# ECOSTRESS Aquatic Applications

Jake Longenecker[1,2], Jacquelyn Meiseles[1,3], Ileana Galdamez[1,4],
Glynn Hulley[1], Christine M. Lee[1], Madeleine Pascolini-Campbell[1]

(1) Jet Propulsion Laboratory, California Institute of Technology, (2) University of Miami, (3) Chapman University, (4) Biola University
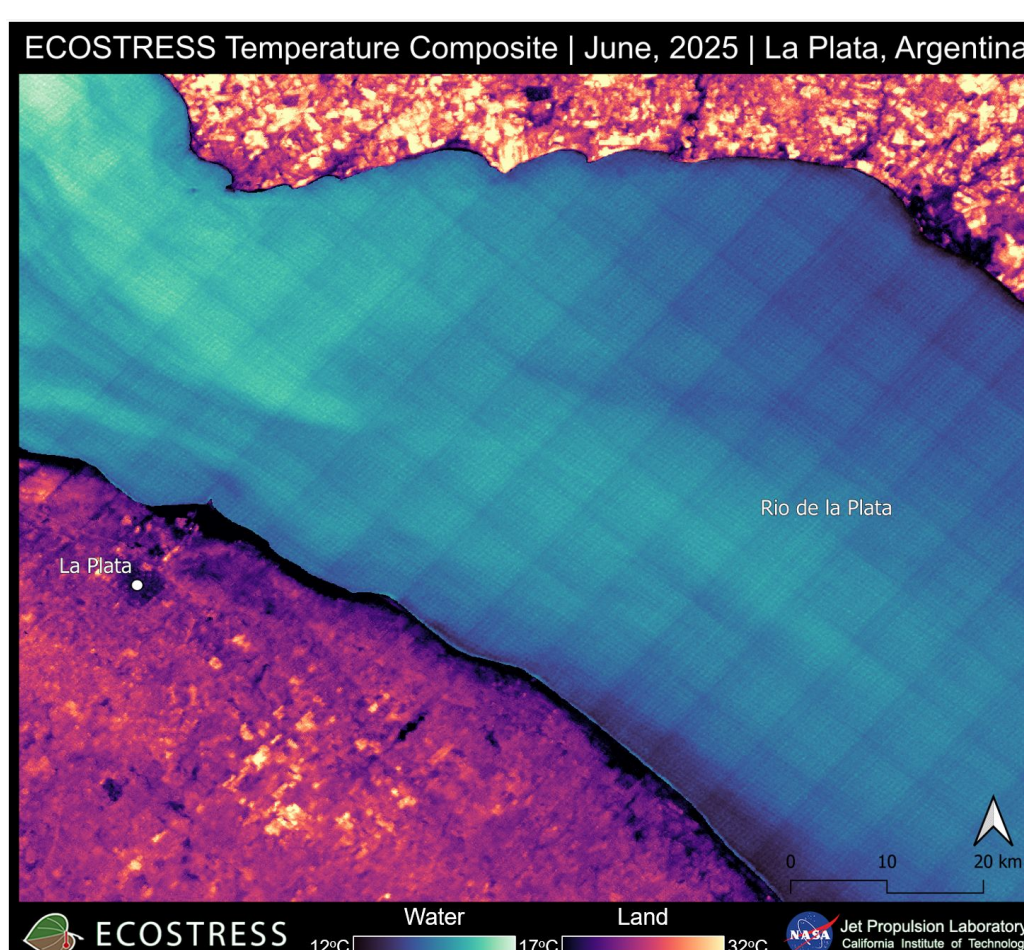
## Overview of ECOSTRESS

NASA's ECOsystem Spaceborne Thermal Radiometer Experiment on Space Station (ECOSTRESS) mission provides high spatiotemporal resolution Land Surface Temperature (LST) data, offering significant potential for aquatic science applications.

- Spatial resolution: 70 m
- Temporal resolution: Variable
- Data availability: July 9, 2018 - Present
- Data products:
  - Level 1: Radiance and Geolocation
  - Level 2: Land Surface Temperature and Emissivity
  - Level 3: Evapotranspiration
  - Level 4: Evaporative Stress Index and Water Use Efficiency
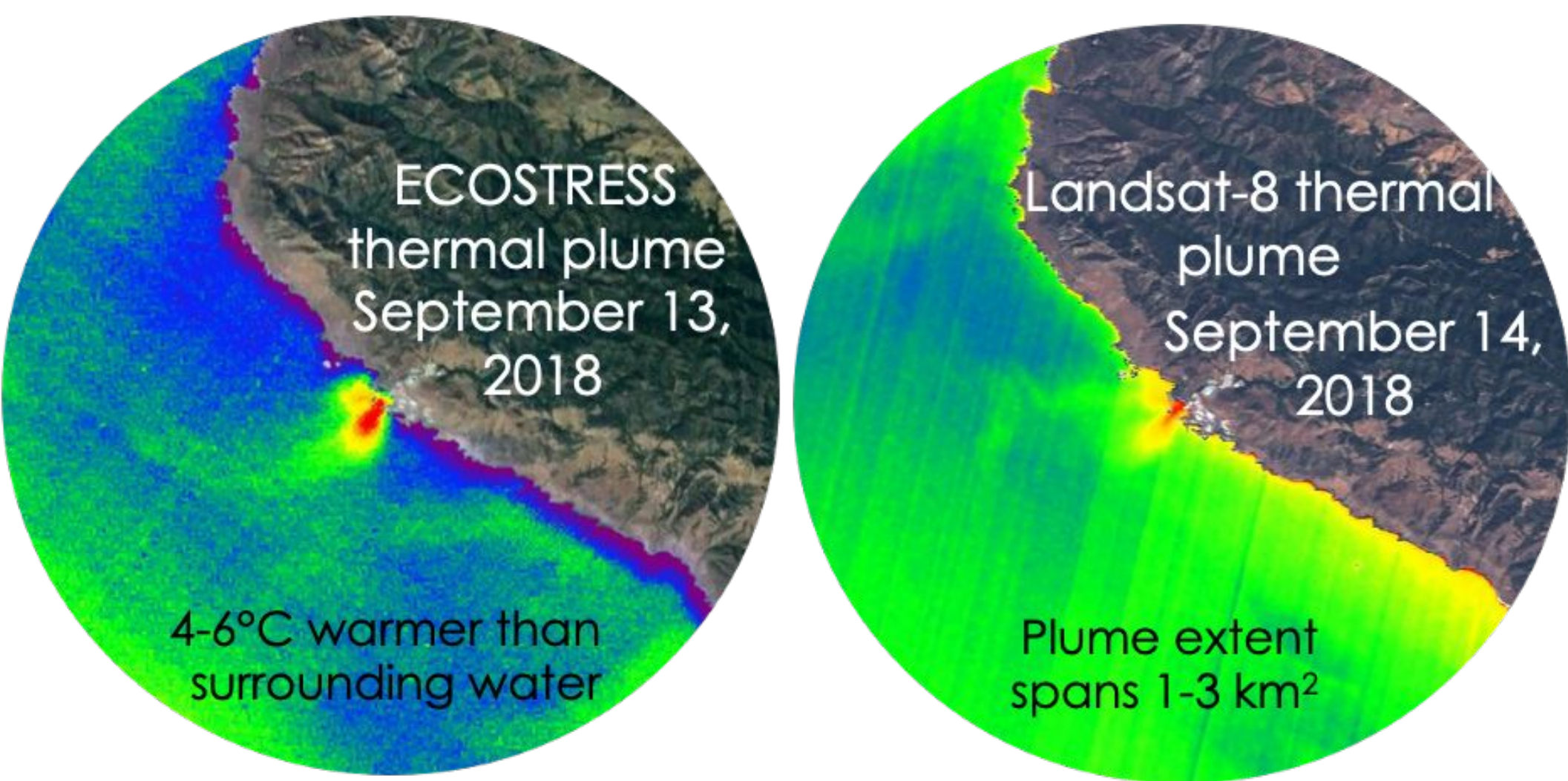
## ECOSTRESS Applications
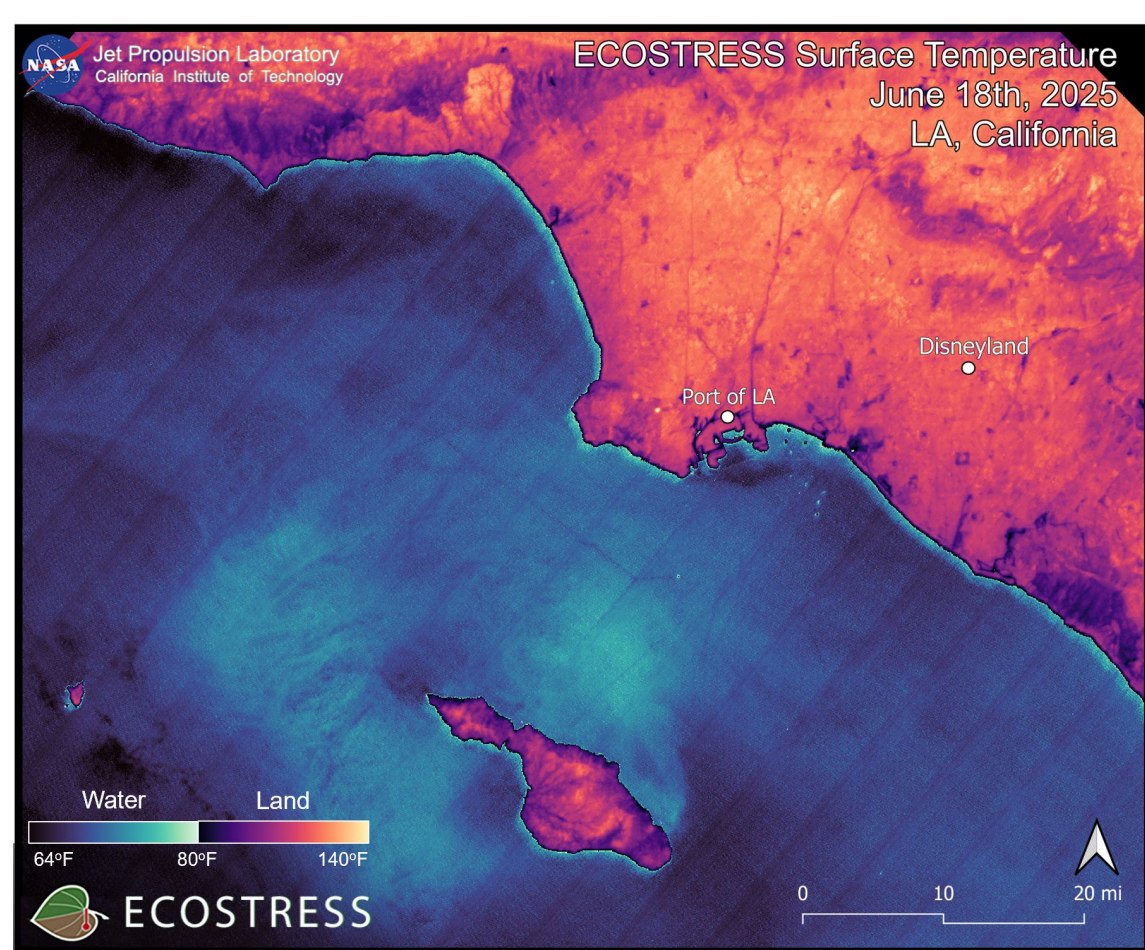


Marine eddy currents and thermal plume from the Palisades fire.

Thermal composite of freshwater river currents.

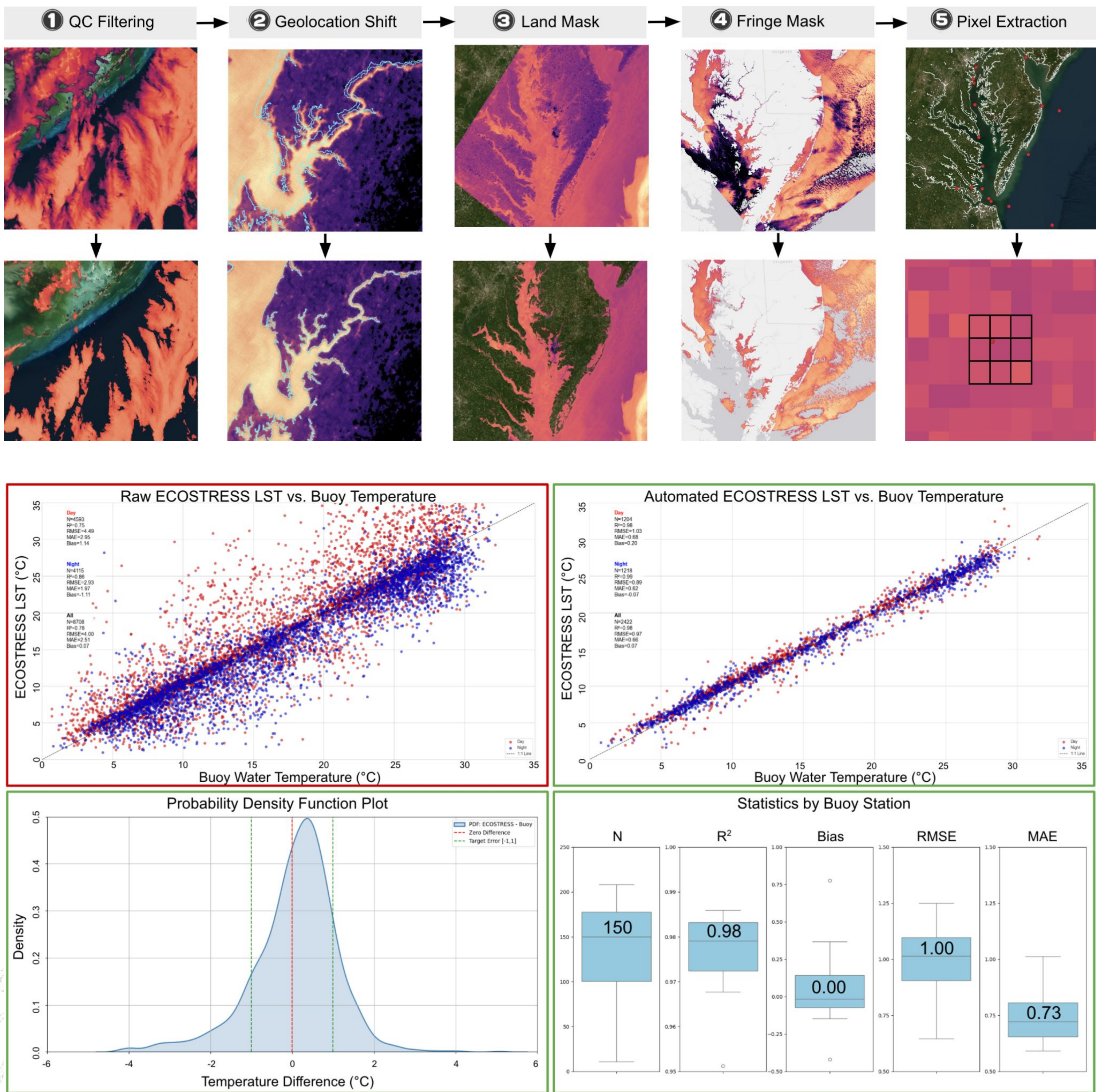### Coral reef thermal microclimates mapped from the International Space Station

J. Longenecker[1] · F. Benzoni[2] · N. Dunn[2] · H. E. Fox[3] · A. Gleason[1] · D. Otis[4] · V. Chirayath[1] · N. Oury[2] · S. J. Purkis[1]



## Power plant discharge detection

Thermal discharge from once-through cooling power plants impact coastal water quality and marine life



ECOSTRESS thermal plume September 13, 2018

Landsat-8 thermal plume September 14, 2018

4-6°C warmer than surrounding water

Plume extent spans 1-3 km²

11.85°C — 17.85°C

In situ site

Diablo Canyon Nuclear Power Plant, San Luis Obispo County, CA

## Data Fusion: ECOSTRESS and Landsat

ECOSTRESS Collection 2 Level 2 and Landsat thermal fusion product.



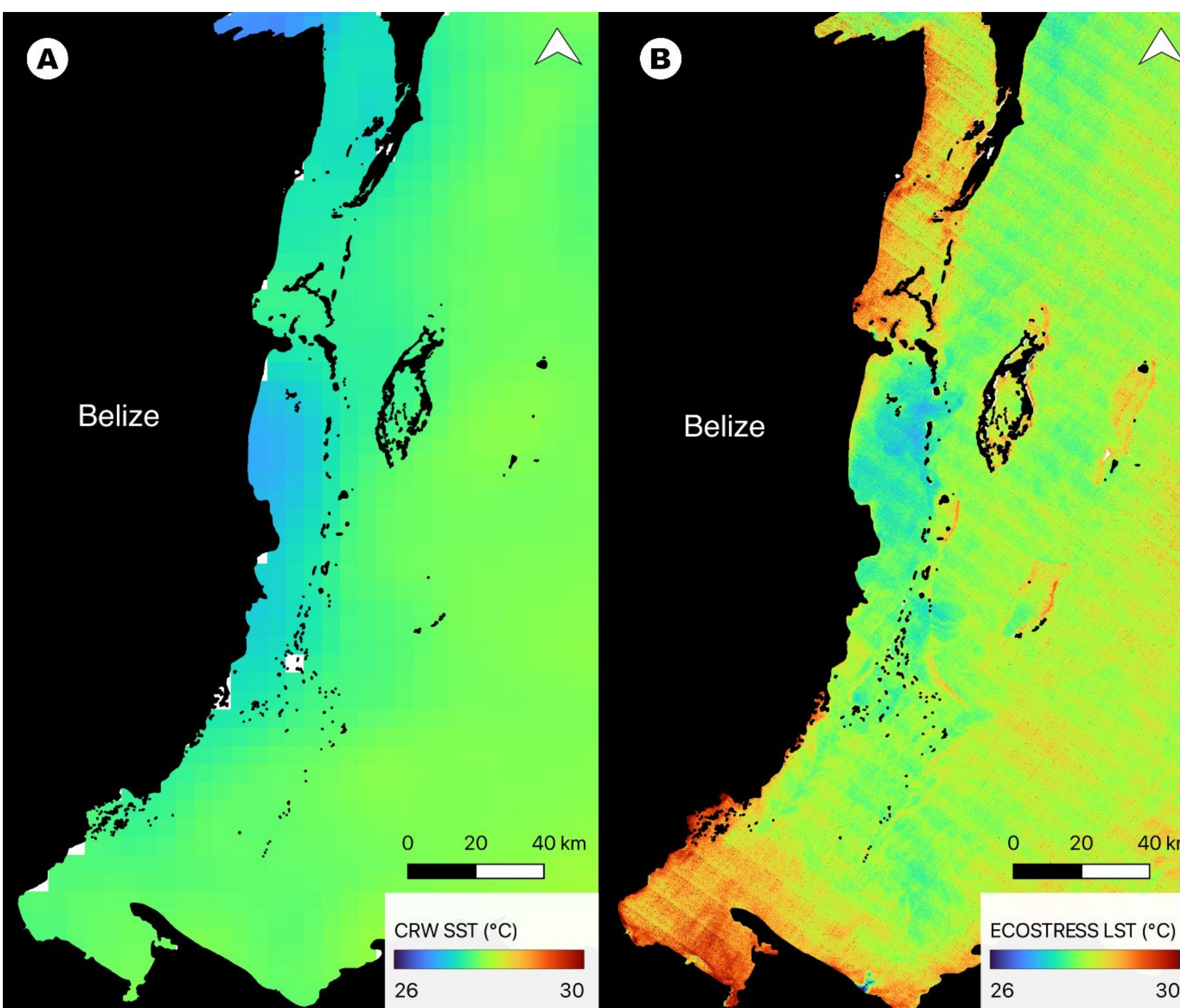50m Thermal Fusion Variance

5.0 °C²

1.0 °C²

Hawaiian Islands

5km

## Validation of ECOSTRESS with NOAA Buoys

Goal: Evaluate ECOSTRESS LST Product using In-Situ National Data Buoy Center Observations



① QC Filtering ② Geolocation Shift ③ Land Mask ④ Fringe Mask ⑤ Pixel Extraction

| N | R² | Bias | RMSE | MAE |
|---|---|---|---|---|
| 150 | 0.98 | 0.00 | 1.00 | 0.73 |

Chesapeake Bay LST (°C) 2023-10-03 19:34



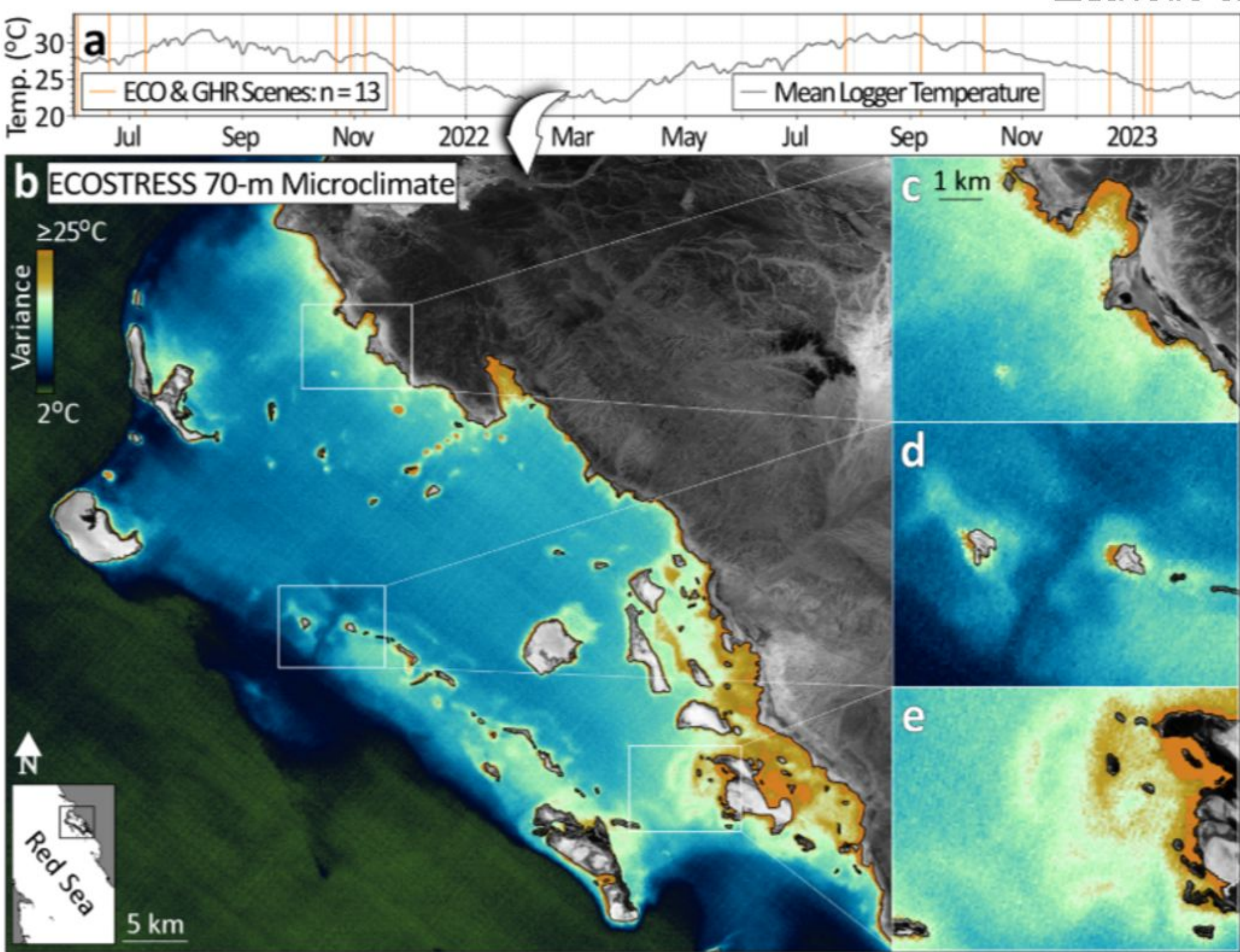## ECOSTRESS and NOAA Coral Reef Watch Comparison in Belize

Comparison of NASA ECOSTRESS Land Surface Temperature (LST) and NOAA Coral Reef Watch (CRW) Sea Surface Temperature (SST) for the Belize Barrier Reef on Jan 12, 2024. (A) NOAA CRW daily SST nighttime product. (B) ECOSTRESS LST acquired at 23:54 UTC (5:54 PM local time).
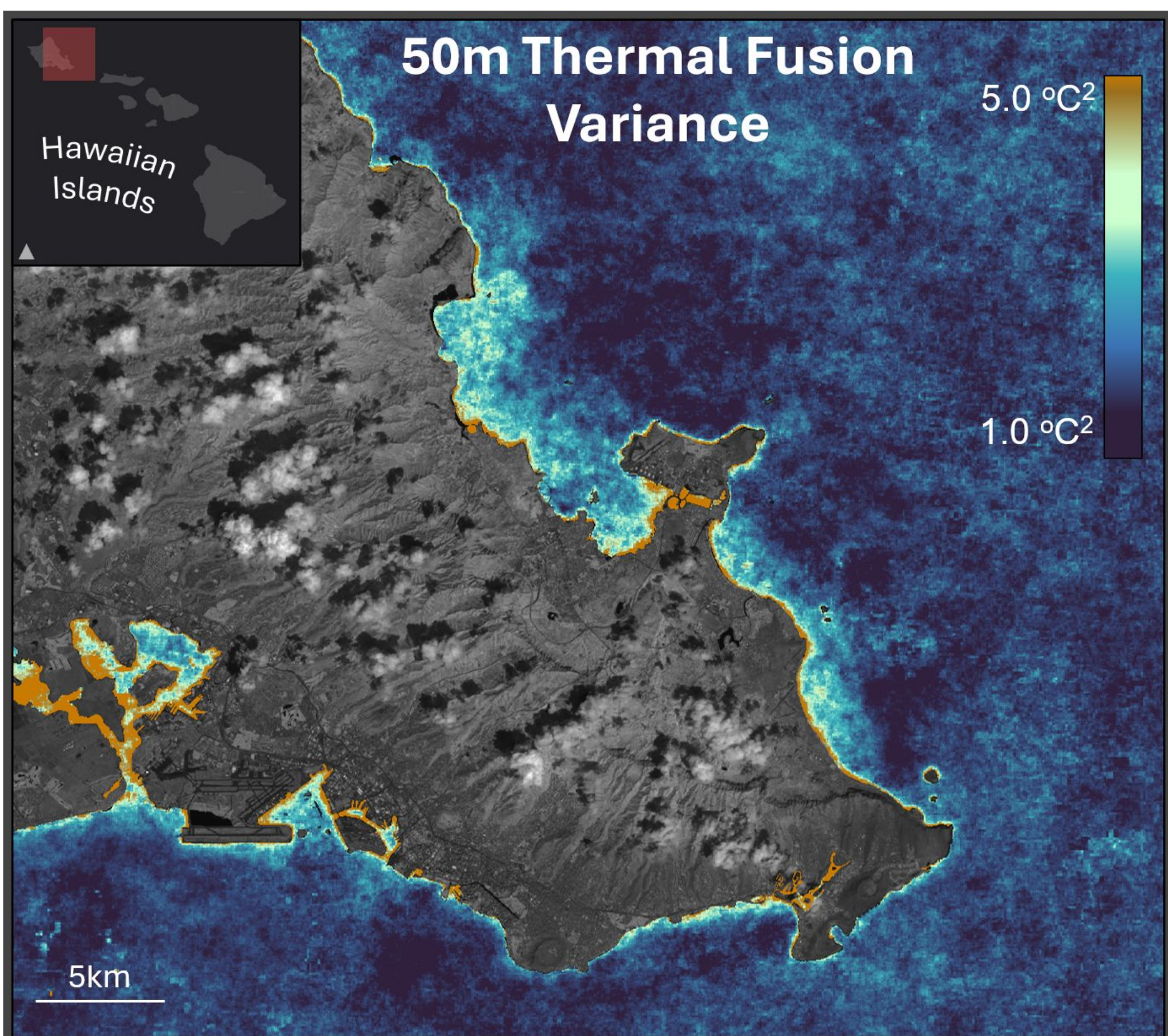


Belize

Belize

CRW SST (°C) 26 — 30

ECOSTRESS LST (°C) 26 — 30

## Resources



NASA JPL THERMAL VIEWER
SEMI-AUTOMATED GEOREFERENCER

ECOSTRESS thermal georeferencing program and documentation.
ECOSTRESS Tutorials on Github: https://github.com/ECOSTRESS-Tutorials

## Acknowledgements

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