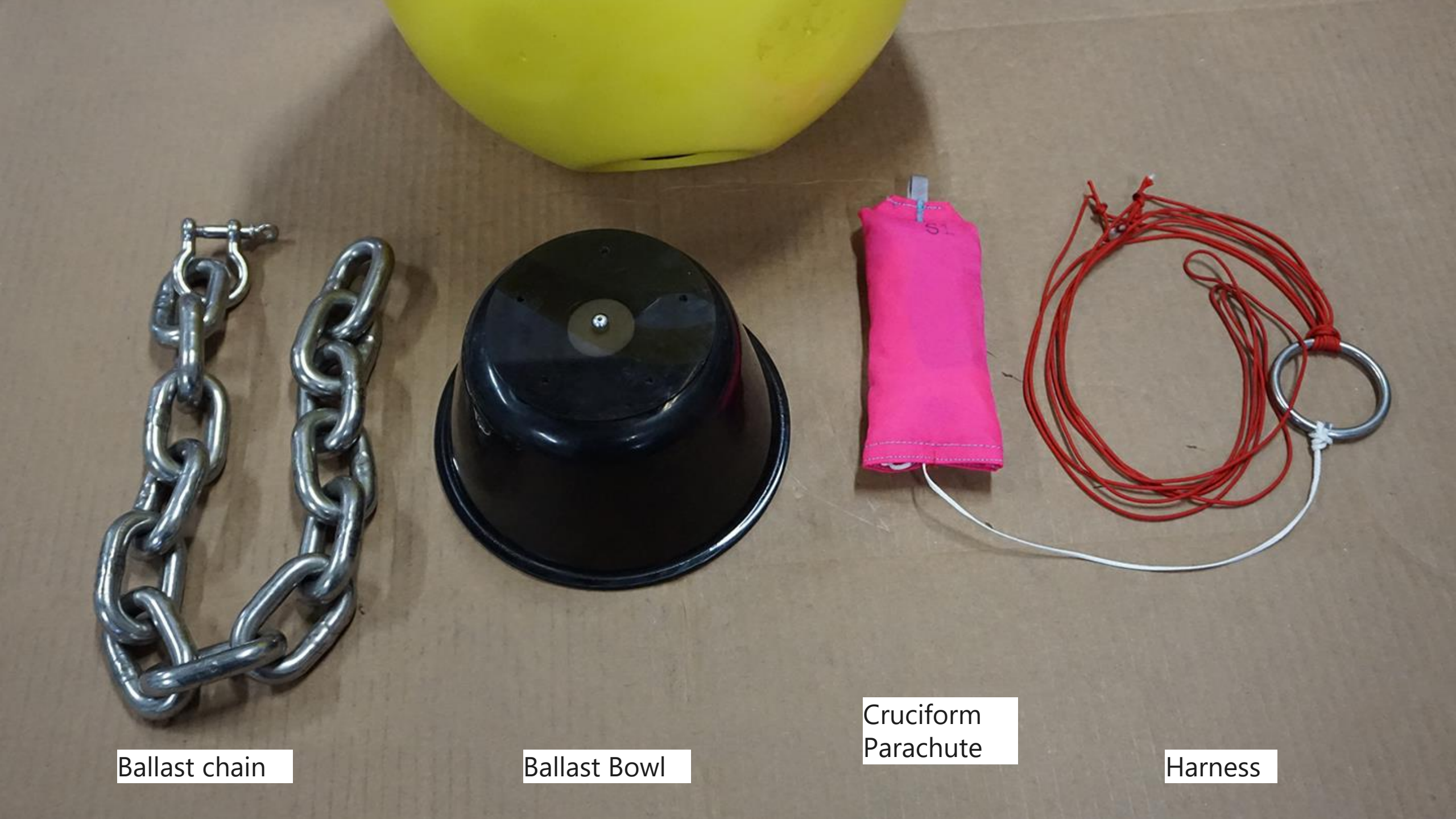
Failure modes
(identified, and fixed)

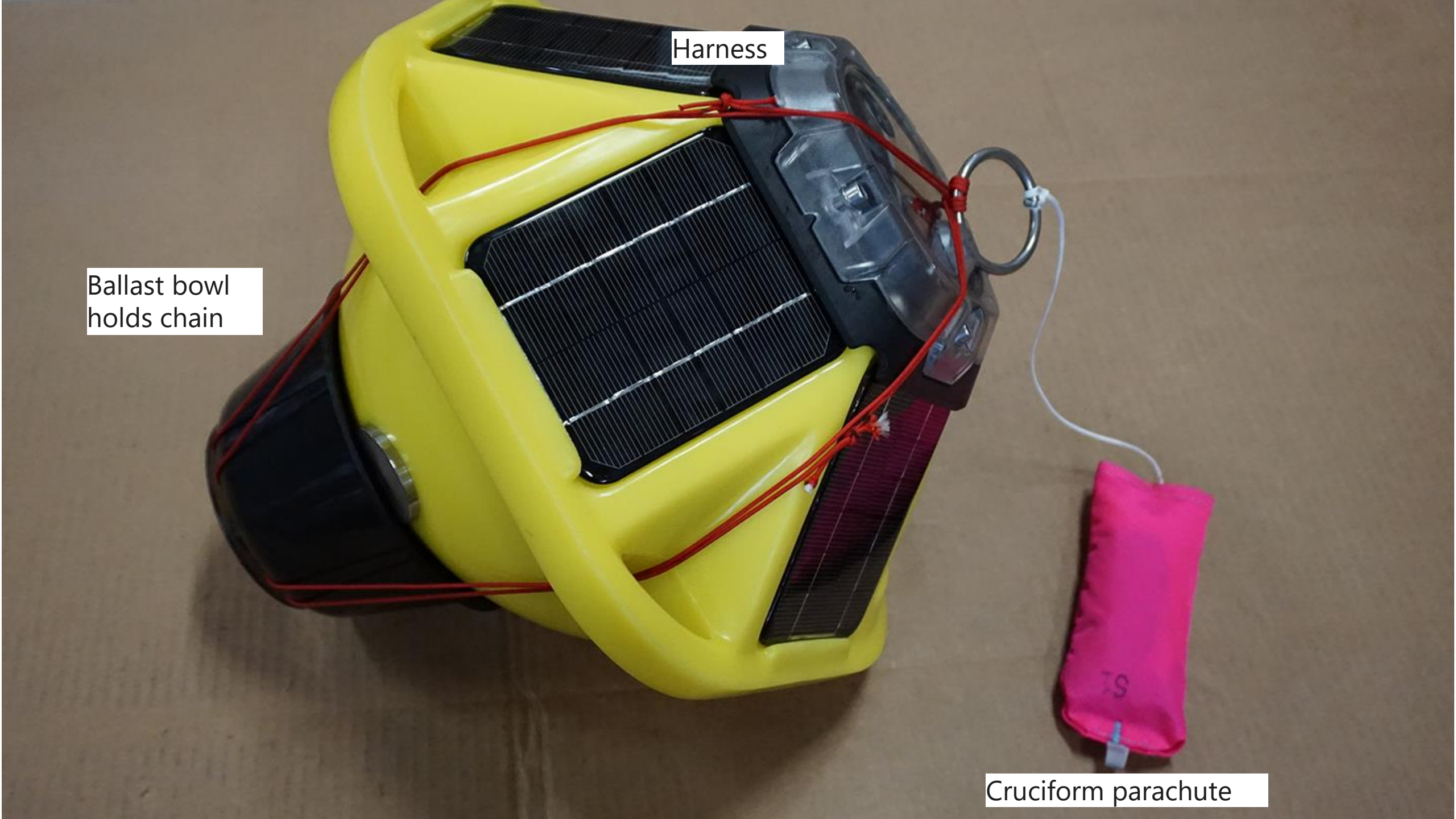
Iridium connector on pcb



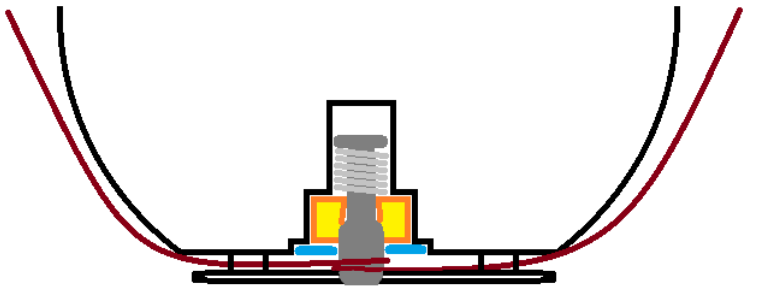
Flange holding e-box

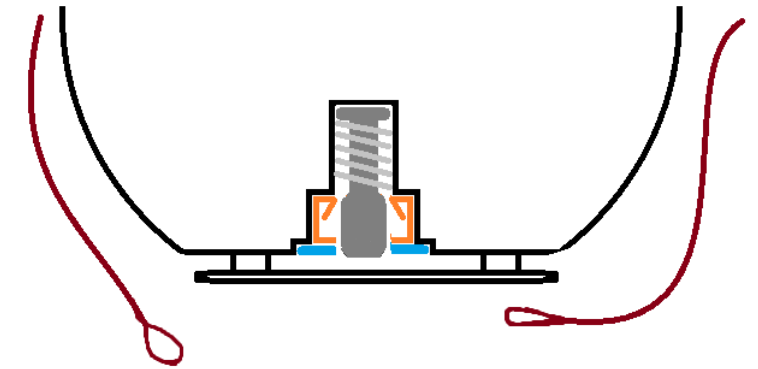



Ballast chain
Ballast Bowl
Cruciform Parachute
Harness


Harness
Ballast bowl holds chain
Cruciform parachute

Trigger mechanism for release.





Air Drop:

(May 31, 2019)

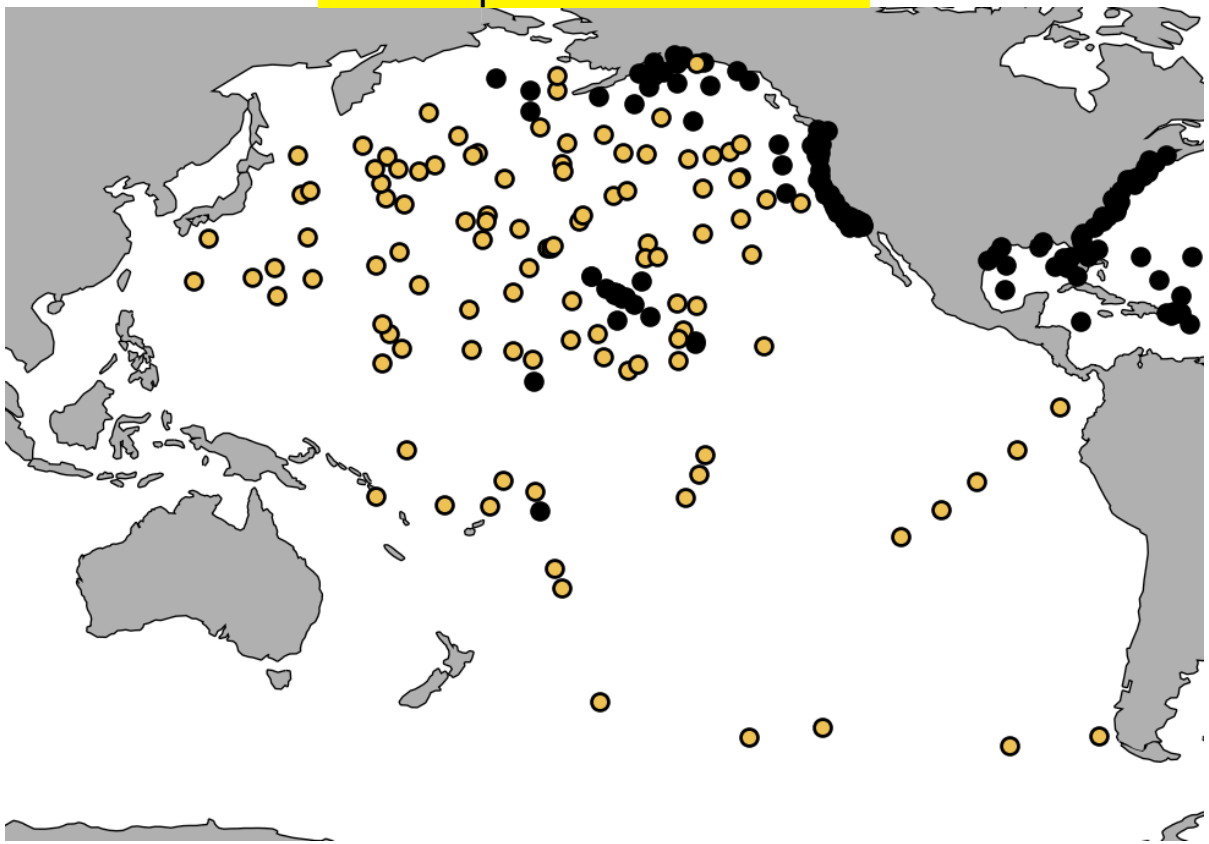
Drop four units from 350m

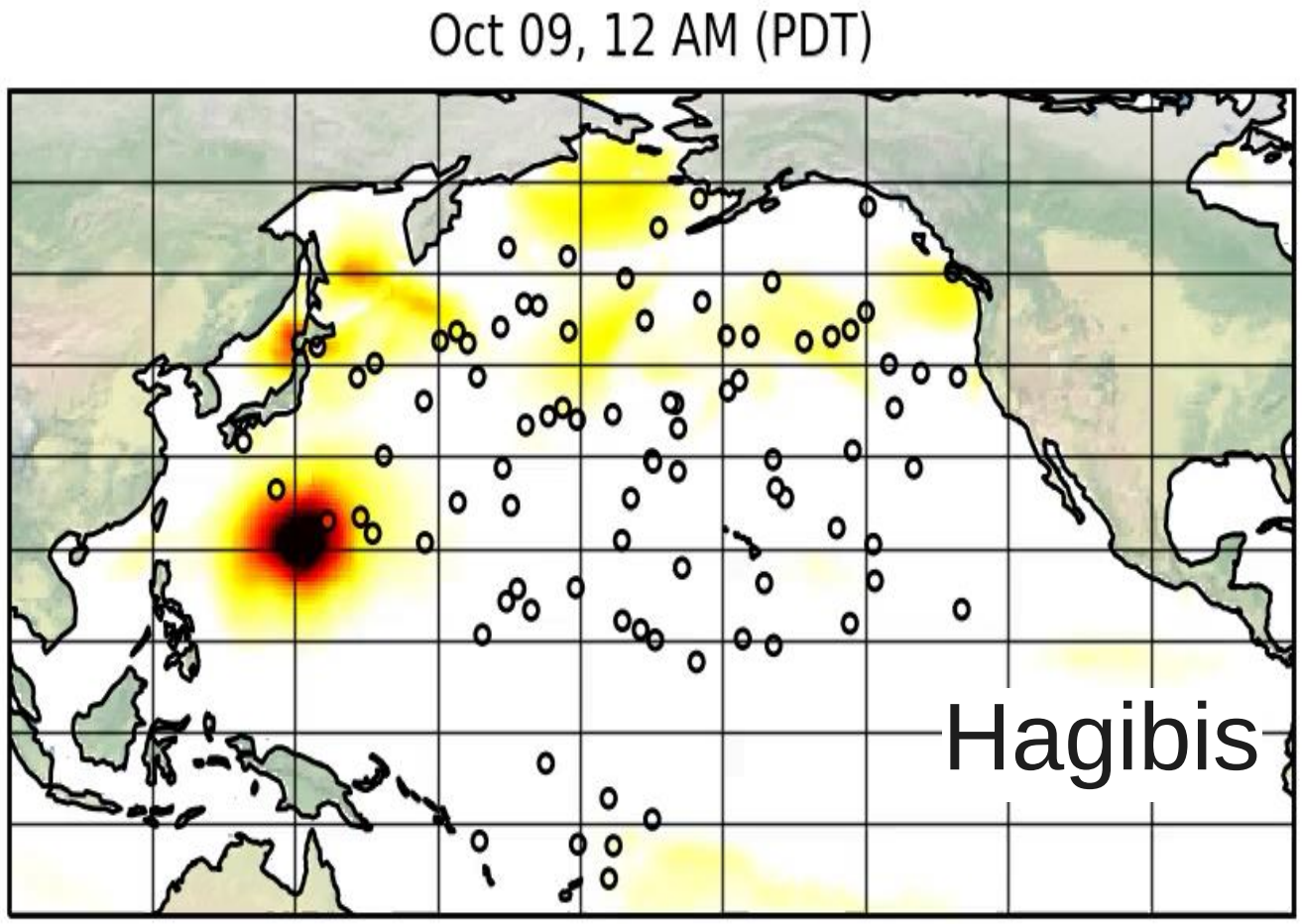

ENABLES QUICK
AIR DEPLOYMENT

(Air)drop allows for greater deployment flexibility

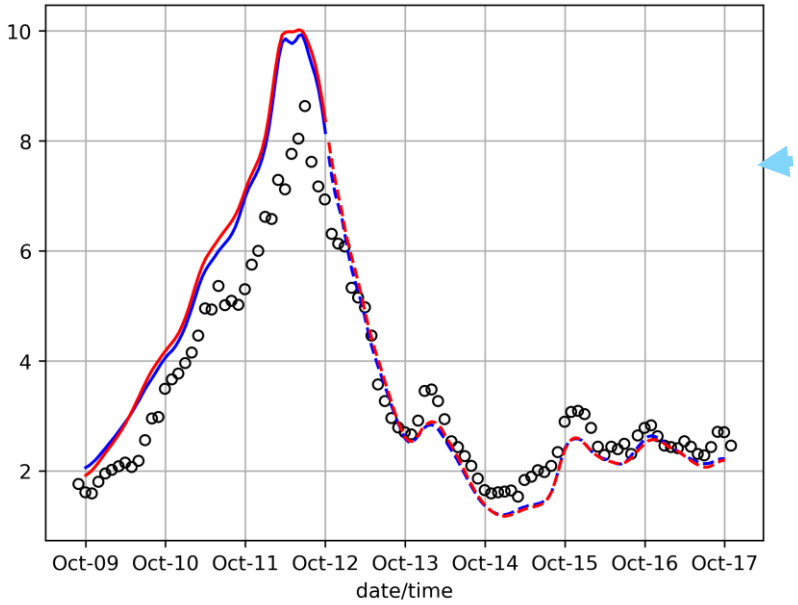
Why it matters

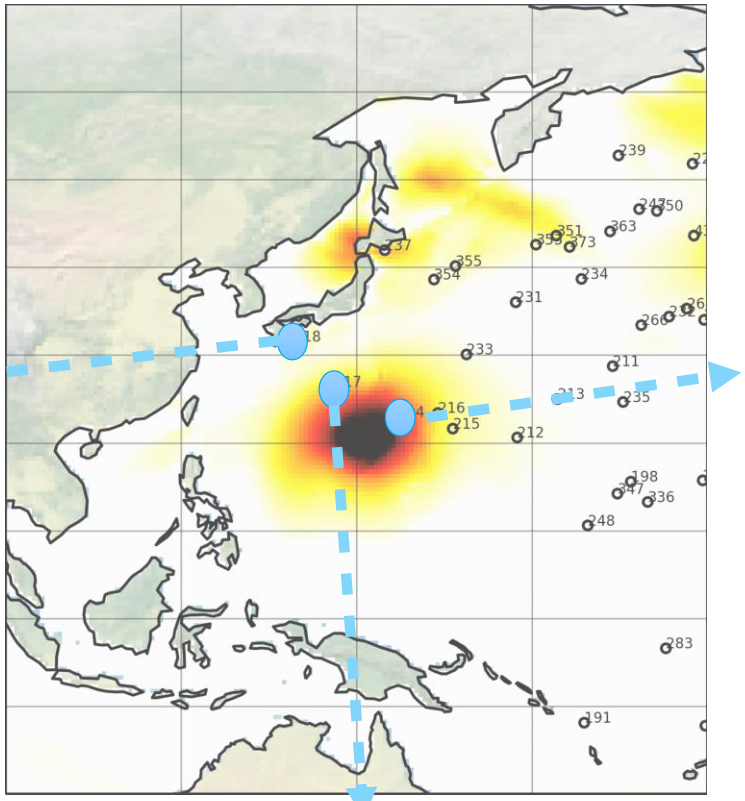
Sofar Operational Grid

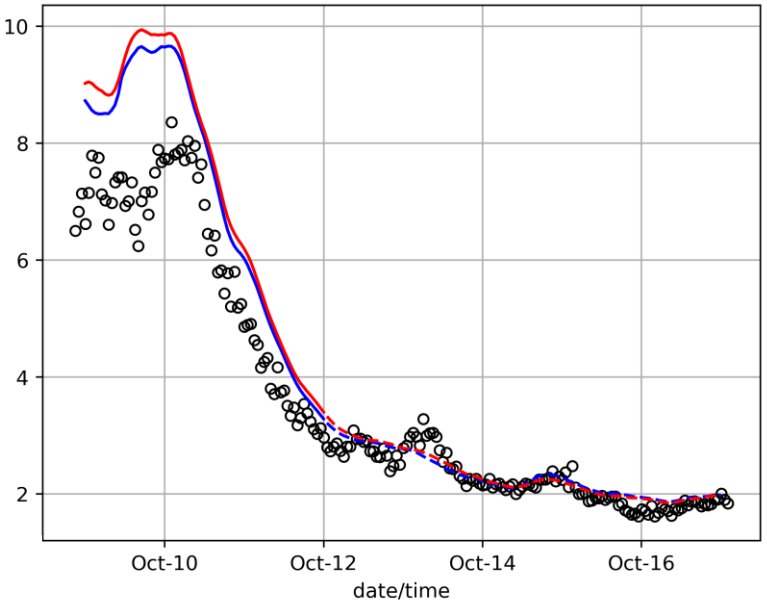


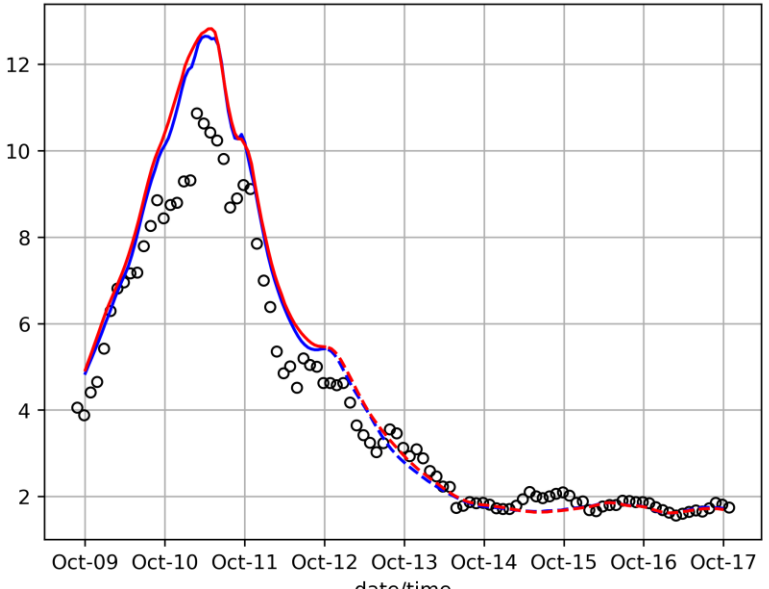


Making sensors affordable and easy to deploy has allowed us to deploy a large grid of Spotters (>100)







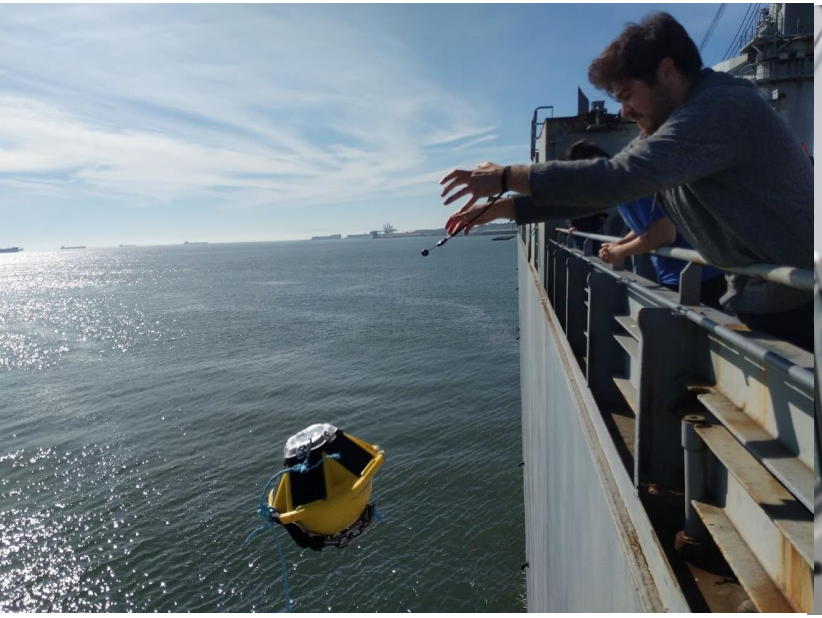


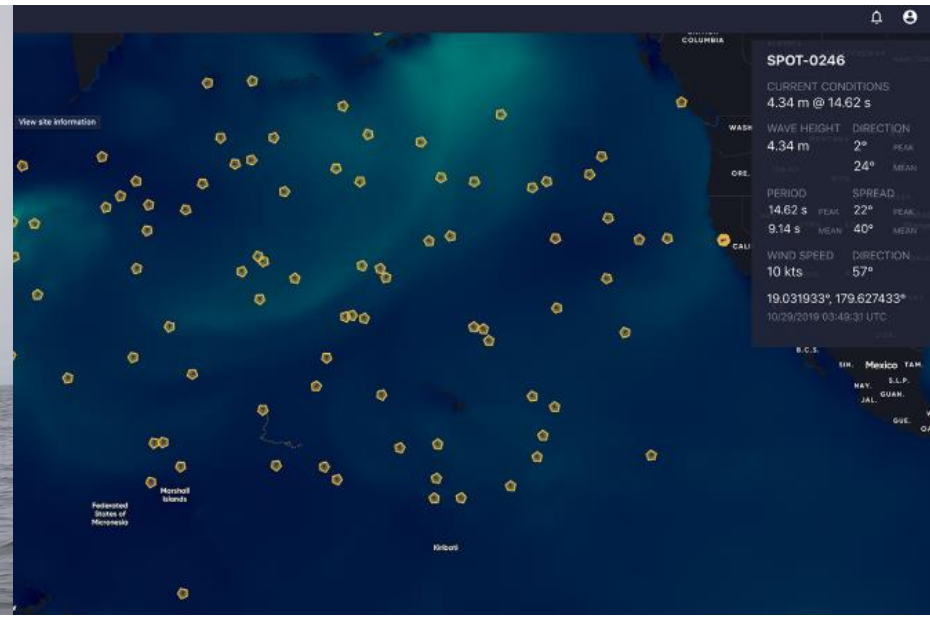
○ Observation

NOAA ww3

Sofar ww3

Takeaway





Moving towards a data abundant ocean!