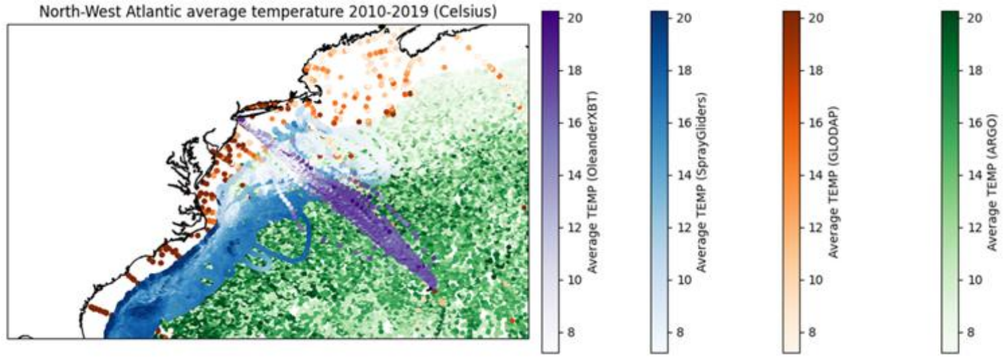
THEME 3 · SHARING EXPERIENCES OF CO-DESIGN

# Connecting emerging ocean observations observations to data assimilation systems



A co-design initiative linking CrocoLake, DART, and JEDI




North-West Atlantic average temperature, 2010–2019 (°C), from OleanderXBT, OleanderXBT, SprayGliders, GLODAP, and Argo.

**Nick Rome**
Director, Center for Ocean Leadership, UCAR

**PROJECT CO-LEADS**

Dan Amrhein, NSF NCAR

Enrico Milanese, WHOI

26 August 2026 · Mutsu, Japan / Remote

# The Challenge:
## Connecting more novel observations with ocean prediction systems

systems



**Currently**

Strong value, often within individual applications

local science · climatologies · animal detection · near-real-time models · operations

**Opportunity to expand**

Broader use in prediction and observing-system design

regional prediction · global climate modeling · coordinated network evaluation

**Requires a shared workflow for every data source**

ID data sources → Interpret QC, data structure → Standardize for target application → Develop “forward operators” → Assimilate & Forecast

# CROCODILE: An Emerging Solution

**C**ESM **R**egional **O**cean and **C**arbon c**O**nfigurator with
**D**ata assim**IL**ation and **E**mbedding

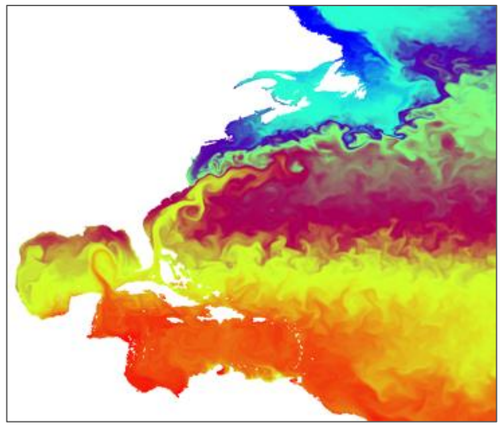
## CrocoLake standardizes the data

### Cloud-optimized collection of observations

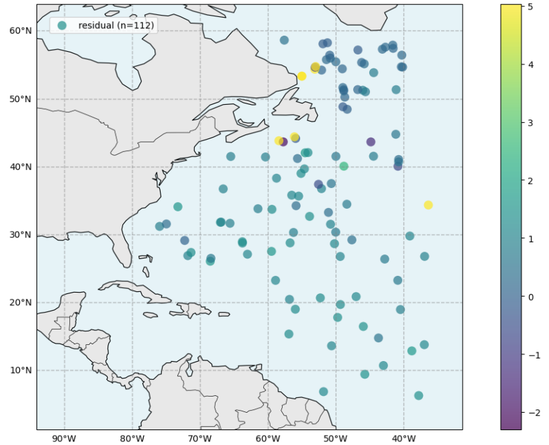
- Currently maintained by WHOI-NCAR
- ~1.2 billion observations (physical and biogeochemical)
- Argo, GLODAP, Spray Gliders, Oleander XBT, OCS Saildrones
- QCed data, updated weekly

**model-data comparison**

Ocean model output (MOM6, ROMS)



Model interpolated to obs location




## DART/JEDI provides pathways to use them

### Data Assimilation Testbed (DART)

- Ensemble assimilation
- Synthetic observations
- OSSE design and evaluation

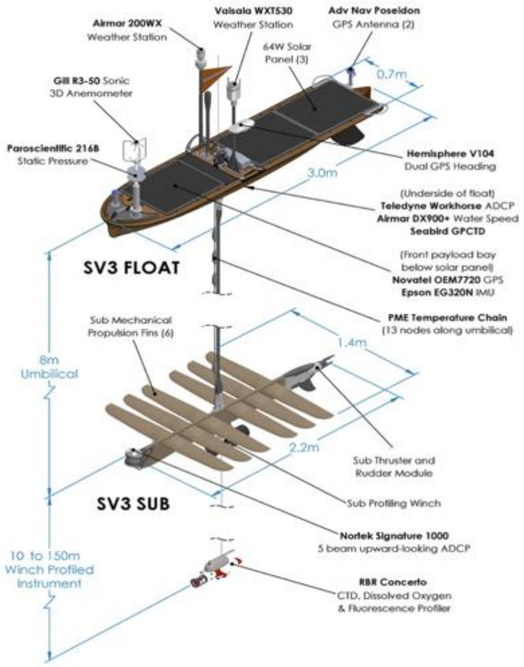
### Joint Effort for Data assimilation Integration (JEDI)

- Observation processing
- Forward operators
- Research-to-operations pathways

# Improving observation network design with OSSEs

Where should six Wave Gliders sample to best estimate tropical Pacific upwelling (NOAA TEPEX)?

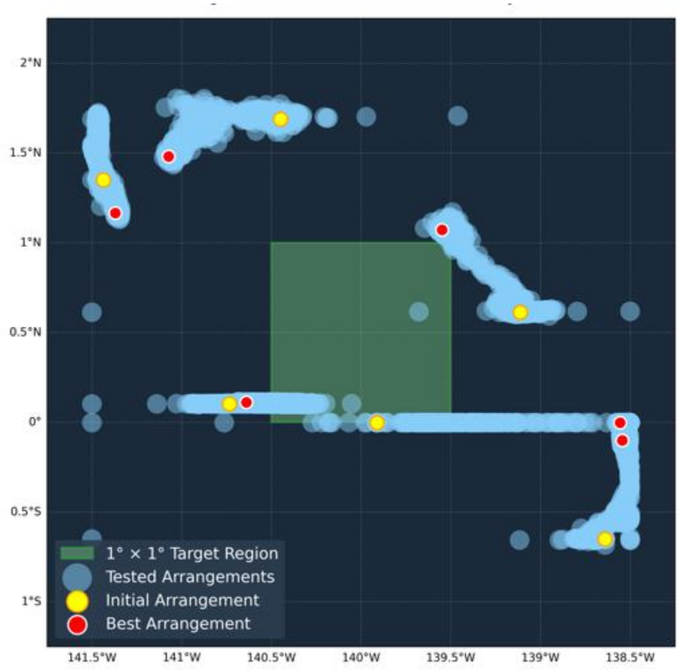
### 1) Wave Glider




### 2) MOM6 nature run (target field)




### 2) Tested Arrangements




**1 Simulate observations**
Sample the MOM6 nature run at proposed locations

→

**2 Estimate upwelling**
Reconstruct the target field from sparse measurements

→

**3 Evaluate performance**
Compare estimates with the known nature run

→

**4 Optimize the design**
Test configurations before field deployment

# Data Pipeline Initiative for Novel Ocean Observations

## UCAR's President's Strategic Initiative fund

**Funding**

UCAR

**Observing communities**

UG2 Underwater Glider User Group

OASIS Observing Air-Sea Interactions Strategy

SUN Fleet

IOOS Integrated Ocean Observing System

IOOS Association

NOAA Global Ocean Monitoring & Observing

GOOS Global Ocean Observing System

OTO Voice of the Ocean

OCEAN Tracking Network

**Technical capabilities**

CROCODILE

Woods Hole Oceanographic Institution

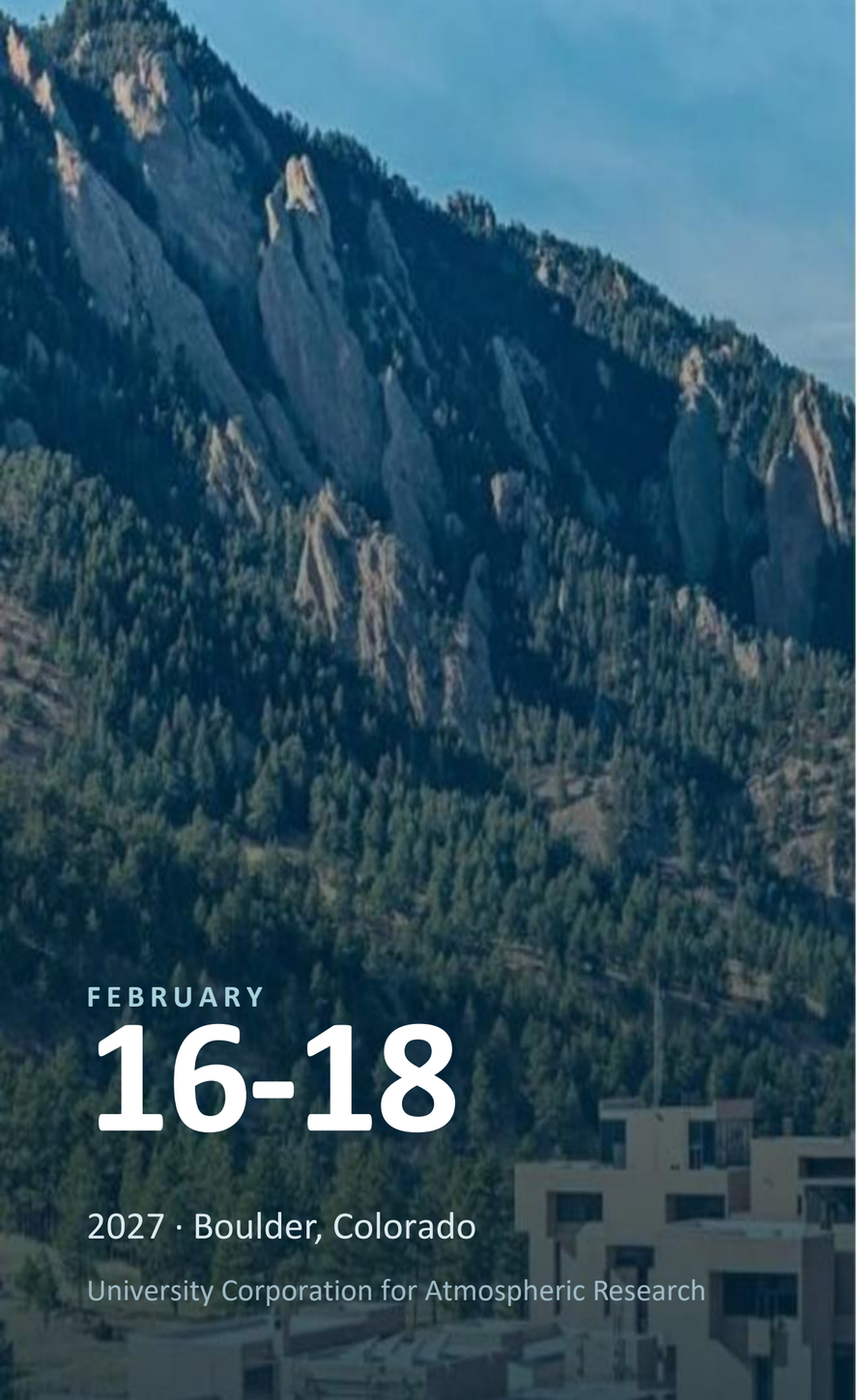
NCAR | DART

JCSDA

JEDI

**Partnership coordination coordination**

Center for Ocean Leadership



FEBRUARY

# 16-18

2027 · Boulder, Colorado

University Corporation for Atmospheric Research

# Workshop (Hackathon):

## Data Pipeline Initiative for Novel Ocean Observations Observations

| | |
|---|---|
| **Bring** | A real dataset from a glider, uncrewed surface vehicle, or another novel platform |
| **Standardize** | Document metadata and QC, place it in a public repository, convert it into CrocoLake |
| **Compare** | Evaluate the observations against model output |
| **Explore** | Tools for high-resolution models, assimilation, and OSSEs |

## Bring a dataset you would like to work with.

**Applications due October 16 · Some travel assistance available**

Scan to apply!

# Potential to shape global priorities

## 2026

**SynObs**

Share methods and experience

## 2027

**Hackathon**

Test shared workflows

## 2029

**OceanObs'29**

Set priorities and mobilize commitments

**Ocean Decade**

Carry forward an integrated agenda

**Thank you!**

ありがとうございます！

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