

# Saildrone Development for Science and Operations

## from the Arctic to the Tropics

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**THE SAILDRONE-PMEL PARTNERSHIP** started in 2014 with a CRADA to develop USV technology for high quality ocean and atmosphere sampling. PMEL provided engineering expertise on sensors and sampling schemes and Saildrone provided USV hardware and software expertise.

The Saildrone is a solar and wind powered ocean unmanned surface vessel (USV) developed by Saildrone Inc. in partnership with the NOAA Pacific Marine Environmental Laboratory (PMEL). This platform is approximately twice as fast as similar USVs, carries a large payload capacity (~200 lbs), and is equipped with four high-throughput solar panels. The speed, size, and power capacity of the Saildrones extend the operational potential of USVs to cover large areas, safely access remote regions, and operate over long periods of time.

Saildrones can be launched and recovered dockside and are remotely controlled from shore, requiring no ship time and limited advance scheduling. This enables adaptive deployments that can adjust to seasonal conditions and target anomalies as they arise. Data can also be transmitted in real time through a user-friendly interface, enabling researchers to responsively target important features as they are observed or as scientific priorities evolve.

The adaptability of the Saildrone platform is a game-changing benefit for cross-Line Office and multidisciplinary collaboration. Onboard sensor suites can be adjusted to meet mission-specific needs across a broad range of applications, and given the size and power capacity of the Saildrone, multiple USV missions can now be combined.

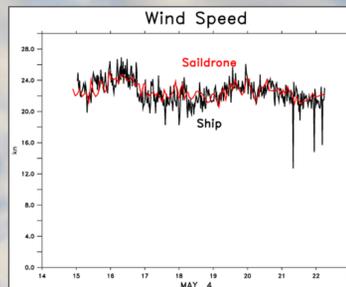
## RESEARCH TO OPERATIONS



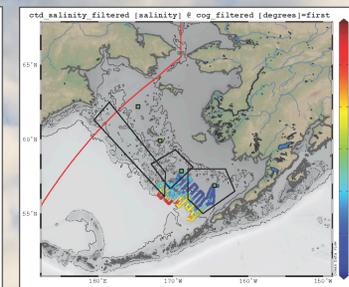
Engineering Development & Sensors (CRADA)



Operations & Field Test Planning



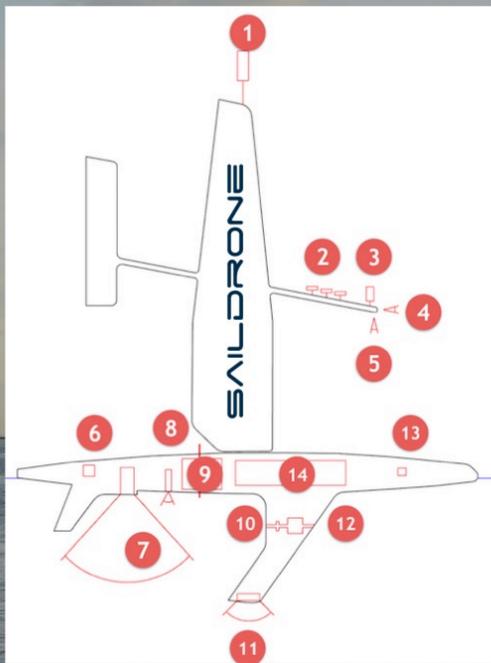
Validation of Data



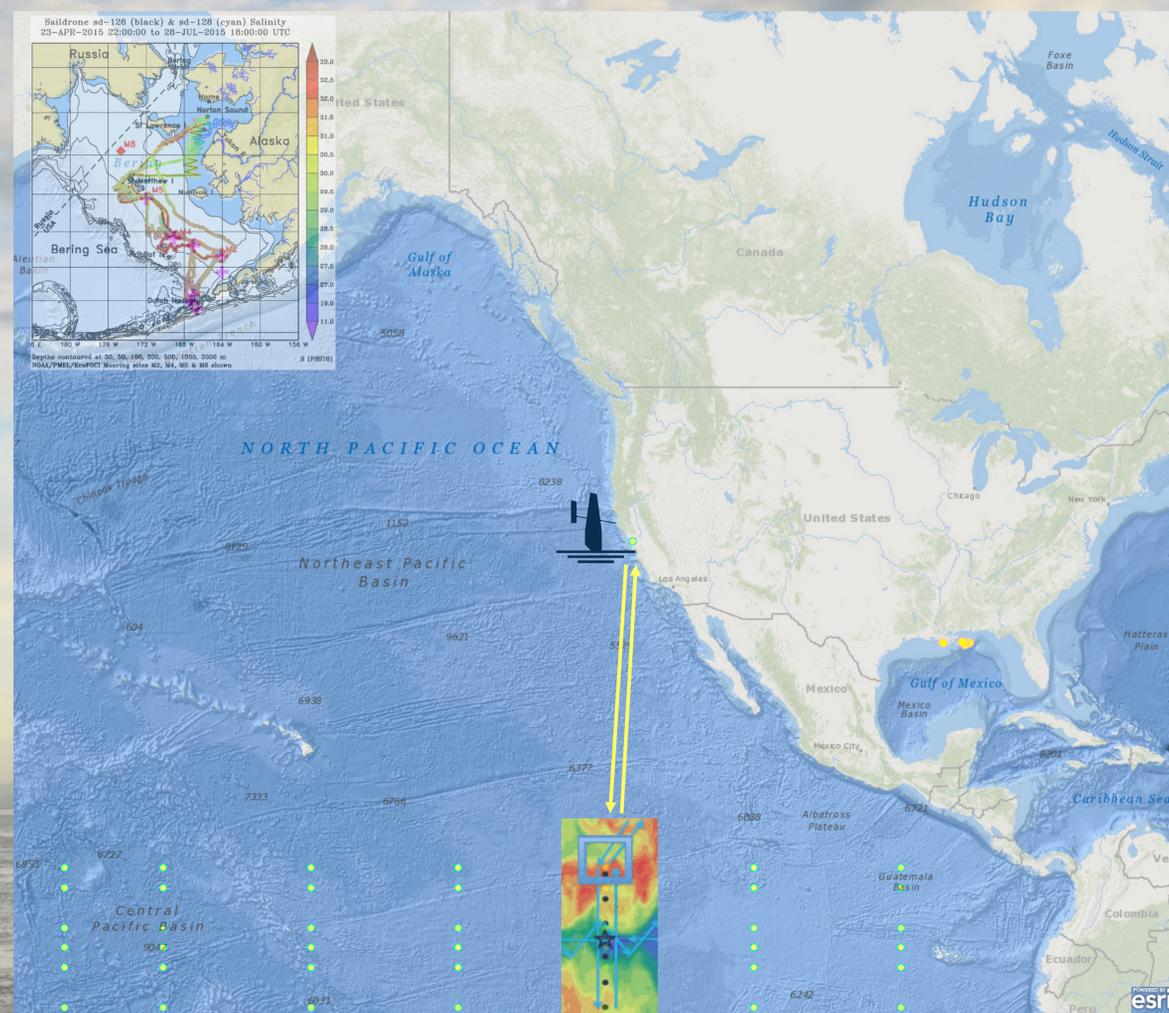
Integrated Research Missions



Transition to Operations



1 Anemometer @ 4.5m Windmaster 3D ultrasonic 20Hz	6 Barometric Pressure Viasala PTB210	11 Wide Band Acoustic Transducer SIMRAD EK60
2 Long & Shortwave Radiometers Sunshine Pyranometer	7 ADCP 150kHz Phased Array	12 Thermosalinograph @0.5m Teledyne
3 AT/RH @ 2.2m Rotronic HC2 - 53 w/ rad shield	8 Fluorometer @2m Wetlabs (Chl., CDOM, Fluor., backscatter)	13 Magnetometer Barrington MAG 648
4 Wide angle camera - 4 forward, aft, left, right	9 pCO2 PMEL MAPCO2	14 Guest Payload 250lb capacity
5 IR Pyrometer KT15 II for SST	10 Dissolved Oxygen @0.5m Teledyne	



2016 SAILDRONE MISSION PATCH



### INNOVATION

- ✓ Enables new research
- ✓ No research vessel required
- ✓ More efficient shiptime
- ✓ Extended duration of surveys
- ✓ Increased area of survey region
- ✓ Real-time adaptive sampling
- ✓ High-latitude capable
- ✓ Large payload capacity
- ✓ Large renewable power source



### EFFICIENCIES

- Saildrone is big, fast & durable - extending the observation, monitoring and research of:
- ✓ Weather & Climate
  - ✓ Ecosystems
  - ✓ Oil Spills & Seeps
  - ✓ Fisheries
  - ✓ Protected & Endangered Species
  - ✓ Hydrographic Surveys



### BENEFIT TO SOCIETY

- Monitoring of the Weather, Oceans, Coasts and Climate leads to:
- ✓ Informed Decision Making
  - ✓ Better Weather Forecasts & Warnings
  - ✓ Better Climate Forecasts
  - ✓ Food Security

### COLLABORATION

- Engineers and Researchers working together on a single mission, including these NOAA line-offices:
- ✓ Office of Atmosphere and Ocean
  - ✓ National Marine Fisheries Service
  - ✓ Office of Marine and Aviation Operations
  - ✓ National Weather Service
  - ✓ National Ocean Service
  - National Environmental Satellite, Data and Information Service

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SAILDRONE