



**ANTARCTICA**  
INSYNC

# Theme II: Rapid sea ice decline and its causes and consequences

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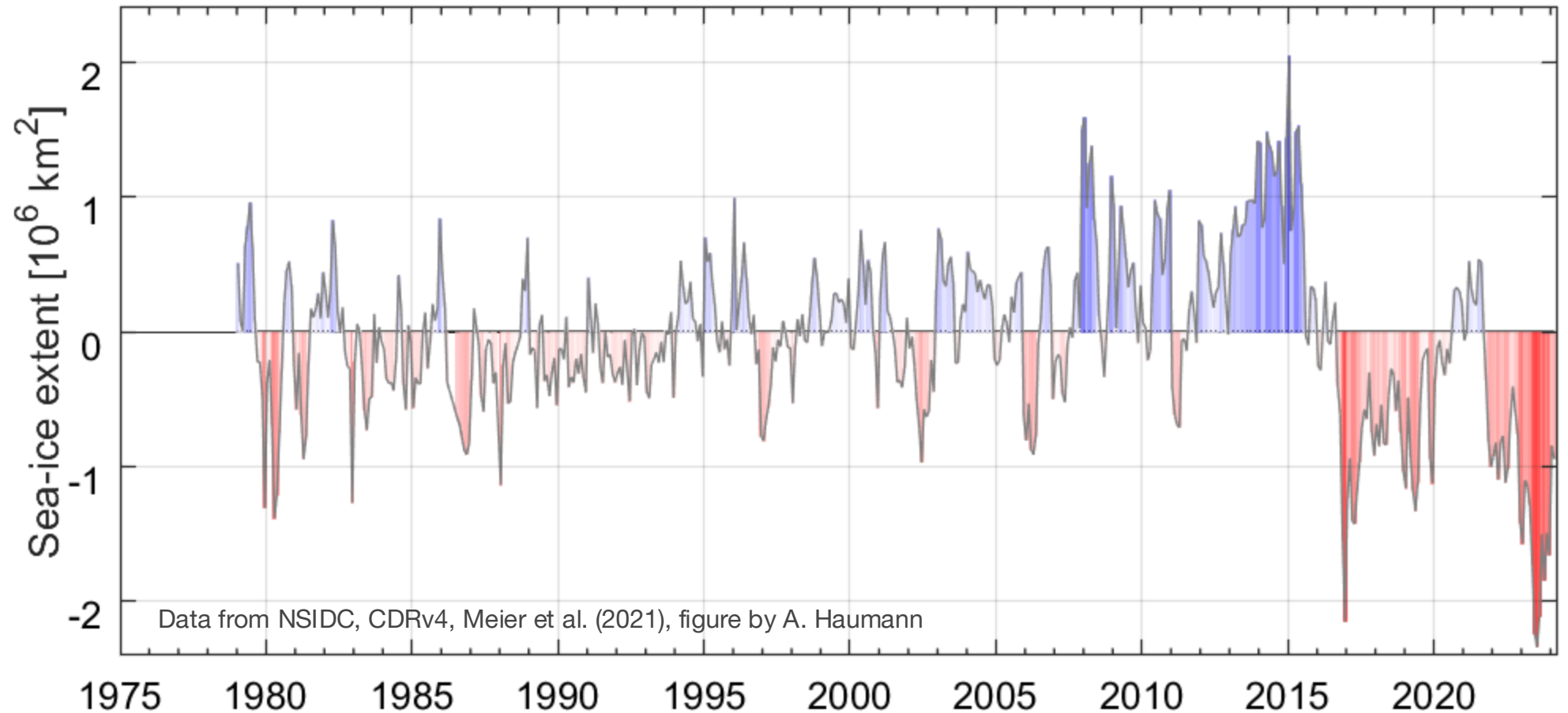
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# Current state and change of Antarctic sea ice



## Rapid decline of Antarctic sea ice

- What?
- Why?
- How?





# Thematic areas for synchronous research in the SCAR Horizon Scan and Action Plan

- **Processes/Feedbacks driving changes** in extent, volume, properties and distribution of Antarctic sea ice - and its interactions with atmosphere and ocean
- Seasonal variability of sea ice contributing to ocean/air **fluxes across a range of spatio-temporal scales**
- Impact of sea ice on ocean circulation, biogeochemical cycling and biological processes (**ice/ecosystem interaction**)
- Influence of changes in **freshwater fluxes** from iceberg melting, sub-ice shelf melting, subglacial discharge and sea ice on ocean circulation and marine ecosystems



→ **What are causes and consequences of the rapid sea ice decline?**



# Work toward these objectives

- **Standardized observations** and surveys of sea ice and snow properties at both small and floe-size scales
- Deployment of a comprehensive, **multi-disciplinary network of autonomous ice-tethered platforms** for seasonal observations along Lagrangian drift trajectories
- Regional **airborne surveys** by drones, helicopters, and airplanes
- Continuous generation of comprehensive **seasonal validation datasets for satellite remote sensing**, along with enhancements in retrieval methodologies and accuracy
- Enhanced **process understanding in climate models** through increased resolution and refined model parameterizations



# Antarctica InSync as a community opportunity

Existing initiatives in the Antarctic sea ice community

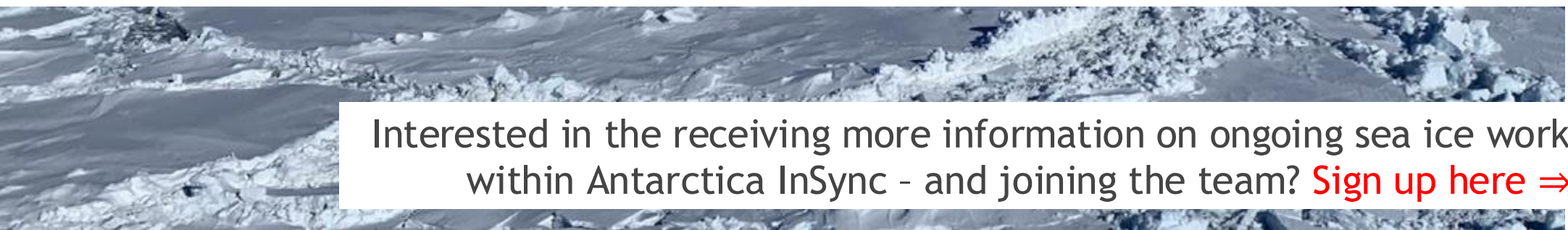
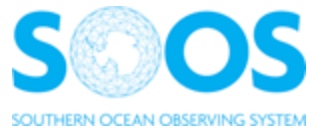


Existing international working groups



International  
Antarctica InSync  
Sea Ice Team

New Zealand United Kingdom South Africa  
Finland Australia Germany Switzerland  
Japan Belgium Denmark Norway US ...



Interested in the receiving more information on ongoing sea ice work within Antarctica InSync - and joining the team? [Sign up here](#) ⇒



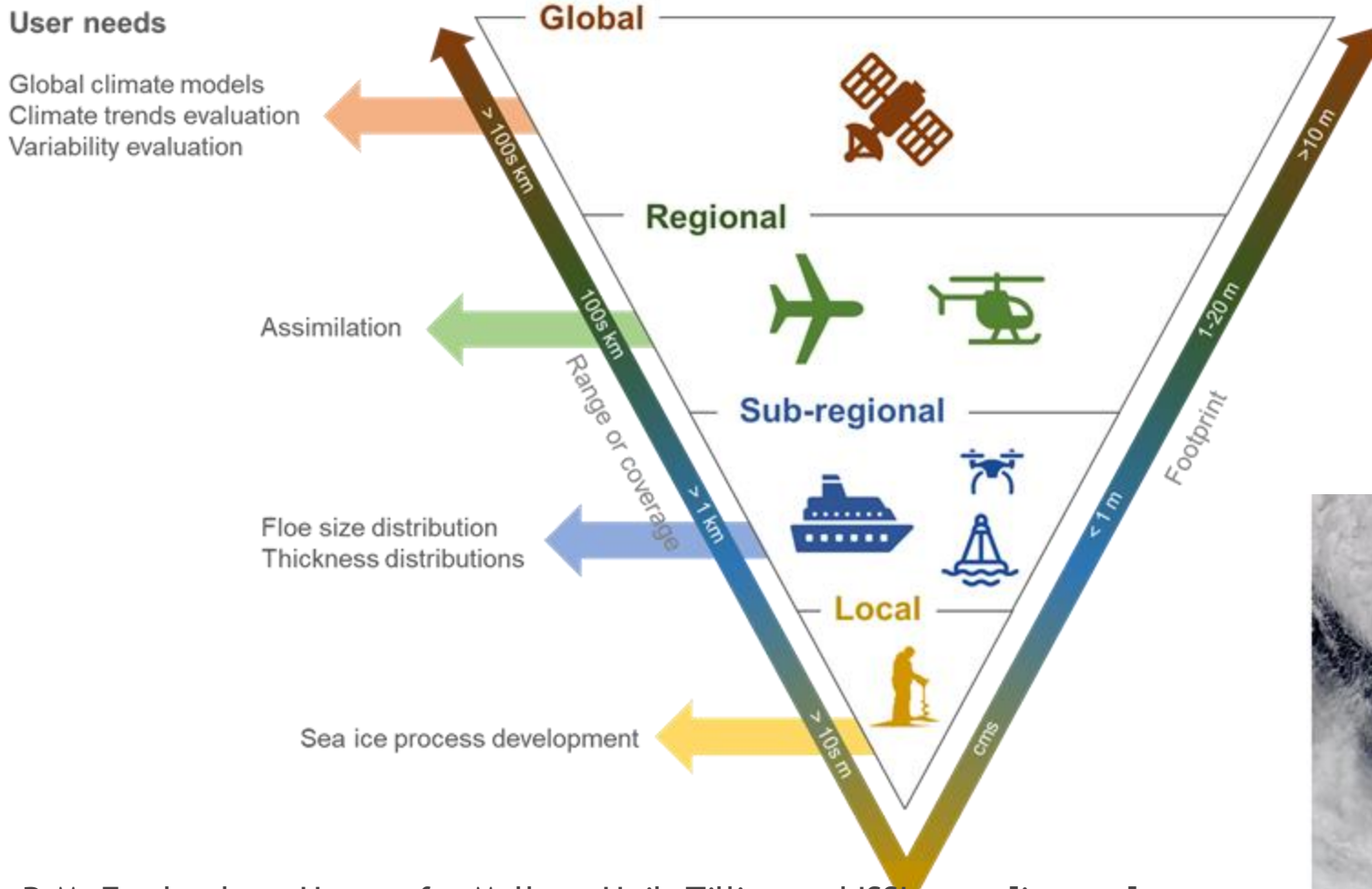
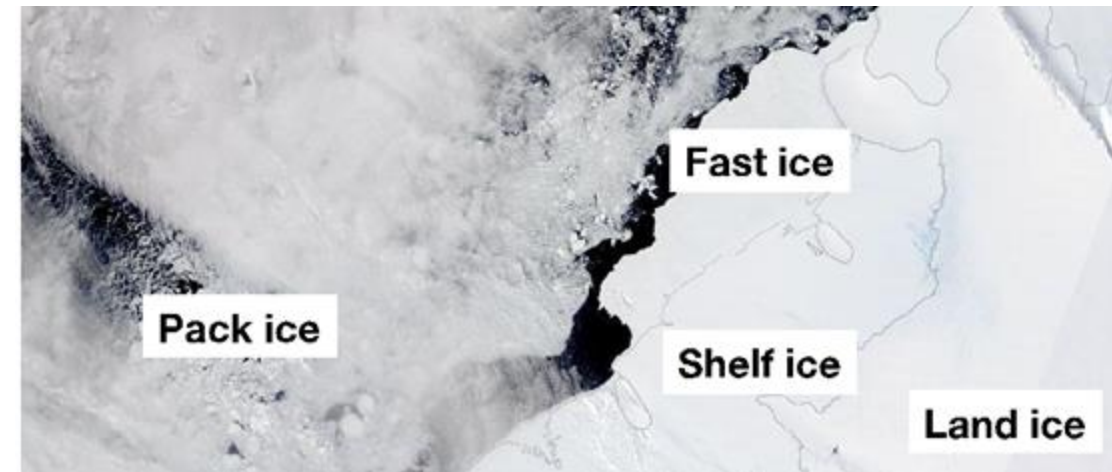


# Antarctica InSync as a multi-scale approach

Bridging observations, models and satellite remote sensing

## Challenges and Uncertainties in Observing Antarctic Sea Ice

- Fast ice/ coastal polynyas
- Pack ice
- Marginal ice zone (MIZ)



R.M. Fredensborg Hansen for Mallett, Heil, Tilling and ISSI team [in prep]



# Antarctica InSync as a multi-scale approach

Bridging observations, models and satellite remote sensing

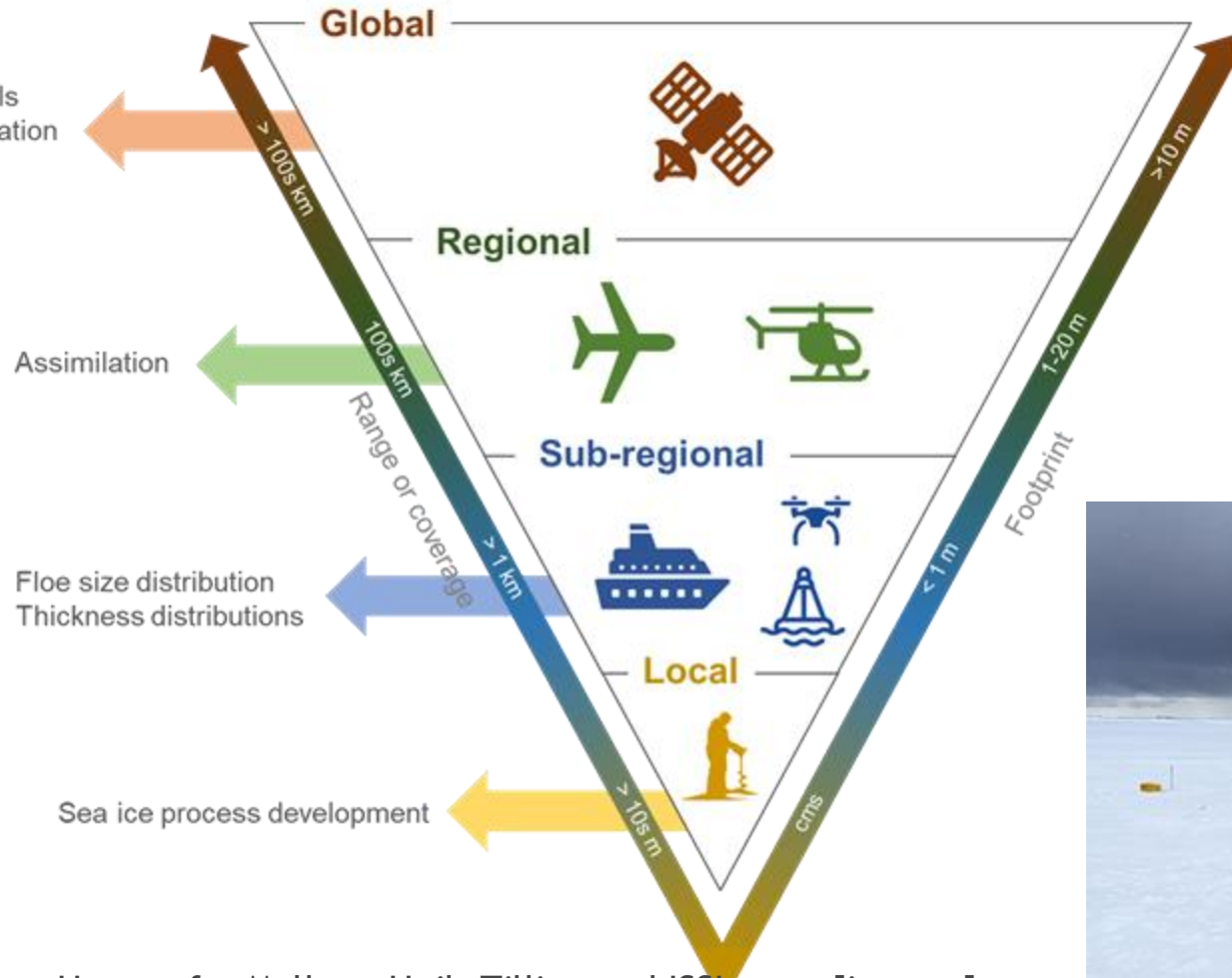
How to address these challenges?  
Which research methods are needed?

- Essential Climate Variables (ECVs) vs. scales vs. processes



## User needs

Global climate models  
Climate trends evaluation  
Variability evaluation



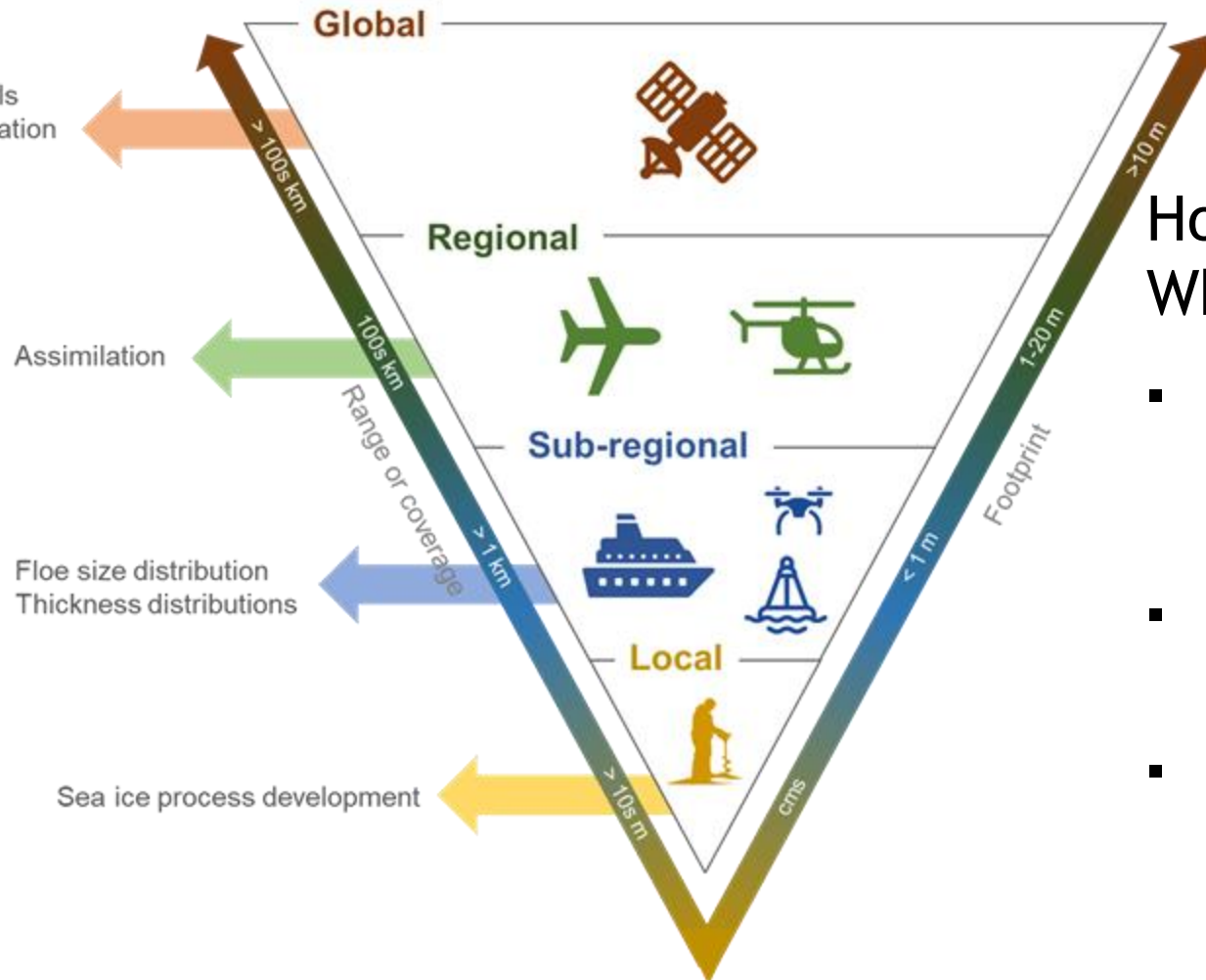
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# Sea ice work | What? Where? How?



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Global climate models  
Climate trends evaluation  
Variability evaluation



How to address these challenges?  
Which research methods are needed?

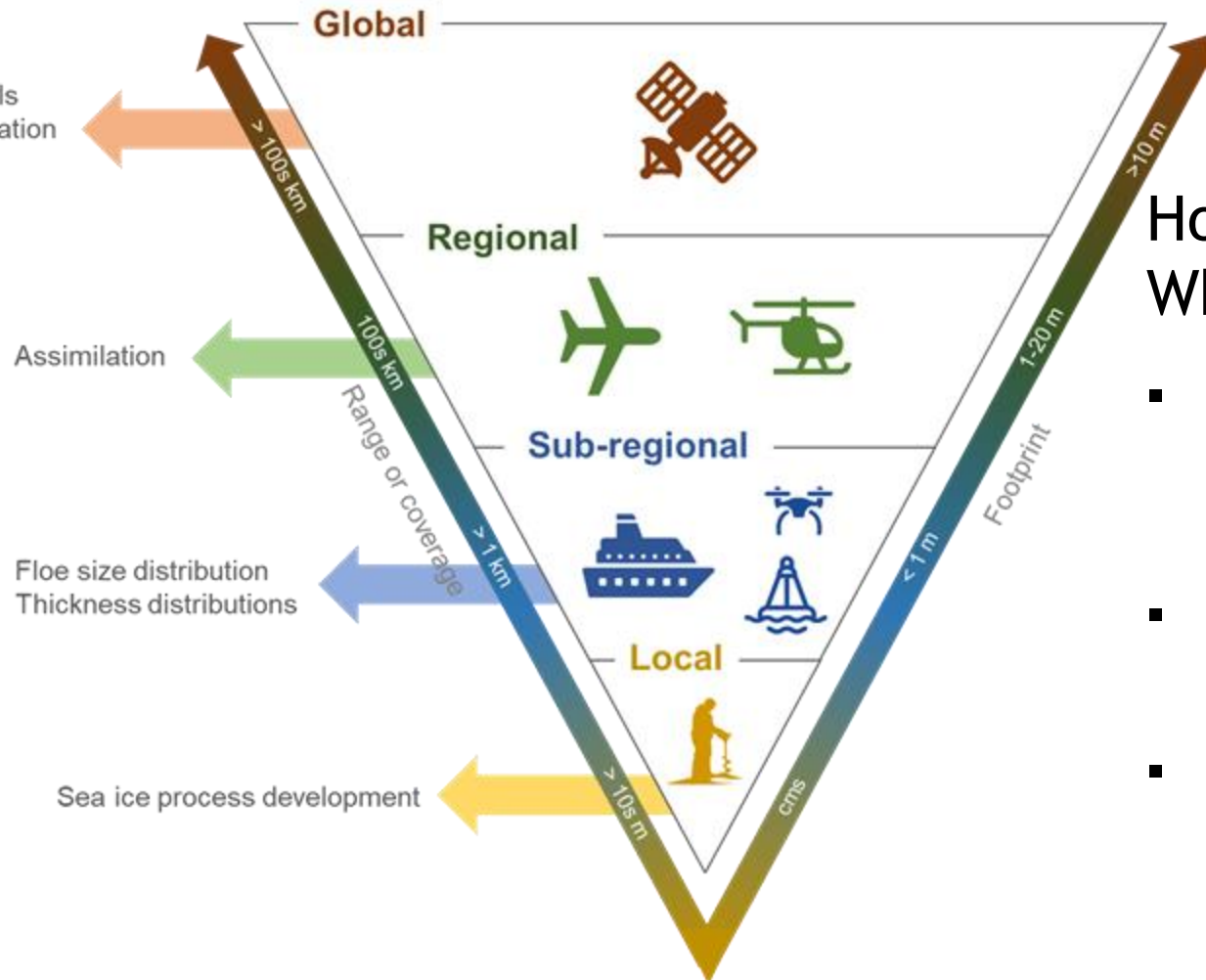
- **Autonomous observations**  
= vertical climate system interaction  
= seasonality/ sequence of events
- **Repetitive observations**  
= process studies/ horizontal distribution
- **Event-driven observations**  
= (local) process studies

# Thanks! Questions?



## User needs

Global climate models  
Climate trends evaluation  
Variability evaluation



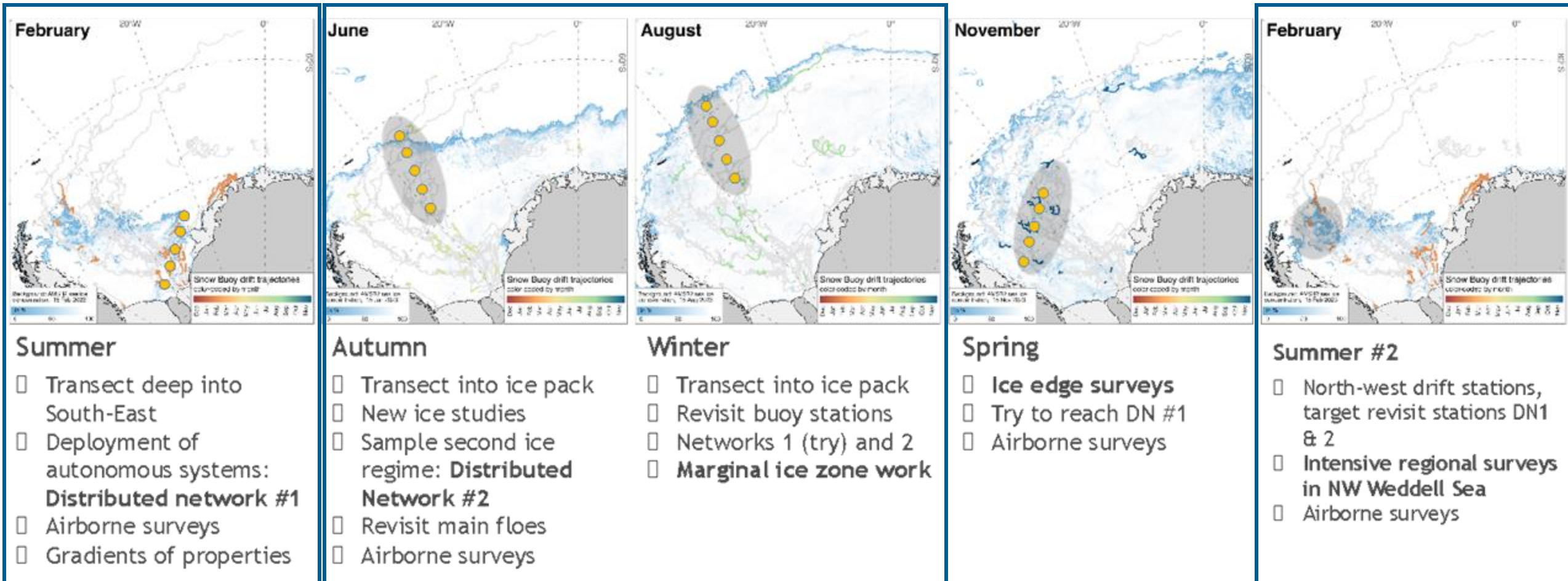
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Backup slide(s)



# Sea ice work | What? Where? How?



**Buoy deployment + revisits**

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(longer stays on-site in freeze-up conditions)

→ **ISPOL-2D**