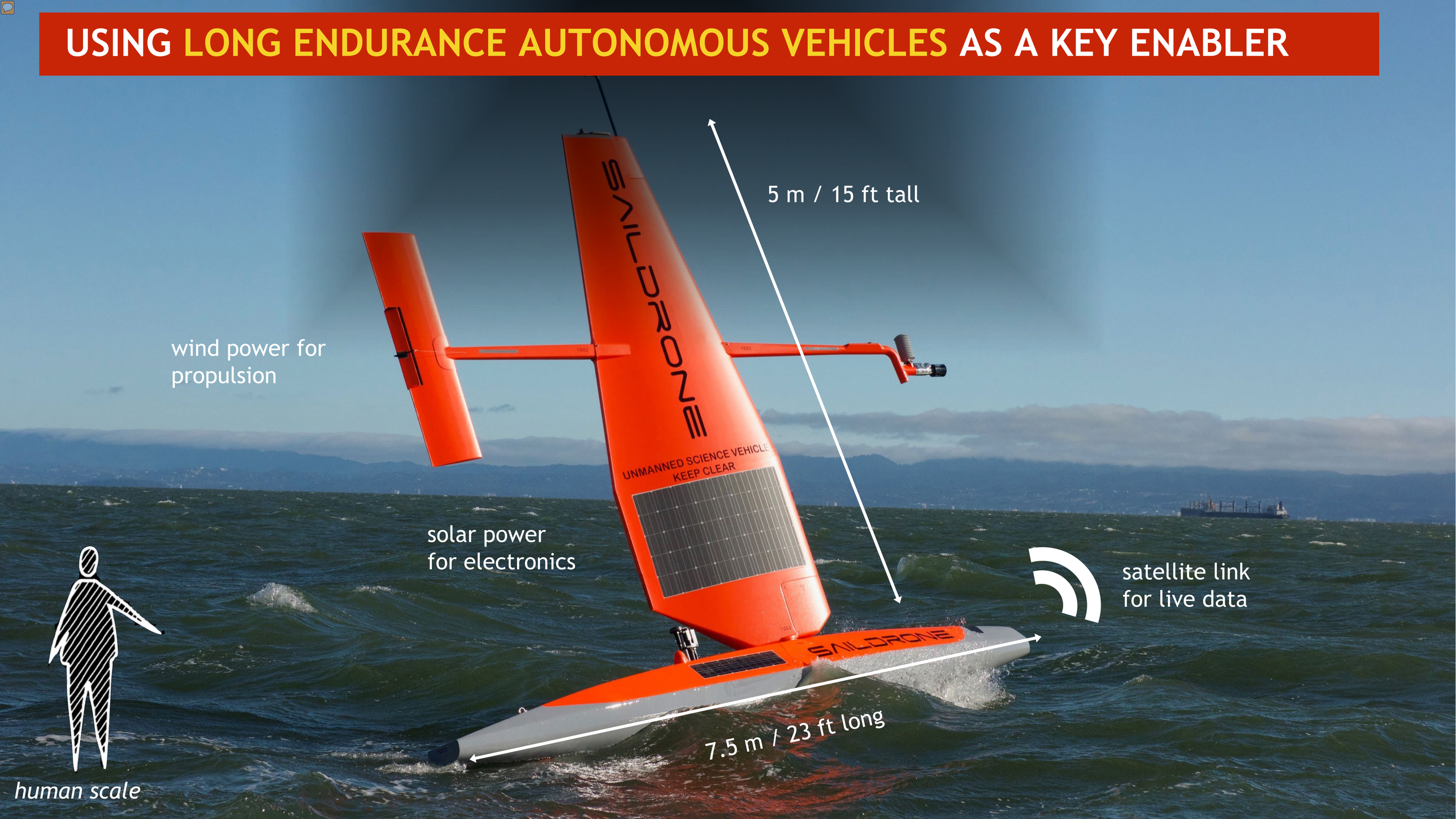
TOWARDS THE QUANTIFIED PLANET USING UNMANNED SURFACE VEHICLES

TROY M. BERTRAM, CRO

SAILDRONE

USING LONG ENDURANCE AUTONOMOUS VEHICLES AS A KEY ENABLER



DEMONSTRATED MISSIONS DURATION OF UP TO 12 MONTHS

Atmospheric Measurements

- Wind Speed
- Wind Direction

1 **Anemometer @ +5 m**
Gill Windmaster 3D ultrasonic 20Hz

- Radiation

2 Photosynthetically active radiation (PAR) @ +2.2 m
Li-Cor LI-192SA

3 Sunshine Pyranometer @ +2.2 m
Delta-T Devices SPN1

4 Pyranometer @ +2.2 m
Eppley PSP & PIR

- Air Temperature
- Relative Humidity

5 **Meteorological Probe @ +2.2 m**
Rotronic HC2 - S3 with rad shield

- Pressure

6 **Digital Barometer @ +0.2 m**
Vaisala BAROCAP PTB210

- pCO_2

7 **Atmospheric pCO_2 @ +0.2m**
PMEL MAPCO$_2$

Physical Measurements

- Wave Height & Period

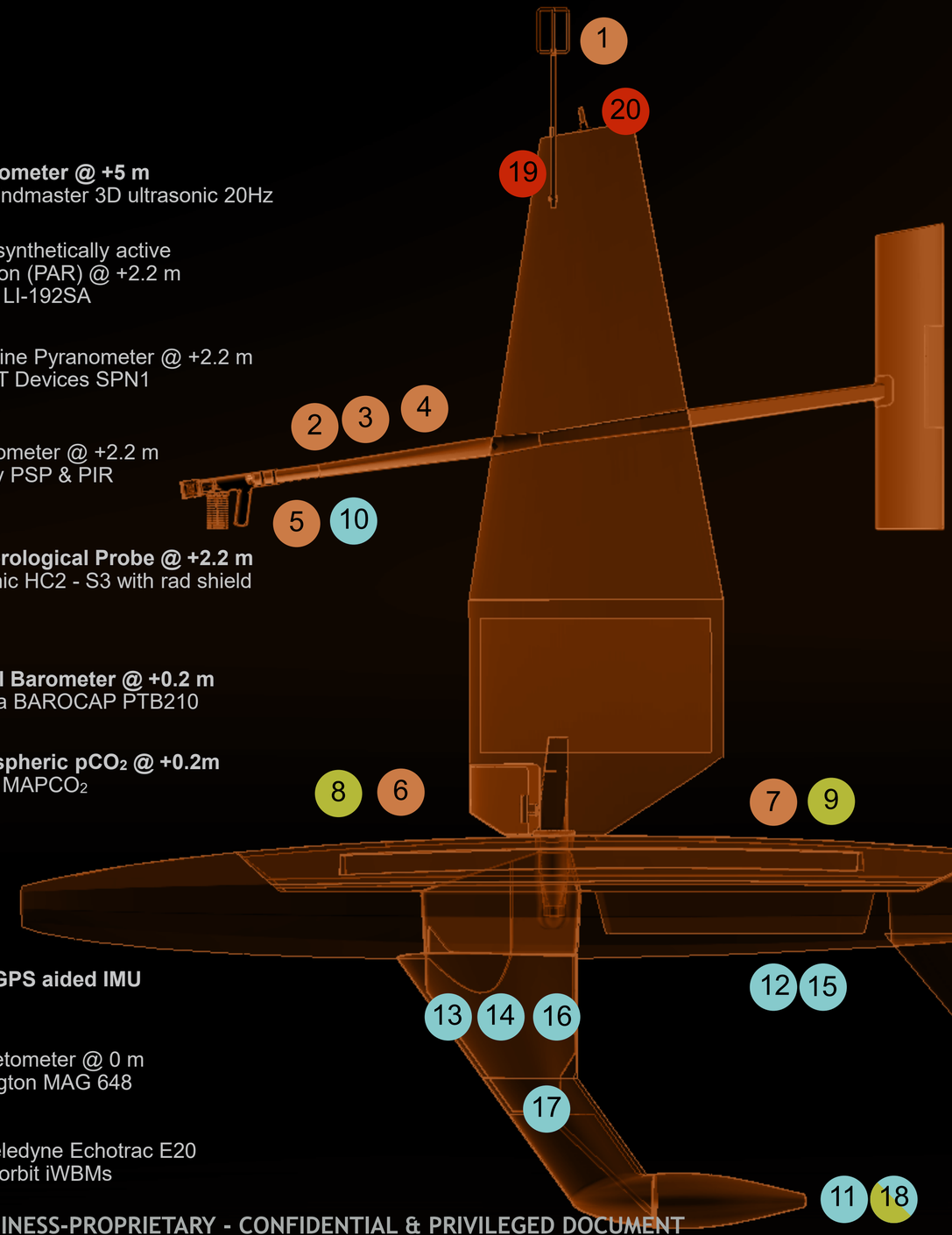
8 **Dual GPS aided IMU**

- Magnetic Field

9 Magnetometer @ 0 m
Barrington MAG 648

- Bathymetry

18 SB: Teledyne Echotrac E20
MB: Norbit iWBMs



Ocean Measurements

- Skin Temperature

10 **SST IR Pyrometer @ +2.2 m**
Heitronics CT15.2

- Ocean Currents

11 **ADCP @ -0.2 m**
Teledyne RDI Workhorse 300 kHz

- pH

12 pH Sensor @ -0.5m
Honeywell Durafet

- Chl - *a*
- CDOM Concentration
- Red Backscatter

13 **Fluorometer @ -0.2 m**
RBR Chl-a Fluorometer or
Seabird Scientific WET labs
Eco Triplet

- Dissolved Oxygen

14 **Oxygen Optode @ -0.5 m**
Aanderaa 4831 or RBR DO

- pCO_2

15 Dissolved pCO_2 @ -0.5 m
PMEL MAPCO$_2$

- Water Temperature
- Salinity

16 Thermosalinograph @ -0.5 m
RBR CTD or
Teledyne RDI Citadel TS-NH
or Sea-Bird Scientific CTD

- Marine Mammal Acoustics

17 Passive Acoustic Recorder
Acousonde

- Fish Biomass

18 SIMRAD Echo Sounder @ -2.5 m
SIMRAD EK80 (WBT Mini)

- AIS

19 Class B AIS Transceiver

- Camera Array

20 Saildrone M/L Camera Array
with onboard GPU processing

SAILDRONE IS FULFILLING A WIDE RANGE OF MISSION OBJECTIVES

MARITIME DOMAIN AWARENESS

Monitor illegal traffic in any area

core sensors
+
AIS
Smart cameras

BATHYMETRY

Accurate charting for safe surface and sub-surface navigation

core sensors
+
multi-beam echo sounders
sound velocity profile

METOCEAN

improve forecasting or satellite cal/val

core sensors
+
ADCP
radiometers

FISH BIOMASS

Manage sustainable fisheries

core sensors
+
echo-sounder

EMERGENCY RESPONSE

Detect and track oil seeps and spills

core sensors
+
oil detector
echo-sounder

SURFACE FLUXES

Heat and Carbon fluxes (air-sea interaction)

core sensors
+
pCO2
pH

ANIMAL TRACKING

Track tagged fish and mammals

core sensors
+
acoustic tag receiver
hydrophone

DATA RELAY

Harvest data from seabed sensors

core sensors
+
acoustic modems
long range radio

RIGOROUSLY TESTED DATA QUALITY BY EXTERNAL COLLABORATORS

“Comparisons with shipboard measurements showed good agreement, inspiring confidence in these new instrument platforms.”

THE USE OF SAILDRONES TO EXAMINE SPRING CONDITIONS IN THE BERING SEA: INSTRUMENT COMPARISONS, SEA ICE MELTWATER AND YUKON RIVER PLUME STUDIES.

“The Saildrones performed well in the harsh conditions of the Bering Sea and demonstrated the potential of this innovative platform to advance ecosystem research.”

ADVANCES IN ECOSYSTEM RESEARCH: SAILDRONE SURVEYS OF OCEANOGRAPHY, FISH, AND MARINE MAMMALS IN THE

“A platform that is ready for ocean research missions from the tropics to the Arctic.”

"THE USE OF SAILDRONES TO EXAMINE SPRING CONDITIONS IN THE BERING SEA: VEHICLE SPECIFICATION AND MISSION PERFORMANCE," OCEANS 2015 - MTS/IEEE WASHINGTON, WASHINGTON, DC, 2015, PP. 1-6.

AT-SEA PROCESSORS ASSOCIATION
Partners for Healthy Fisheries

Workshop on Sustaining Ocean Observations

Private Sector Interests and Opportunities to Support Observations

Stephanie Madsen, Executive Director
Juneau, Alaska
September 18, 2020

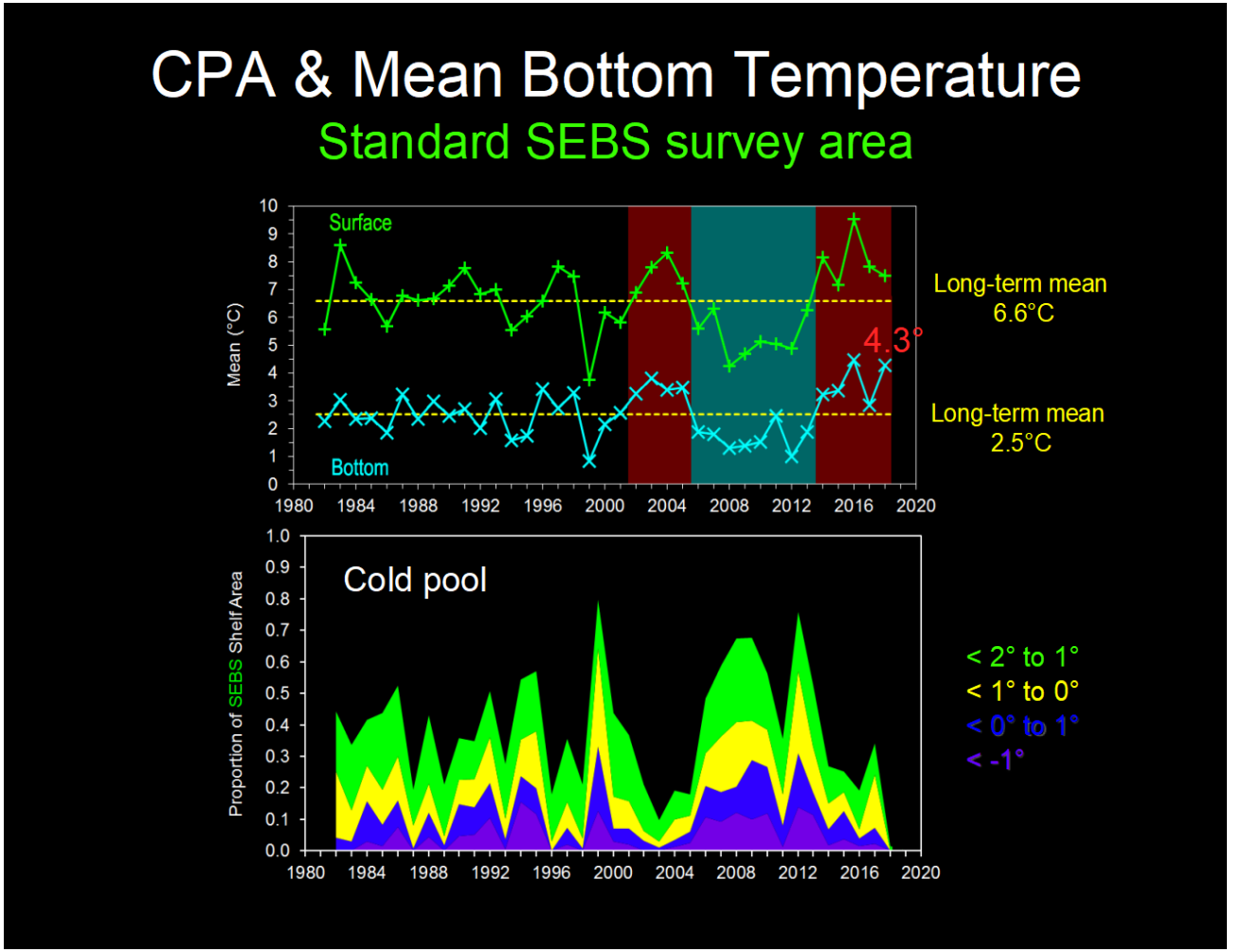
www.atsea.org

At-sea Processors Association - Who are we?

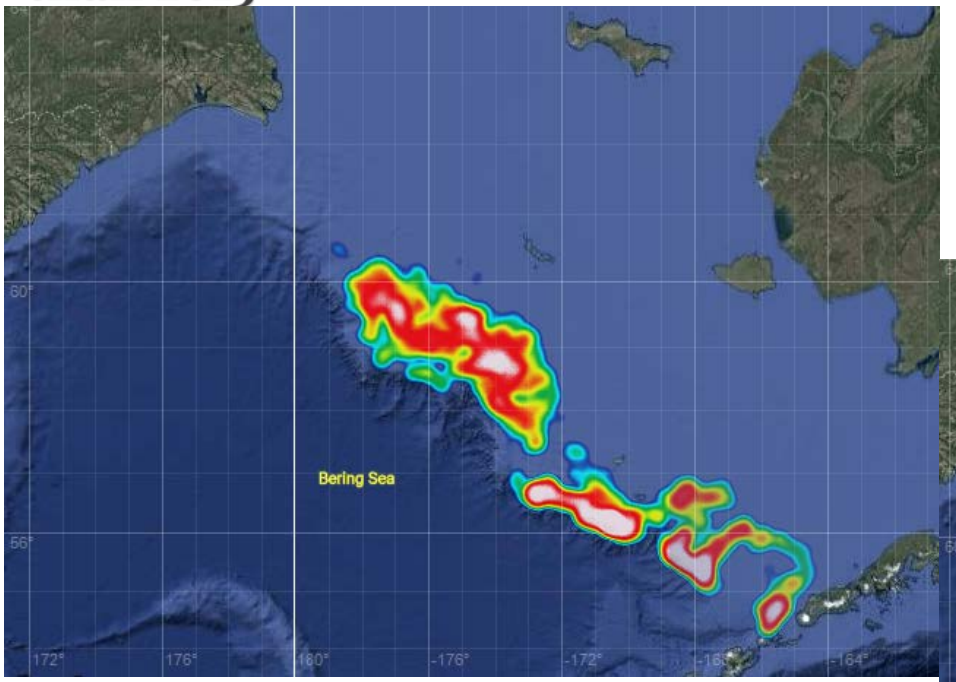
Aleutian Spray Fisheries
American Seafoods Company
Arctic Storm, Inc.
C/P Northern Hawk
Glacier Fish Company
Trident Seafoods Corporation

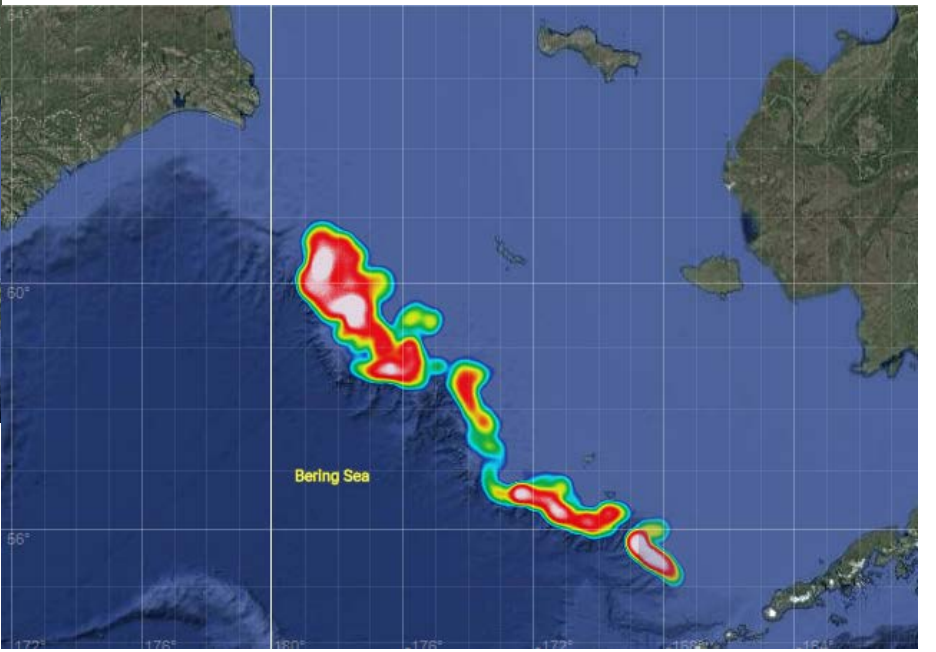
POLLOCK CONSERVATION COOPERATIVE

Why we care about ocean observations……

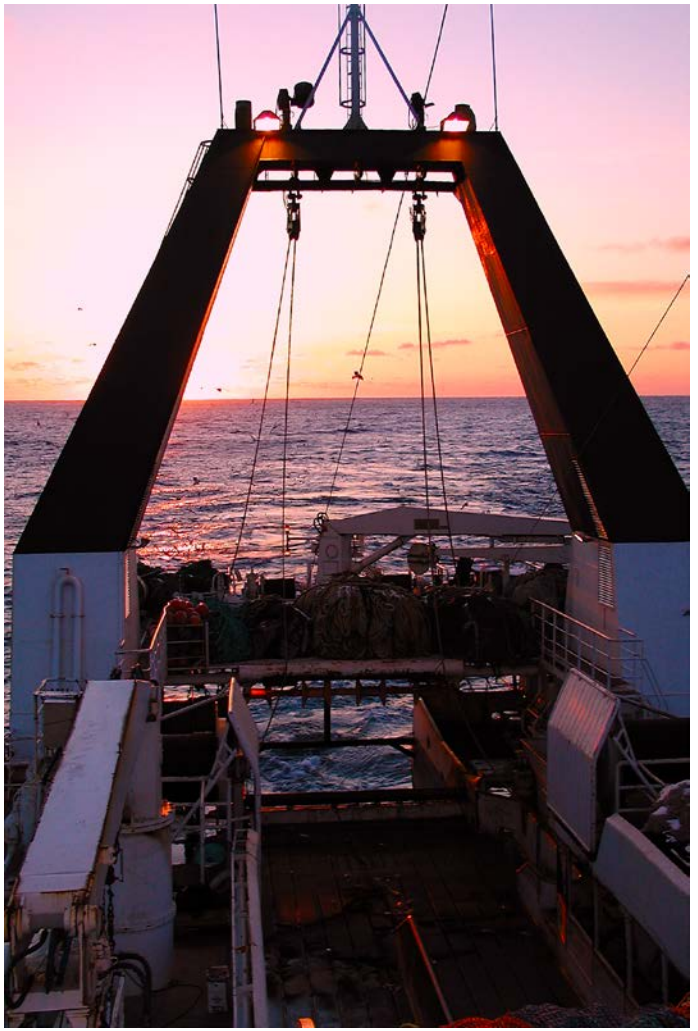


Distributional Shifts- Fishery moving too? 2018 (WARM YEAR) B-season CP fishery—MORE fishing in SE Bering than 2013





Distributional Shifts- Fishery moving too? 2019 (WARM YEAR) B-season CP fishery—Fishery primarily along the shelf break



Summary Thoughts:

- Need for regional level projects
- Clear alignment of goals
- Demonstrated value to private sector partners
- Careful that funding does not replace Federal obligations.

Amazon Sustainability Data Initiative

promoting innovation and problem solving

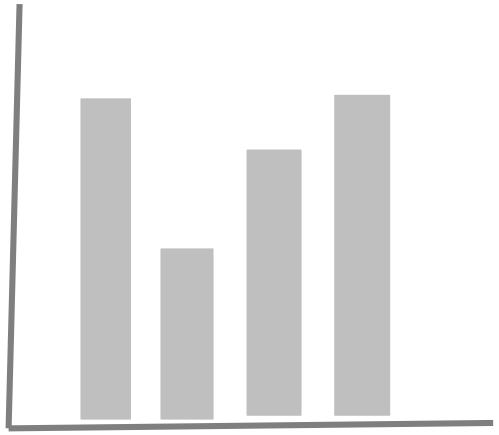
Ana Pinheiro Privette, PhD
Amazon Sustainability Data Initiative, *Lead*
apprivet@amazon.com

sustainability

aws

Amazon Sustainability Data Initiative

building an ecosystem for change

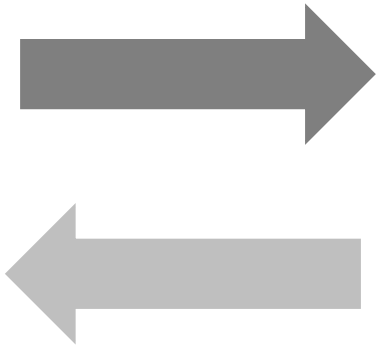


democratize access to

data

enable access to

analytics



promote

knowledge exchange

SINERGISE NCAR DigitalGlobe NOAA Met Office NASA NREL UCAR COMMUNITY PROGRAMS unidata esri THE SCIENCE OF WHERE qed

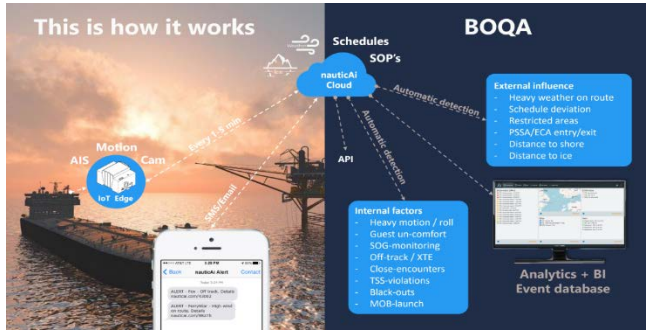
sustainability

aws

Promoting innovation by removing barriers to experimentation

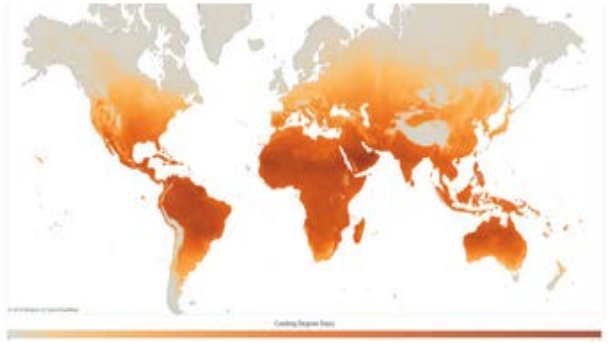
Solcast: Solar irradiance forecasting for the solar powered future

Maritime Operations – Automating Operational Quality Assurance with AWS and Open Data

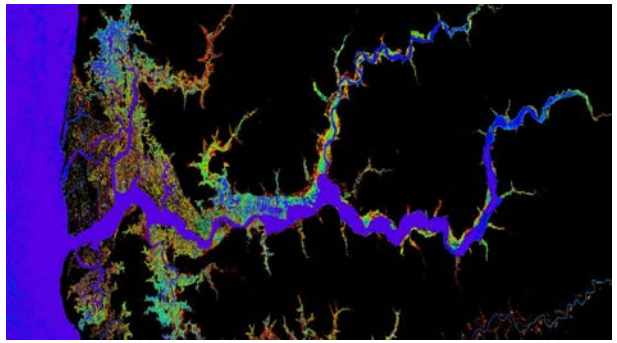


Geo-Diverse Open Training Data as a Global Public Good

Using the AWS Cloud to restore ecosystems around the world



Leveraging the cloud for rapid climate risk assessments



Digital Earth Africa: Enabling insights for better decision-making

Summary:

The Amazon Sustainability Data Initiative (ASDI) significantly reduces the cost, time, and technical barriers associated with analyzing large datasets to generate sustainability insights. Specifically,

- Provides access, at no cost, to foundational datasets through the ASDI Data Catalog
  Visit the ASDI Data Catalog: https://registry.opendata.aws/collab/asdi/
- Covers the storage and egress costs for datasets accepted into the Open Data Sponsorship Program
  Visit: https://aws.amazon.com/opendata/open-data-sponsorship-program/
- Offsets the cost of cloud-based experimentation by providing access to cloud credit
  Apply for cloud credit here: https://aws.amazon.com/earth/research-credits/
- Encourages costumers to share their knowledge and code wit others
  See customer use cases here: https://aws.amazon.com/blogs/publicsector/tag/asdi/
- For more information about the Amazon Sustainability Data Initiative (ASDI)
  Contact: Ana Pinheiro Privette | ASDI Program Lead |apprivet@amazon.com

sustainability

aws

OCEANX

Ocean Exploration and Innovation

July 16, 2020

Who We Are

OceanX is on a mission to explore the ocean and bring it back to the world to drive deeper understanding, excitement, and protection through cutting-edge science and captivating media.

OCEANX

What We Do

THE SHIP

Equipped with next-gen science, including submersibles, labs, and ROVs, OceanXplorer is a state-of-the-art research and media vessel

STORYTELLING

Through social media, exhibits, and featured discoveries on documentary series like Blue Planet 2, we educate, inspire, and drive positive change for the oceans

SCIENCE

Using technologies like ROVs, AUVs, submersibles, and state-of-the-art laboratory and imaging facilities, we empower scientists to increase knowledge and understanding of the oceans

IMPACT

With partnerships and collaboration, we've discovered 83 species, amassed over 1.25m followers, and continue to make scientific breakthroughs

OCEANX

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For more, follow us on social media and explore
OceanX 2019 Annual Report