





# Snowmelt and temperature - but not sea-ice - explain variation in tundra spring phenology at coastal ITEX sites

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# Thank you to:



Isla Myers-Smith  
Tundra Ecology Lab  
The University of Edinburgh



Ally, Richard, Anne, Janet, Greg,  
Niels and Robert

Field Teams &  
Yukon Park Rangers and Staff

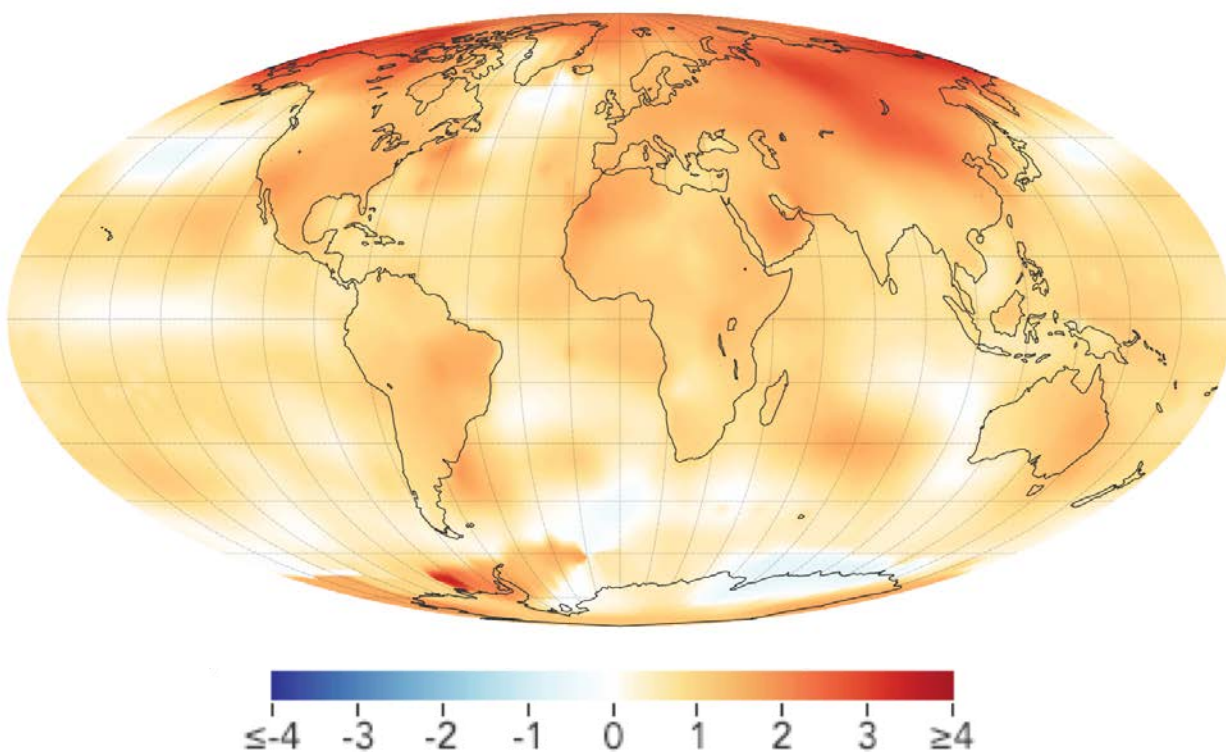
People of the North welcoming us  
onto their traditional land.

Funding for analysis:

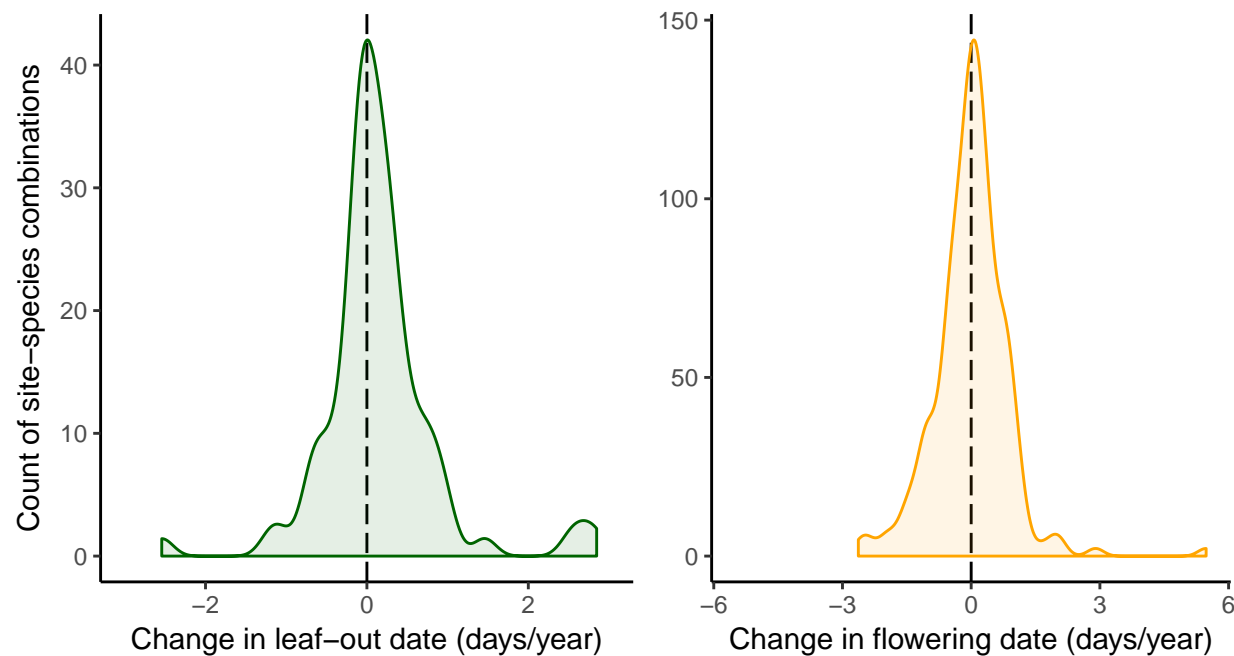


# Rapid warming across the Arctic but no conclusive trend in tundra phenology

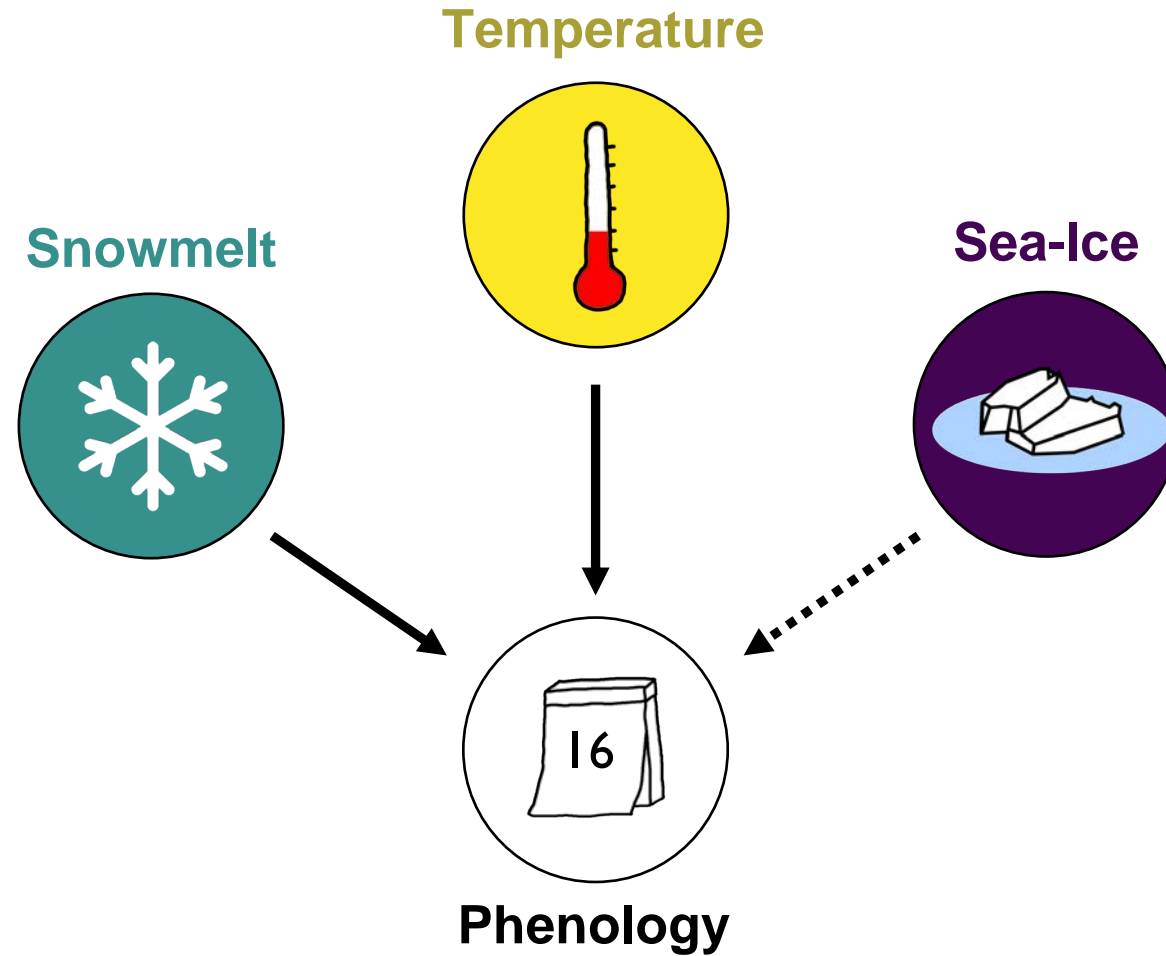
Temperature Anomaly 2017



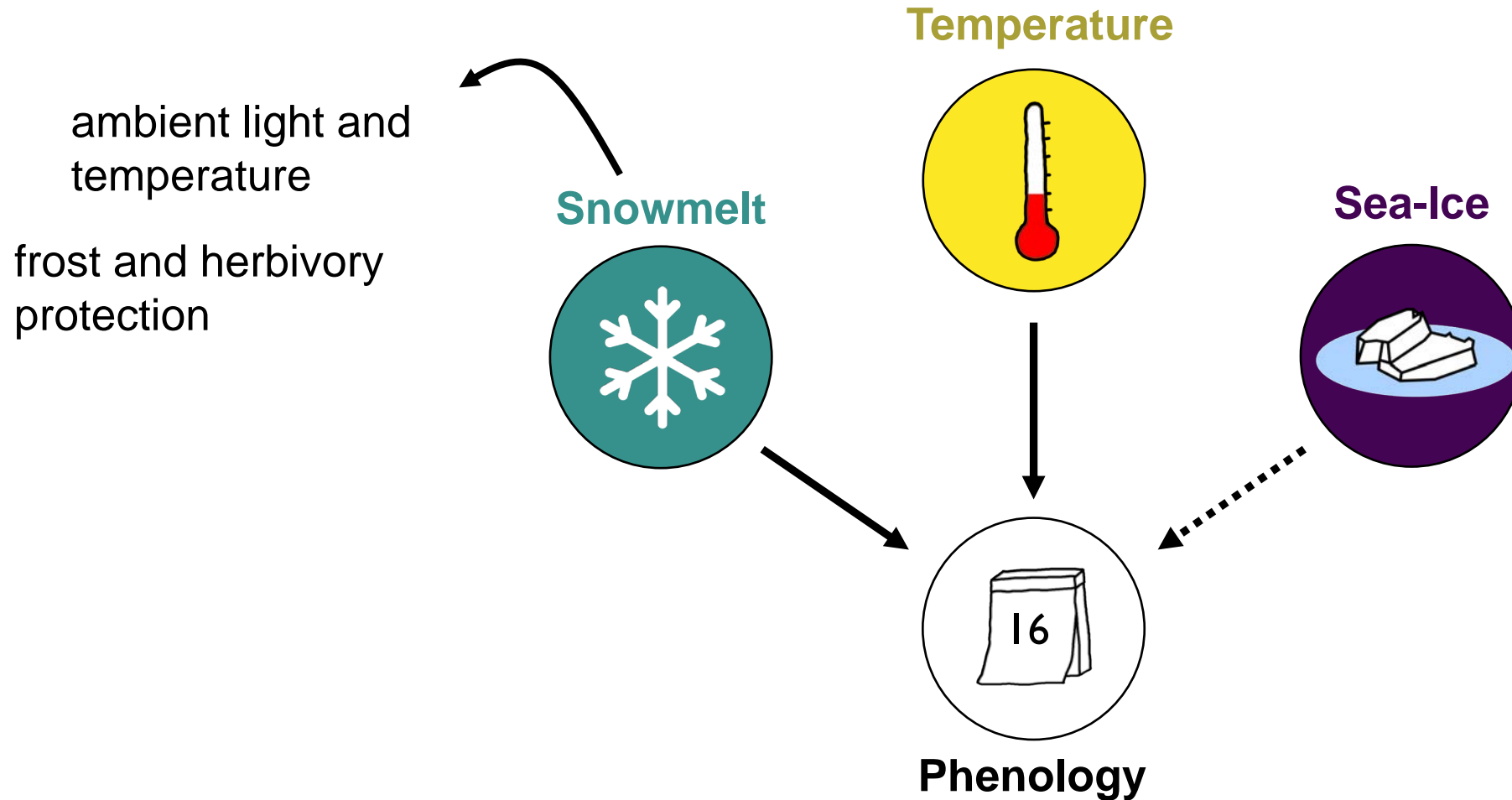
No net change in leaf-out and flowering



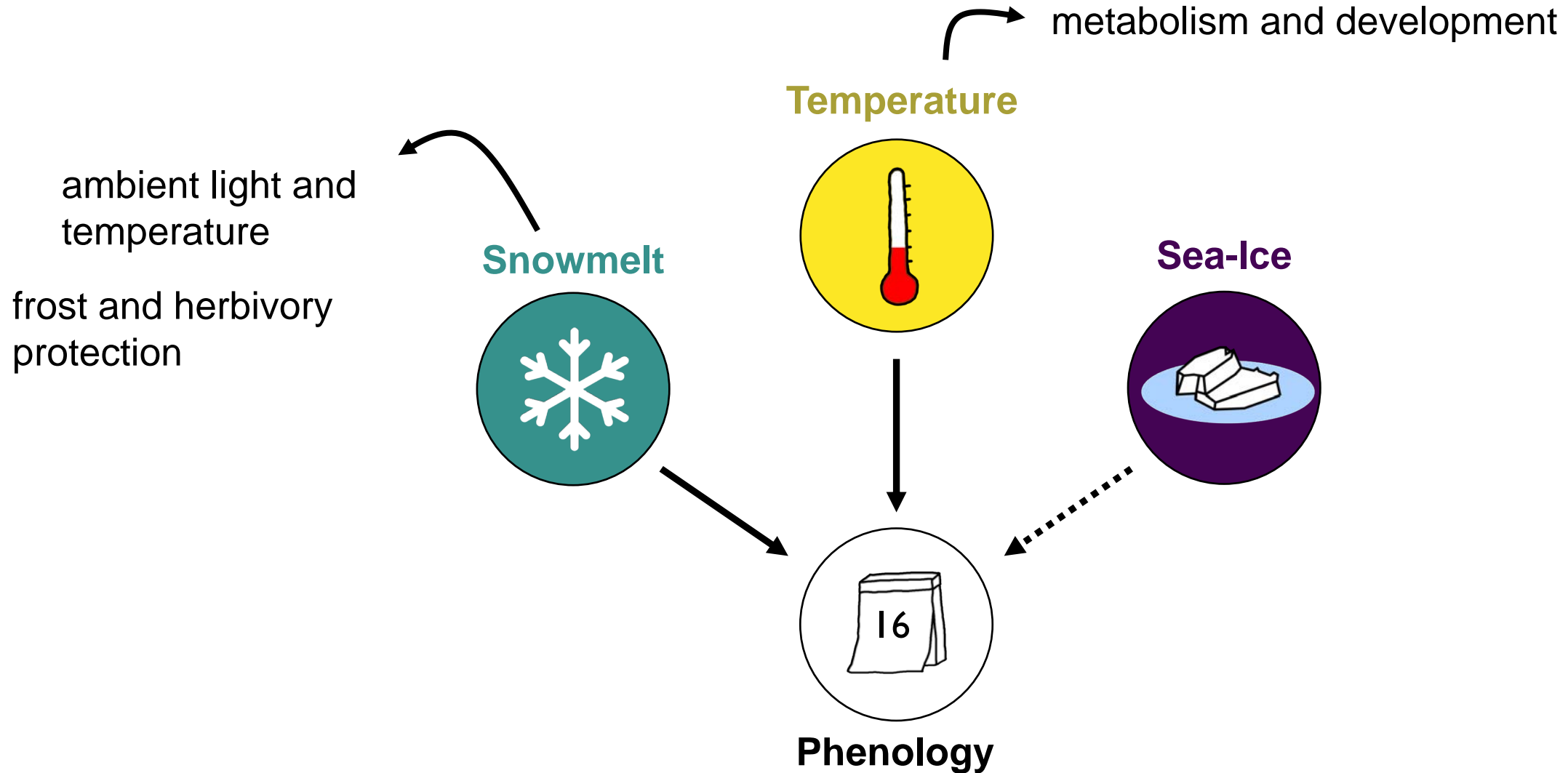
# Snowmelt, Temperature and Sea-Ice have been linked to tundra phenology



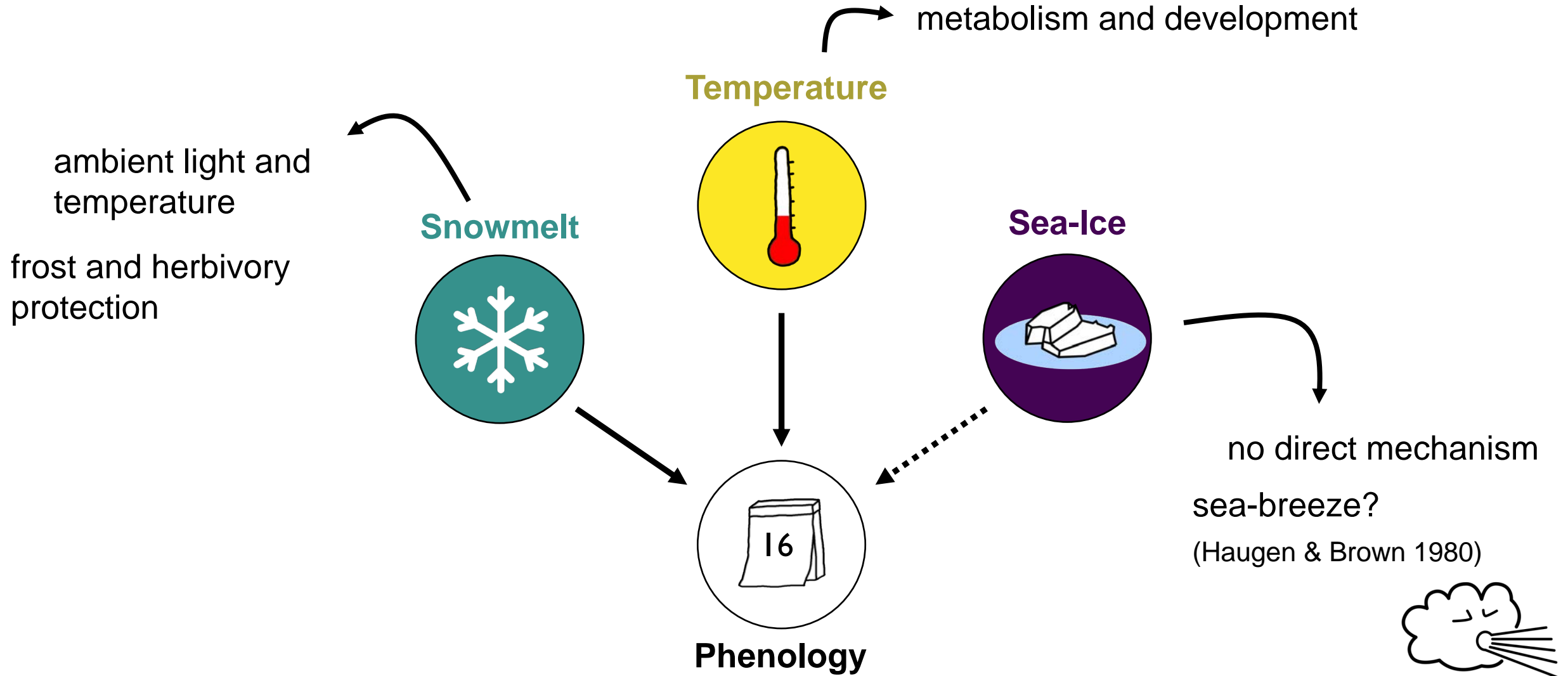
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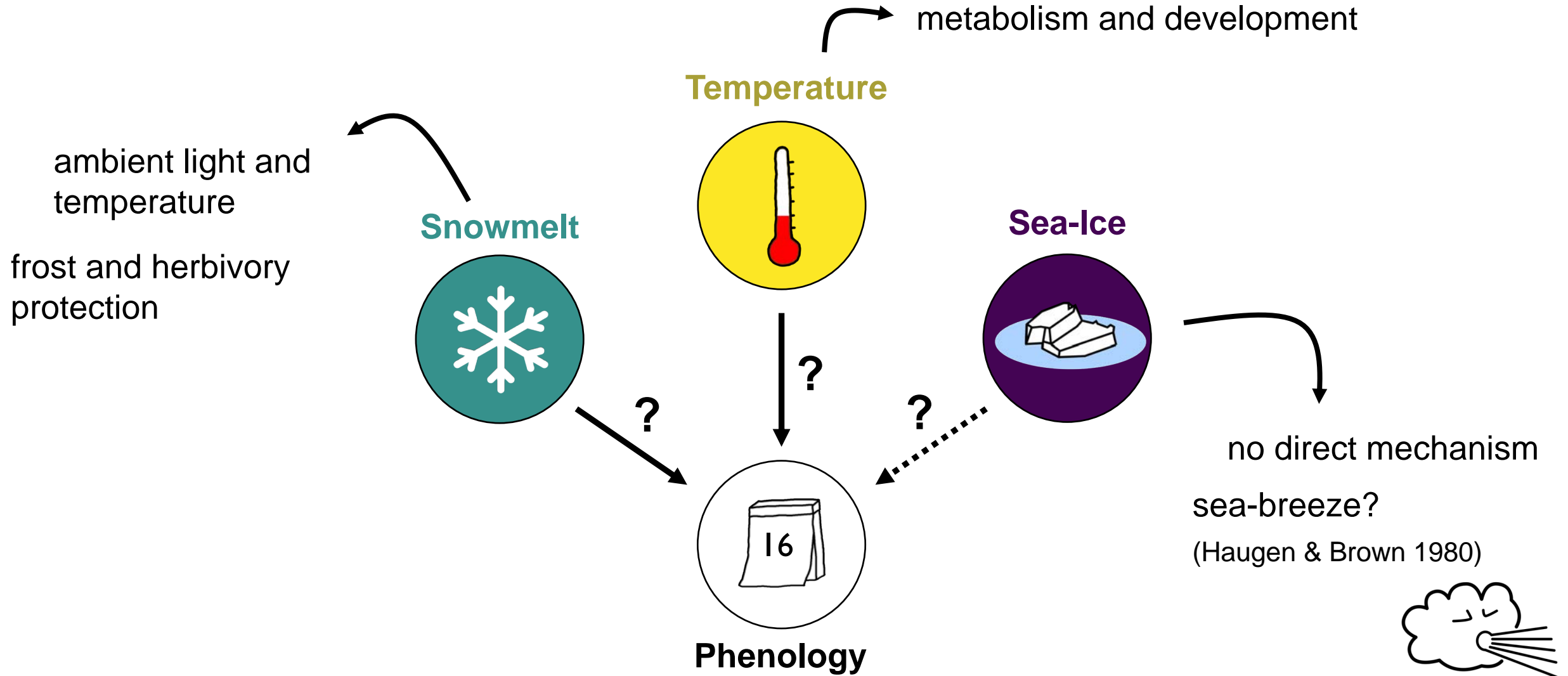
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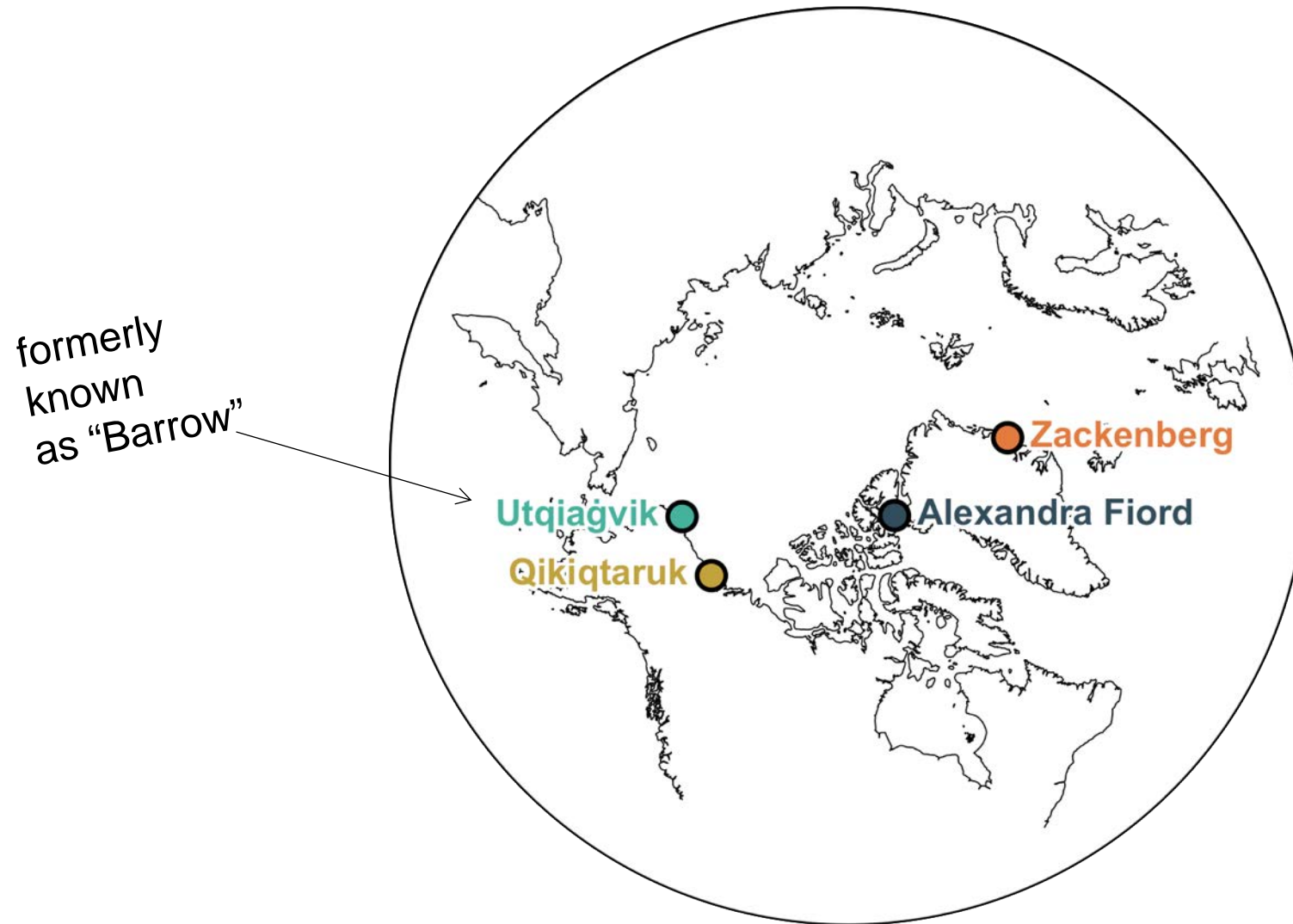
# Snowmelt, Temperature and Sea-Ice have been linked to tundra phenology



# Which environmental factors explain spring phenology at coastal ITEX sites?



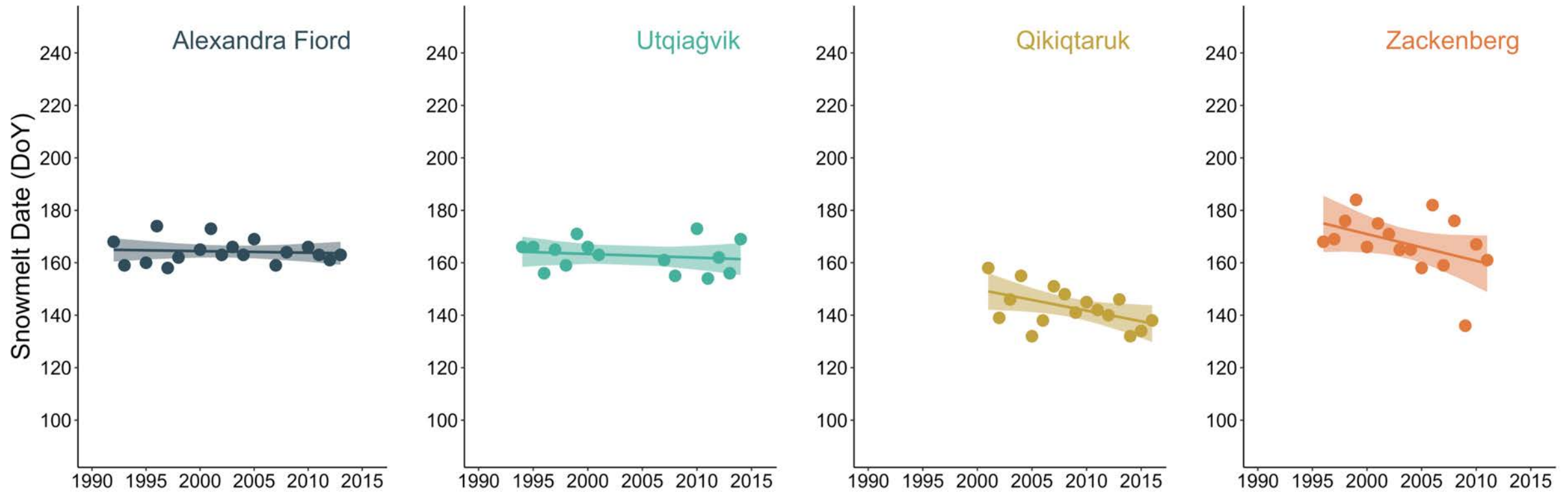
# Which environmental factors explain spring phenology at coastal ITEX sites?



- 10+ Years of Records
- Common Species (10%+ Cover)
- Within 30d of mean snowmelt
- “flowering” and “green up”
- 24 Site-Species-Phenostage Combos

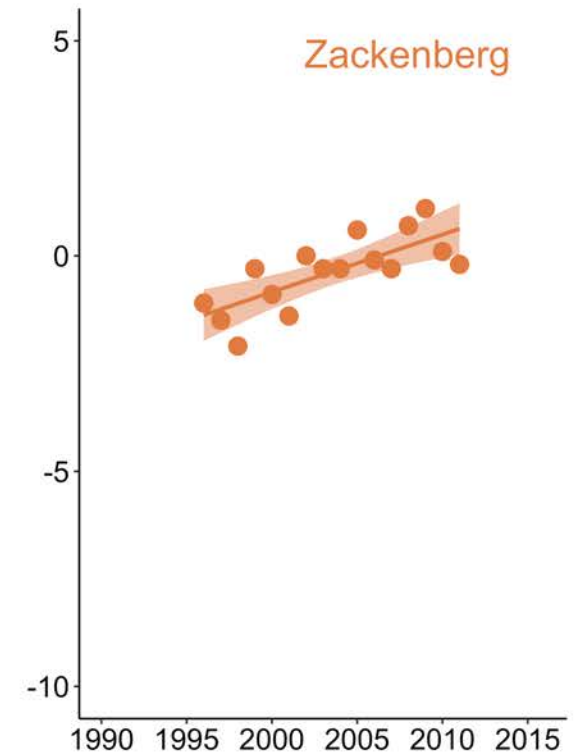
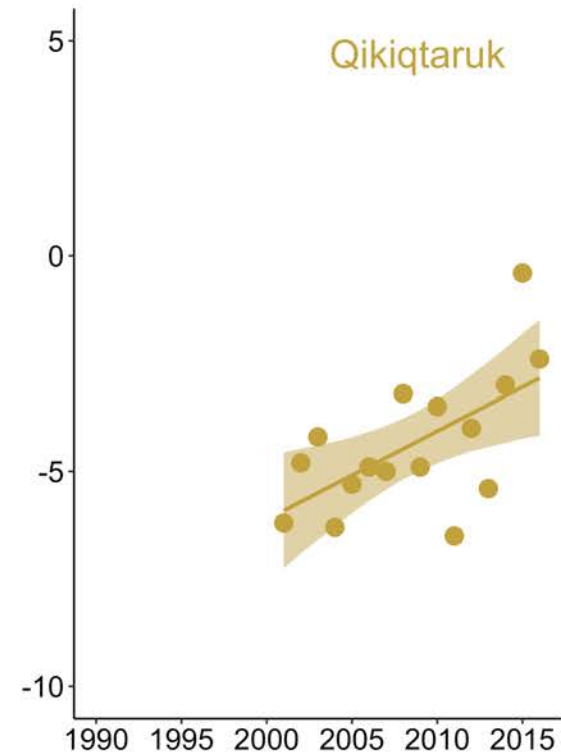
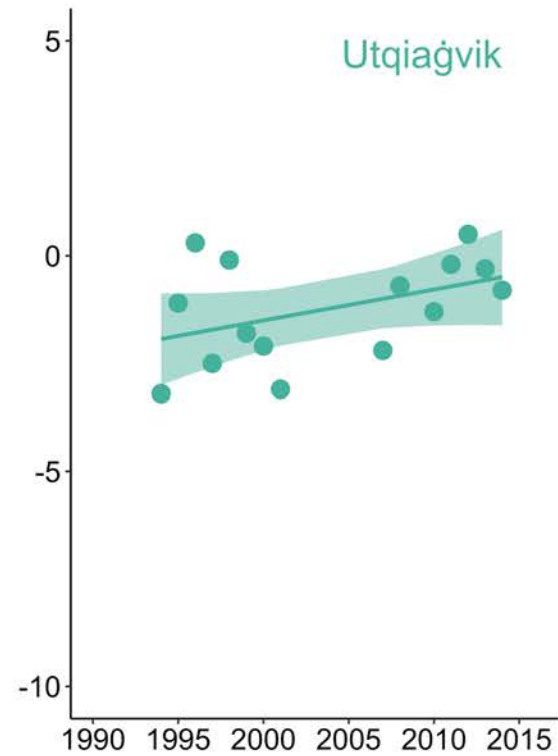
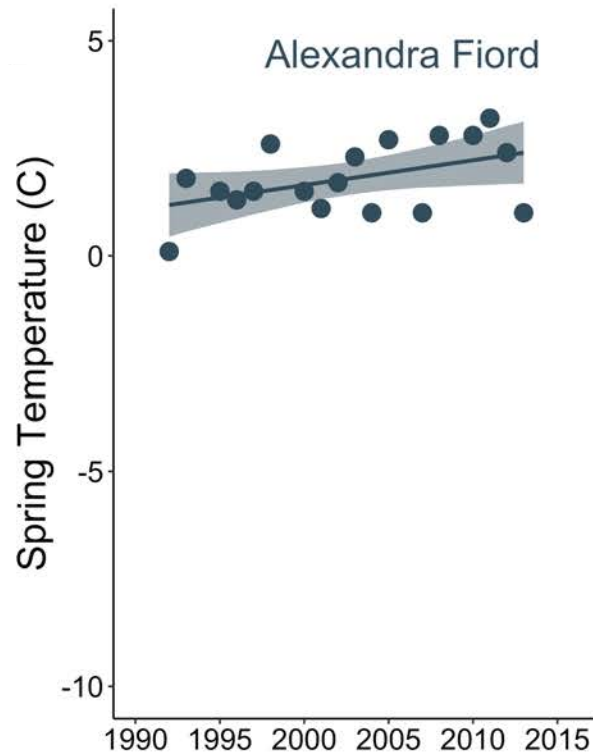


## Snowmelt is advancing at some, but not all sites.



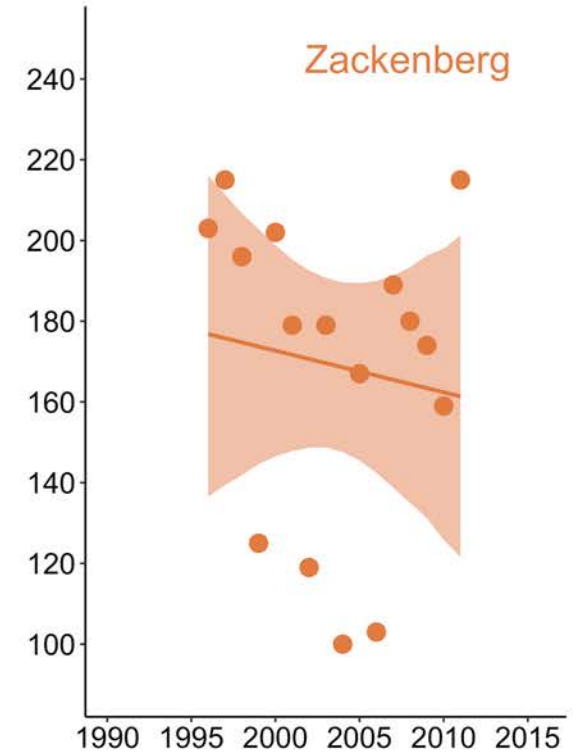
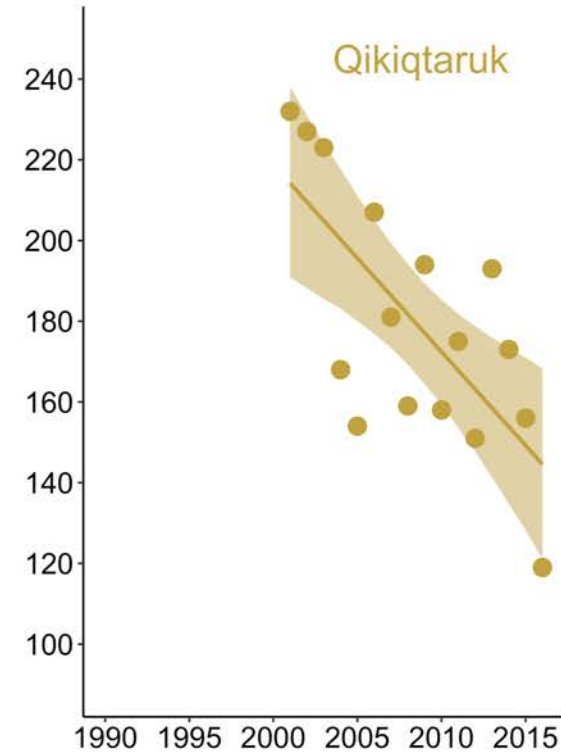
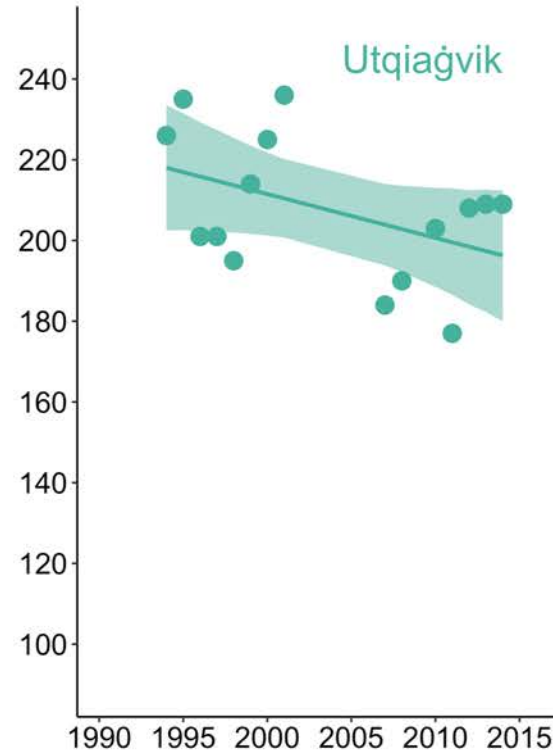
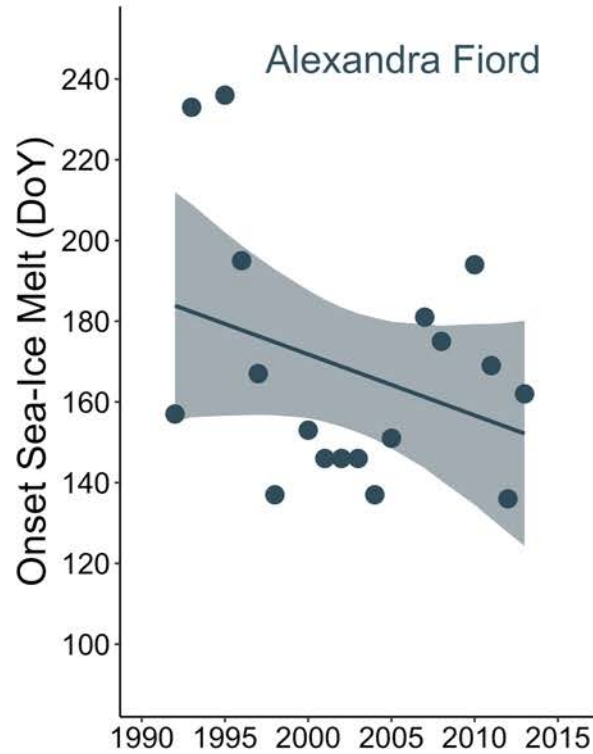


## Spring temperatures are increasing.

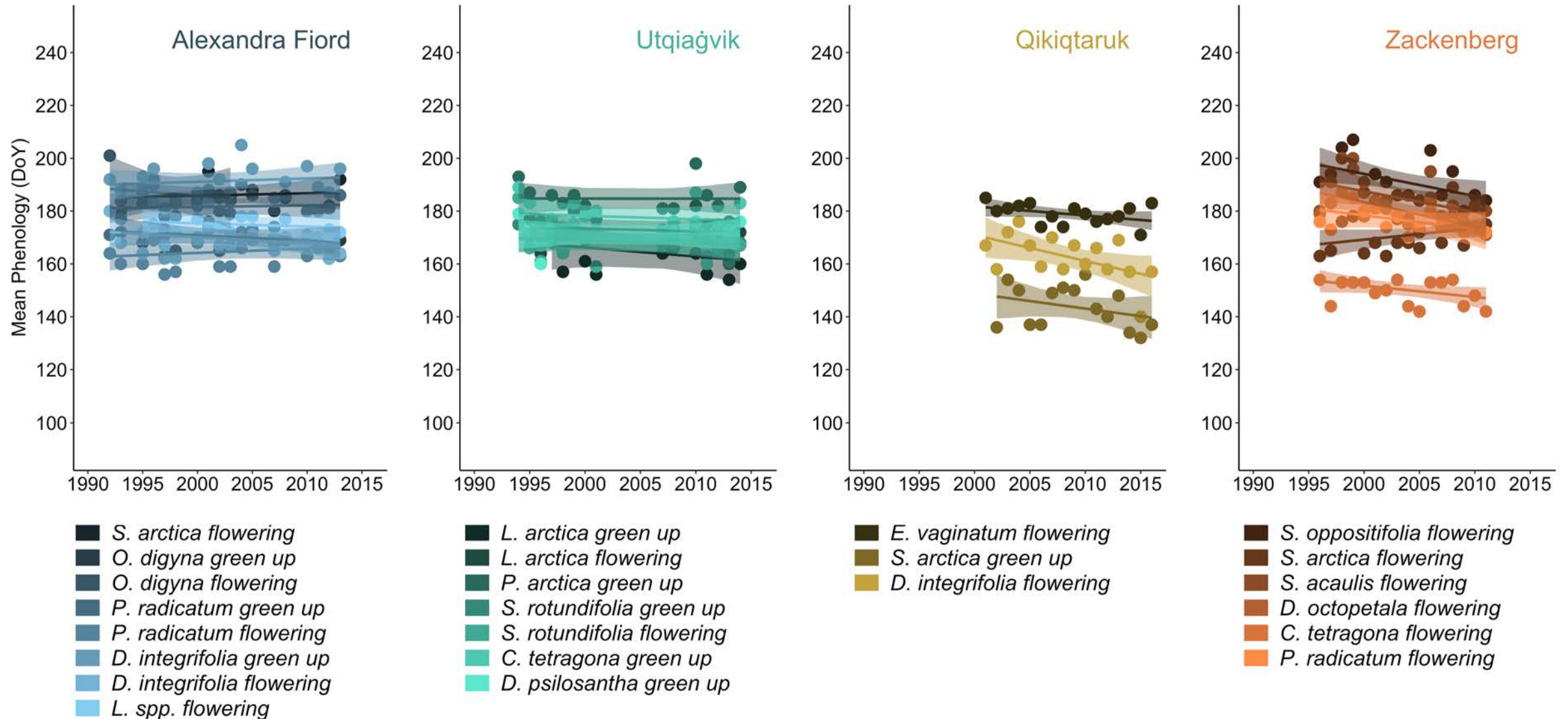




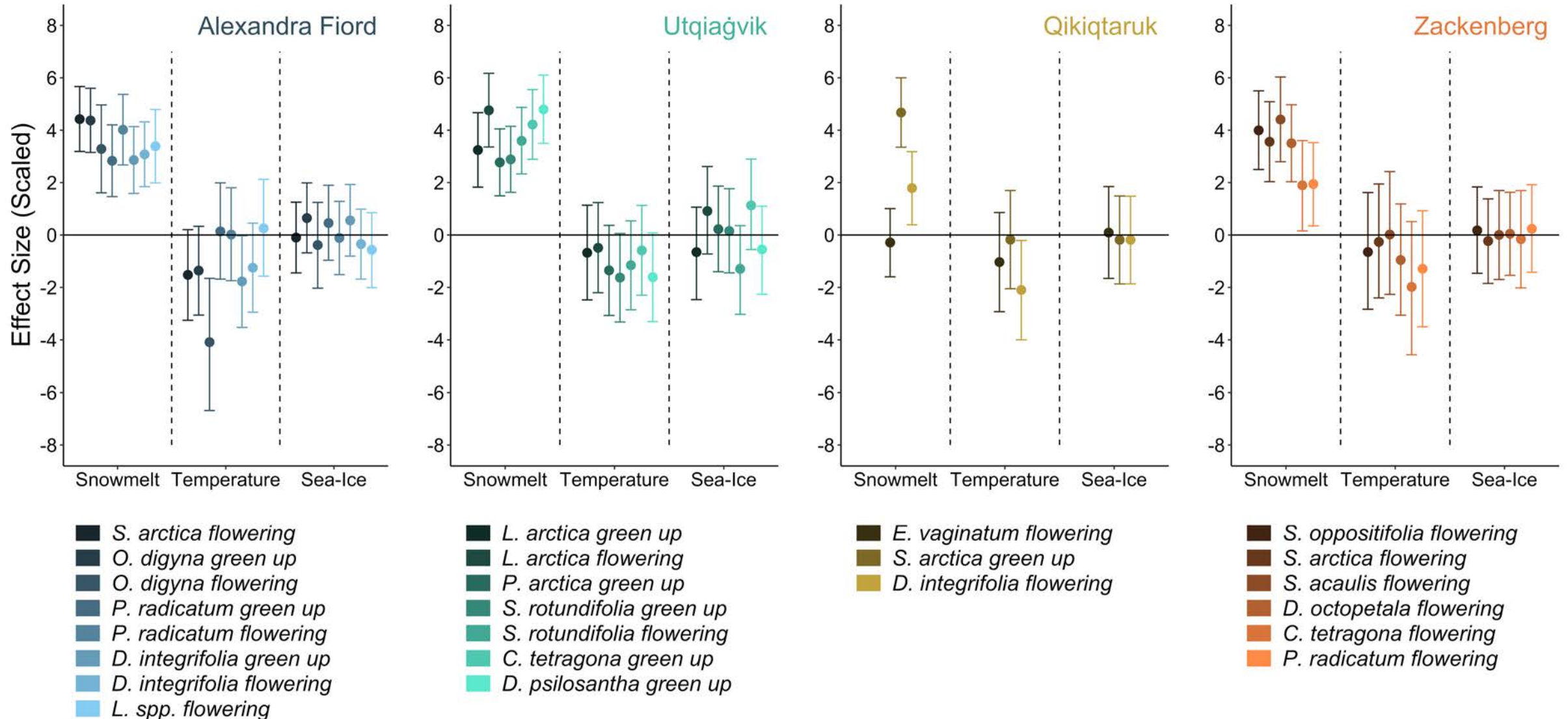
## Onset of sea-ice melt is advancing.



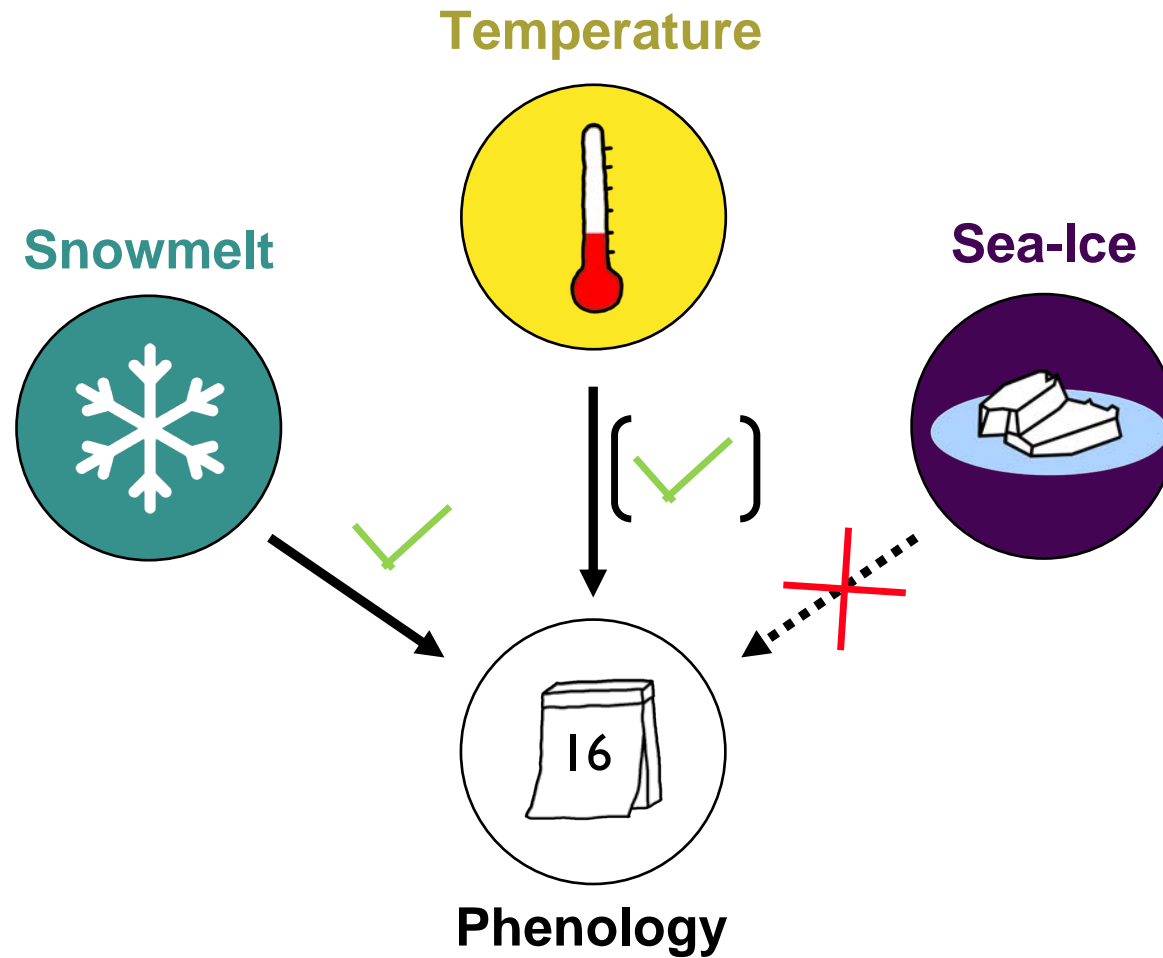
# Spring phenology trends vary across sites and species.



# Snowmelt and temperature - but not sea-ice - explain spring phenology.



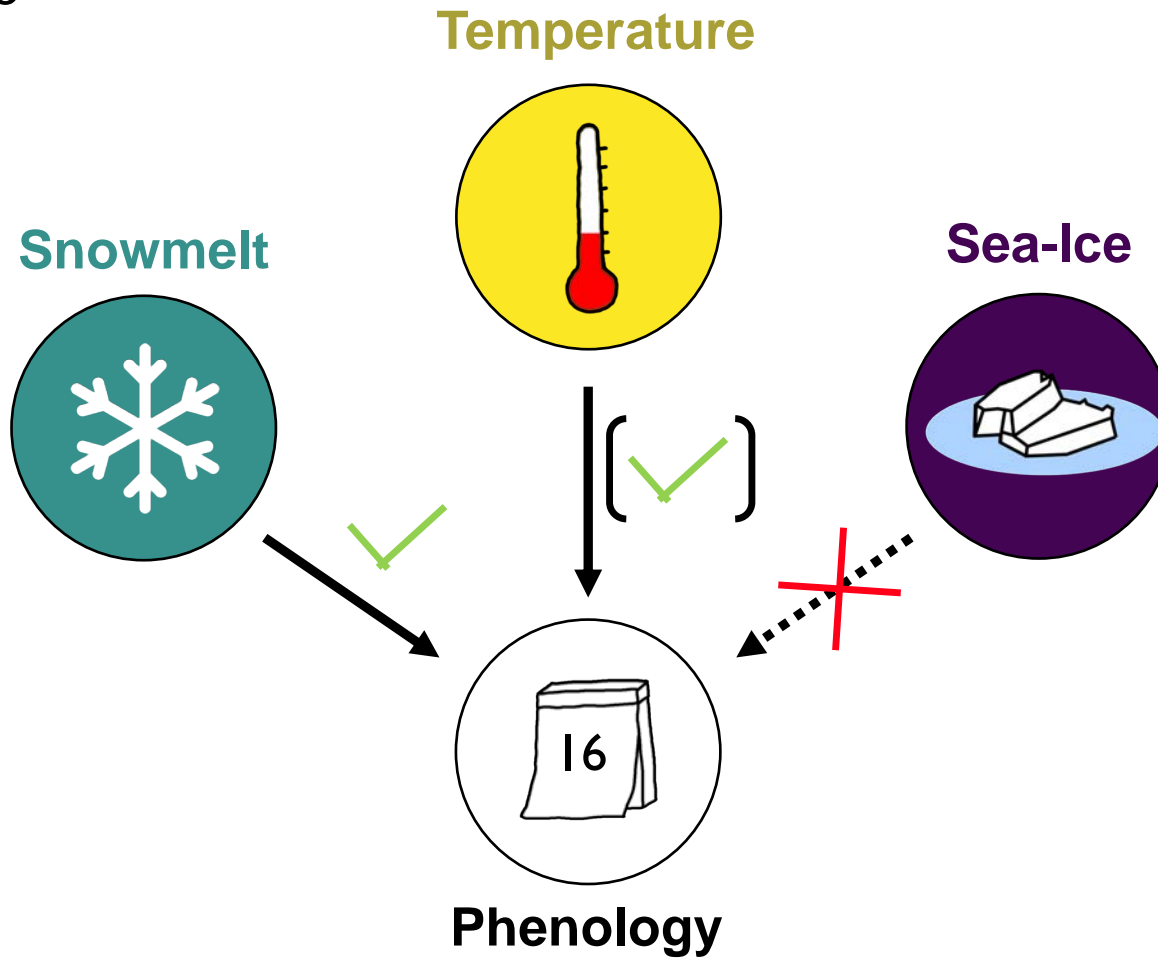
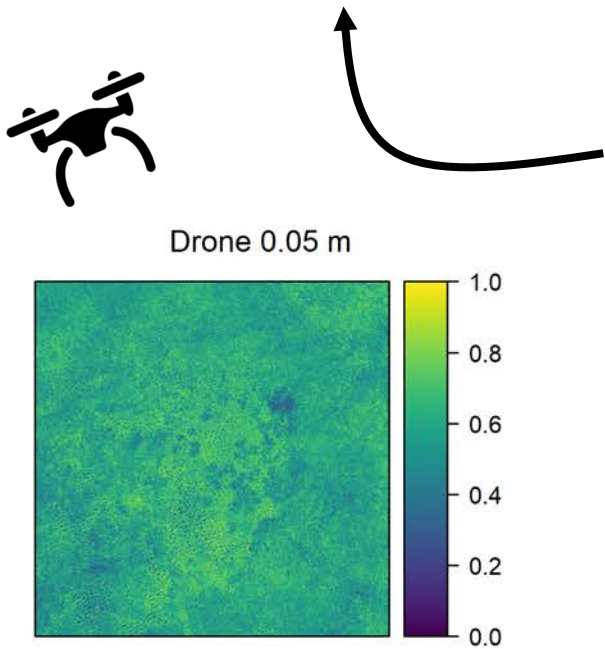
# Snowmelt and temperature - but not sea-ice - explain spring phenology.



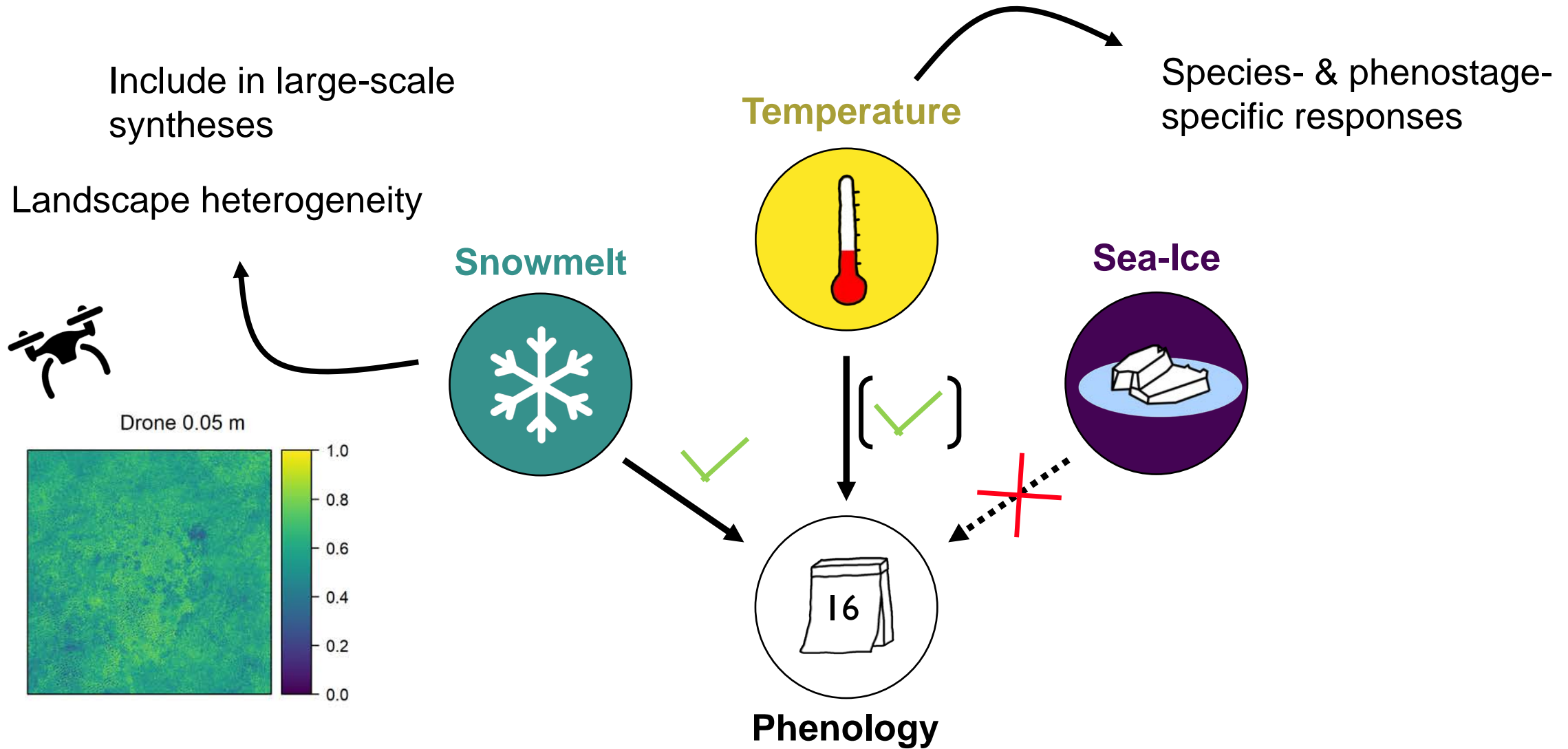
# Snowmelt and temperature - but not sea-ice - explain spring phenology.

Include in large-scale syntheses

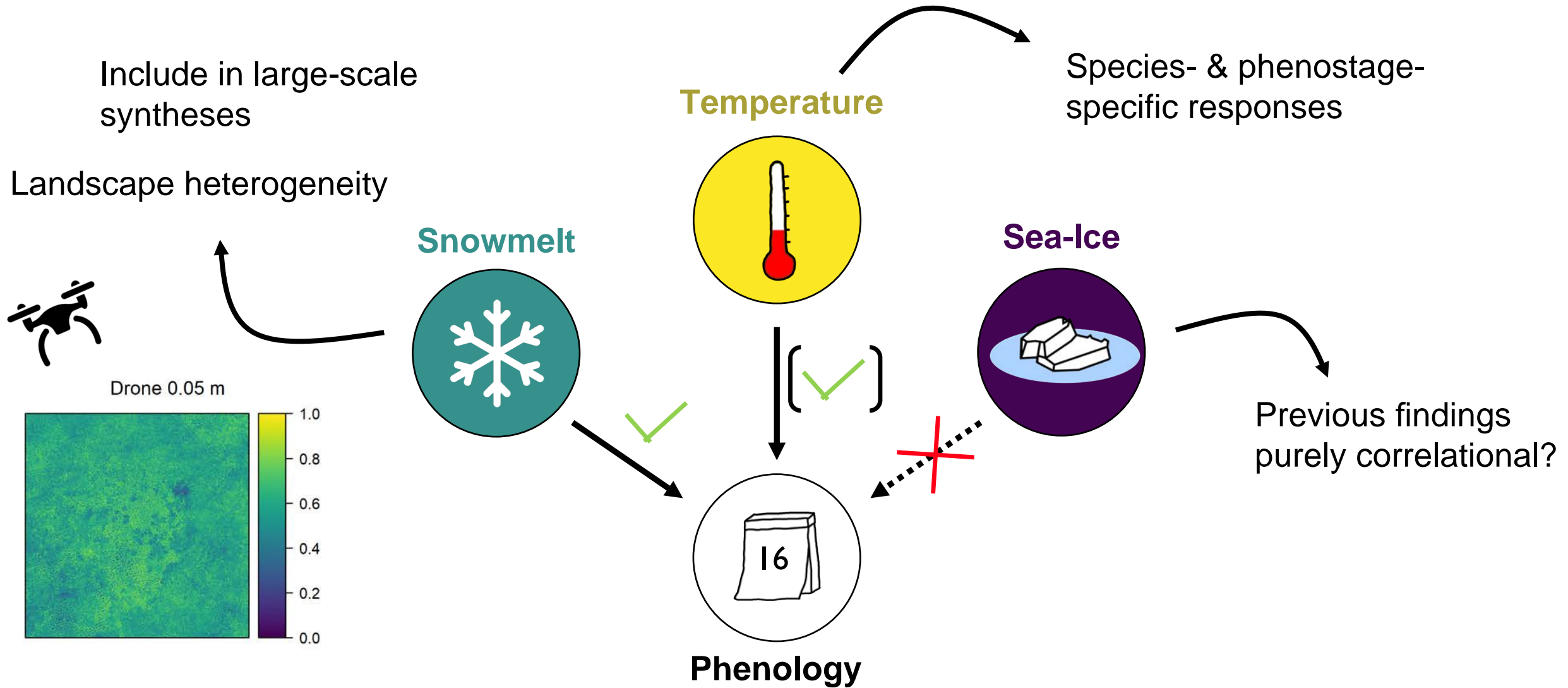
Landscape heterogeneity



# Snowmelt and temperature - but not sea-ice - explain spring phenology.



# Snowmelt and temperature - but not sea-ice - explain spring phenology.



# Thank you!

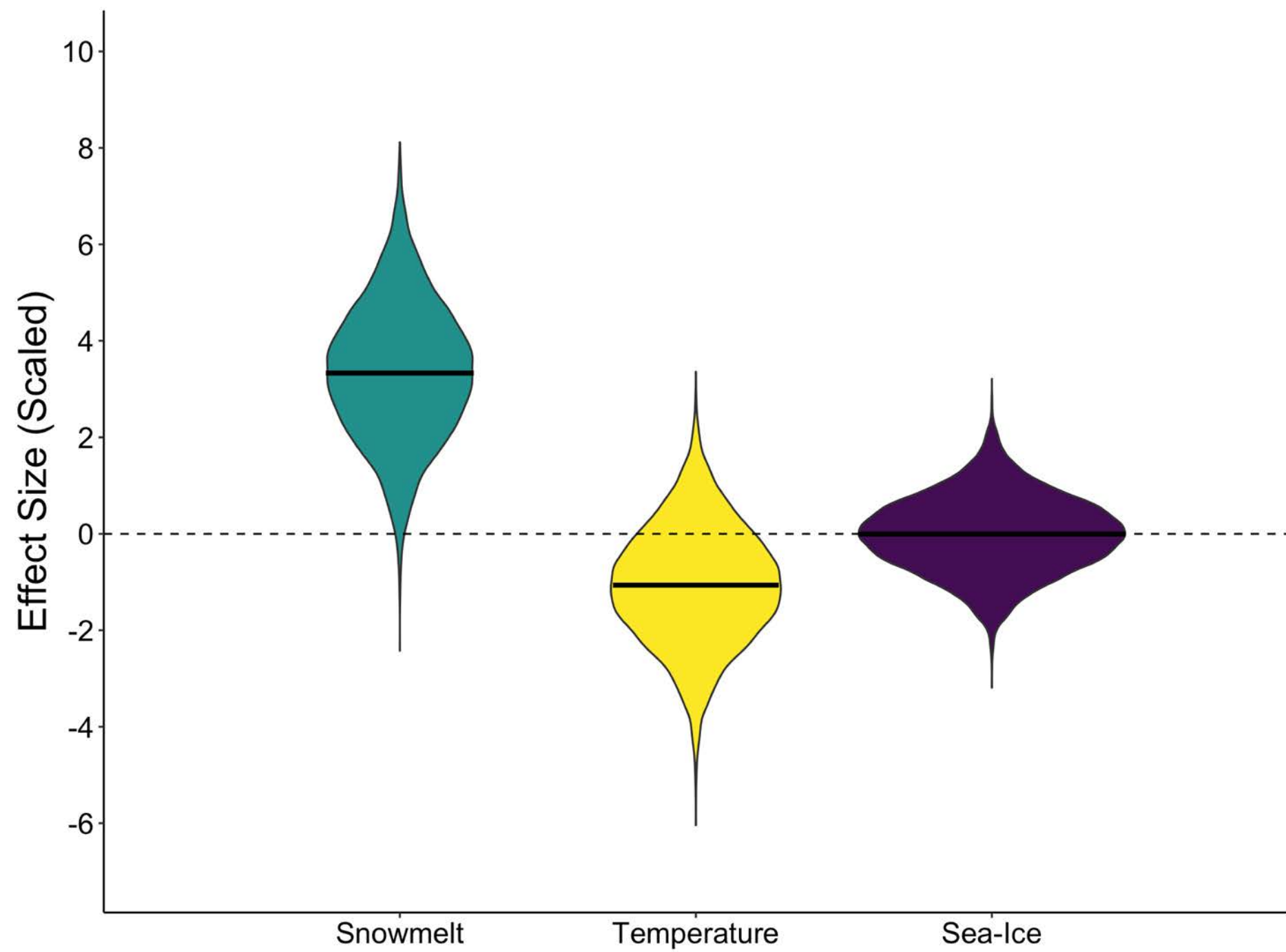


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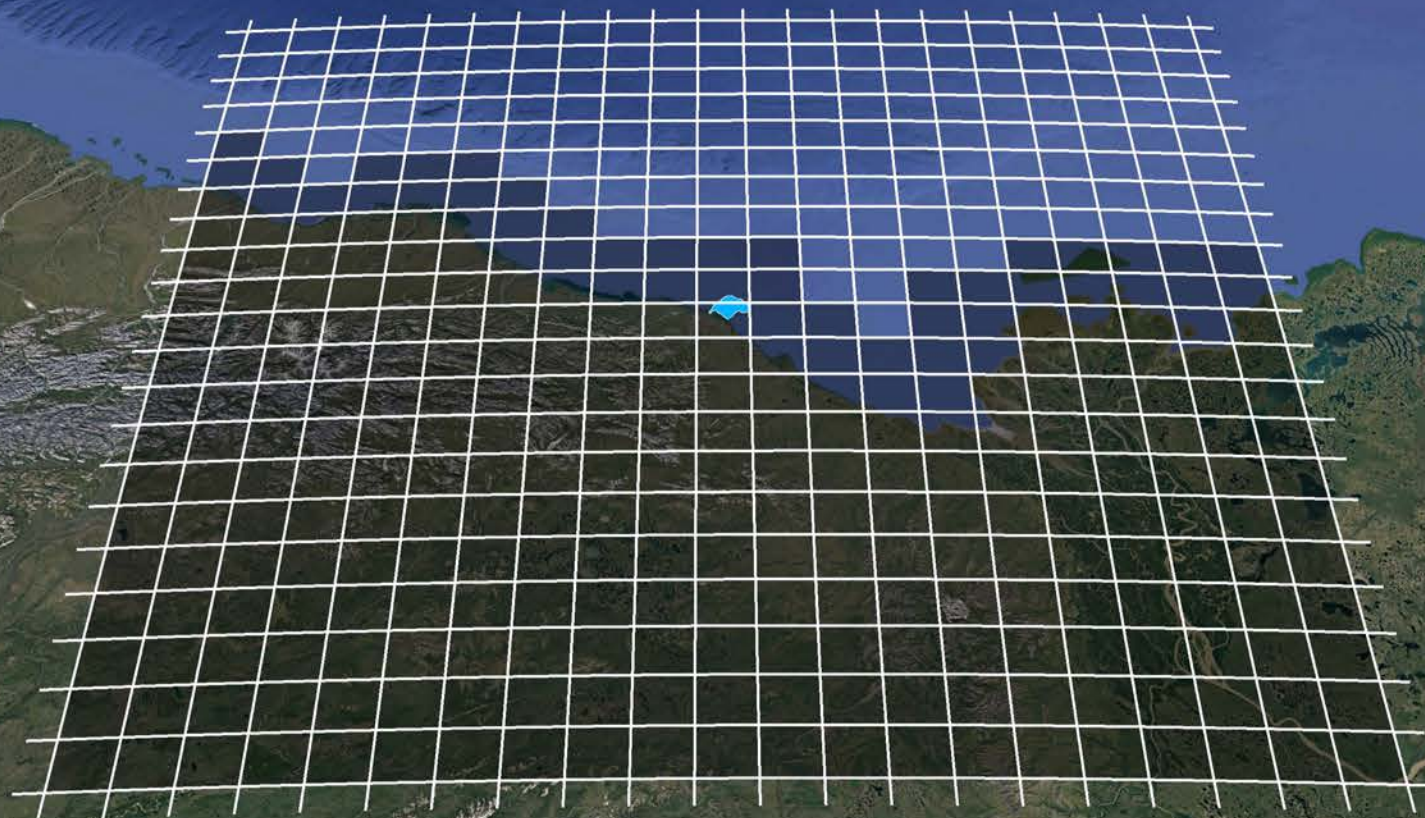
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# Onset of sea-ice melt from Microwave Satellite Data

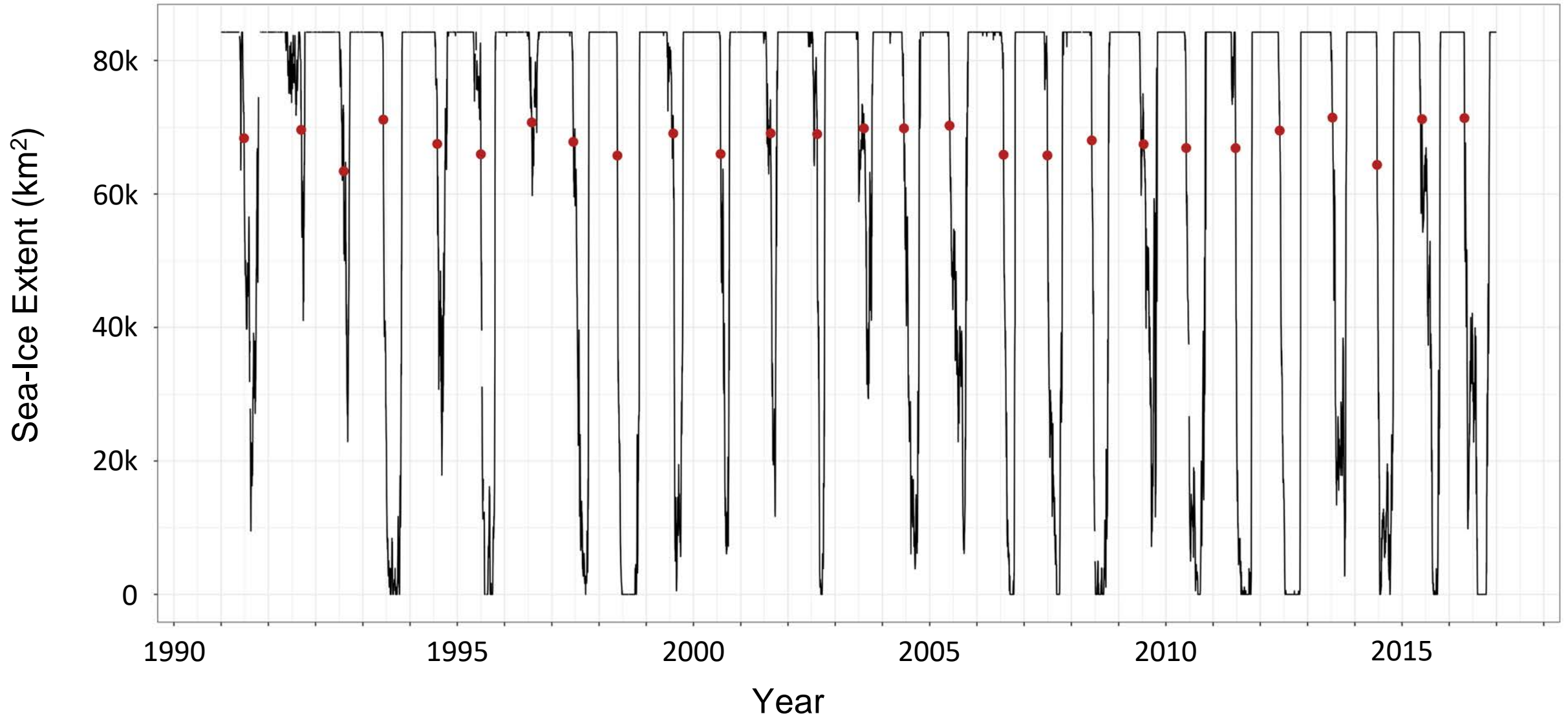




# Onset of sea-ice melt from Microwave Satellite Data

Qikiqtaruk

● Day Onset of Sea-Ice Melt (drop below 85%)

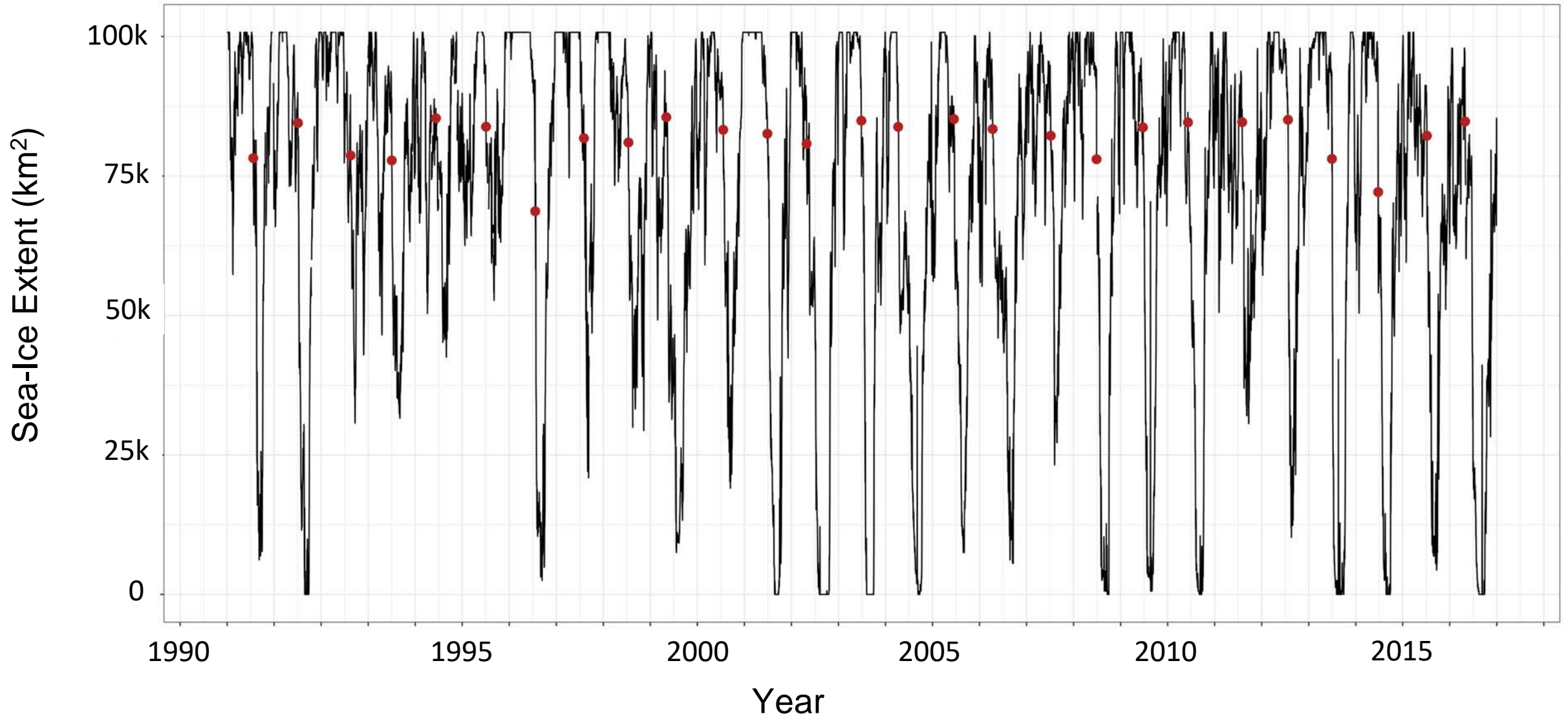




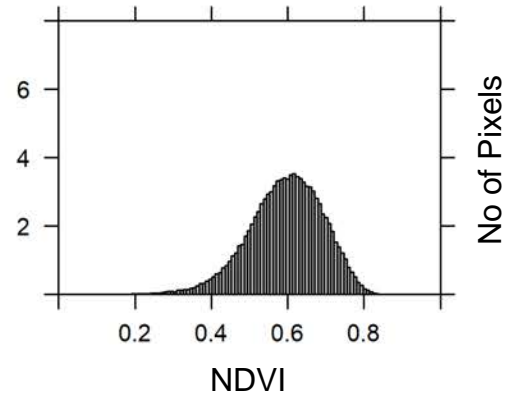
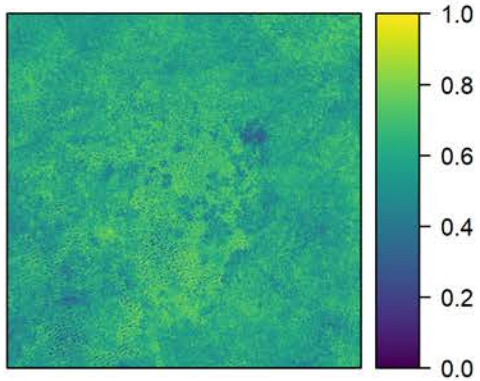
# Onset of sea-ice melt from Microwave Satellite Data

Zackenberg

● Day Onset of Sea-Ice Melt (drop below 85%)



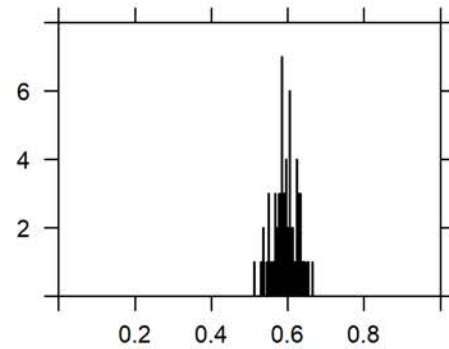
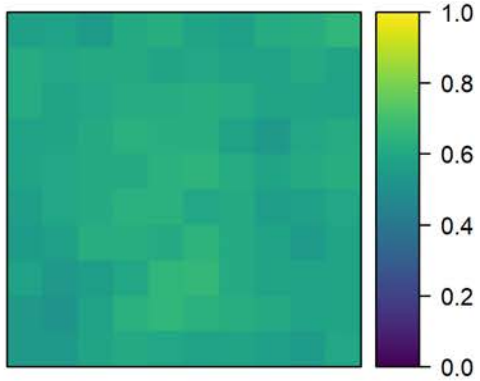
Drone 0.05 m



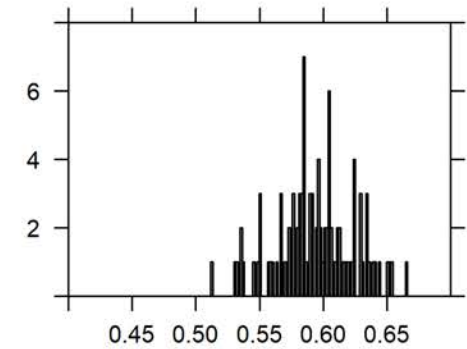
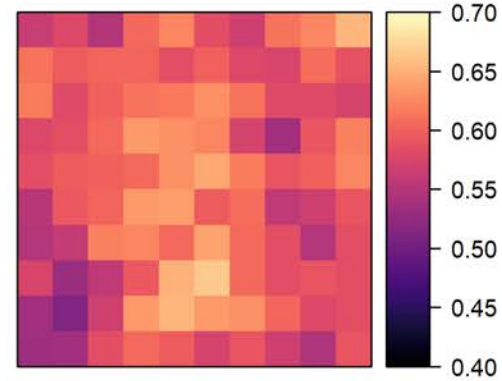
Variation is lost at Sentinel pixel size

resampled

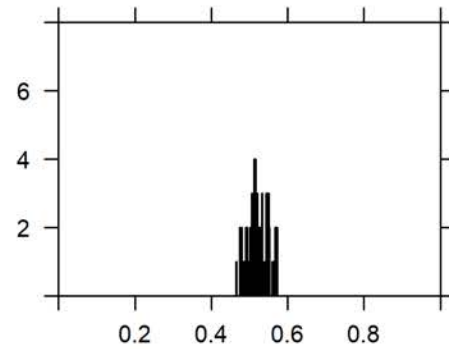
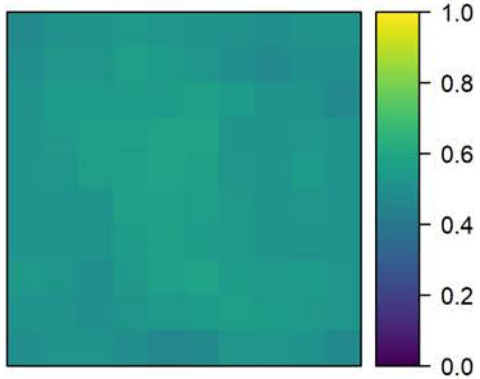
Drone 10 m



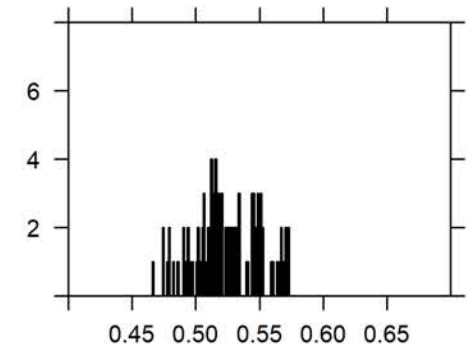
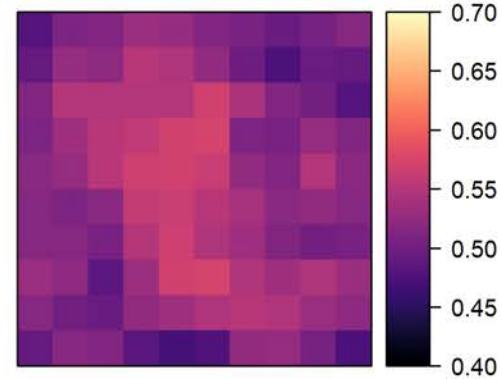
Drone 10 m



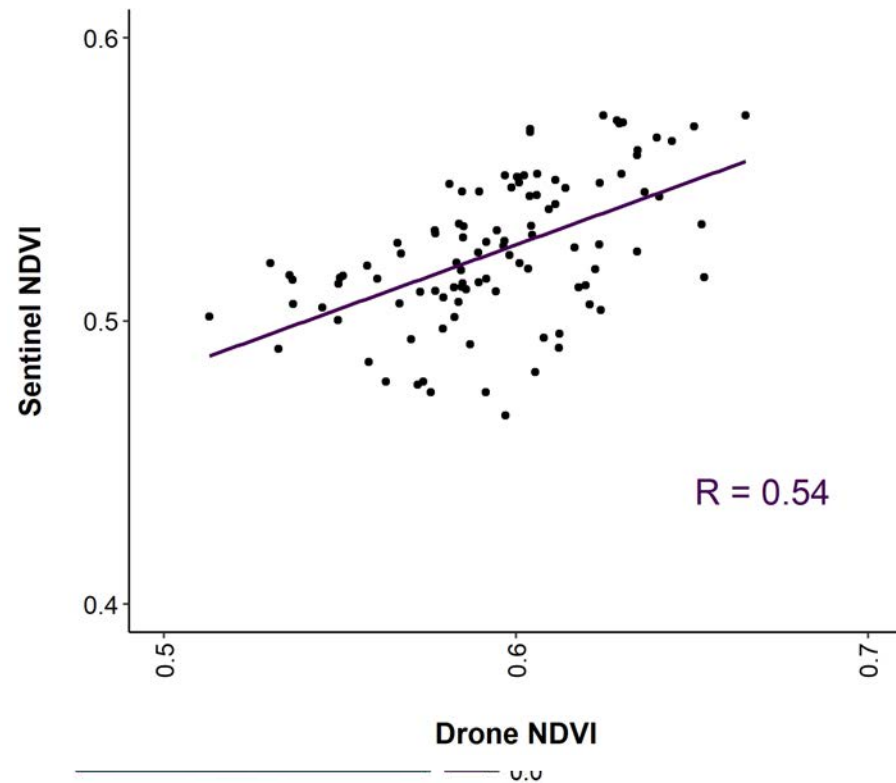
Sentinel 10 m



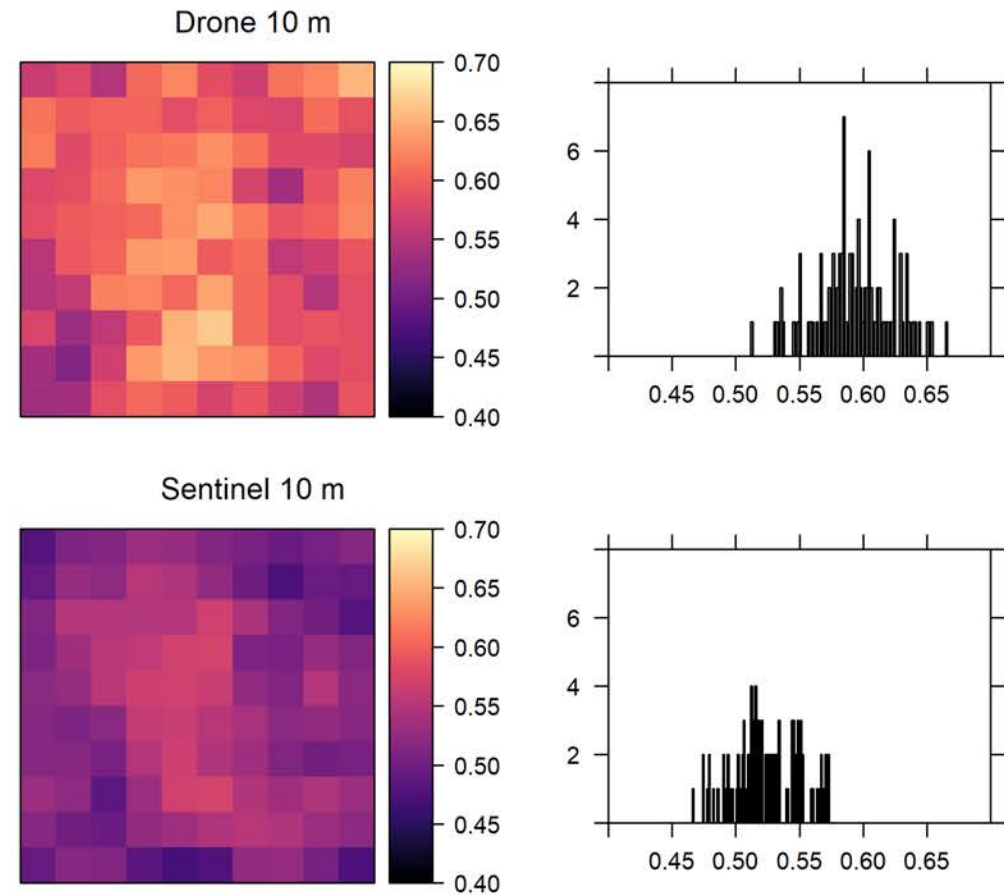
Sentinel 10 m



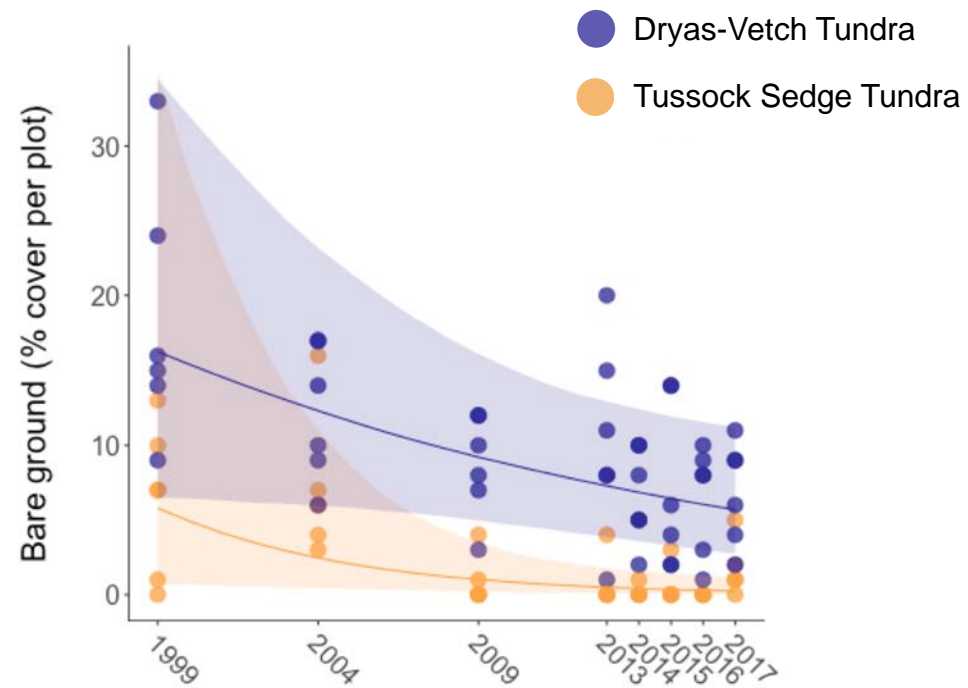
Pixels are moderately correlated



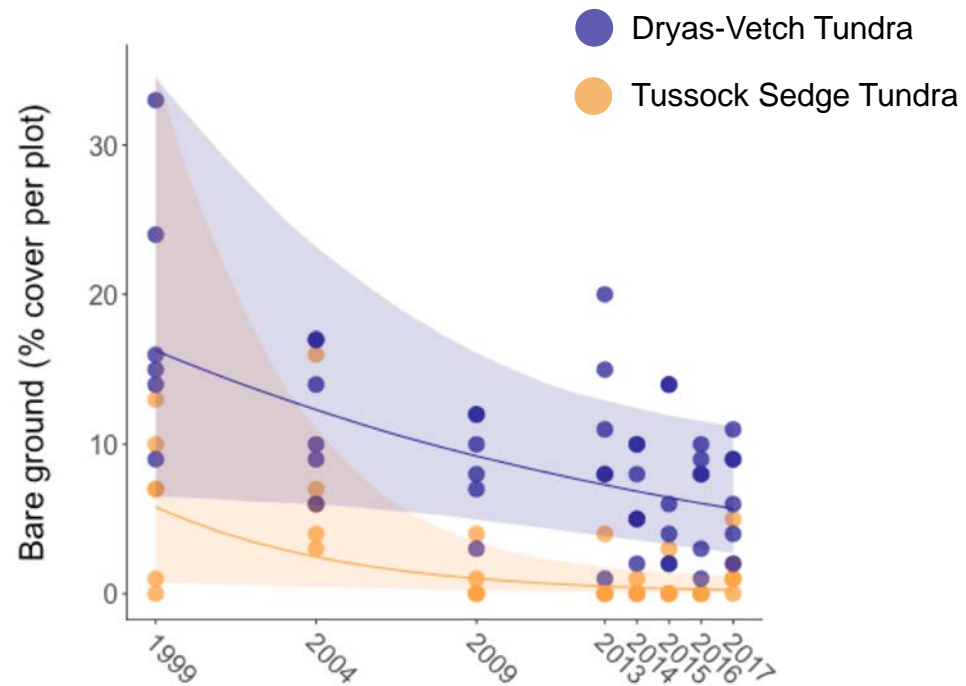
Variation is lost at Sentinel pixel size



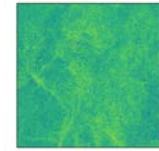
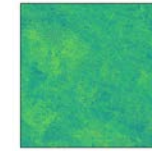
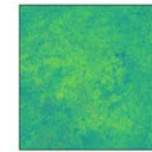
(How) does bare ground cover influence NDVI?



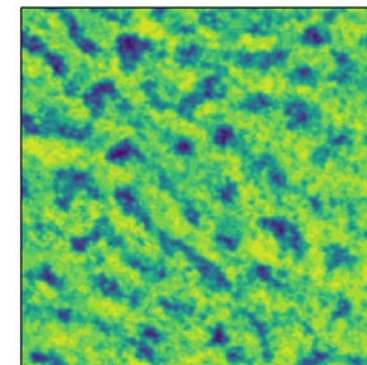
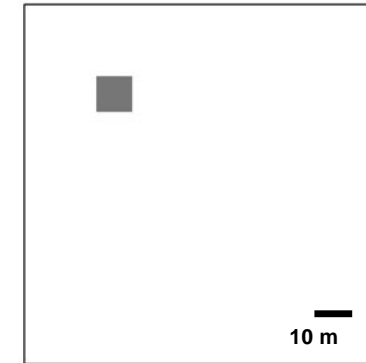
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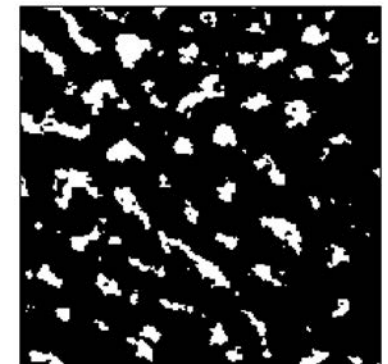
Collinson Head      Bowhead Ridge      Hawk Ridge



10 m x 10 m cell analysis

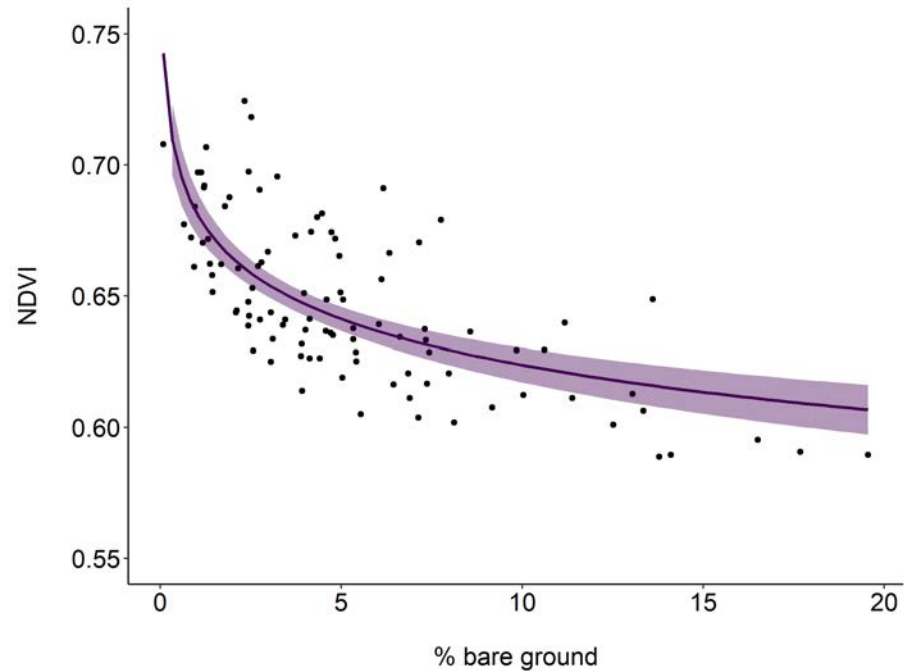


10 m

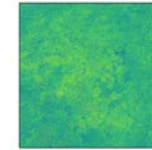


Bare-Ground

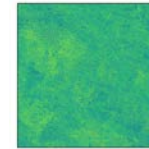
Bare ground and NDVI are coupled, but  
**the relationship is non-linear!**



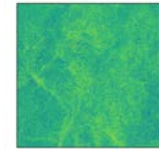
Collinson Head



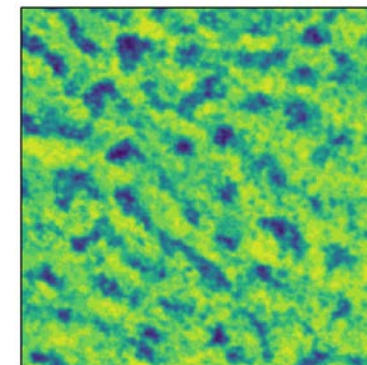
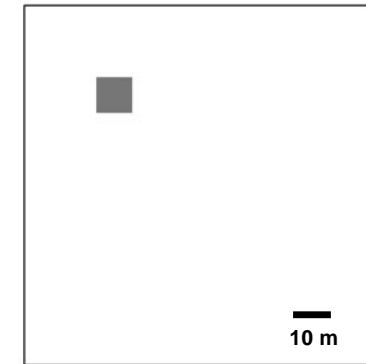
Bowhead Ridge



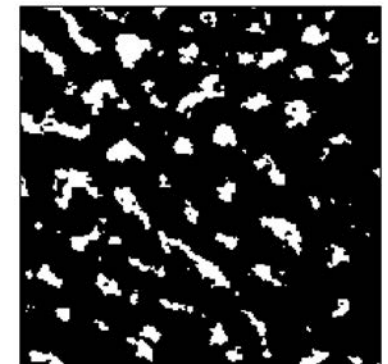
Hawk Ridge



10 m x 10 m cell analysis



10 m



Bare-Ground