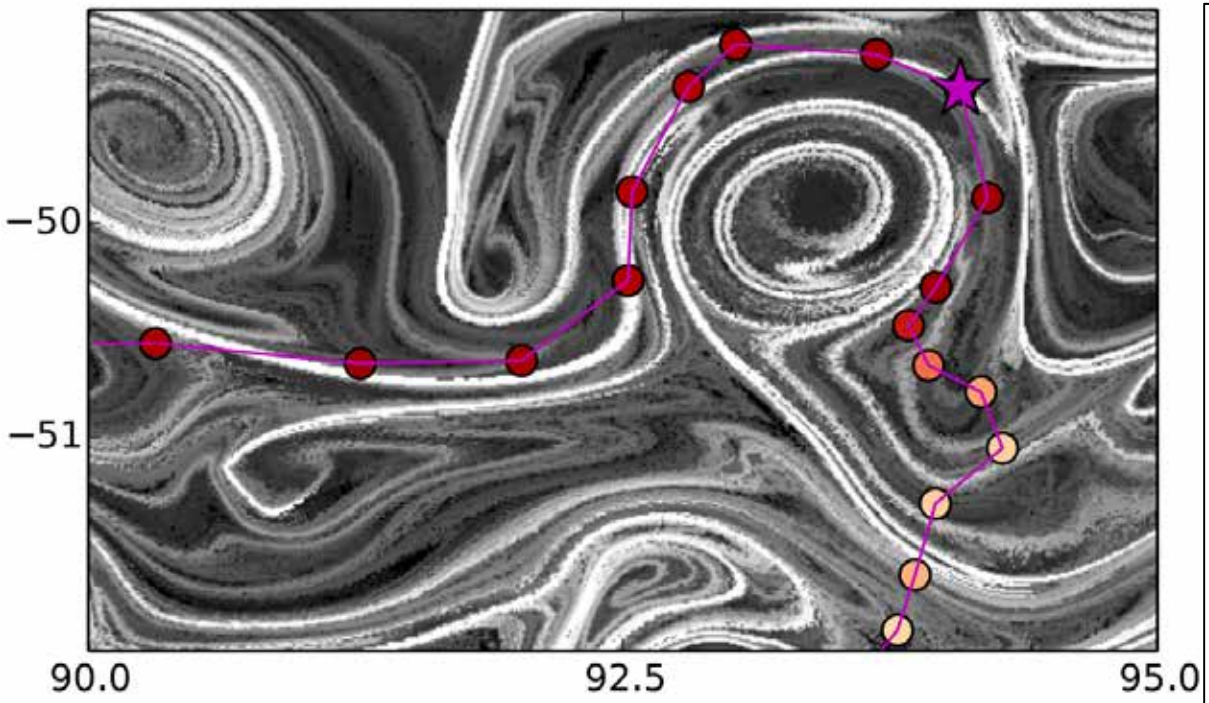
Understanding Elephant Seal Behavior With Altimetry



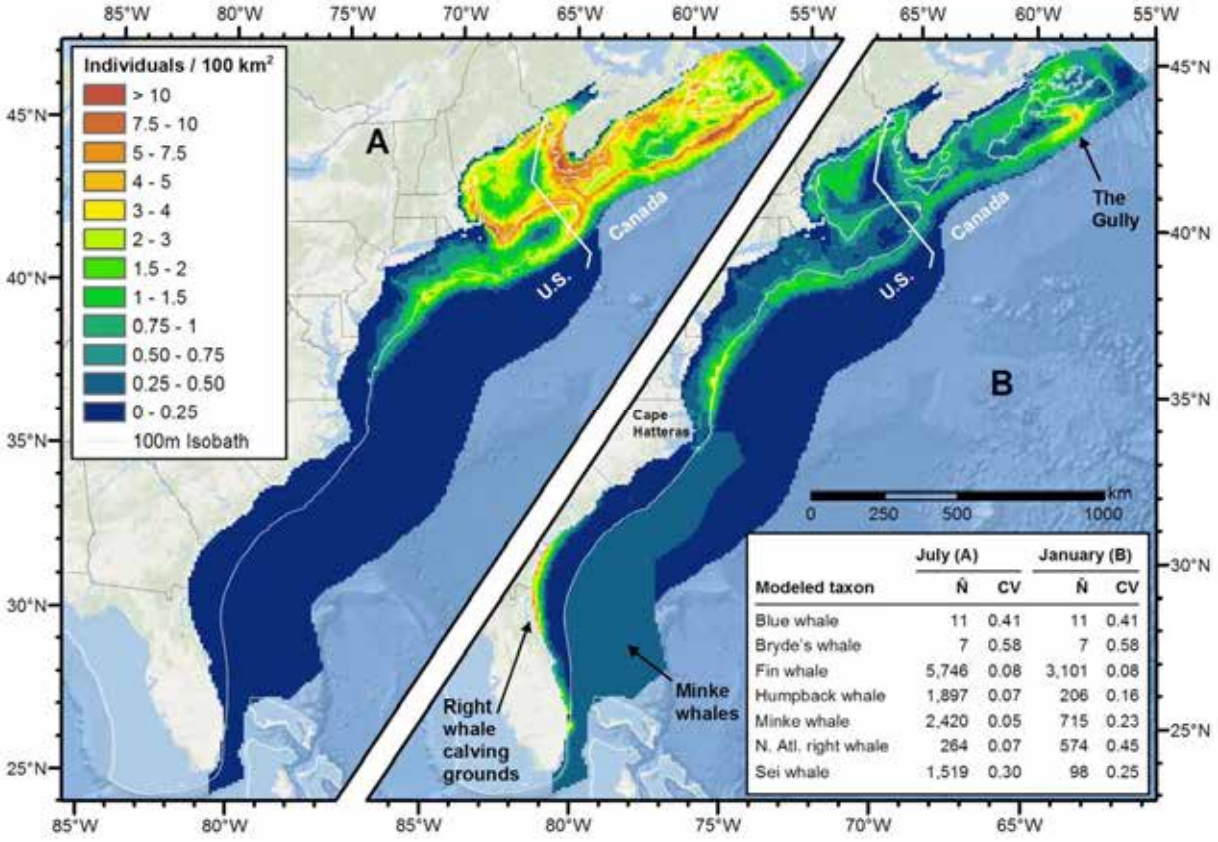
Elephant seal track (red line) follows a transport front; the seal was also foraging during most of the track. (Della Penna et al, 2015, Scientific Reports)

Gary Geller
NASA Jet Propulsion Laboratory
Jason Project & NASA Ecological Forecasting Program

Summary

- **Frontal currents were identified using altimeter-derived velocity fields**
- **Fronts are often where prey can be found**
- **Seals are among the fastest swimming mammals…**
- **But often drifted with the frontal current while foraging**

Predicting Baleen Whale Distribution & Abundance



Modeled taxon	July (A) N̂	July (A) CV	January (B) N̂	January (B) CV
Blue whale	11	0.41	11	0.41
Bryde's whale	7	0.58	7	0.58
Fin whale	5,746	0.08	3,101	0.08
Humpback whale	1,897	0.07	206	0.16
Minke whale	2,420	0.05	715	0.23
N. Atl. right whale	264	0.07	574	0.45
Sei whale	1,519	0.30	98	0.25

Predicted mean density of baleen whales in July (A) and January (B) (Roberts et al 2016, Scientific Reports)

Approach

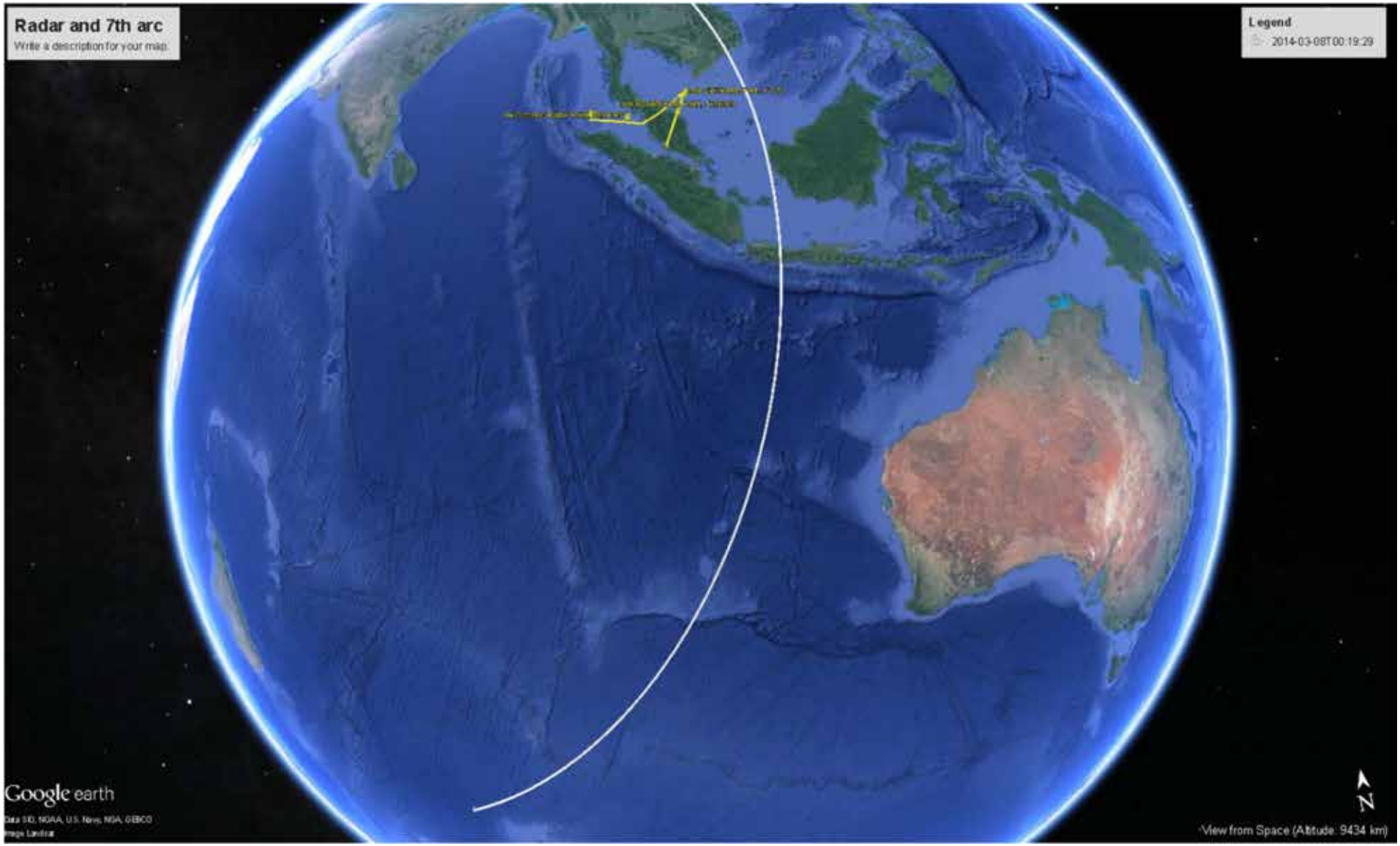
- **Correlated environmental and biological parameters with whale sightings**
- **Developed model**
- **SSH used to derive distance to eddies, used in the model**
- **Similar work used to manage shipping traffic and fishing gear to avoid collisions and entanglements**

Altimetry and the search for MH370

David Griffin
CSIRO Oceans and Atmosphere

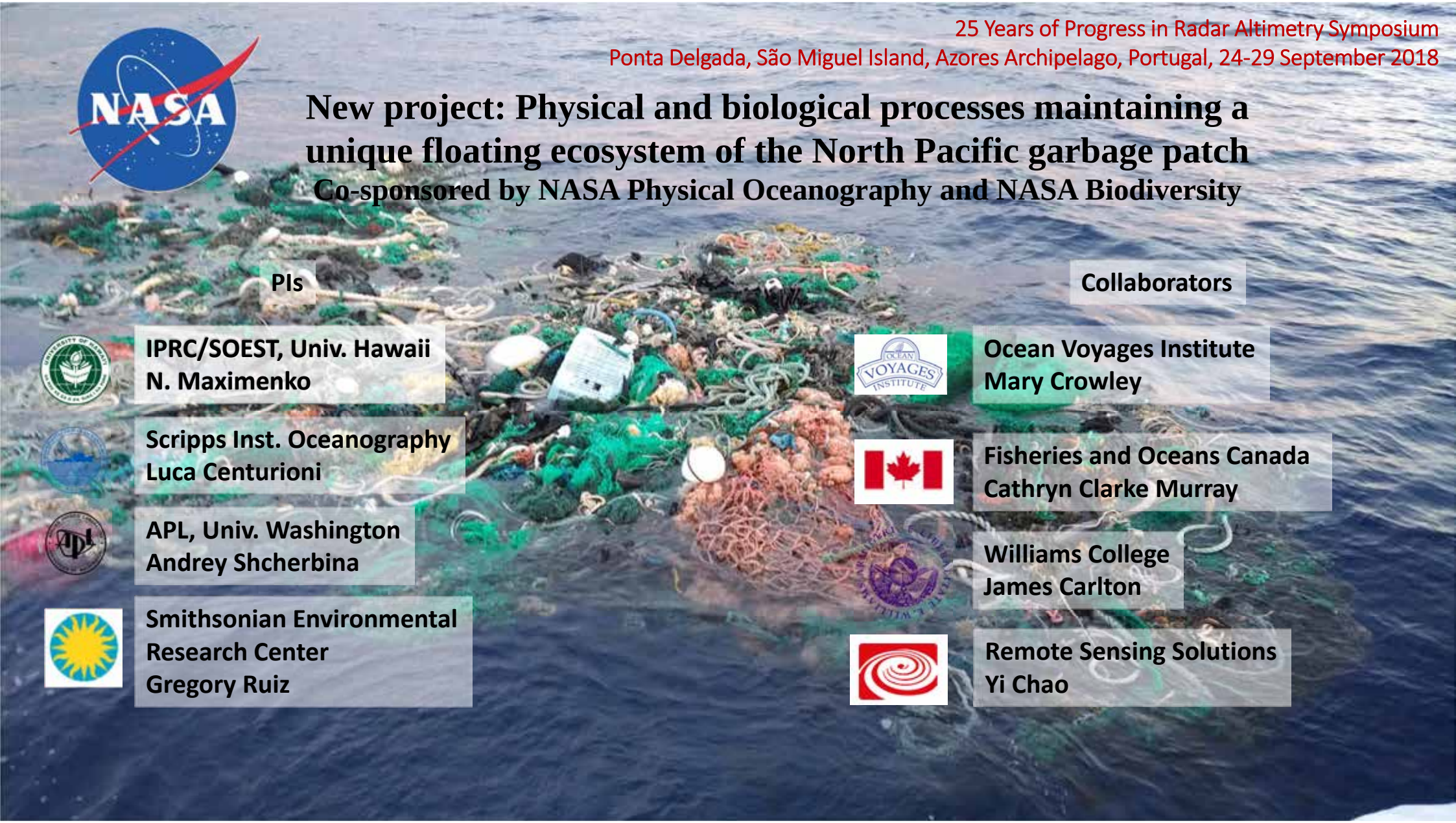
The most tragic aviation incident of all time

- In March 2014, Malaysian airlines flight MH370 simply disappeared
- Assumed to have crashed, a search commenced
- But the SatCom call logs showed it had flown for 7h, into the southern Indian Ocean
- 6 weeks of searching off WA found no trace
- July 2015: a part of the wing was found on Reunion Island (other side of the Indian Ocean)
- Dec 2015-Aug 2016 more pieces on African beaches
- June 2018. Search for plane on sea floor finished, unsuccessfully.
- Mystery now deeper than ever.


Radar and 7th arc
Write a description for your map
Legend
2014-03-08T00:19:29
Google earth
View from Space (Altitude: 9434 km)

The role of altimetry

- We know the plane crashed at some point along this arc, because it was a known distance from an InMarSat satellite.
- We know where and when a number of items were found, and where no items (Australia) were found.
- Drift modelling, powered by altimetry, pointed to 35S as the most likely site.
- But the plane was not found there.
- No one knows where to search next.
- This story has captivated the public while traumatizing the next of kin.
- I have done very many media interviews about this. It has been exhausting, profoundly disappointing but very rewarding.



25 Years of Progress in Radar Altimetry Symposium
Ponta Delgada, São Miguel Island, Azores Archipelago, Portugal, 24-29 September 2018

New project: Physical and biological processes maintaining a unique floating ecosystem of the North Pacific garbage patch

Co-sponsored by NASA Physical Oceanography and NASA Biodiversity

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Remote Sensing Solutions
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25 Years of Progress in Radar Altimetry Symposium

2018 Ocean Surface Topography Science Team Meeting

Ponta Delgada, São Miguel Island, Azores Archipelago, Portugal, 24-29 September 2018

New project: Physical and biological processes maintaining a unique floating ecosystem of the North Pacific garbage patch

Sponsored by NASA Physical Oceanography and NASA Biodiversity

Tasks:

- Understand how the ocean dynamics moves marine debris
- Prove that accumulation of man-made debris changes pelagic ecosystem

NASA sponsors:

- Instruments (drifters, mixed layer float, biological panels, etc.)
- Modeling
- Data analysis
- Interdisciplinary research

NGOs and volunteers provide

- Ship time and
- Perform most of at-sea activity

Example:

- we coordinated tagging this net with OVI satellite tracker,
- analyze its trajectory,
- will coordinate its retrieval,
- will collect biological samples

Contributors:

The Ocean Cleanup

Polynesian Voyaging Society

Greenpeace

eXXpedition

Numerous citizen scientists and volunteers

The Longest Swim

Figure 8 Voyage

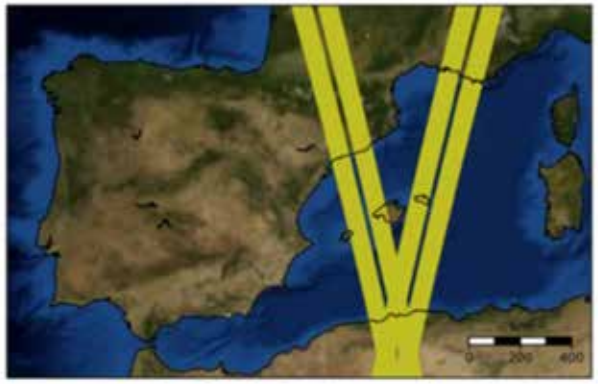
PRE-SWOT

R/V García del Cid – 5-17 May 2018

GOBIERNO DE ESPAÑA
MINISTERIO DE CIENCIA, INNOVACIÓN Y UNIVERSIDADES
AGENCIA ESTATAL DE INVESTIGACIÓN

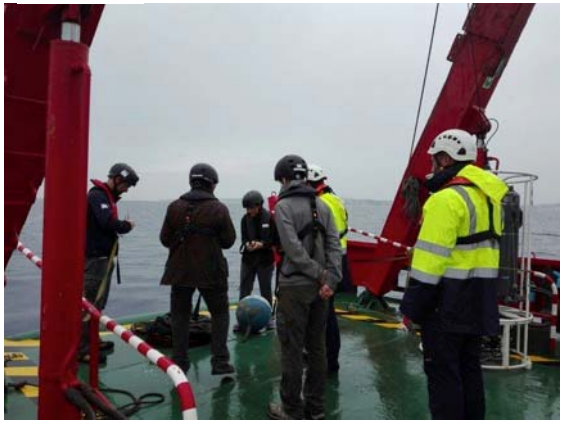
Ananda Pascual

West Med SWOT crossover



#PRE_SWOT Outreach

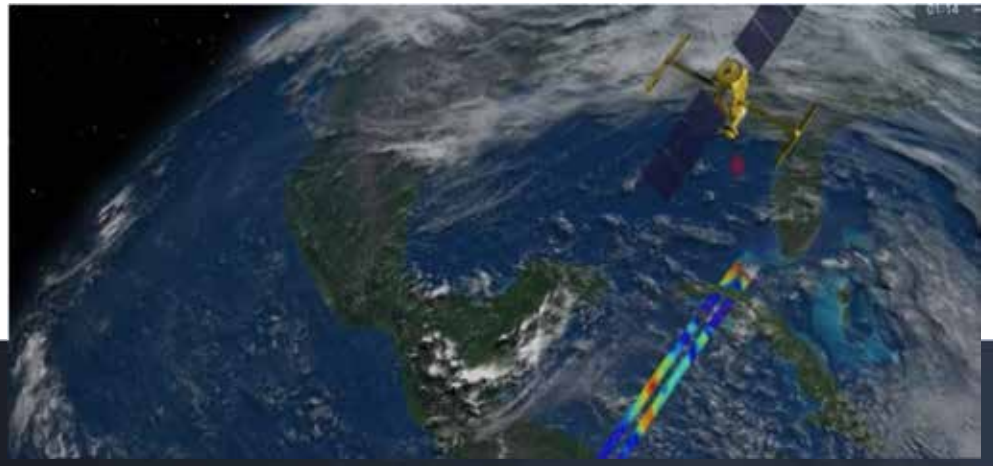
#PRE_SWOT



- Activities with kids (adopt & paint a drifter workshop, talk in the school,…)
- Micro-documentary, press note, TV, radio and newspapers, Twitter,…

#PRE_SWOT micro-video

https://youtu.be/u3bQ0r_zepA google: Youtube PRE-SWOT

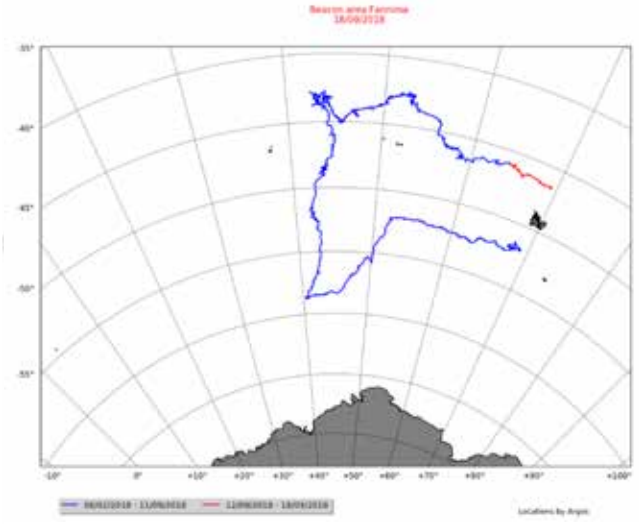


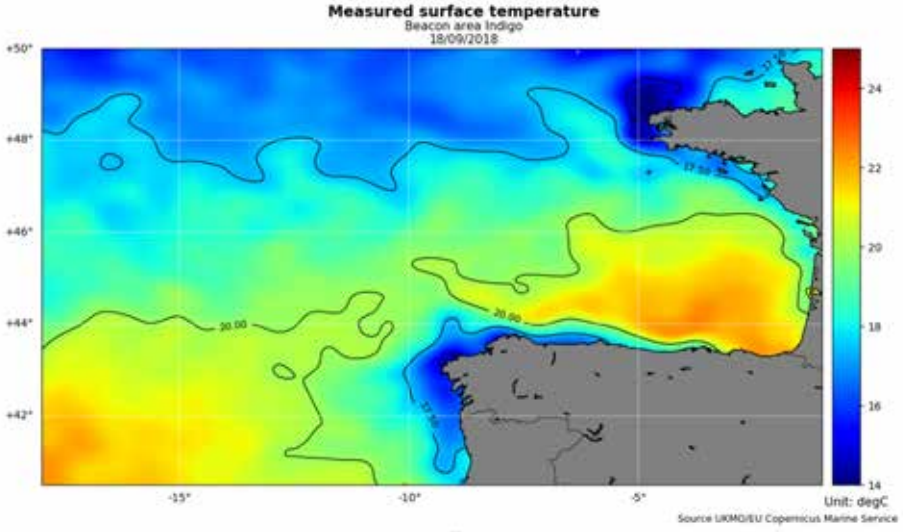
Argonautica new processings

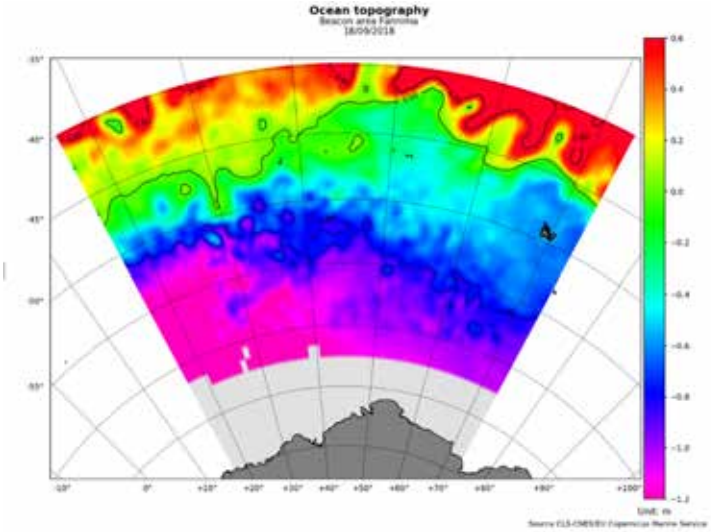
Complete re-coding
of the location formatting
& mapping code
→ nicer plots
→ easier to reprocess
→ easier to maintain &
have evolved

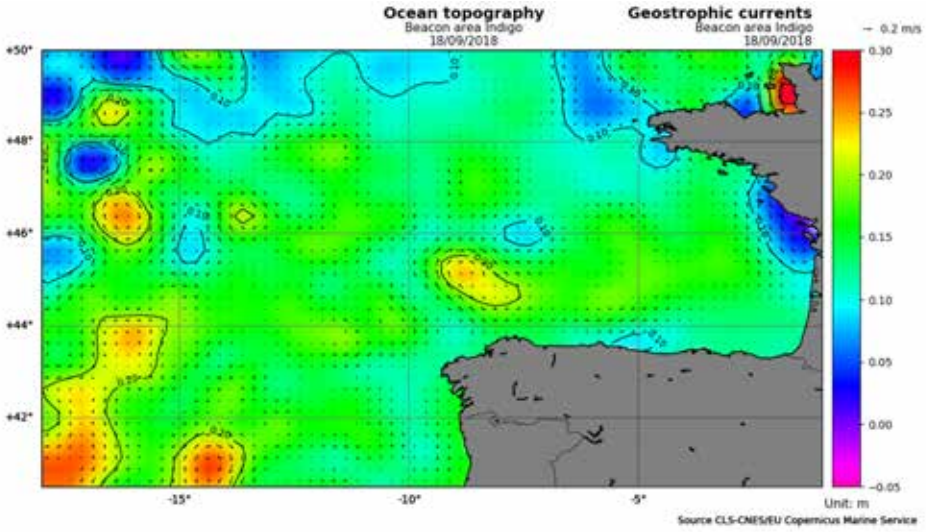
Taking into account
teachers' feedbacks,
our operational experience &
the evolutions of the use of
those maps & locations.

Opening soon (today?)





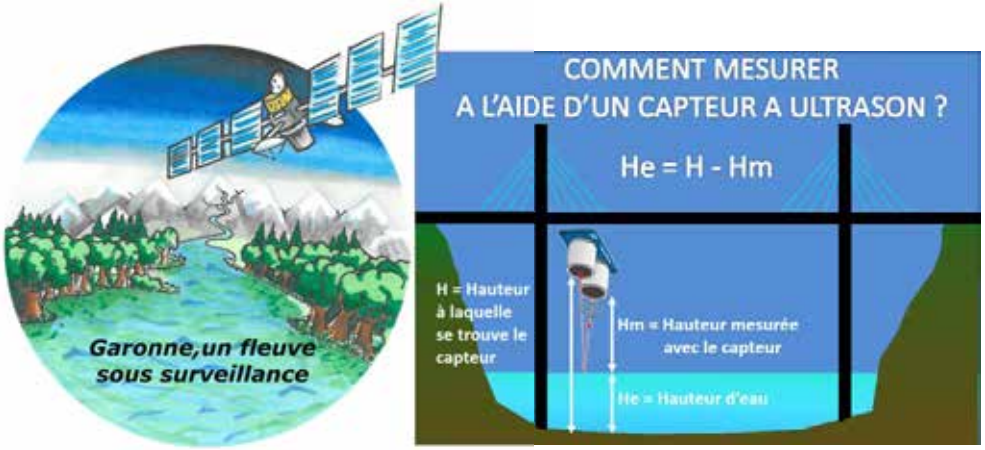




What else is new/upcoming in Argonautica

"ArgoHydro"

Study, with satellites or experimental buoys, the impacts of environmental and climate variations on the water resources of our planet.



Argonautica enquiries

A new section to pinpoint potentially interesting points to teachers

With ideas of what to look at, with what to compare / complement

Presented with the *clichés* of a police investigation (interrogation of the suspect, neighborhood investigation, suspect background, expert advice…)

More complete English version (2019)

SWOT Applications

See swot.jpl.nasa.gov/applications

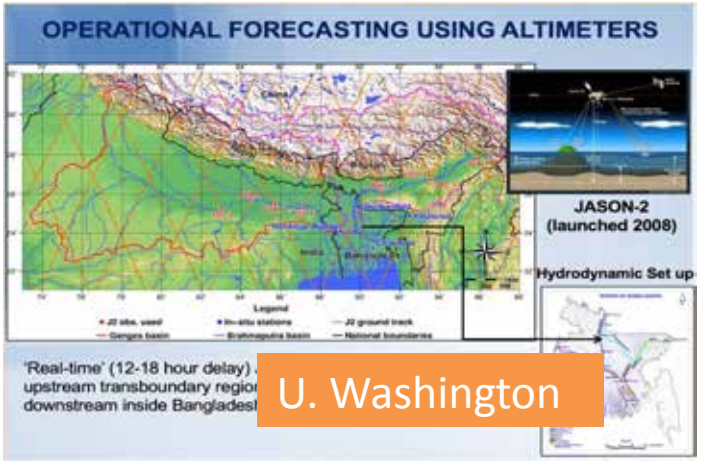
SWOT will provide valuable services to decision makers and national-regional organizations focused on addressing global disaster risk reduction, and potential science-based mitigation activities for water resources challenges. With the surface water measurements anticipated from SWOT, a broad range of applications may inform inland and coastal managers and marine operators of onshore and offshore conditions and currents relevant to their regions.

- NASA & CNES collaboration
- Applications workshops (x2)
- SWOT Applications Working Group
- 11 Early Adopters
- Engage/expand altimetry user community
- Hydrology & oceanography user engagement

SWOT Applications Program highlights;

- **Joint, international applications program for NASA Applied Sciences Program**
- **International working group (SAWG)**
- **Joint/Coordinated plans, communications, & user workshops**

Jason-Missions Applications



Altimetry Missions Applications Program highlights;

- 25+ year history of societal benefits

- International Steering Committee

- Altimetry Applications Plan

- Communications & User Workshops

Plan Focus—practical (not research-oriented) applications;

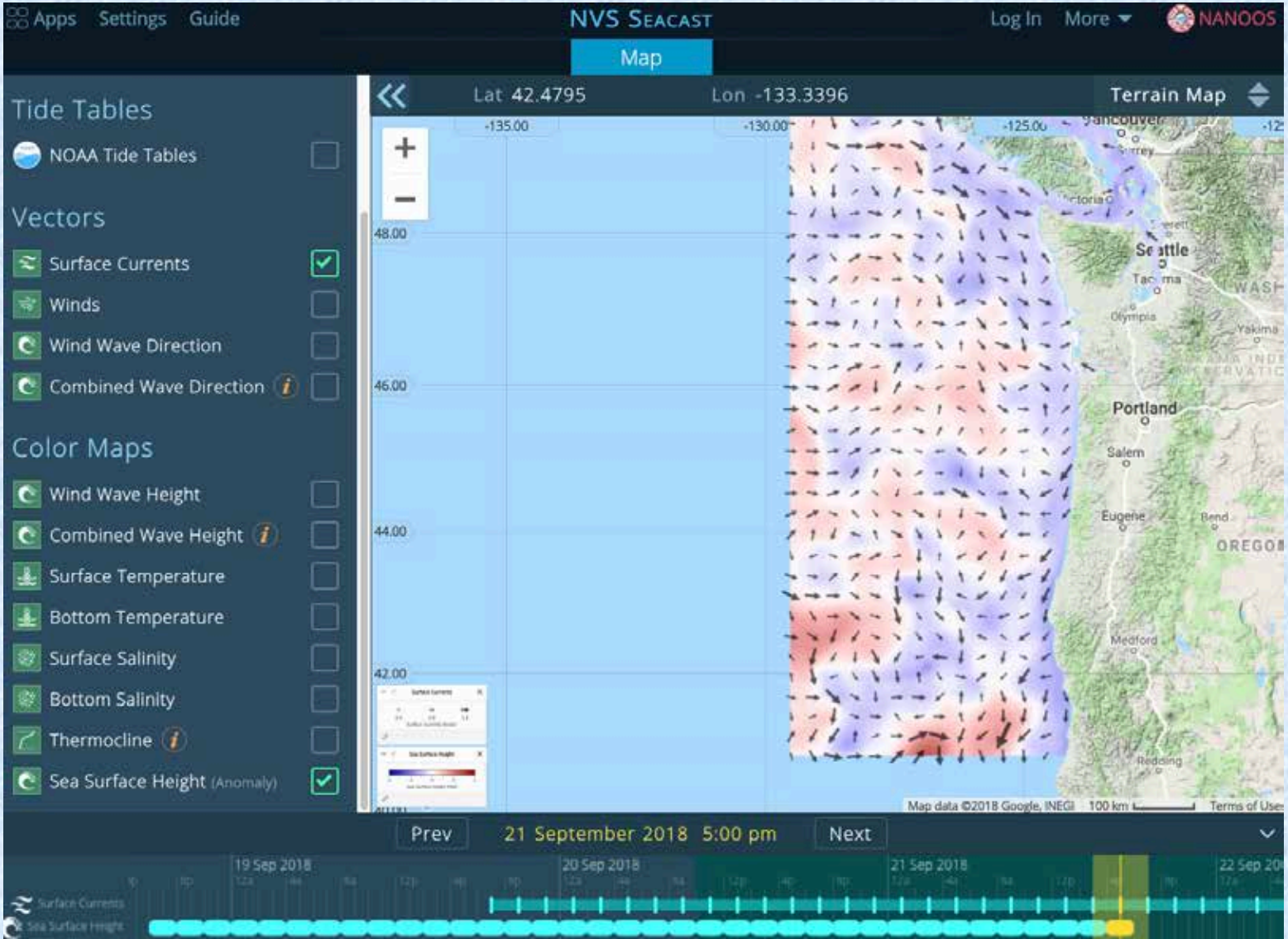
- End-user focused; challenge—effectively connect to end-users
- Ocean practical applications – biological, wind/waves, coastal, SAR/hazards, ocean weather events
- Land hydrology practical applications
- Mission partner activities – NOAA, CNES; ESA; Eumetsat

Besides significant research contributions of altimetry time series, it has also contributed valuable information and services to decision makers and national-regional organizations focused on addressing global disaster risk reduction, and potential science-based mitigation activities for water resources challenges. This new effort will highlight these valuable contributions of societal benefits in a systematic and structured way, including updated web access to information and data products, training, and participation at key meetings and conferences.

See poster; ODS003, deCharon, et al.

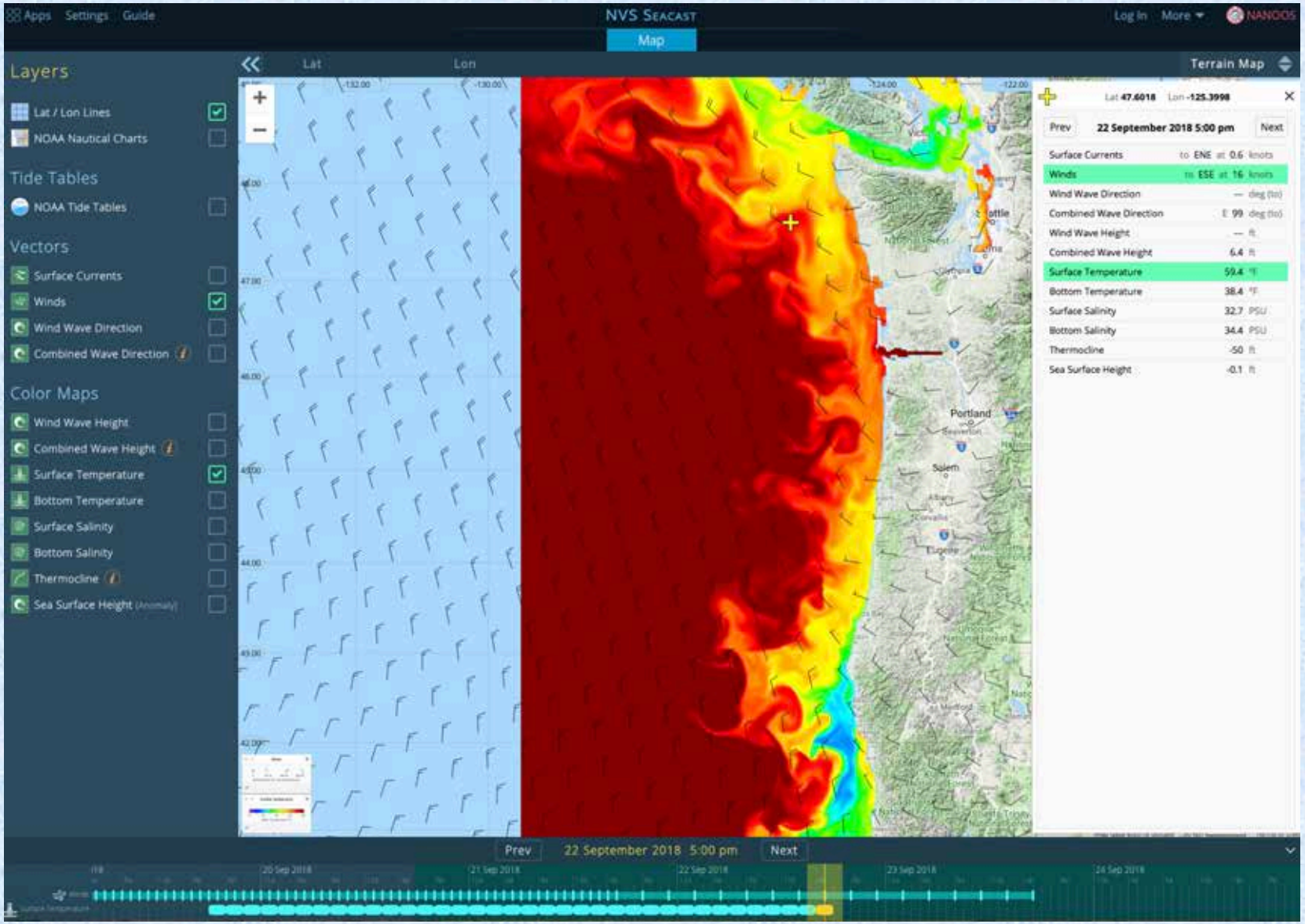
Outreach at Oregon State University – Seacast: A Data-Assimilating Ocean Forecast Viewer

- Alexander Kurapov: Experimental 3-day forecast model assimilating altimeter SLA, SST and HF Radar Velocities
- Ted Strub, Flaxen Conway: A web page designed with fishermen to make a subset of forecast fields available to fishermen and other end-users. The design has been transferred to the NANOOS Visualization System, at the Pacific NW IOOS node: nvs.nanoos.org/seacast . Model Sea Surface Height Anomalies, filtered to remove tidal signals and retain mesoscale eddies, is one of the fields requested by the fishermen (below).



Outreach at Oregon State University − Seacast: A Data-Assimilating Ocean Forecast Viewer

- The Seacast menu (left) allows the viewer to choose one color map and overlay this with one vector field (here choosing SST and winds). It also allows the user to click on a location and get the actual values from the model at that location (the yellow cross on the map). Here the forecast for 22 Sept 5PM is examined on 20 Sept 5PM.



Climate data - on your hands!

The **Climate from Space App for iPad and Android tablets** visualises data from the ESA Climate Change Initiative accompanied by relevant text, plots and animations

A useful, ready-to-use tool to:

- View and compare data sets
- Visualise plots of the many climate indicators (temperature, CO2, **sea level**, sea ice extent, biomass…)
- Showcase the richness of information available in the CCI Data Portal
- Truly and quickly **engage with public, policymakers and climate stakeholders**

For iPad: tinyurl.com/y8uy4yxf
For Android tab: tinyurl.com/y9btdaqp
Also on Mac/Windows: cci.esa.int/content/tablet-app