Monitoring Harmful Algal Bloom in the Pacific Arctic

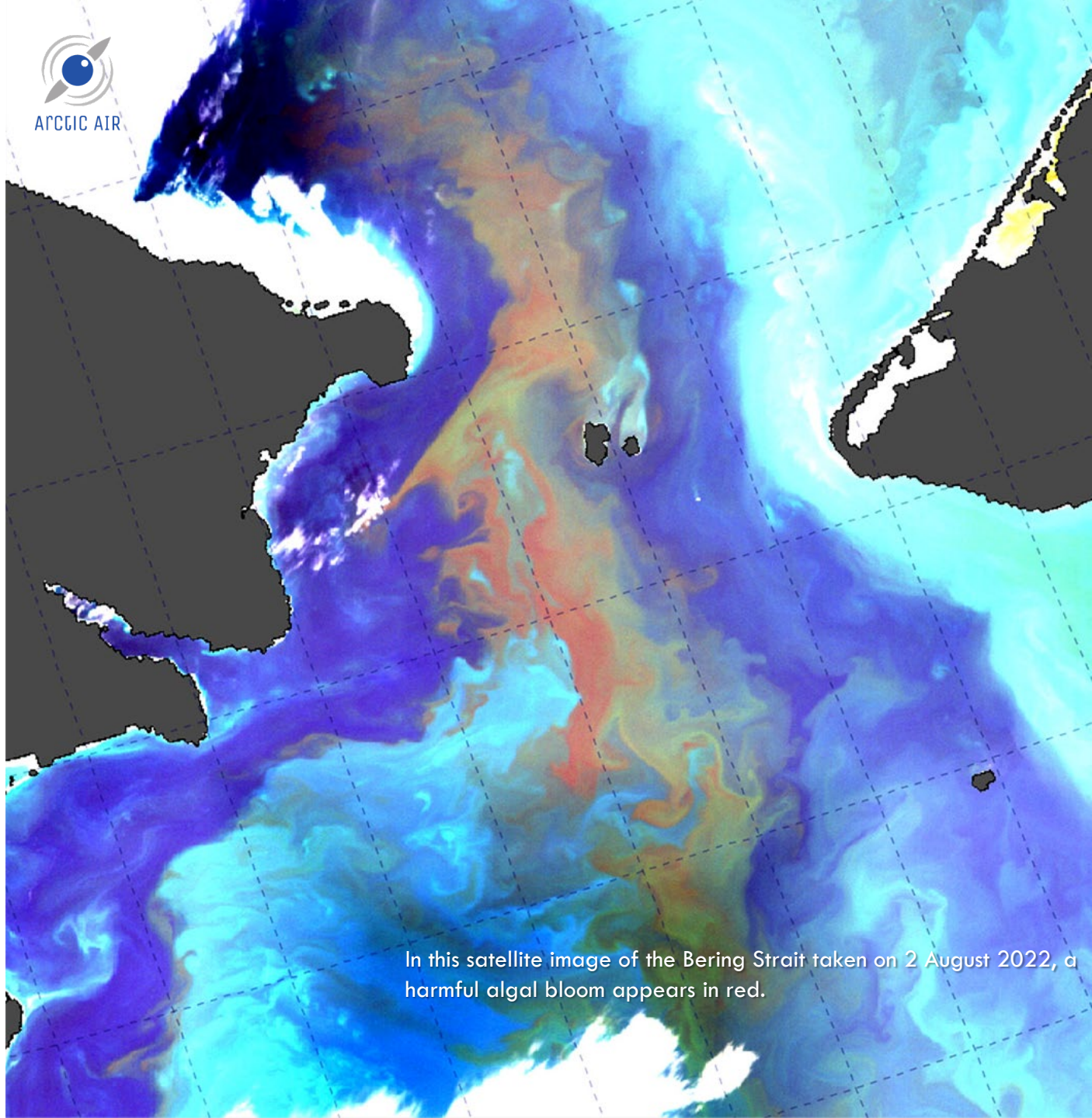
Efforts from Arctic AIR and collaborators

Jiaxu Zhang (UW/CICOES), 06/24/2025

NOAA PMEL

NOAA GLOBAL OCEAN MONITORING & OBSERVING

AOOS Alaska Ocean Observing System

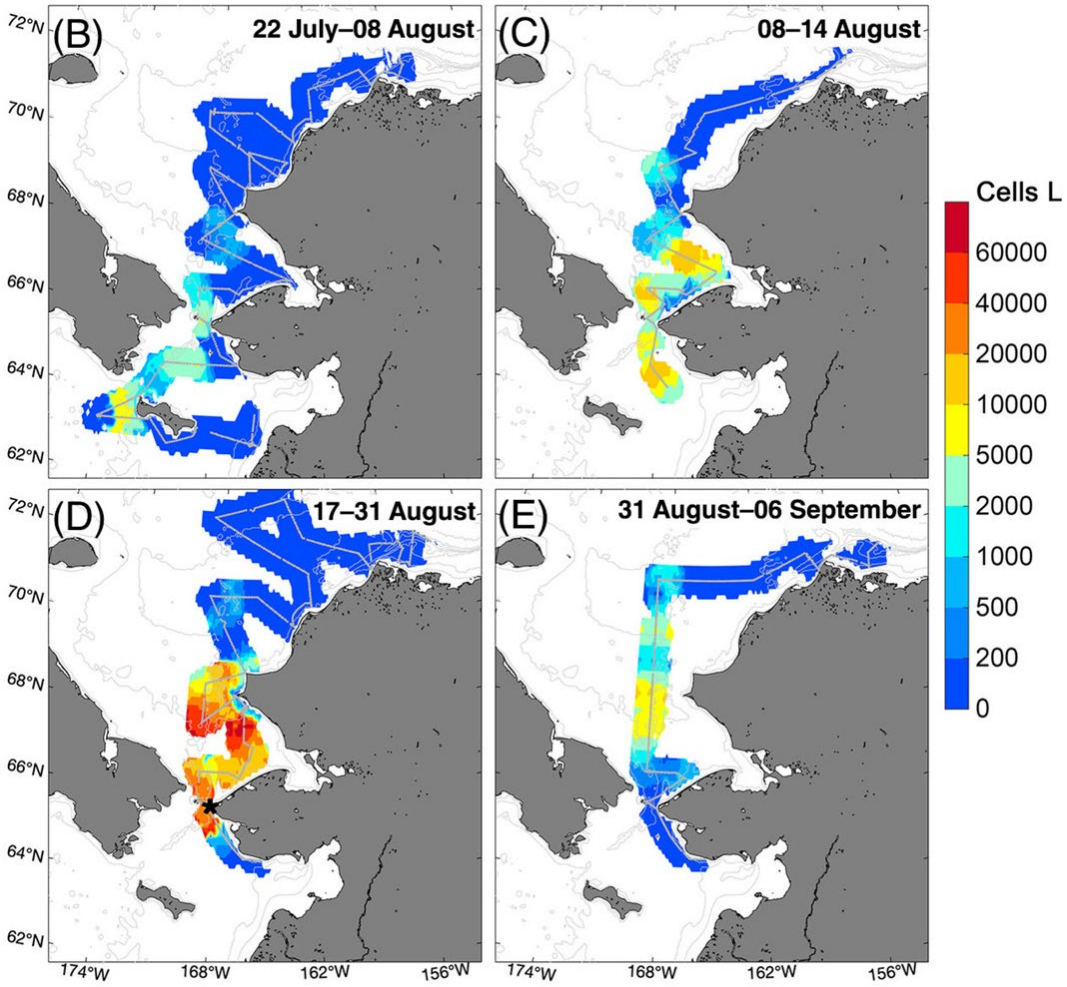


In this satellite image of the Bering Strait taken on 2 August 2022, a harmful algal bloom appears in red.

Why it matters

- Increasing frequency and intensity of HABs in Arctic/sub-Arctic waters
- Impacts on food security, marine ecosystems, and coastal communities
- August 2022: Strongest *Alexandrium catenella bloom* ever detected globally
- Limited monitoring capacity in remote, cloud-covered regions
- Need for **high-resolution, real-time, multi-scale monitoring**

A. catenella cell density calculated from underway IFCB imagery



Fachon et al. (2024)

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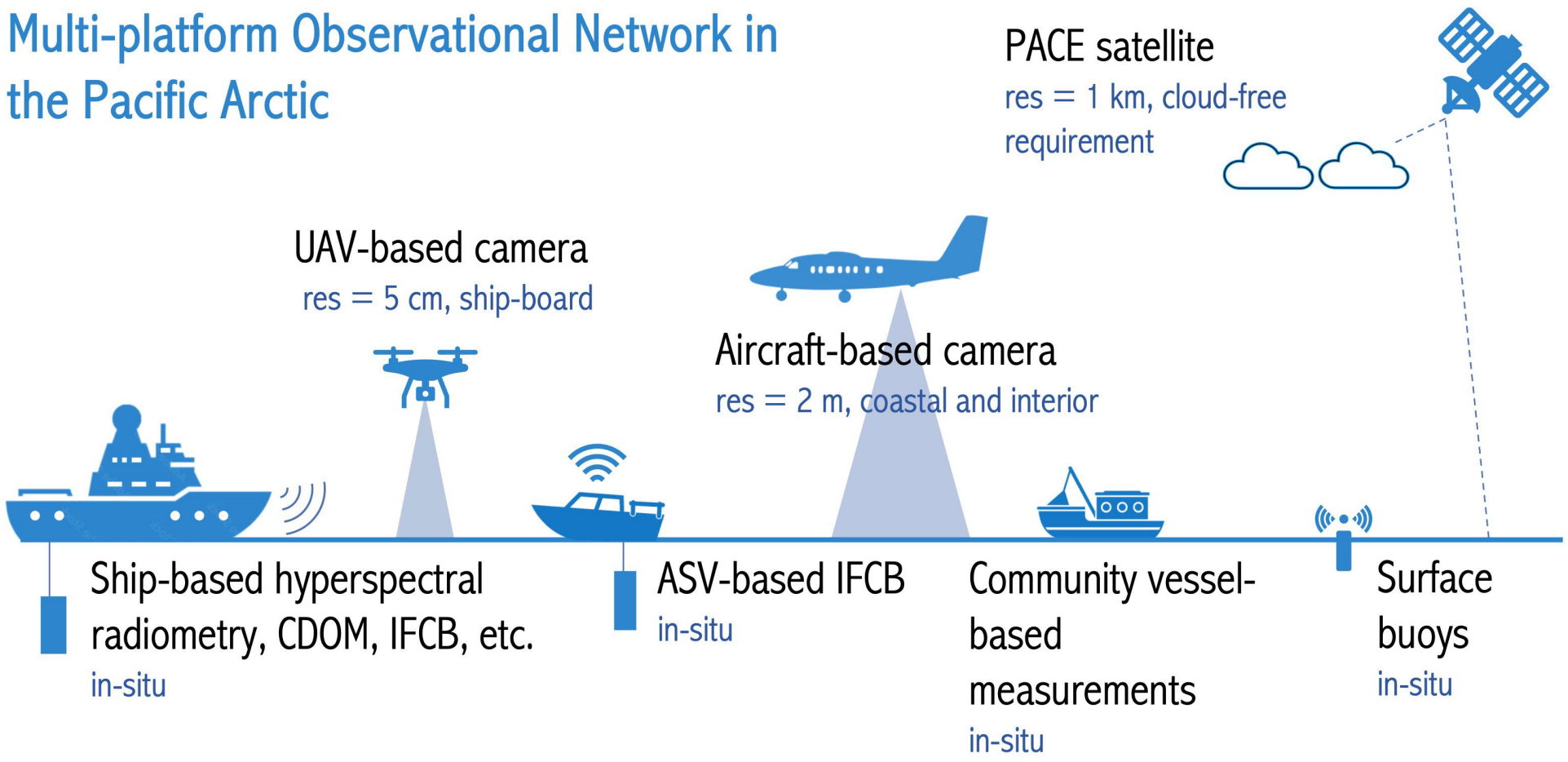
Our Vision



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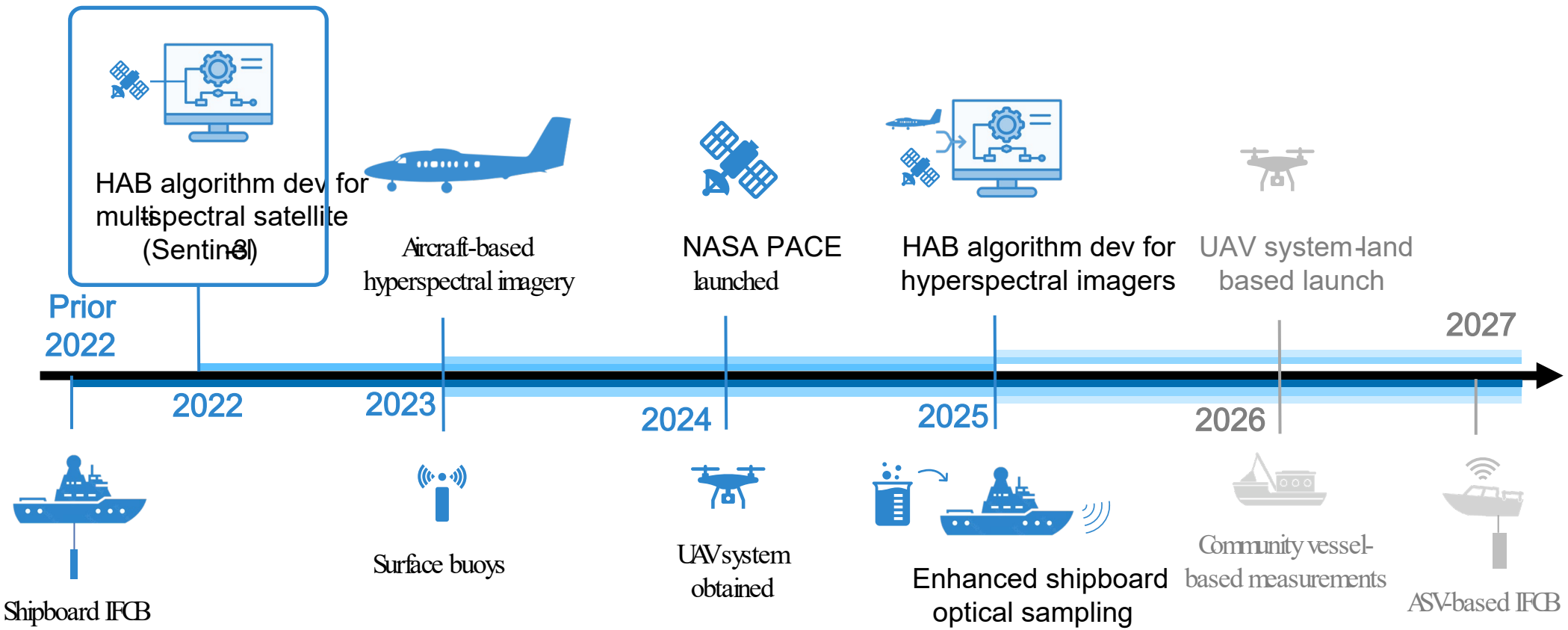
Summary of Ongoing Efforts



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Key Results So Far

- Lange et al. (2025)

Contents lists available at ScienceDirect

Journal of Environmental Management

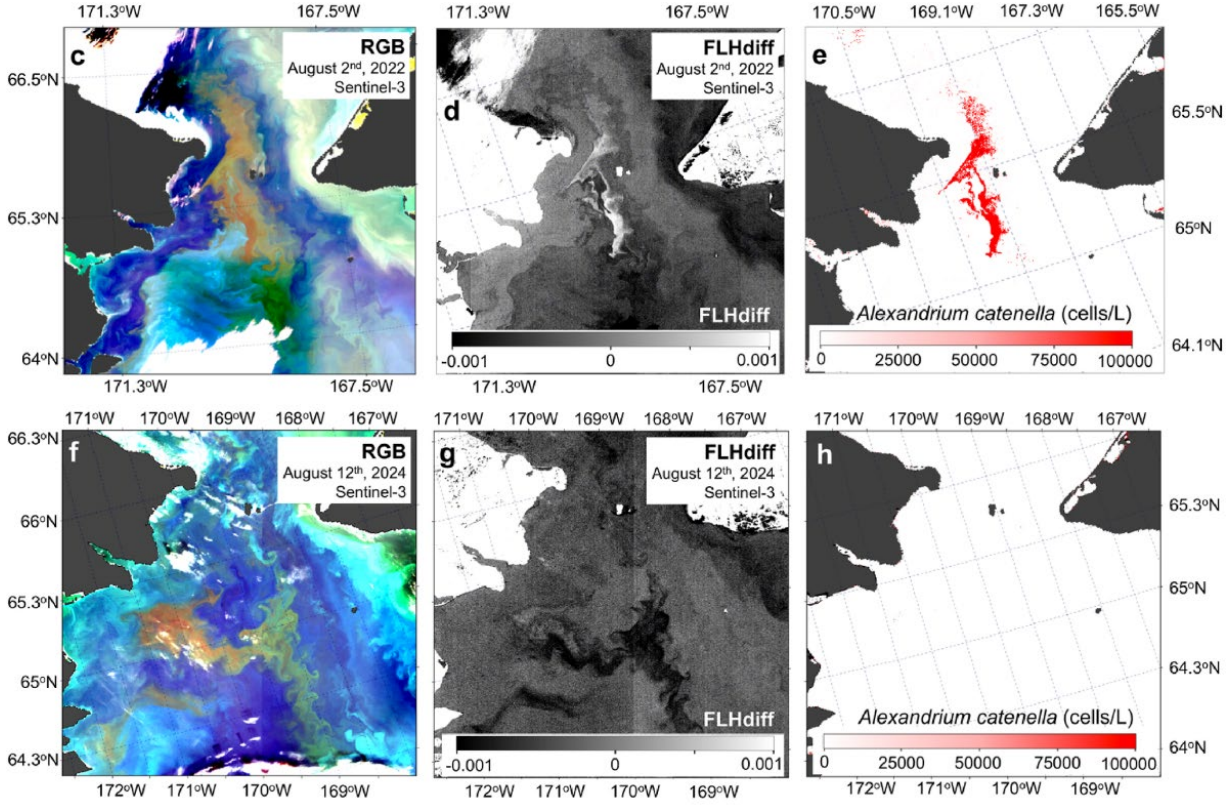
journal homepage: www.elsevier.com/locate/jenvman

Research article

Application of dinoflagellate-specific satellite models to aid *Alexandrium catenella* bloom monitoring in the Bering and Chukchi seas

- Key points
  - *Regionally tuned HAB detection models*
  - *Distinguish A. catenella from other common blooms (e.g., green algae, diatoms)*
  - *Effective for locating HABs, guiding in-situ sampling, estimating concentrations, and tracking extent and transport*

A. catenella bloom index tells HABs from non-HABs



Lange et al. (2025)

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Summary & Next Steps

- Summary
  - *HAB monitoring is a growing Arctic challenge*
  - *Arctic AIR is leading an integrated, scalable effort*
  - *Recent publication lays the foundation*
- Next steps
  - *Continue established capabilities (crewed aircraft, ship-board measurements)*
  - *Develop in-situ optical measurements on R/V cruises*
  - *Develop hyperspectral packages*
  - *Land-based and ship-based drone deployment*
  - *Engage with community monitoring*

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