

Ocean Surface Topography Science Team Meeting, 21-25 October 2019, Chicago, IL

Citizen science and volunteers in FloatEco project



Nikolai Maximenko
and Jan Hafner
University of Hawaii



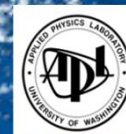
Gregory Ruiz and Linsey Haram
Smithsonian Environmental
Research Center



Luca Centurioni
Scripps Inst. Oceanography



Mary Crowley
Ocean Voyages Institute



Andrey Shcherbina
APL, Univ. Washington



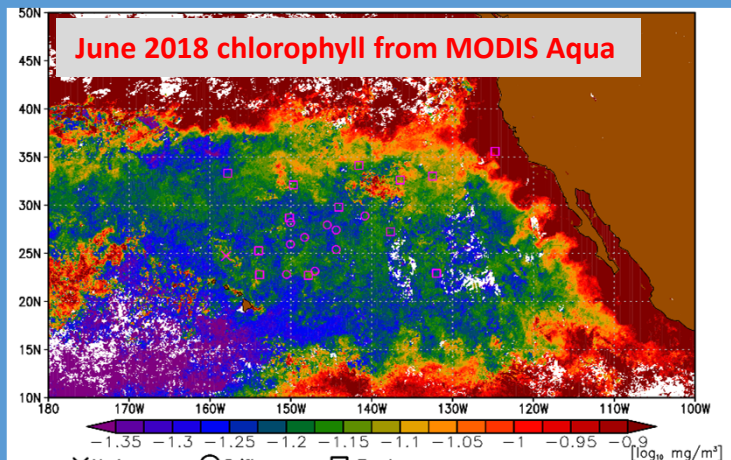
James Carlton
Williams College



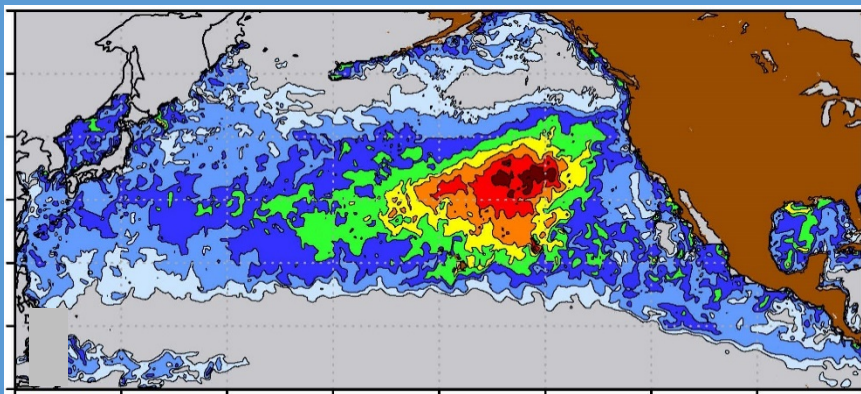
Cathryn C. Murray
Fisheries and Oceans Canada

Partners and volunteers

The Swim
Algalita
The Ocean Cleanup
eXXpedition
Greenpeace
Polynesian Voyaging Society
Figure 8 Voyage
Rick Pelton S/V Anais
Jim Linderman S/V Lyric
Russ Johnson S/V Blue Moon
Ray McCormack S/V Firefly
and many others



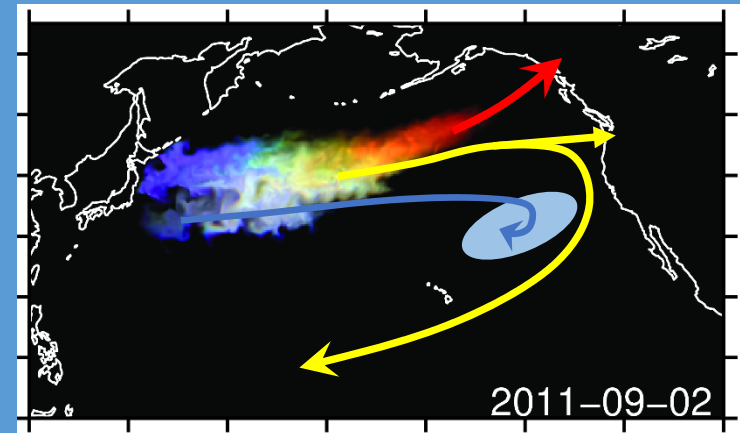
North Pacific pelagic subtropical ocean is nutrients poor. Asian and North American coastal ecosystems are disconnected. Floating debris plays important role in sustaining pelagic ecosystem.



Model simulation of debris accumulation in the “garbage patch” (See poster APOP_012)

The fact that flux of Asian coastal species never stopped suggests that they have established on marine debris floating in the “garbage patch”. FloatEco project studies physical and biological, Processes sustaining the floating ecosystem”. (See poster SC3_005).

Model simulation of debris from the 2011 tsunami in Japan
Pathways of debris depend on their windage

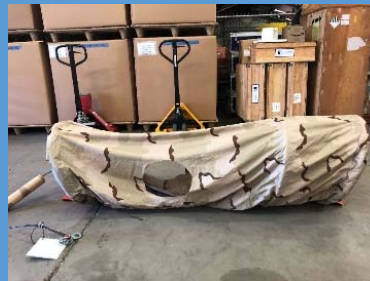
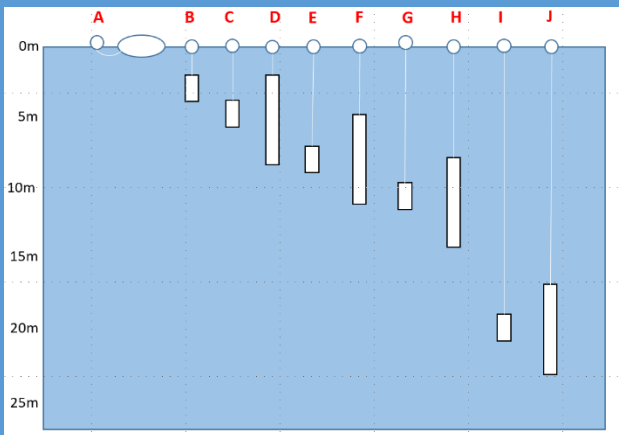


20-m dock arrived in Oregon in 2012, bringing >100 Japanese coastal species, some known as invaders.

FloatEco heavily relies on help of dozens of companies and individuals to:

- **deploy, inspect and recover scientific instruments**
- **search for floating debris and tag it with satellite trackers**
- **collect biological samples**
- **survey large debris to validate satellite and model data**
- **publicize outcomes of the project and raise awareness.**

Drifter array to study debris interaction with vertically sheared currents



Lagrangian Drifters Lab, Scripps IO



Maersk Launcher

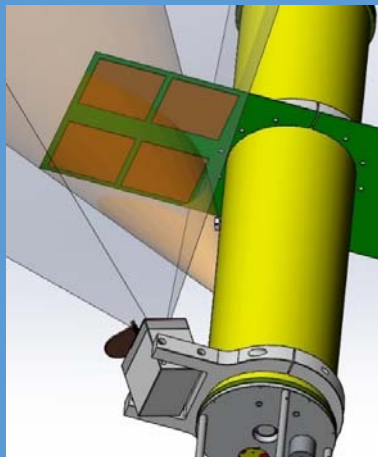
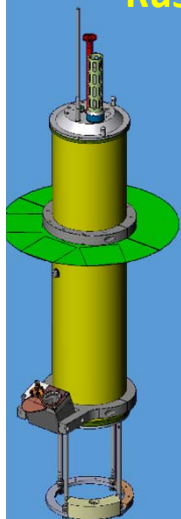


The Ocean Cleanup

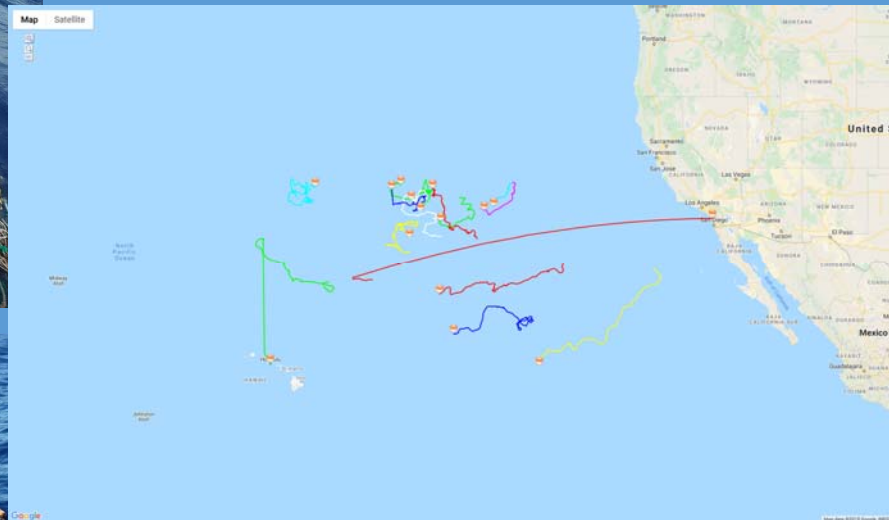
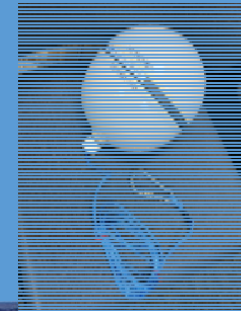


Mixed layer float to simulate movement of plankton and microplastics and to monitor biofouling

Russ Johnson and his S/V Blue Moon (departing from Honolulu next week)

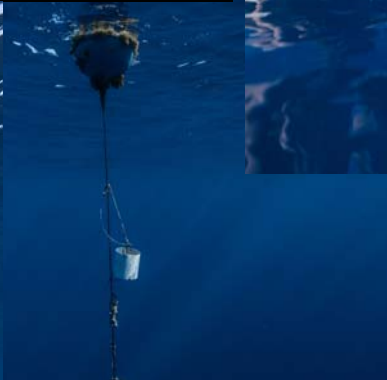
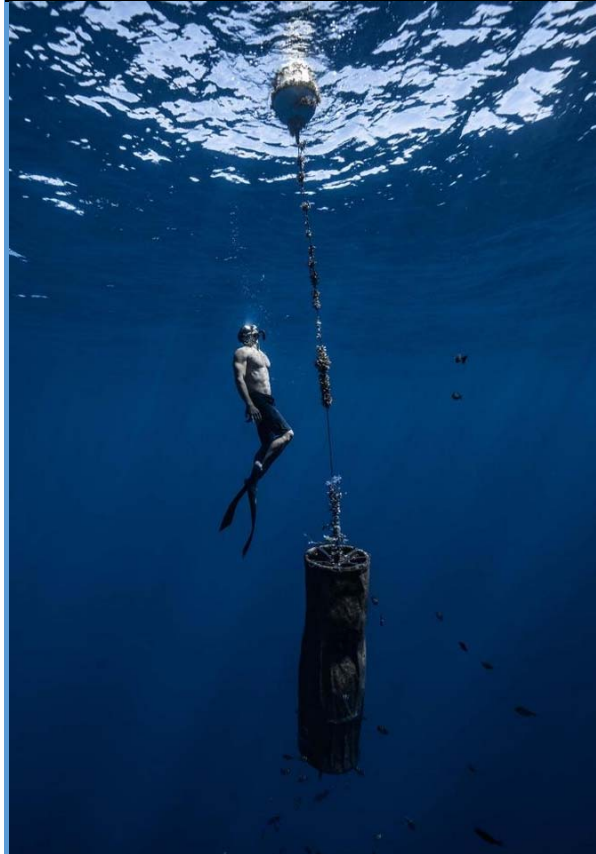
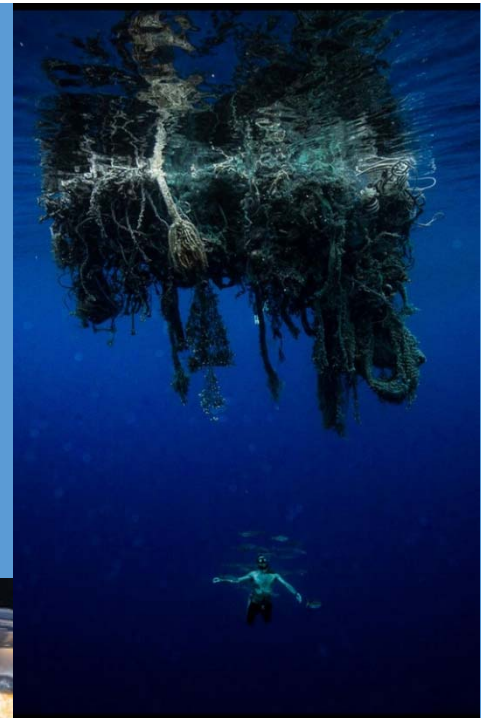


Tagging marine debris with Ocean Voyages Institute's satellite trackers



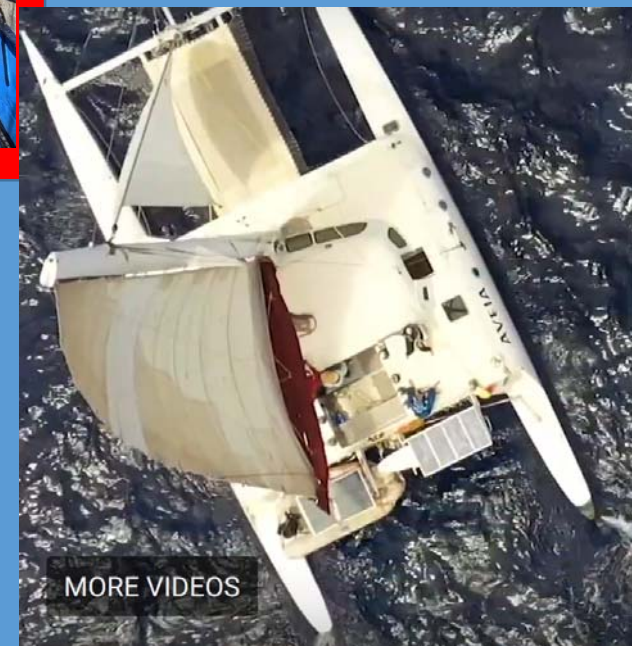
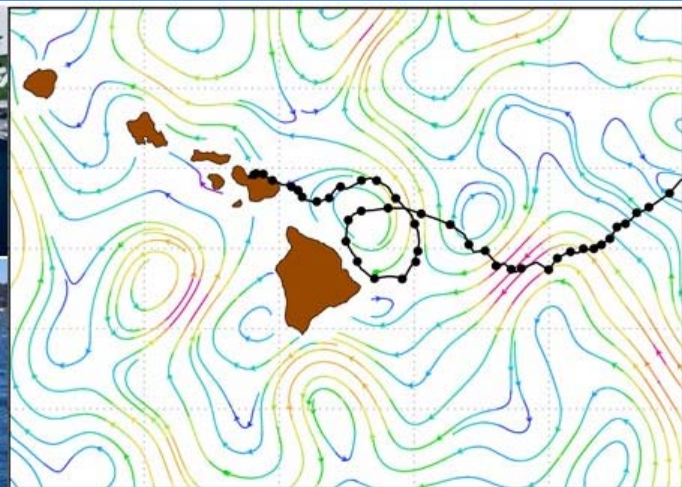


Inspecting instruments and biological panels



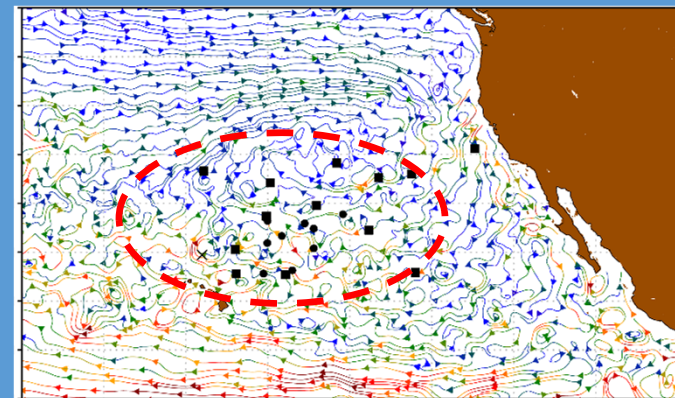
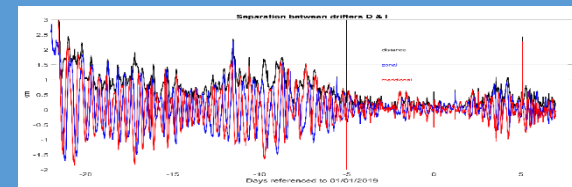
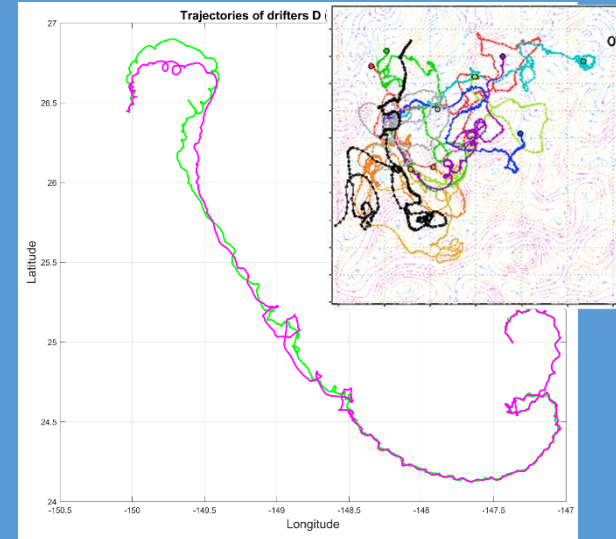
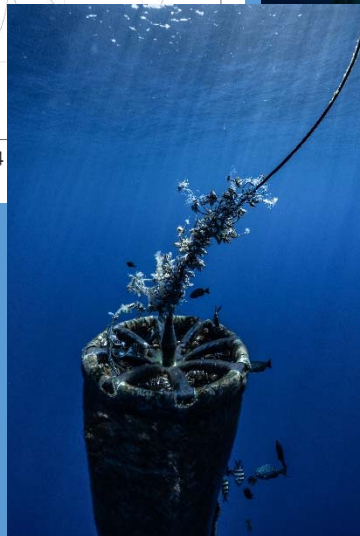
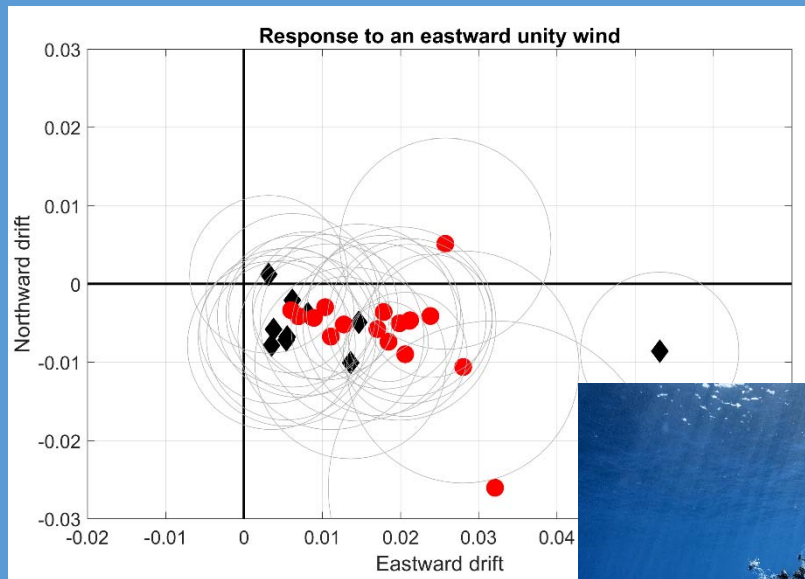
Sample collection during cleanups

**Ocean Voyages Institute
removed 40 tons of plastic,
including a 5-ton ghost net**



Preliminary results: physics

- Very strong interaction on small scales
- Submesoscale eddy with a life span of six months
- Low sensitivity to drifter geometry
- Drifter and debris response to the wind will improve models



Preliminary results: biology

- Dozens of coastal species (mostly Asian) have been found on samples, collected in the “garbage patch”

Coastal taxa

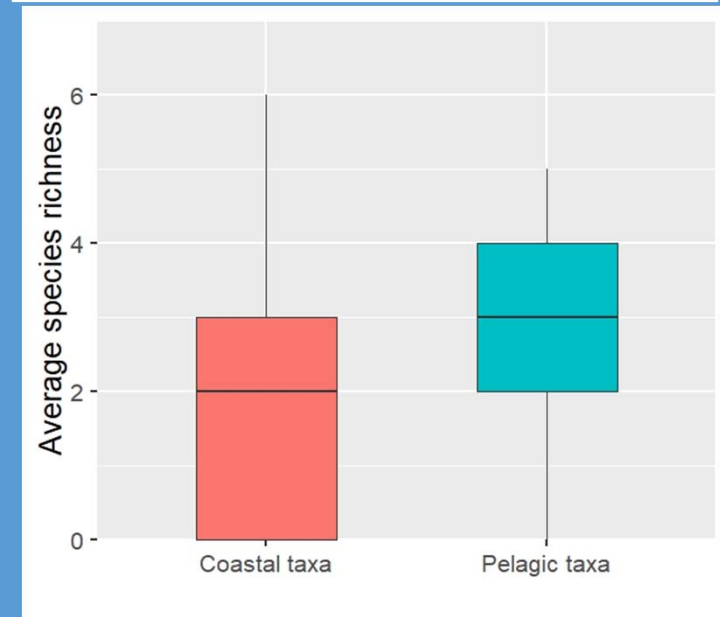
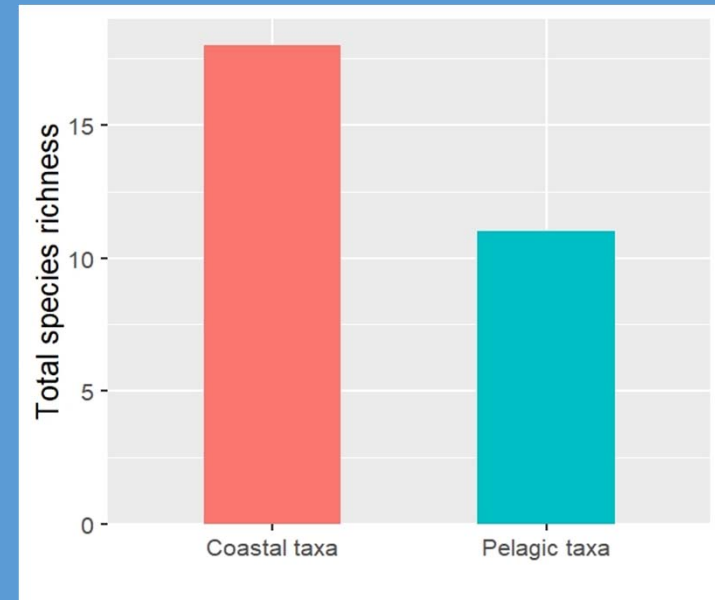


73%
of debris

Pelagic taxa



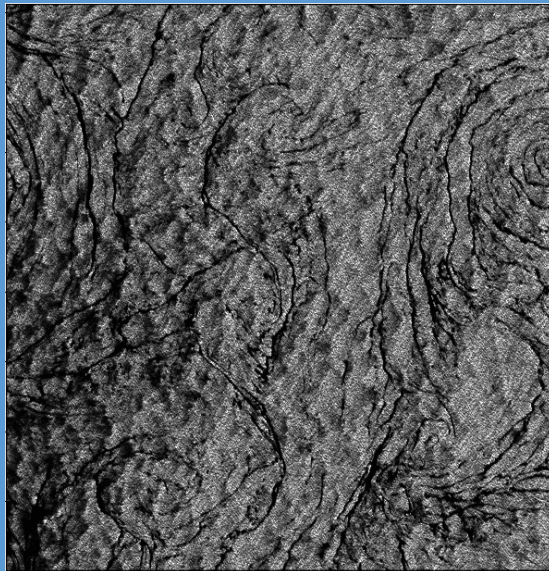
95%
of debris



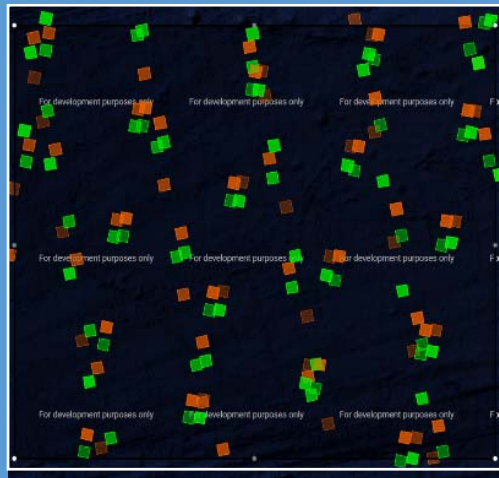
Next steps

- Further broaden collaborations with citizen scientists
- Experiments with the mixed layer float to study effect of buoyancy on horizontal transport.
- A new set of 10 drifters will be deployed to measure effects of windage.
- Quantifiable biological experiments with new settlement panels.
- Chase submesoscale using ships of opportunity.

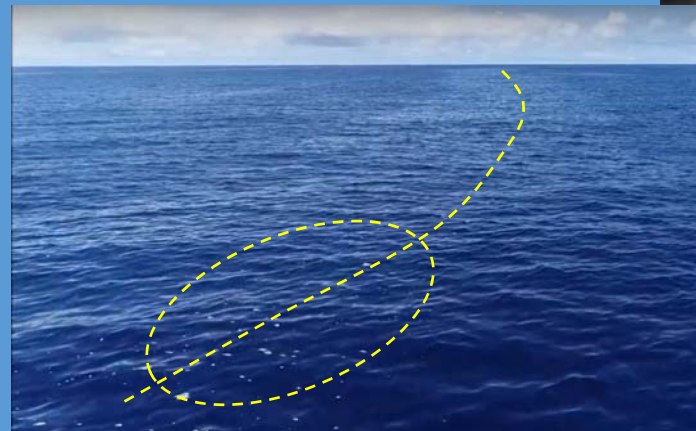
Example of SAR image of submesoscale fronts



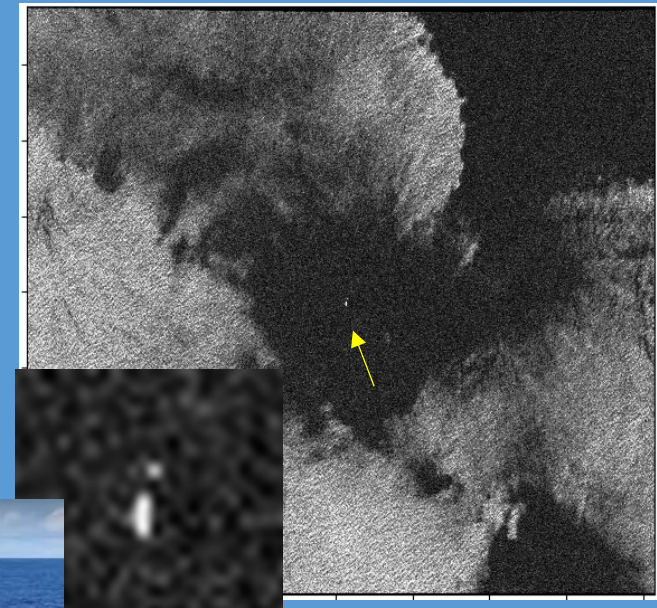
20 km



1000 km
Sentinel-1 pattern



IAMOCAM boat on Sentinel-1A
SAR image taken July 23, 2019



Microplastics in a slick,
observed in August 2019
by Algalita