Surface Drifters:

Global Science, Monitoring and Rapid Response

Martha Schönau, Luca Centurioni, Terri Paluszkiewicz, Lance Braasch

Scripps Institution of Oceanography's LAGRANGIAN DRIFTER LABORATORY

SCRIPPS INSTITUTION OF OCEANOGRAPHY UC San Diego

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE

Lagrangian Drifter Laboratory, Scripps Institution of Oceanography, CIMEAS

DRIFTER SCIENCE AT THE AIR-SEA INTERFACE

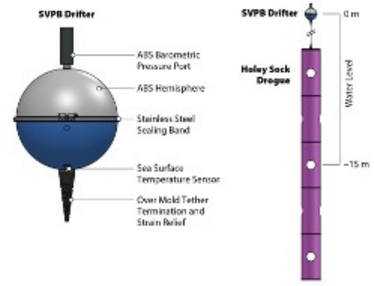
Scripps Institution of Oceanography's
LAGRANGIAN DRIFTER LABORATORY

- Wave conditions
- Ocean surface velocity

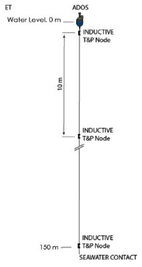
- Mixed-layer structure
- Sea level pressure

- Surface winds and
- Sea surface temperature

SVP and SVP-B

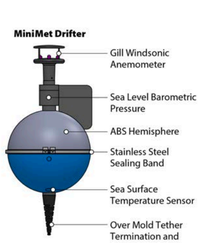


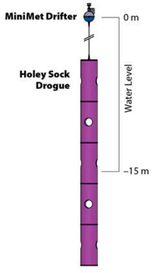
Atmospheric data and currents



ADOS

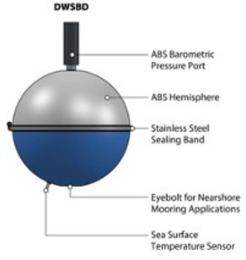
Atmospheric and Upper Ocean Heat Content





MiniMet

Atmospheric data (SLP and winds)



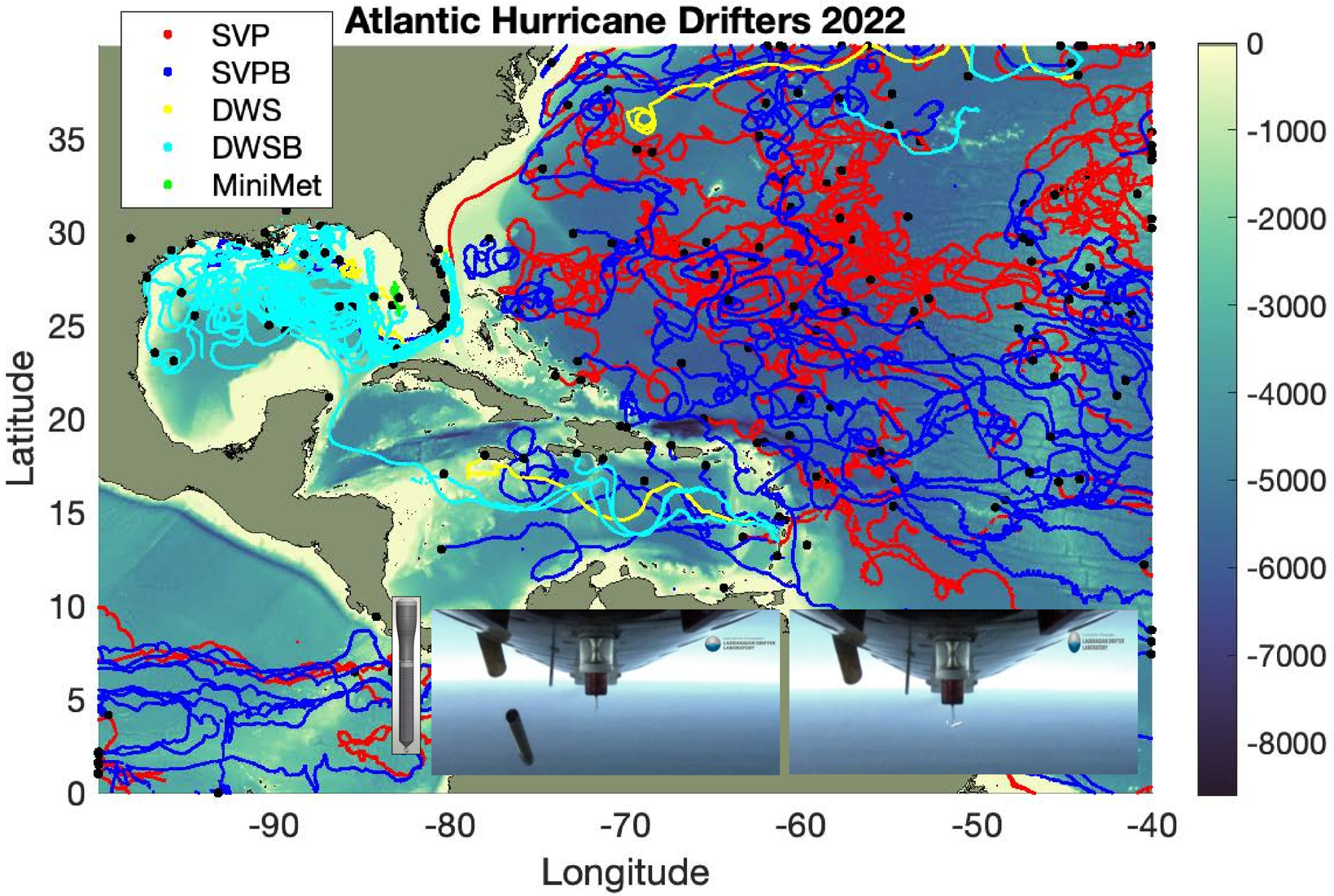
DWSD-B and A-DWS

Atmospheric data and waves

+ MORE

DRIFTERS MONITOR GLOBAL CLIMATE AND EXTREME EVENTS

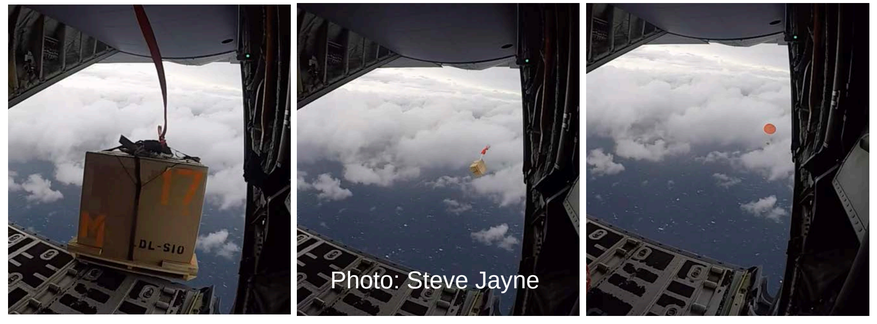
Scripps Institution of Oceanography's
LAGRANGIAN DRIFTER LABORATORY



- Further our understanding of **ocean, atmosphere and climate** by studying surface physical processes of the global ocean

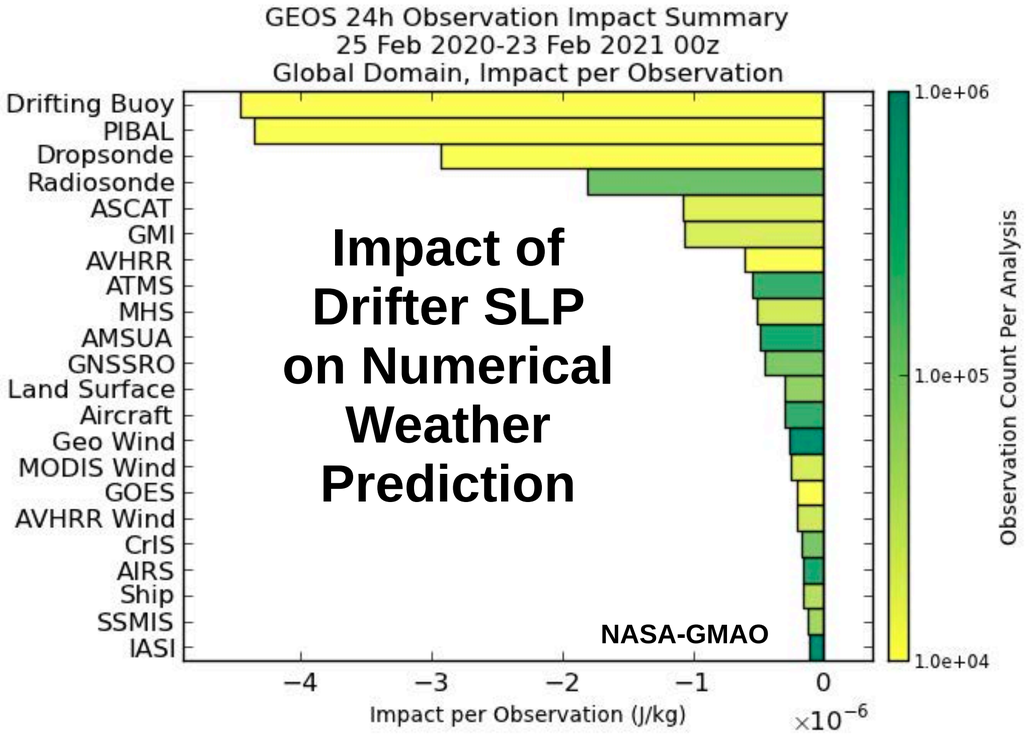
- **Maintain** a 5º x 5º array of drifters providing real-time data to the GTS with quality-controlled data archive

- **Adaptively sample** and **target** extreme events with air-deployable drifters

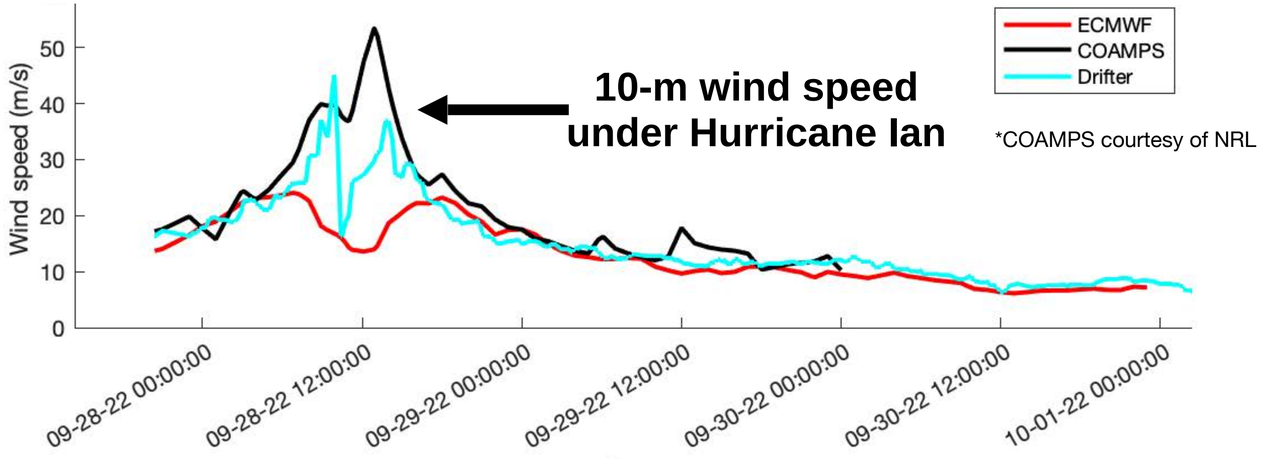


DRIFTERS BENEFIT THE PUBLIC AND RESEARCH

Scripps Institution of Oceanography's
LAGRANGIAN DRIFTER LABORATORY

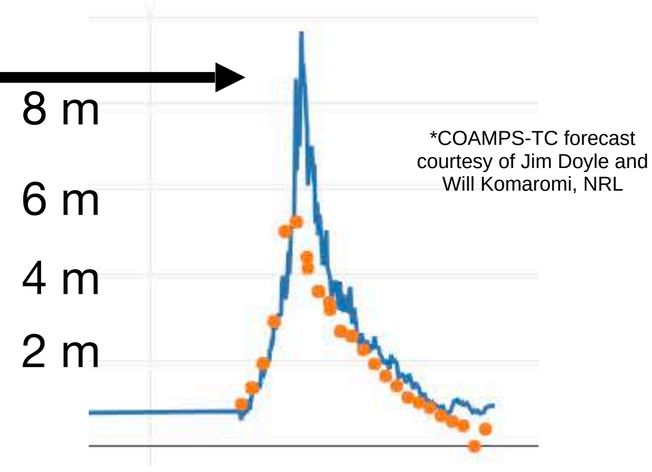


- Real-time observations delivered to Global Telecommunication System (GTS) to improve weather forecasts
- Feed into observational products and climate indices (e.g., surface currents, CalCOFI)
- Calibration and validation of models and satellites (SST, wind, waves, currents), and data assimilative studies
- Active research and instrument development



WAVEWATCH III underestimated peak wave conditions under Ian

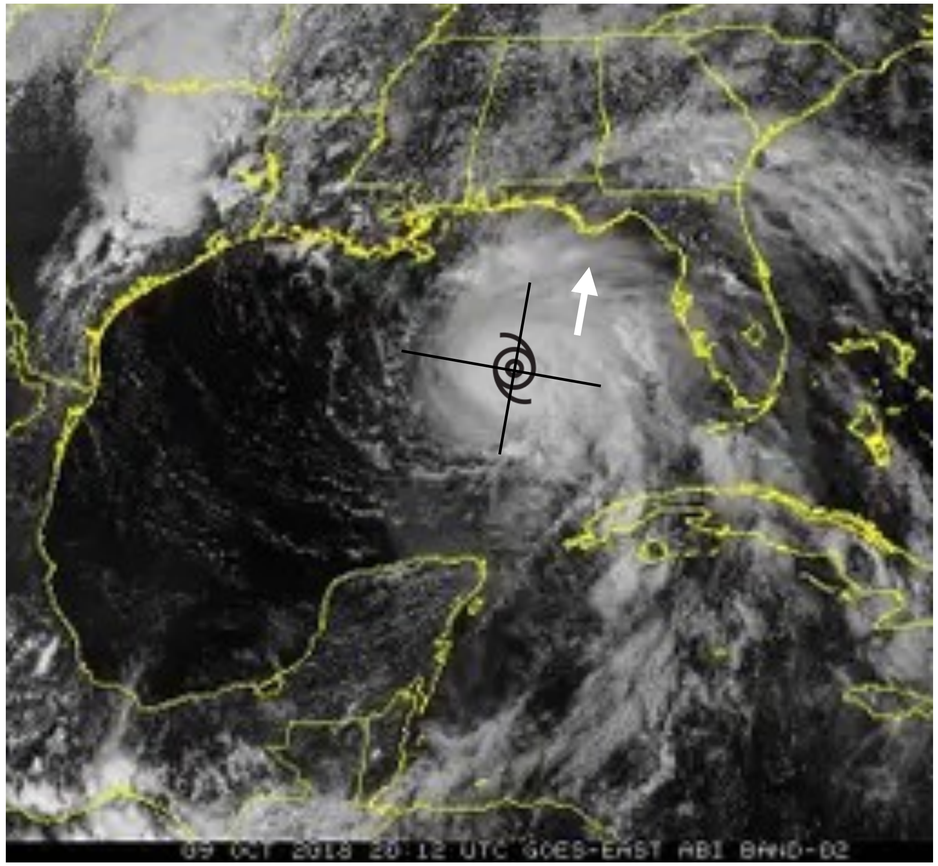
We support FAIR-O DATA!



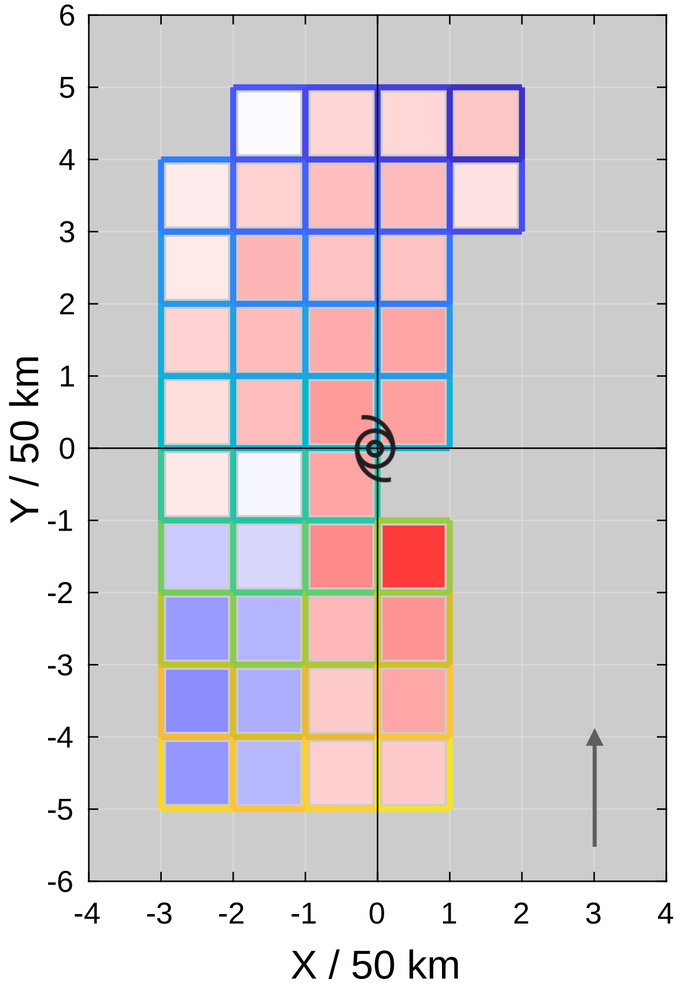
DRIFTERS BENEFIT THE PUBLIC AND RESEARCH

Scripps Institution of Oceanography's
LAGRANGIAN DRIFTER LABORATORY

Hurricane Michael (Satellite)



Wave energy (0.12-0.16 Hz) in each quadrant of the storm

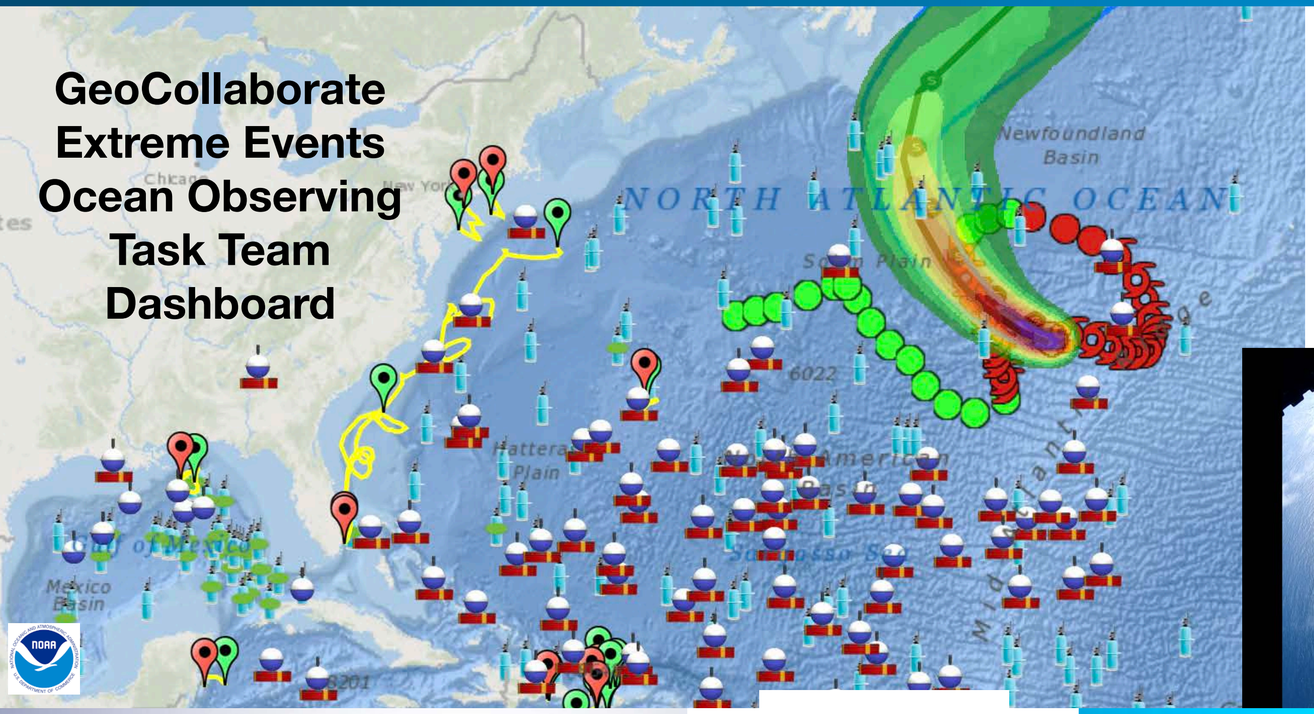


Hurricane Storm Surge Predictions

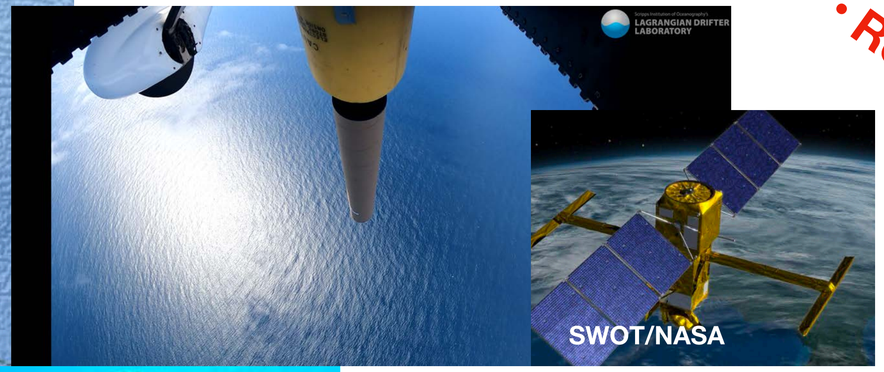
COLLABORATION AND VOLUNTEERING

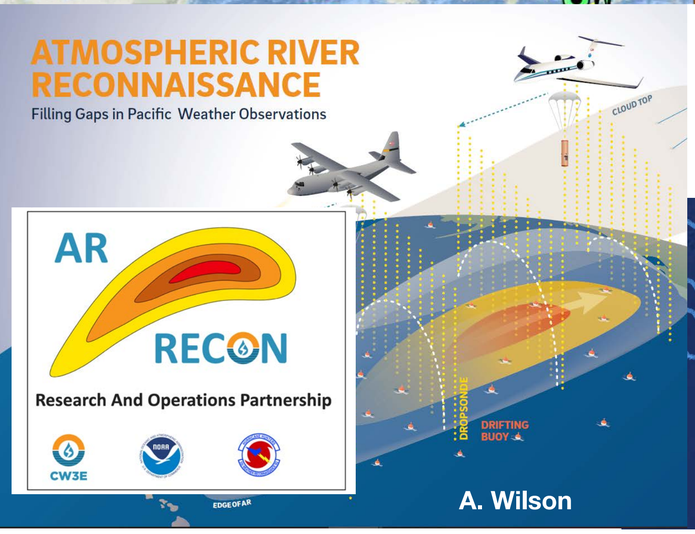
Scripps Institution of Oceanography's
LAGRANGIAN DRIFTER LABORATORY

GeoCollaborate Extreme Events Ocean Observing Task Team Dashboard



- Tropical cyclones
- Atmospheric Rivers
- Monsoons
- Buoy intercomparison
- Satellite validation
- High-latitude
- Regional process studies





A. Wilson

INCOIS
ESSO- Indian National Centre for Ocean Information Services

Pat Colin; CRRF

- Participation and leadership in the Data Buoy Cooperation Panel, the buoy component of GOOS

DBCP WMO – IOC DATA BUOY COOPERATION PANEL

SOLOMON ISLANDS GOVERNMENT
MINISTRY OF ENVIRONMENT, CLIMATE CHANGE, DISASTER MANAGEMENT AND METEOROLOGY

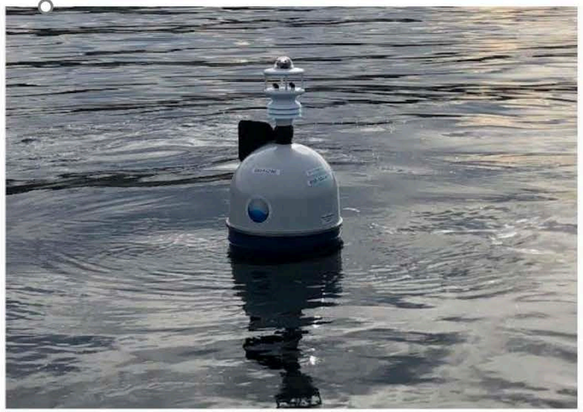
- INCOIS, Solomon Islands, Fiji, CRRF
- USACE, ONR, NOPP

TECHNOLOGICAL INNOVATION

Scripps Institution of Oceanography's
LAGRANGIAN DRIFTER LABORATORY

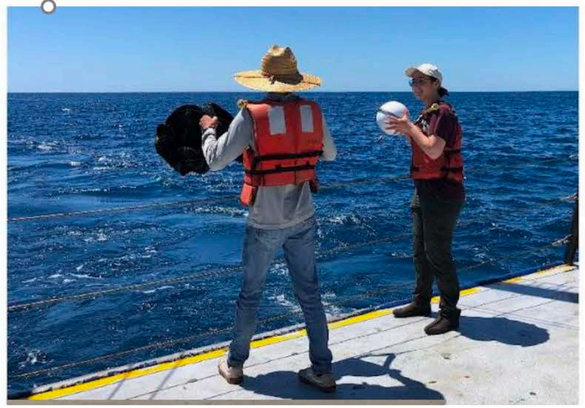
Salinity Drifters

Precipitation Drifter with Met Sensors

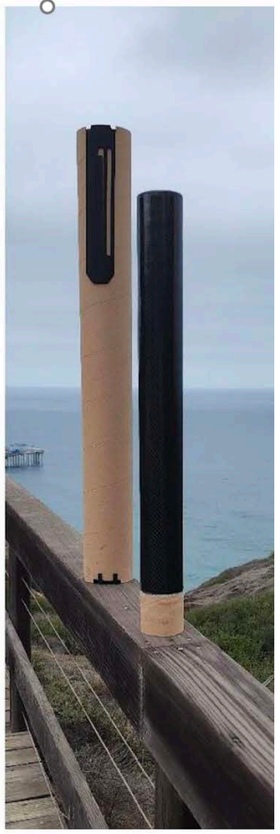


Debris Tracker

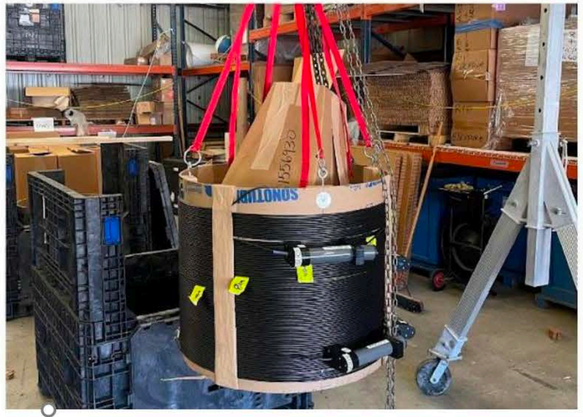
MICRO-SVP



A-DSWD



ADOS Drifter



TpPod Depth Profile Drifter

DWSBD with Mooring Kit

- Innovation for new science
- Maximizing deployment opportunities

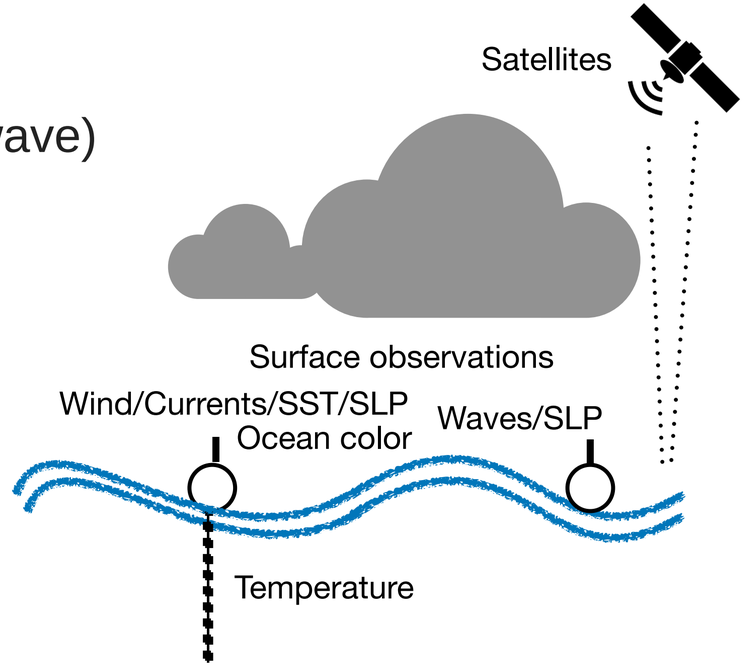
COMMUNITY DATA SHARING

Scripps Institution of Oceanography's
LAGRANGIAN DRIFTER LABORATORY

- Real-time observations delivered to Global Telecommunication System (GTS) to improve weather forecasts

- Data available from LDL ERDDAP server to include diverse drifter data (wind, wave)
  https://drifterdata.ucsd.edu/erddap/index.html

Grid DAP Data	Sub-set	Table DAP Data	Make A Graph	WMS	Source Data Files	Title	Sum-mary	FGDC, ISO, Metadata	Back-ground Info	RSS	E mail	Institution	Dataset ID
	set	data	graph			* The List of All Active Datasets in this ERDDAP *		M	background			UCSD SIO LDL	allDatasets
		data	graph			Lagrangian Drifter Laboratory at Scripps Institution of Oceanography 2019 MISO-BOB Drifter Data		F I M	background	RSS		UCSD SIO	LDL_MISOBOB2019
	set	data	graph		files	Lagrangian Drifter Laboratory at Scripps Institution of Oceanography 2022 CALYPSO DWS Drifter Data		F I M	background	RSS		UCSD SIO, OGS	CMRE_CALYPSO22_DWSD
	set	data	graph		files	Lagrangian Drifter Laboratory at Scripps Institution of Oceanography 2022 CALYPSO SVP Drifter Data		F I M	background	RSS		UCSD SIO, OGS	CMRE_CALYPSO22
		data	graph			Lagrangian Drifter Laboratory at Scripps Institution of Oceanography Drifter Data		F I M	background	RSS		UCSD SIO	LDL_DrifterData
		data	graph			Lagrangian Drifter Laboratory at Scripps Institution of Oceanography GTS Atlantic Hurricane 2021 Data		F I M	background	RSS		UCSD SIO	LDL_AtlanticHurricane2021
		data	graph			Lagrangian Drifter Laboratory at Scripps Institution of Oceanography GTS Atlantic Hurricane 2022 Data		F I M	background	RSS		UCSD SIO	LDL_AtlanticHurricane2022
		data	graph			Lagrangian Drifter Laboratory at Scripps Institution of Oceanography GTS Atlantic Hurricane 2023 Data		F I M	background	RSS		UCSD SIO	LDL_AtlanticHurricane2023
						Lagrangian Drifter Laboratory at Scripps Institution of Oceanography Hurricane Michael (2018)							



- Data integrated into collaborative projects - GeoCollaborate, NOPP NHCI
- Quality Controlled / gridded product available from AOML ERDDAP server (to Feb. 2023)
  https://erddap.aoml.noaa.gov/gdp/erddap/tabledap/drifter_6hour_qc.html

In-situ observations in the open ocean are sparse.

The FAIR-O data policy is CRUCIAL for rapid advancement of science

SURFACE DRIFTERS IN A BROADER COMMUNITY

Scripps Institution of Oceanography's
LAGRANGIAN DRIFTER LABORATORY

- **Ocean ecosystem health and resource management:** CalCOFI, Coral Reef Research Foundation, ocean color, debris tracker,

- **Ocean physics at the air-sea interface:** INCOIS, ONR process studies, kinematics

- **Weather and climate:** Numerical weather forecasting, Helheim (glaciology), AR RECON, Hurricanes research, NOAA Weather Program Office, JMA