

# Changes in the Arctic Ice Cover

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# Overview

❄ Arctic Climate

❄ Sea ice

❄ Arctic Ocean

❄ Greenland

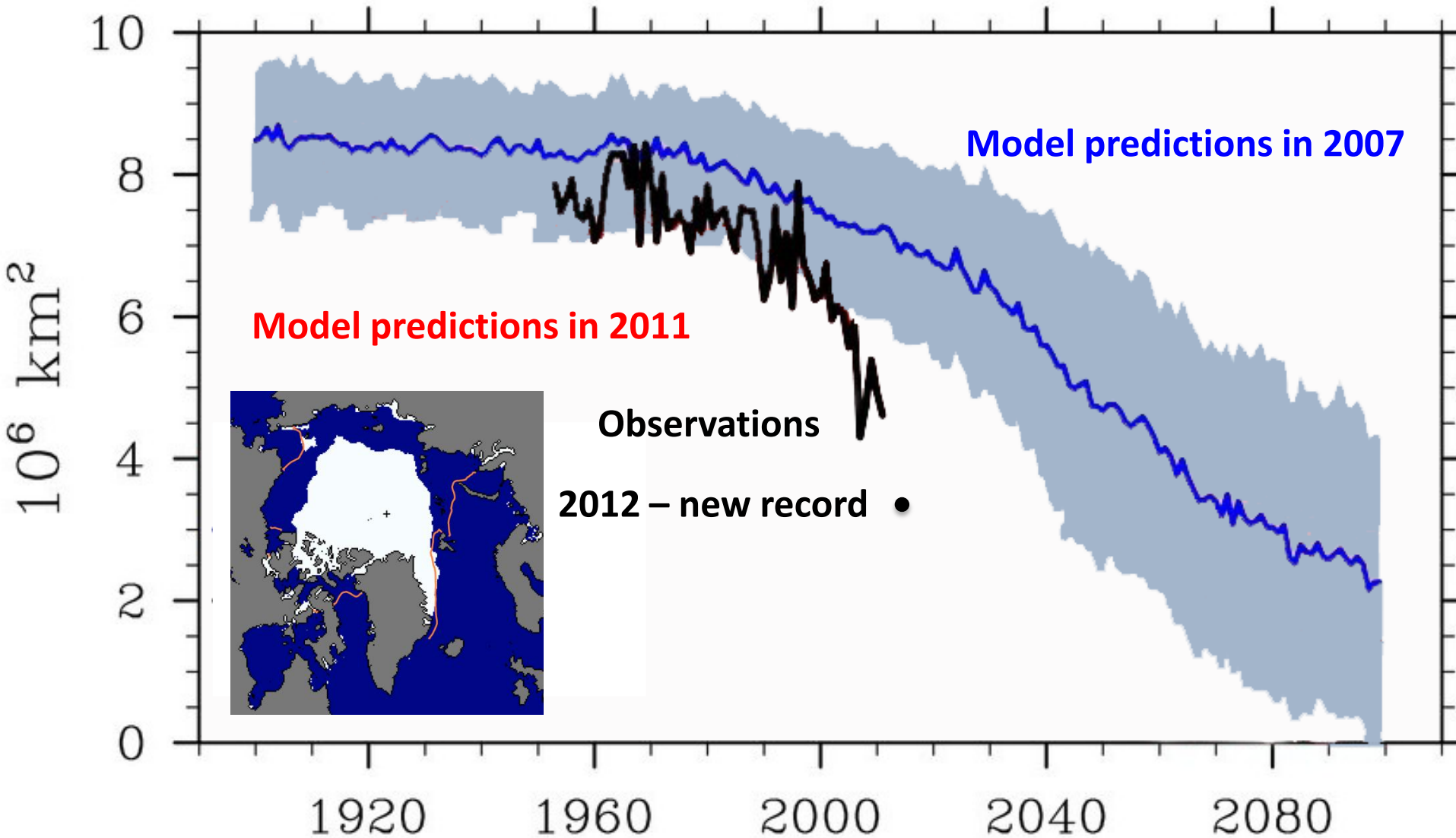
# Arctic Climate



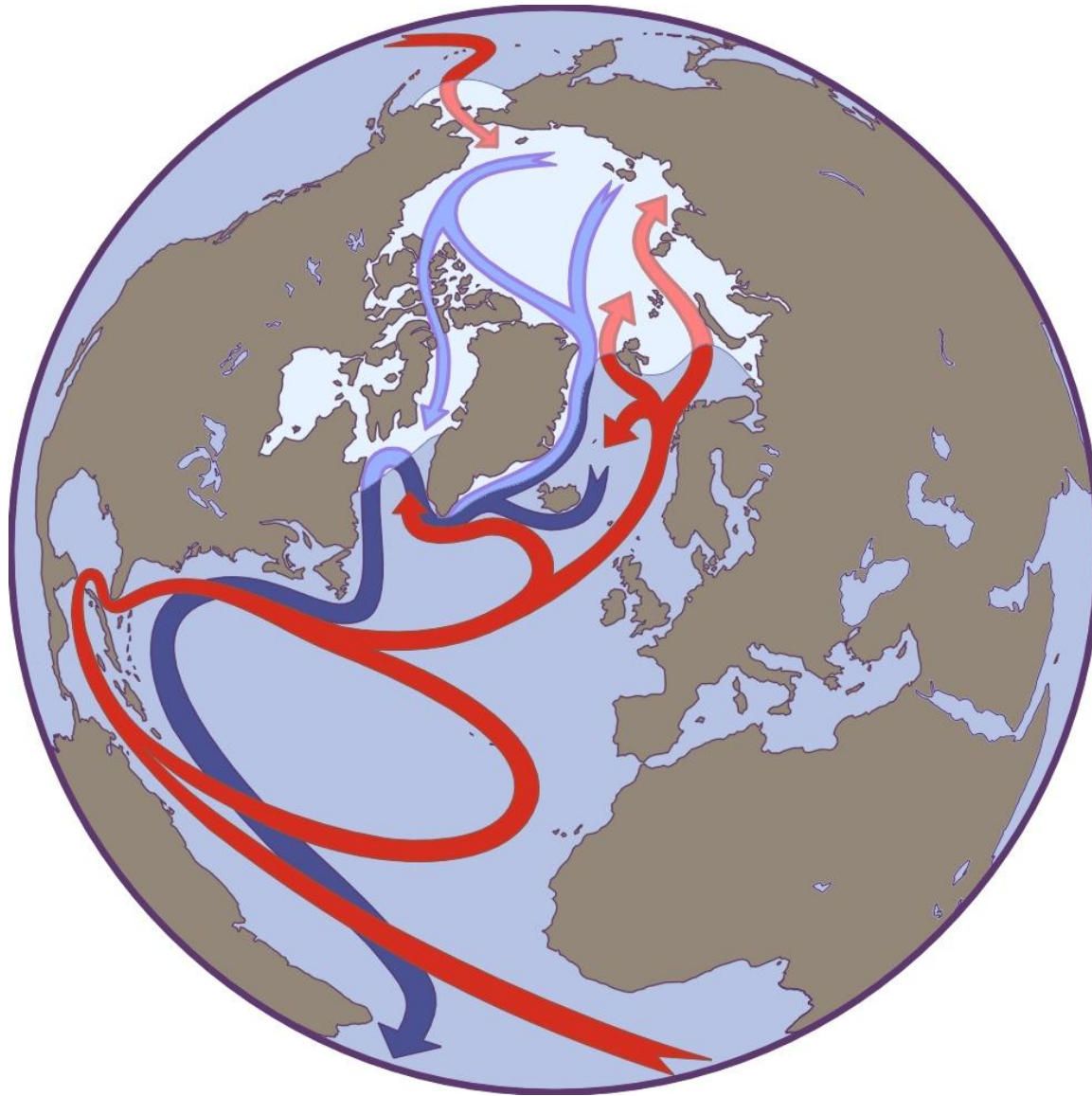
Date: 20030928



# Arctic Climate



# Arctic Climate



# Arctic Climate

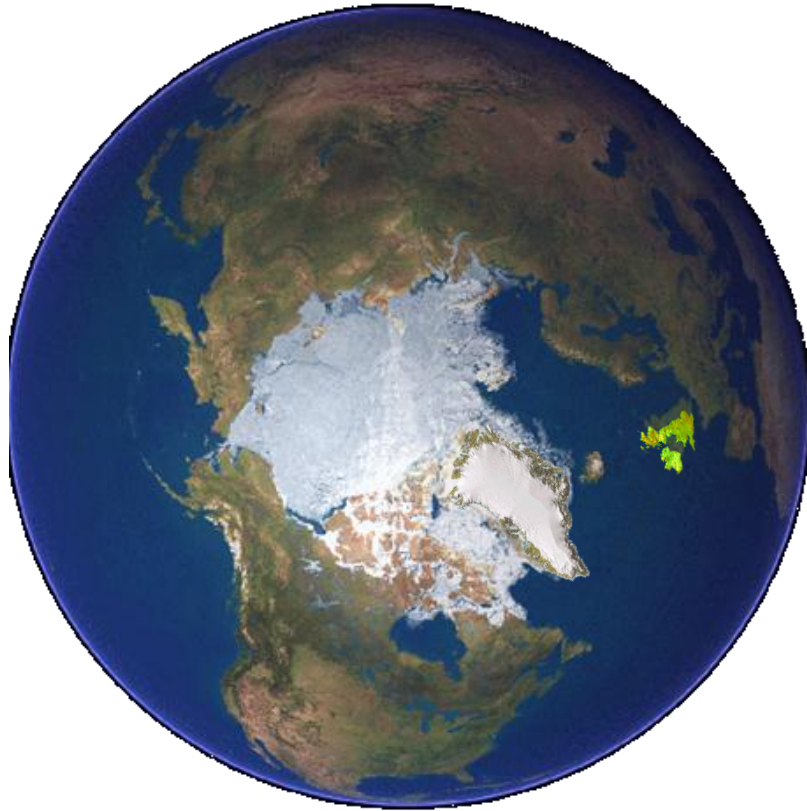


# Arctic Climate

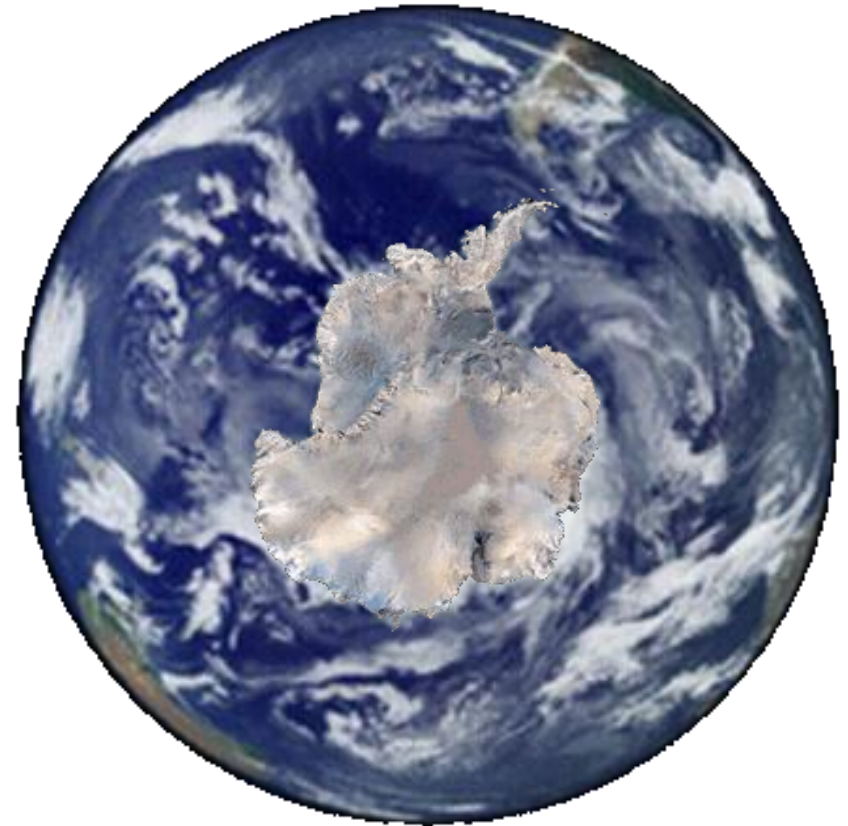




# Arctic Climate



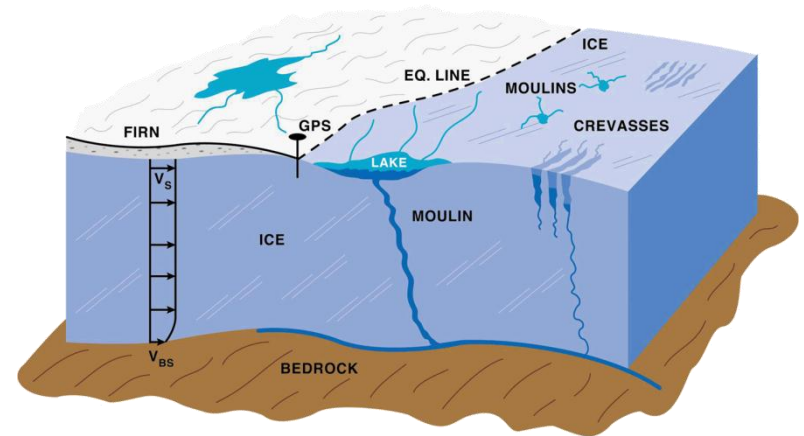
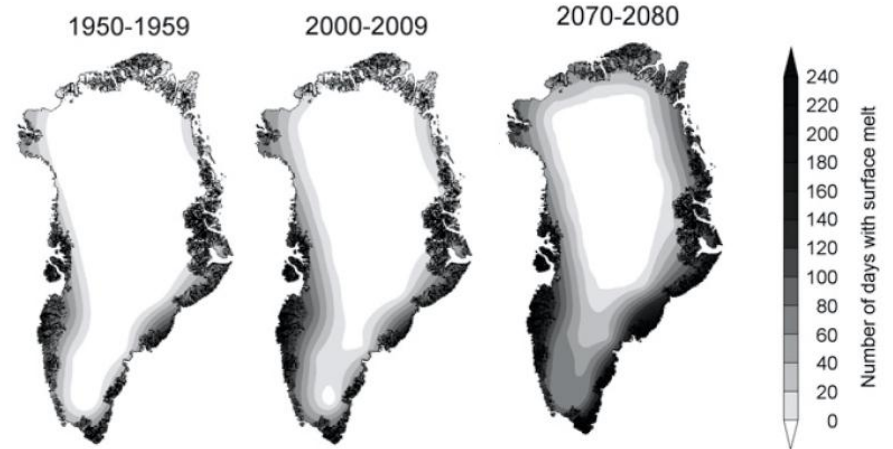
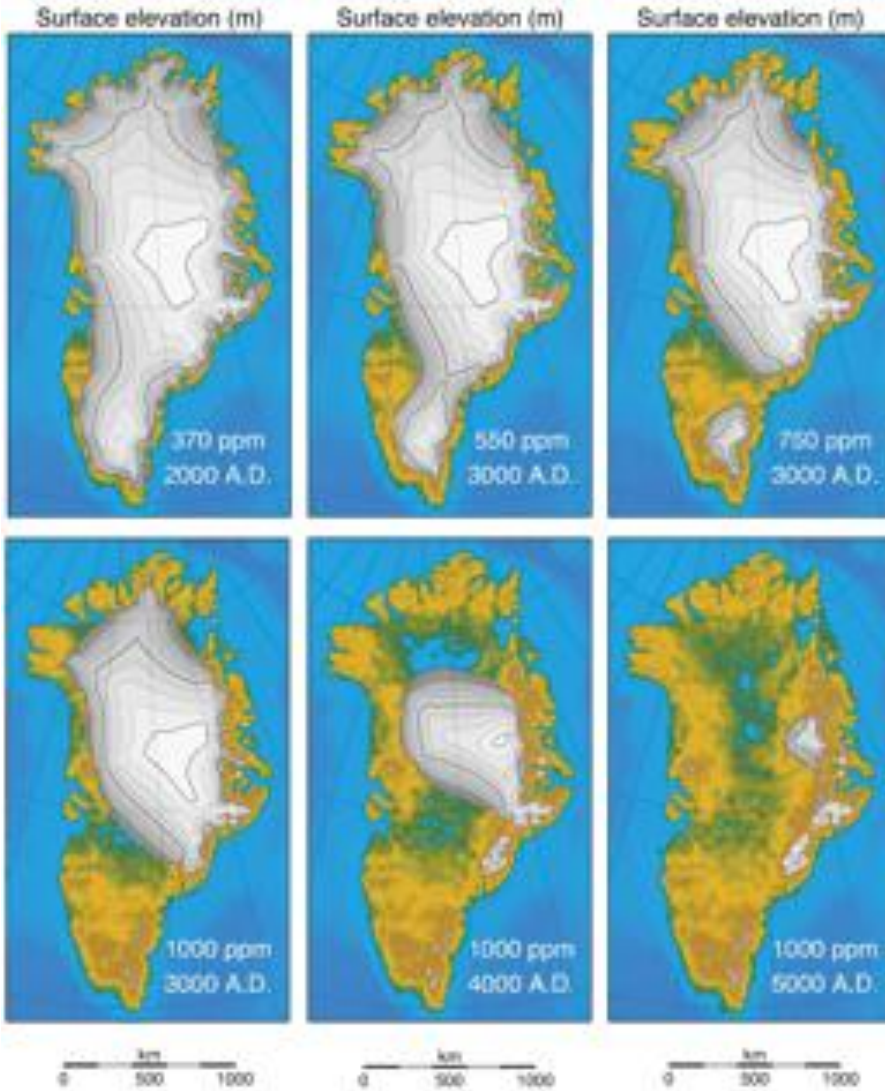
Greenland contains  
enough ice to raise  
sea levels by 7m



Antarctica contains  
enough ice to raise  
sea levels by 57m

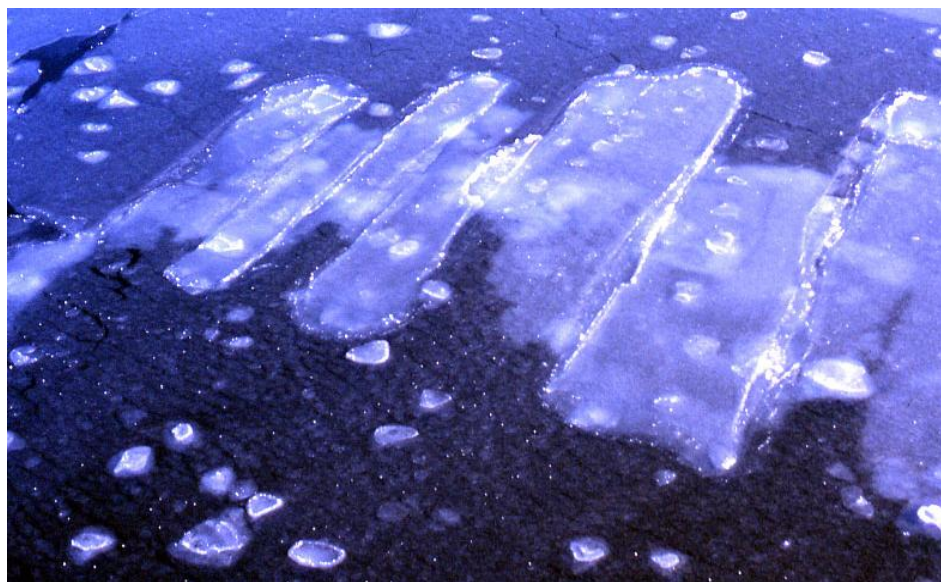
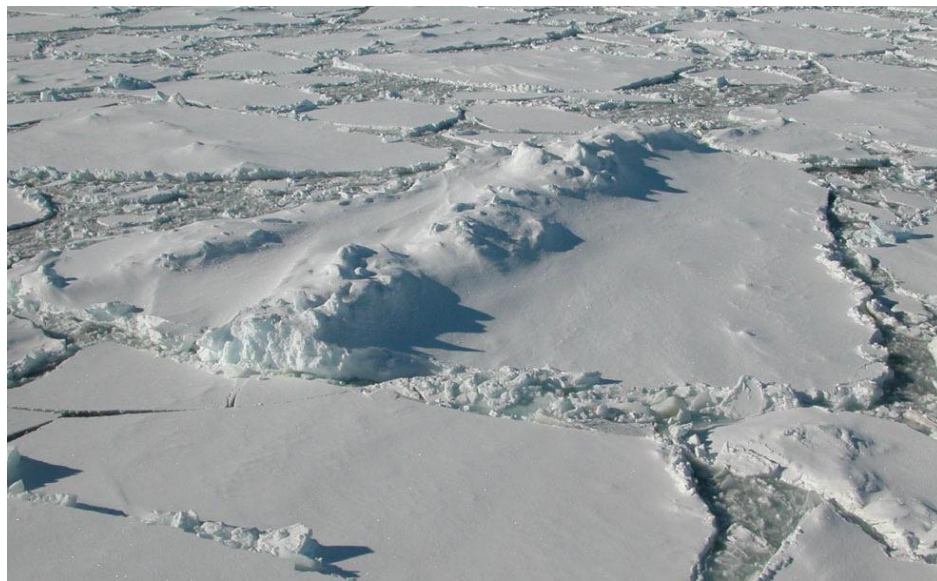
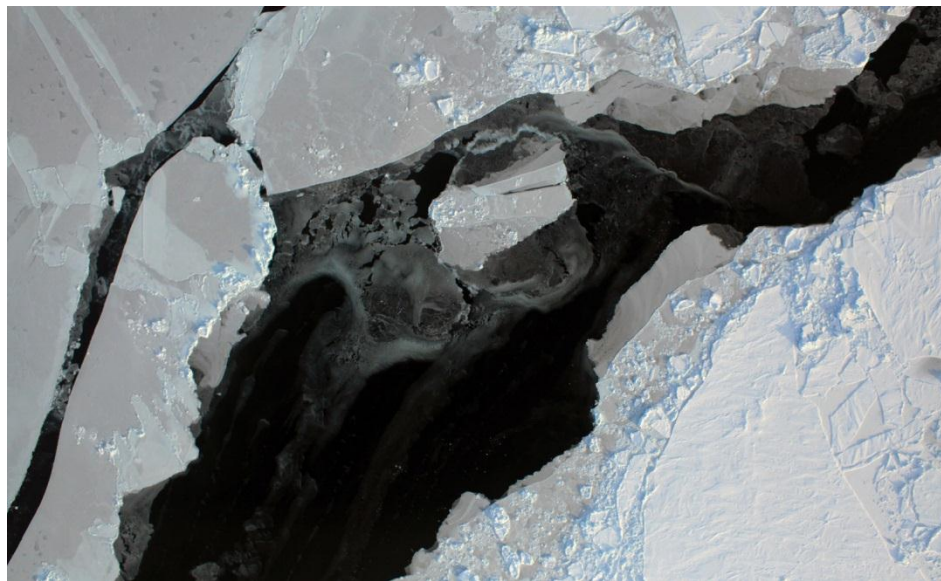


# Arctic Climate



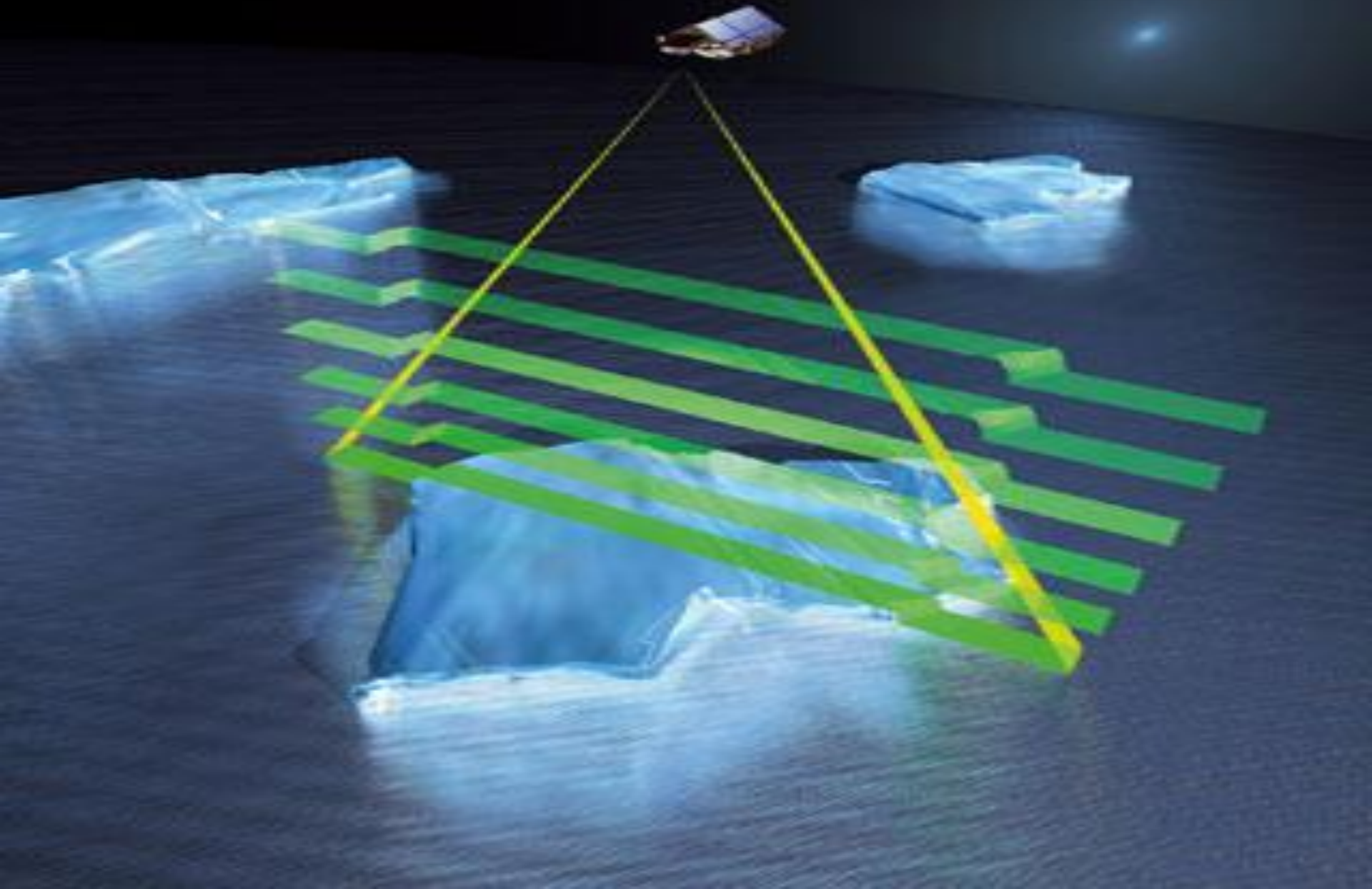


# Sea ice



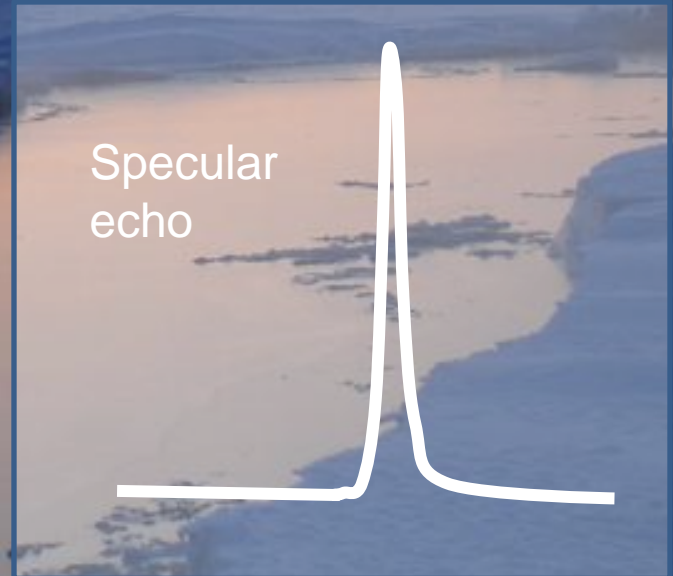
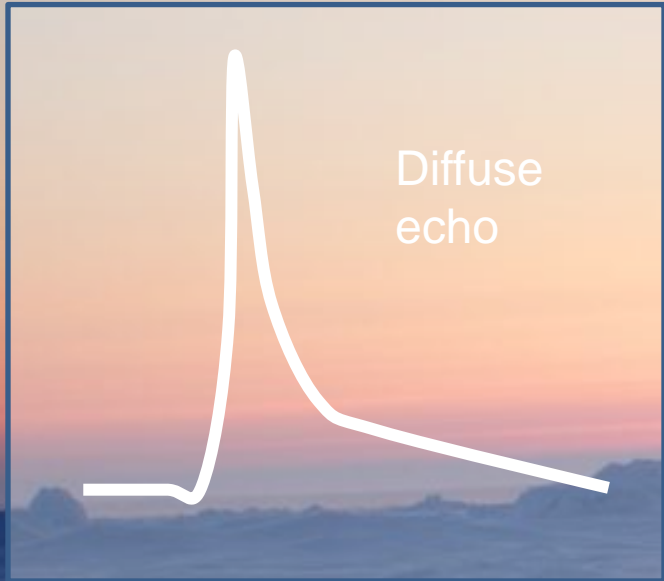


# Sea ice

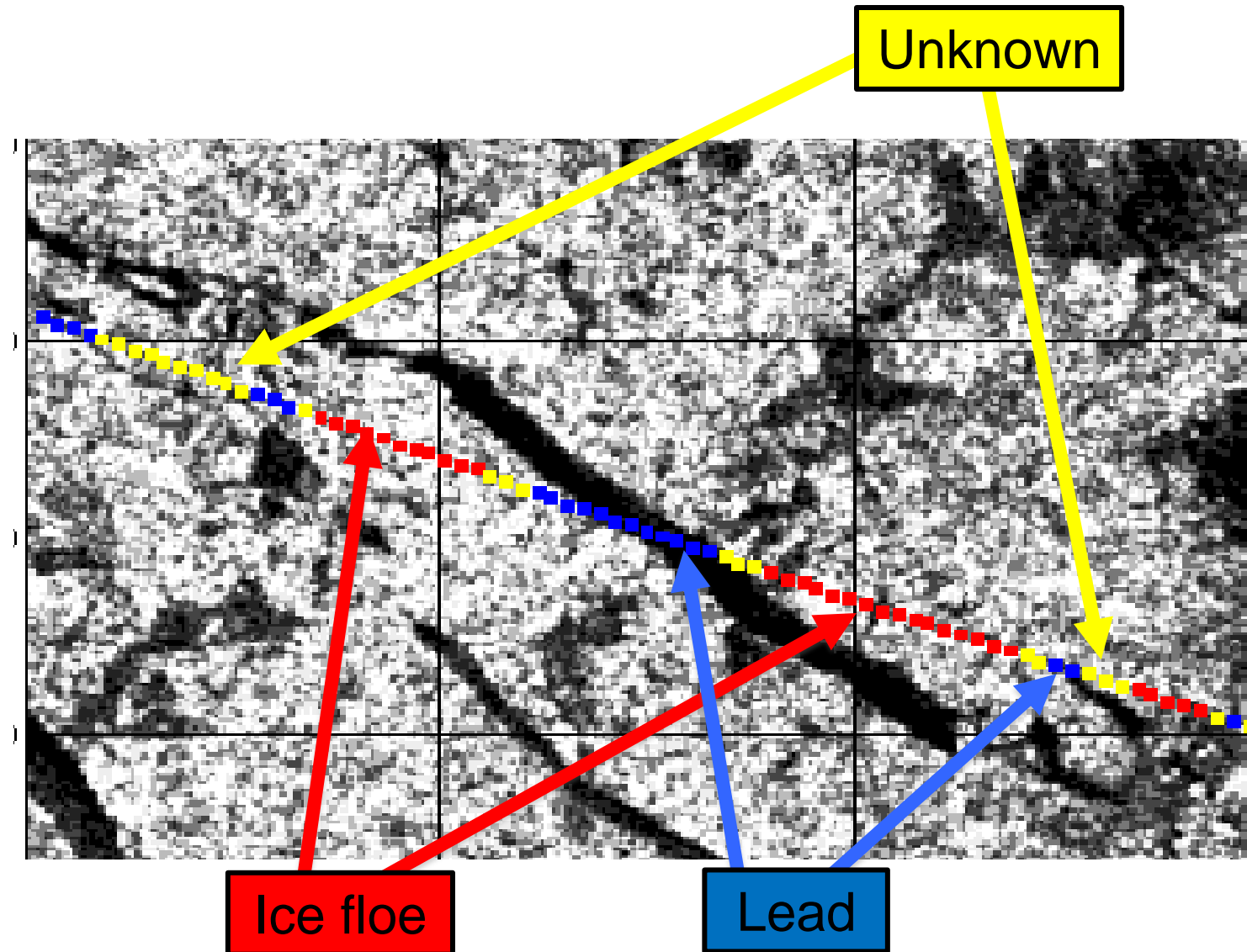




# Sea ice

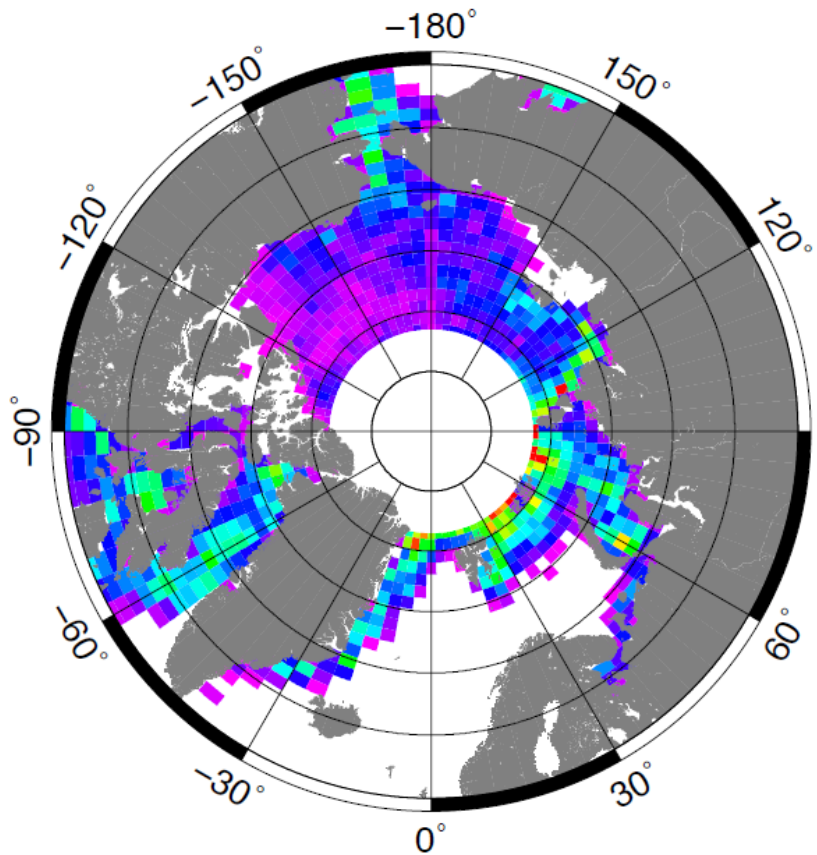


# Sea ice

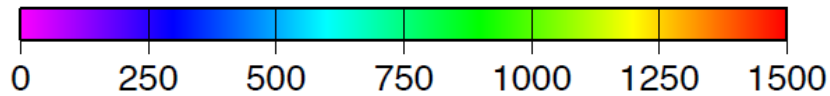
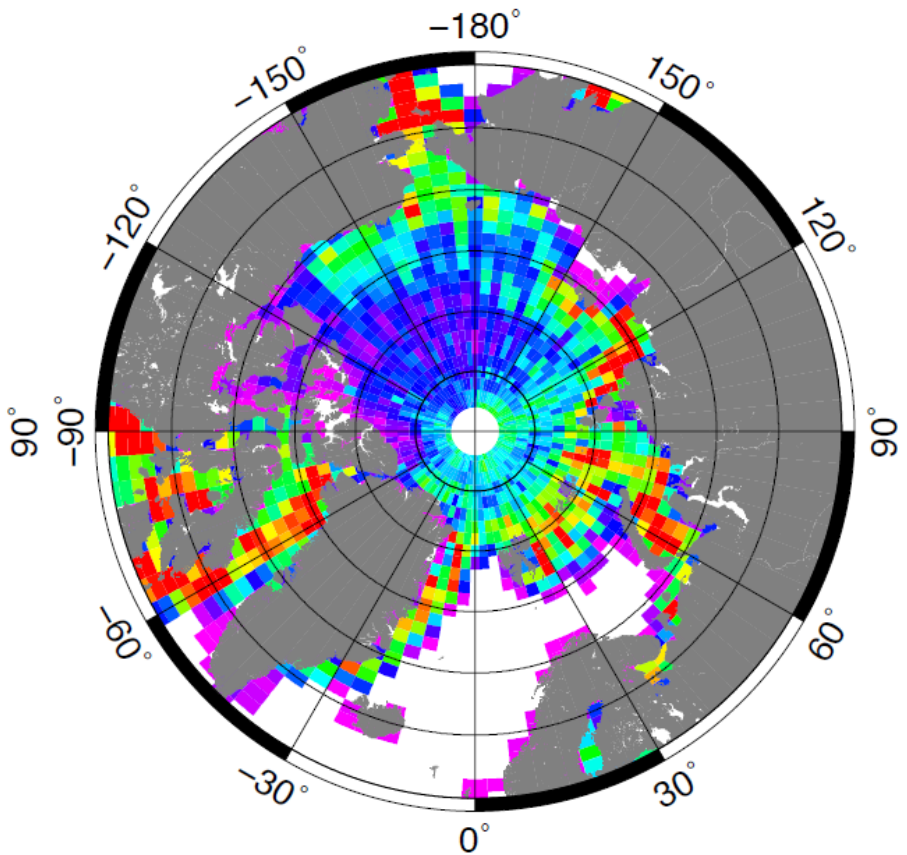


# Sea ice

## Envisat



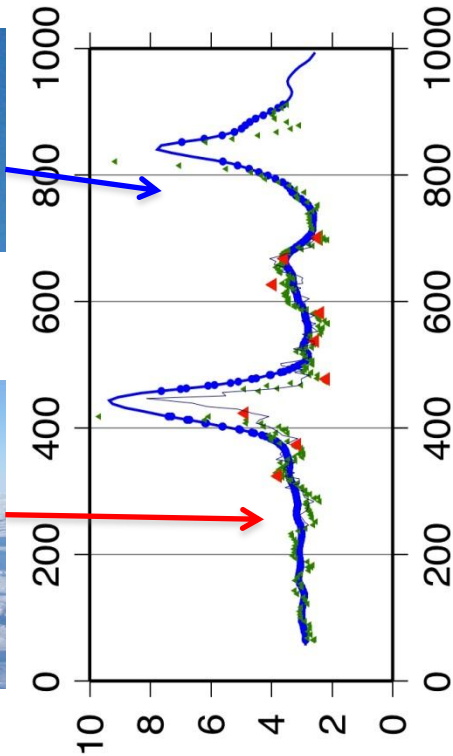
## CryoSat



Number of lead measurements (March 2011)



# Sea ice



Blue Markers

Blue Tarp

Blue CR

Transect

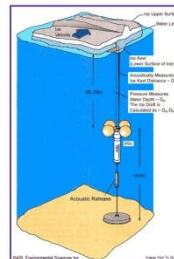
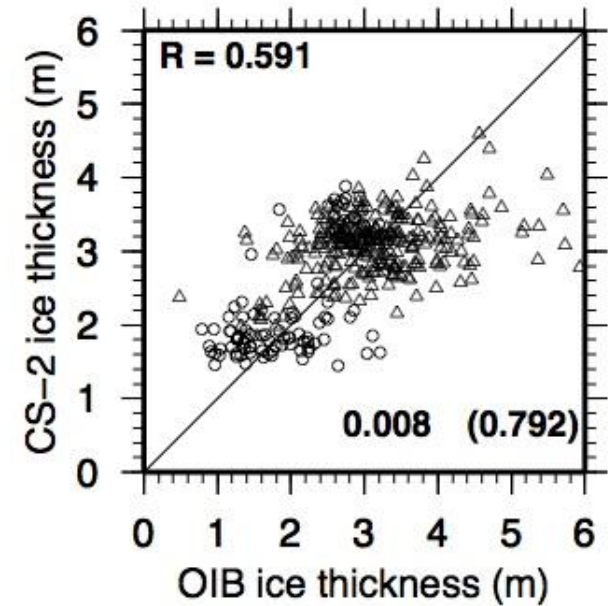
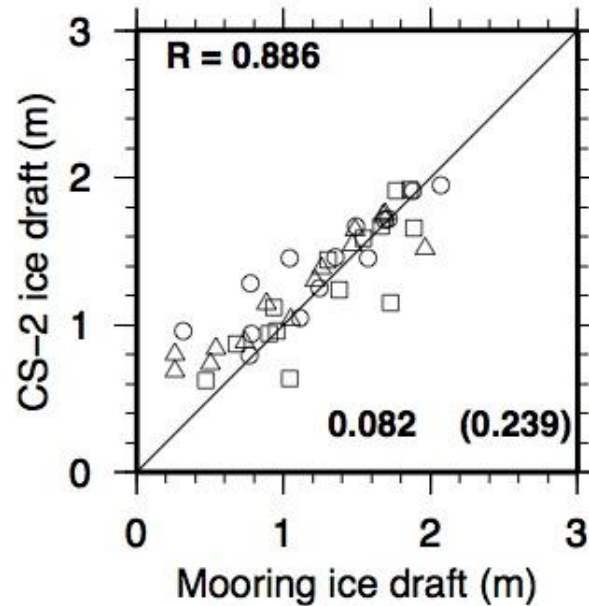
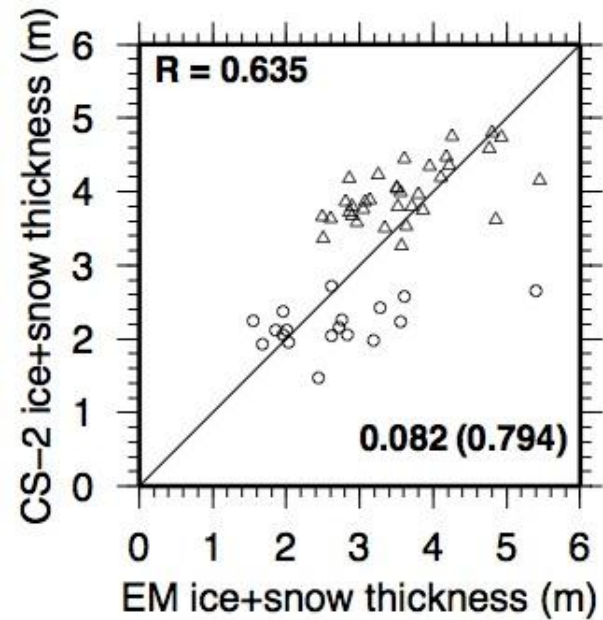
Snow Survey  
(21x21m)

Orange CR

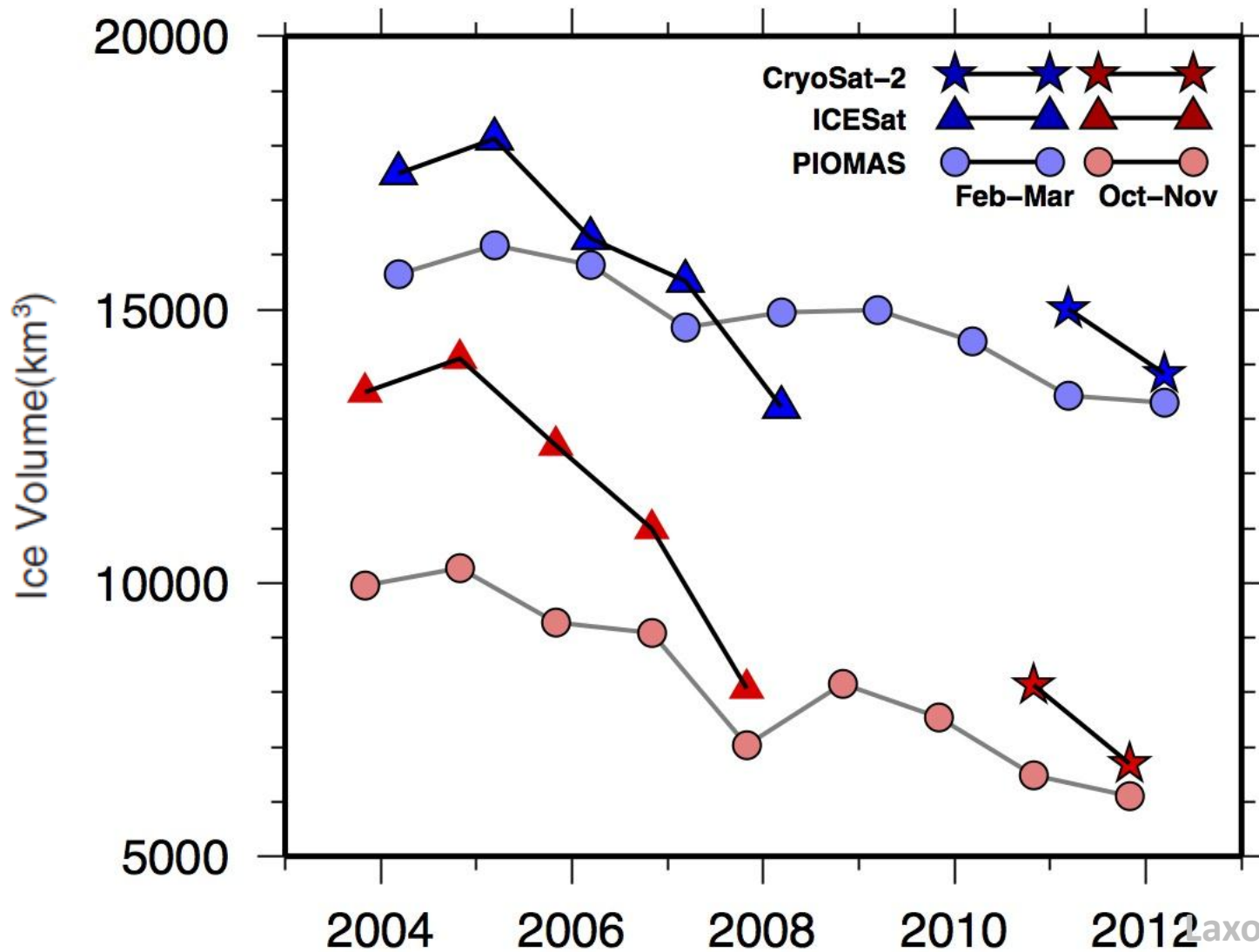
Orange Tarp

Orange Markers

# Sea ice

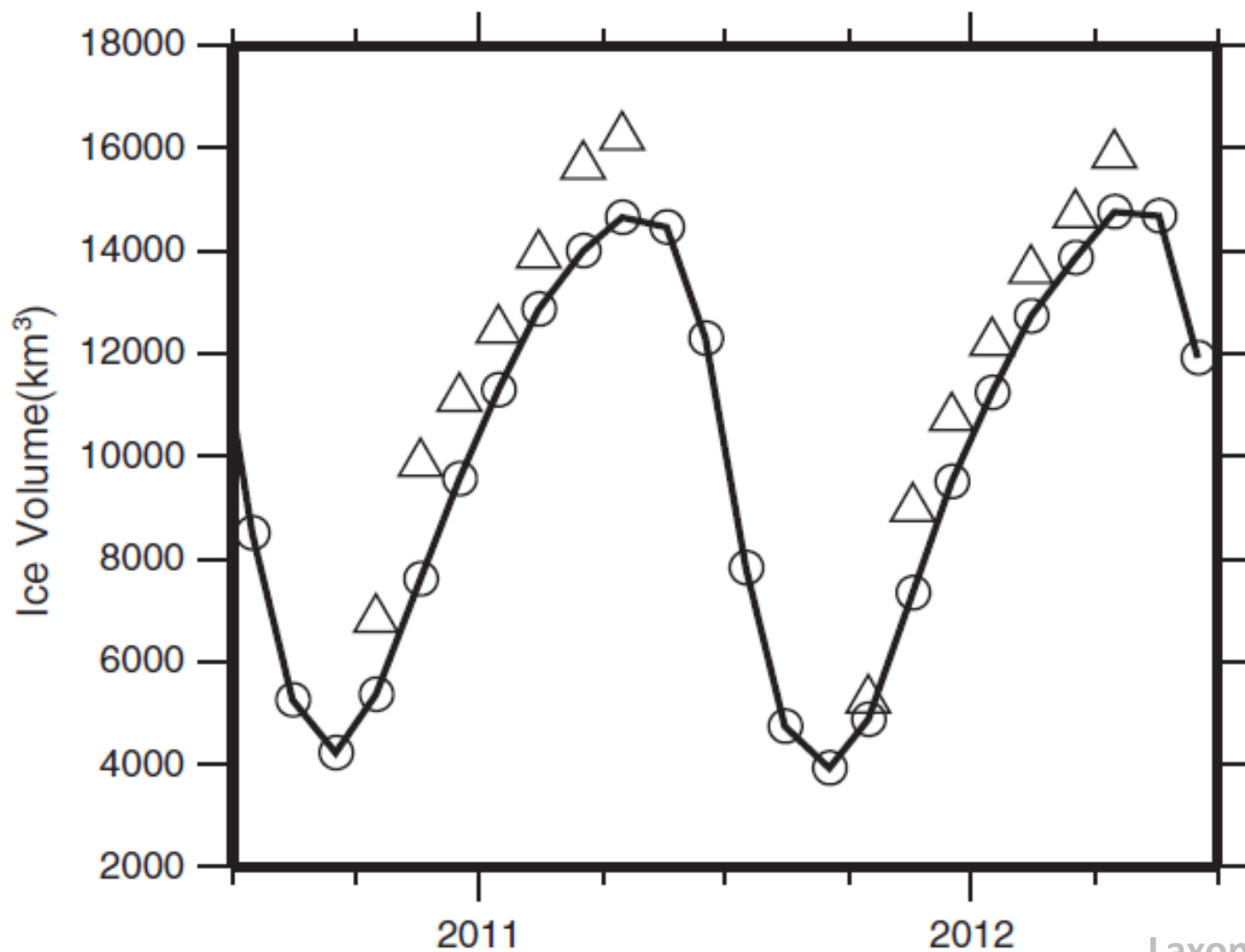


# Sea ice





# Sea ice



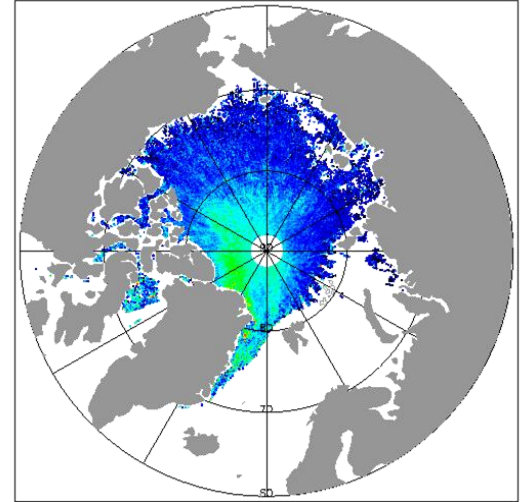
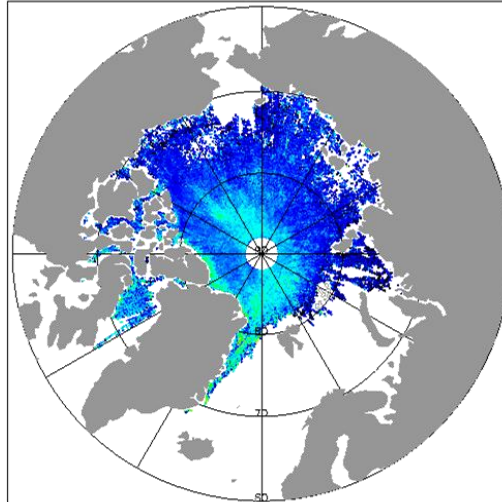
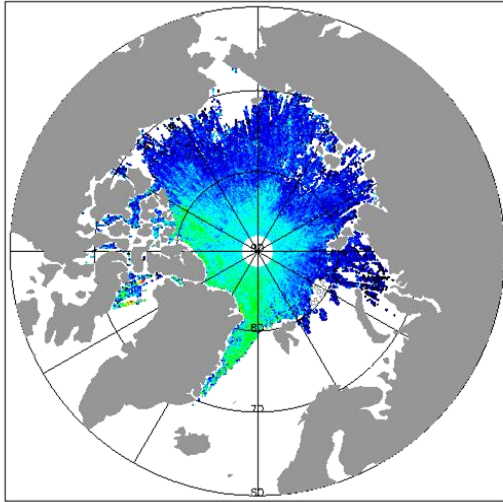
# Sea ice

2010

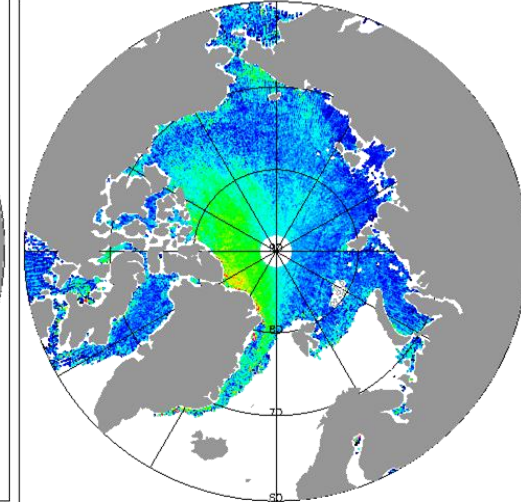
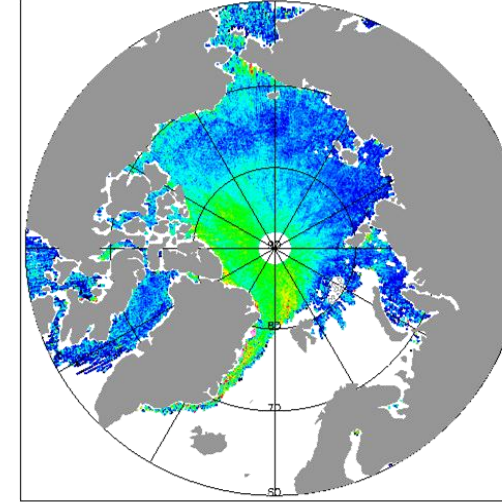
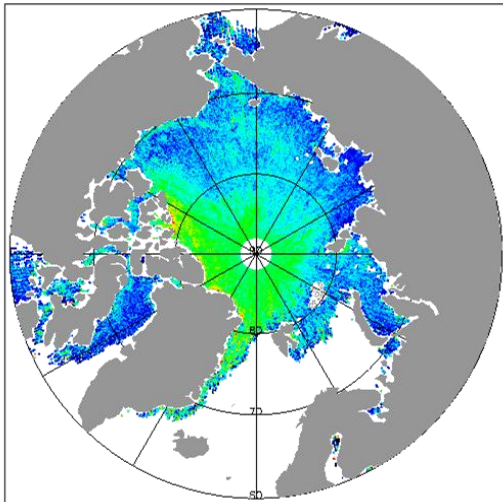
2011

2012

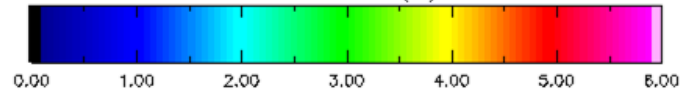
Summer



Winter



Ice Thickness (m)



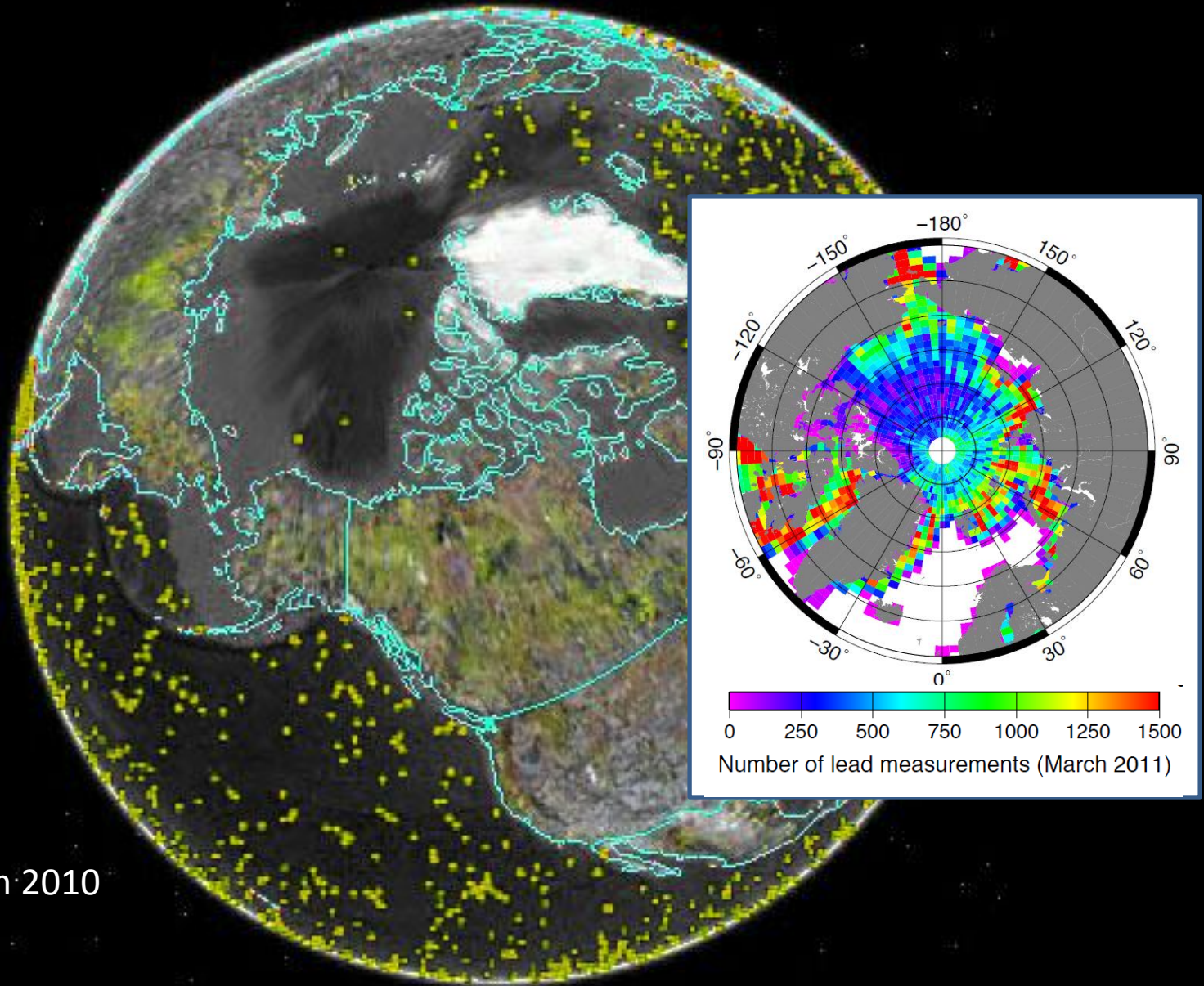


# Arctic Ocean





# Arctic Ocean

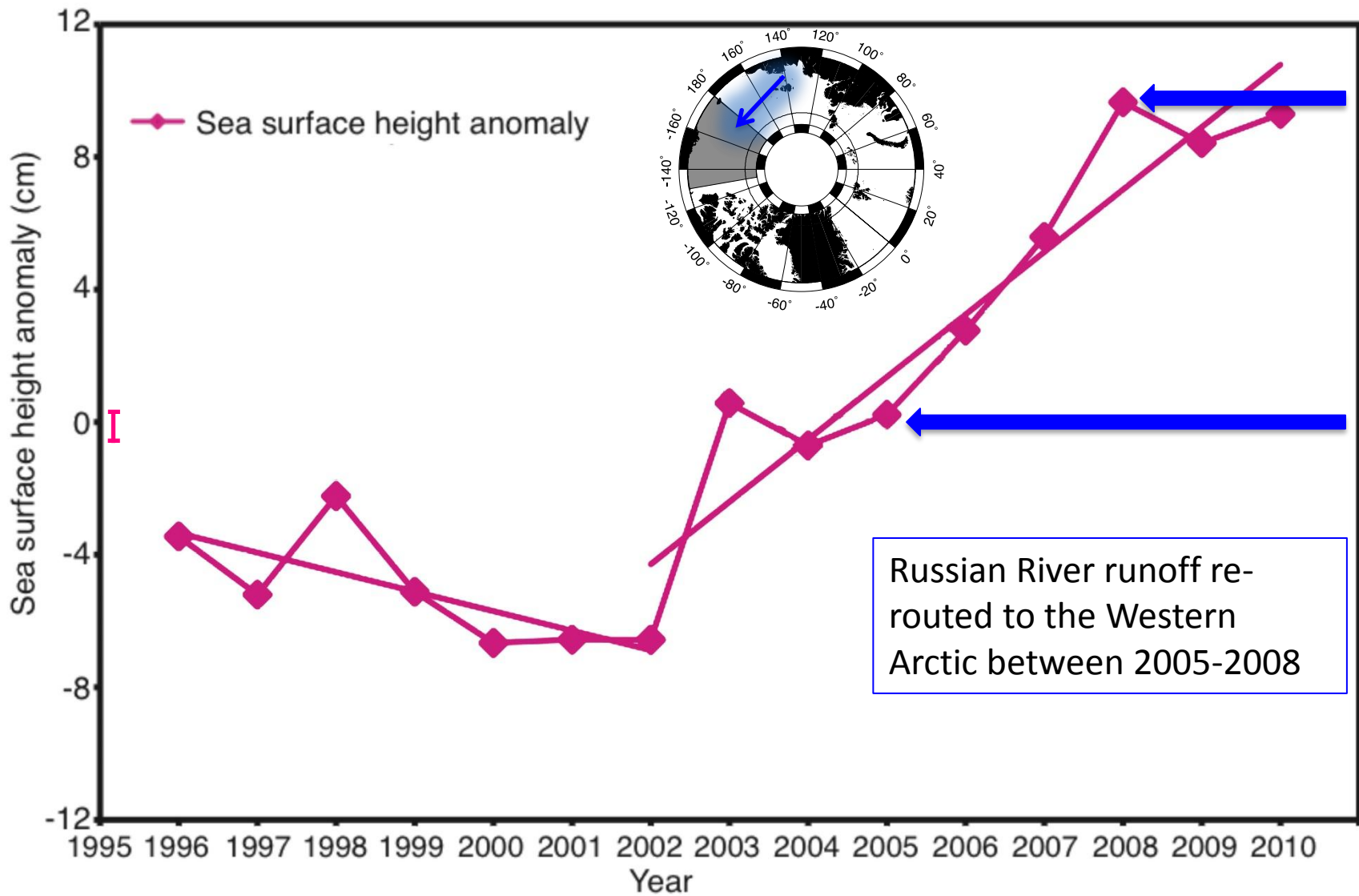


Argo floats – March 2010

# Arctic Ocean

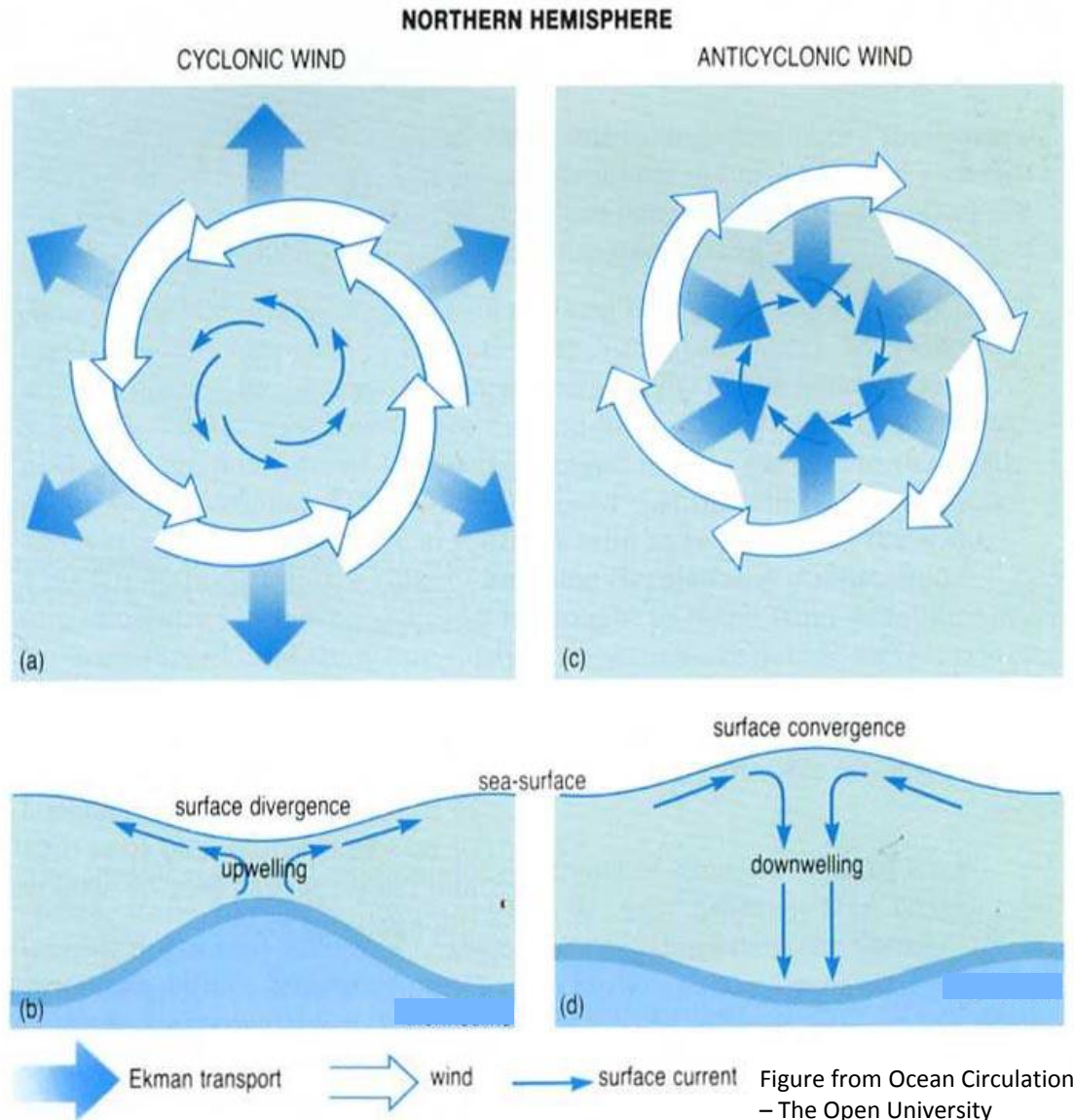


# Arctic Ocean

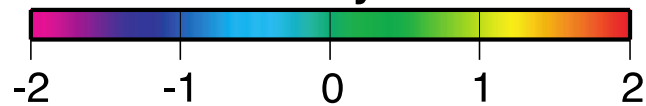
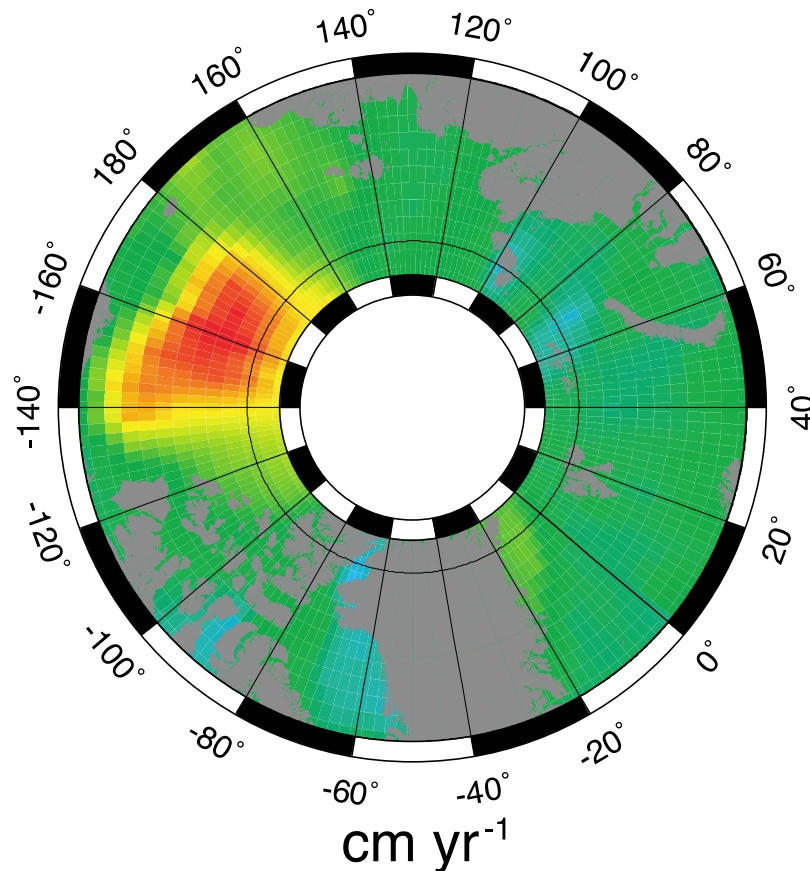




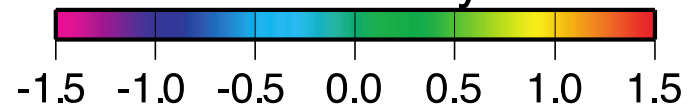
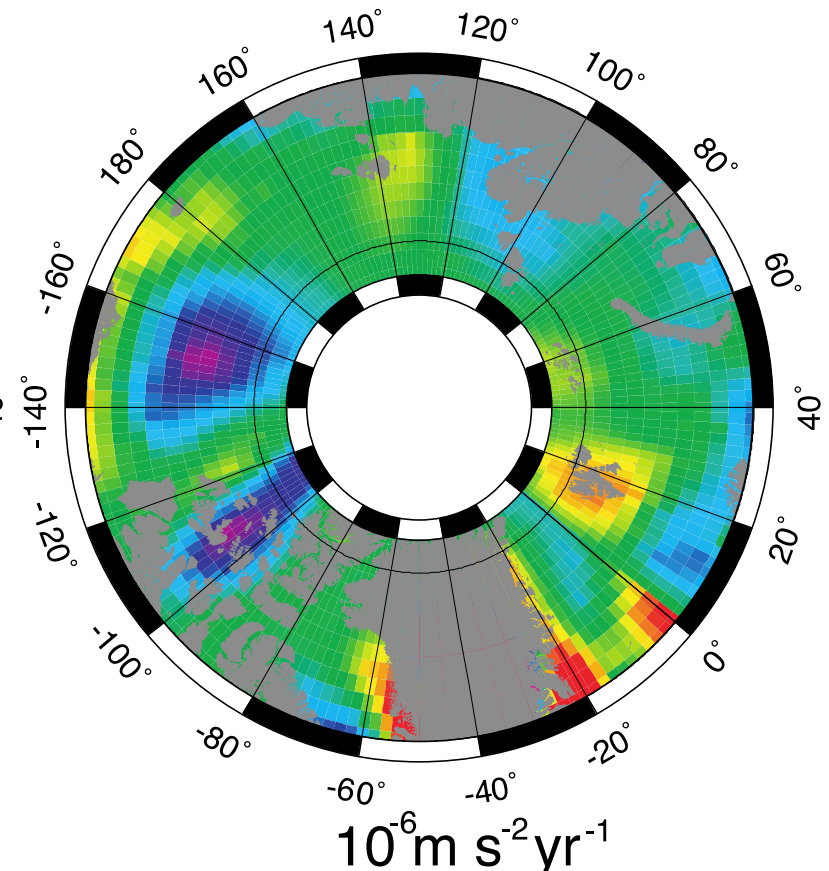
# Arctic Ocean



# Arctic Ocean

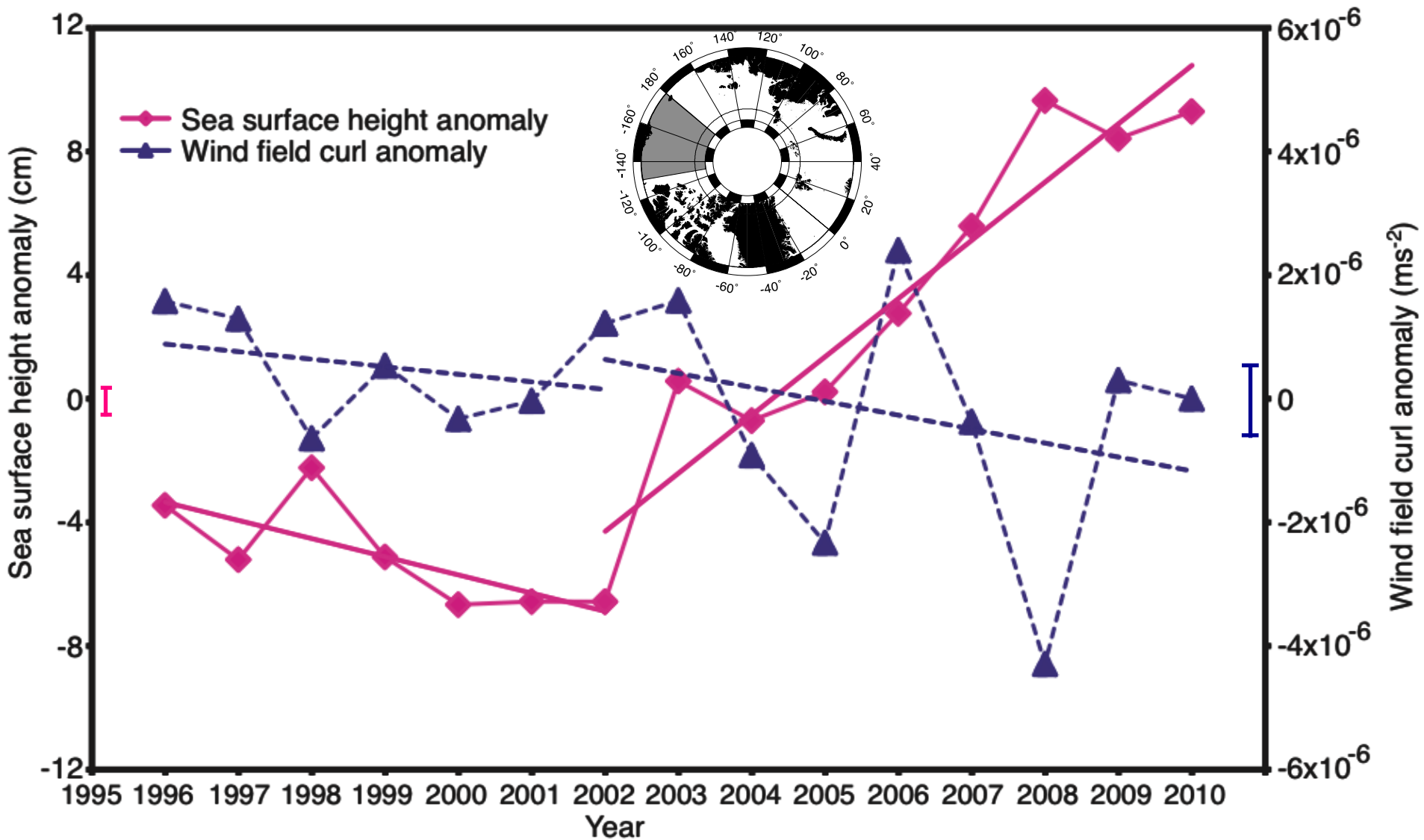


Trend in sea surface height



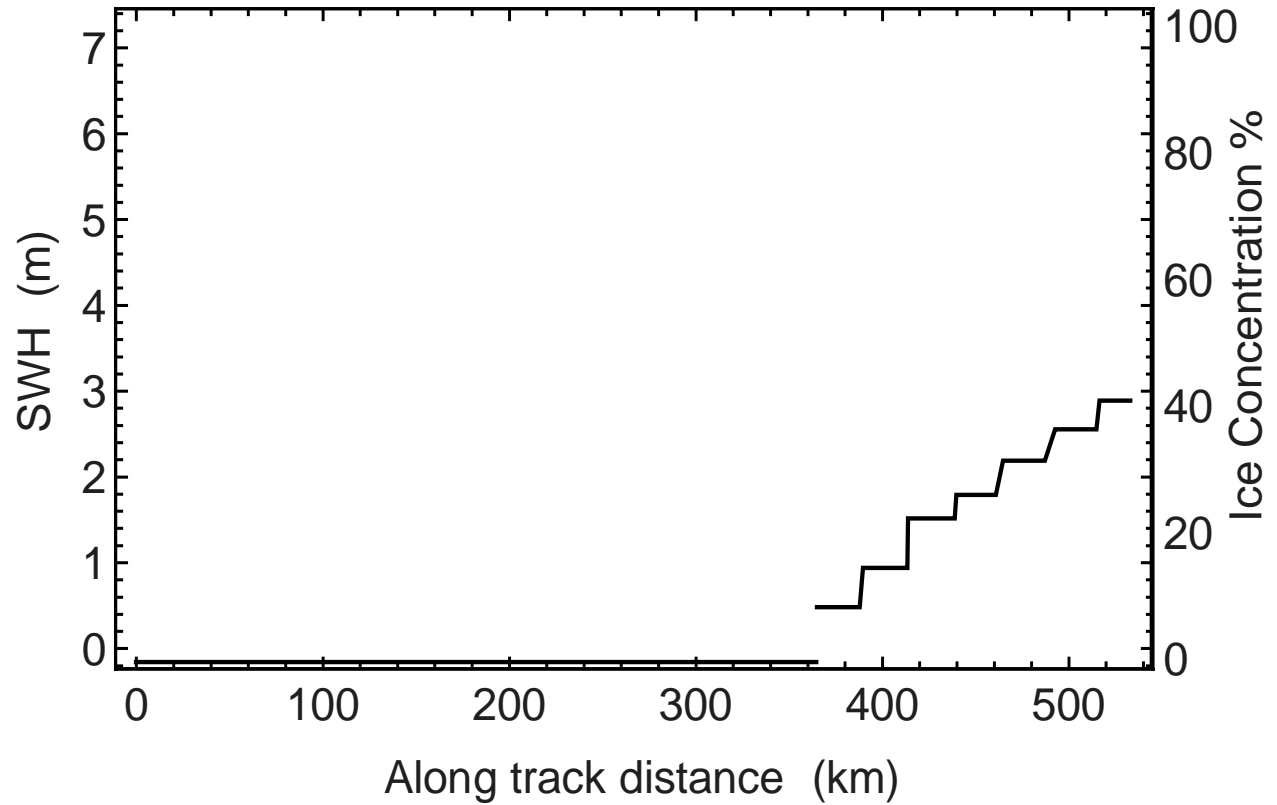
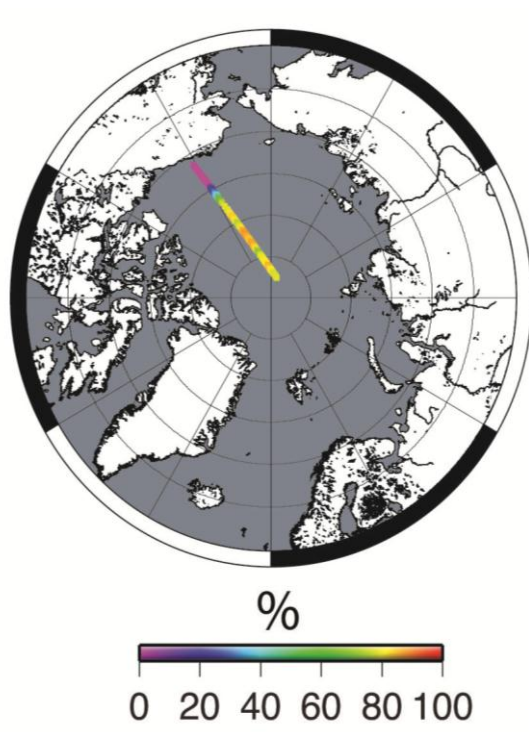
Trend in the wind field curl

# Arctic Ocean





# Arctic Ocean



# Greenland



**(1) Altimetry** measures changes in ice sheet shape

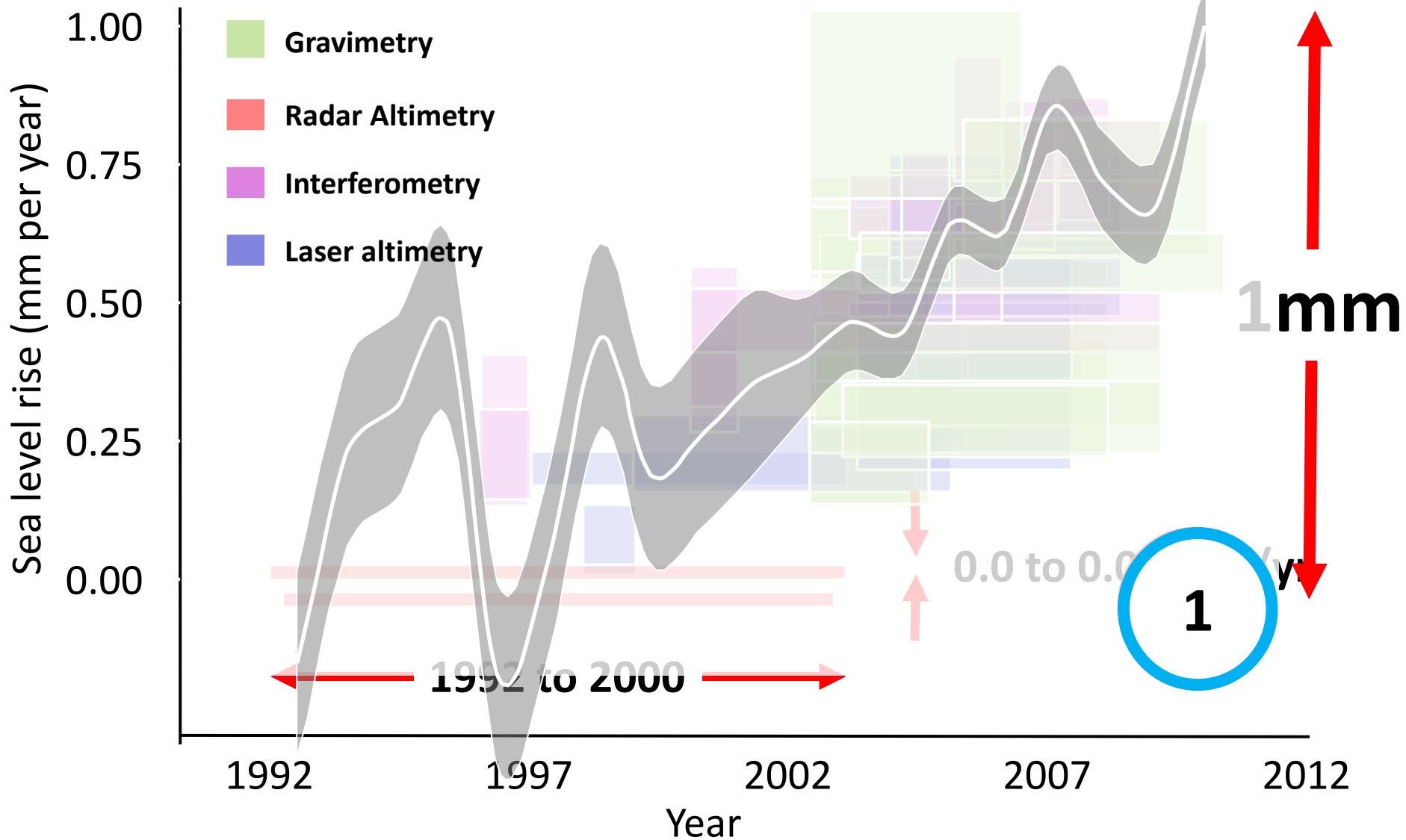
**(2) InSAR** measures changes in ice sheet flow

**(3) Gravimetry** measures changes in ice sheet weight

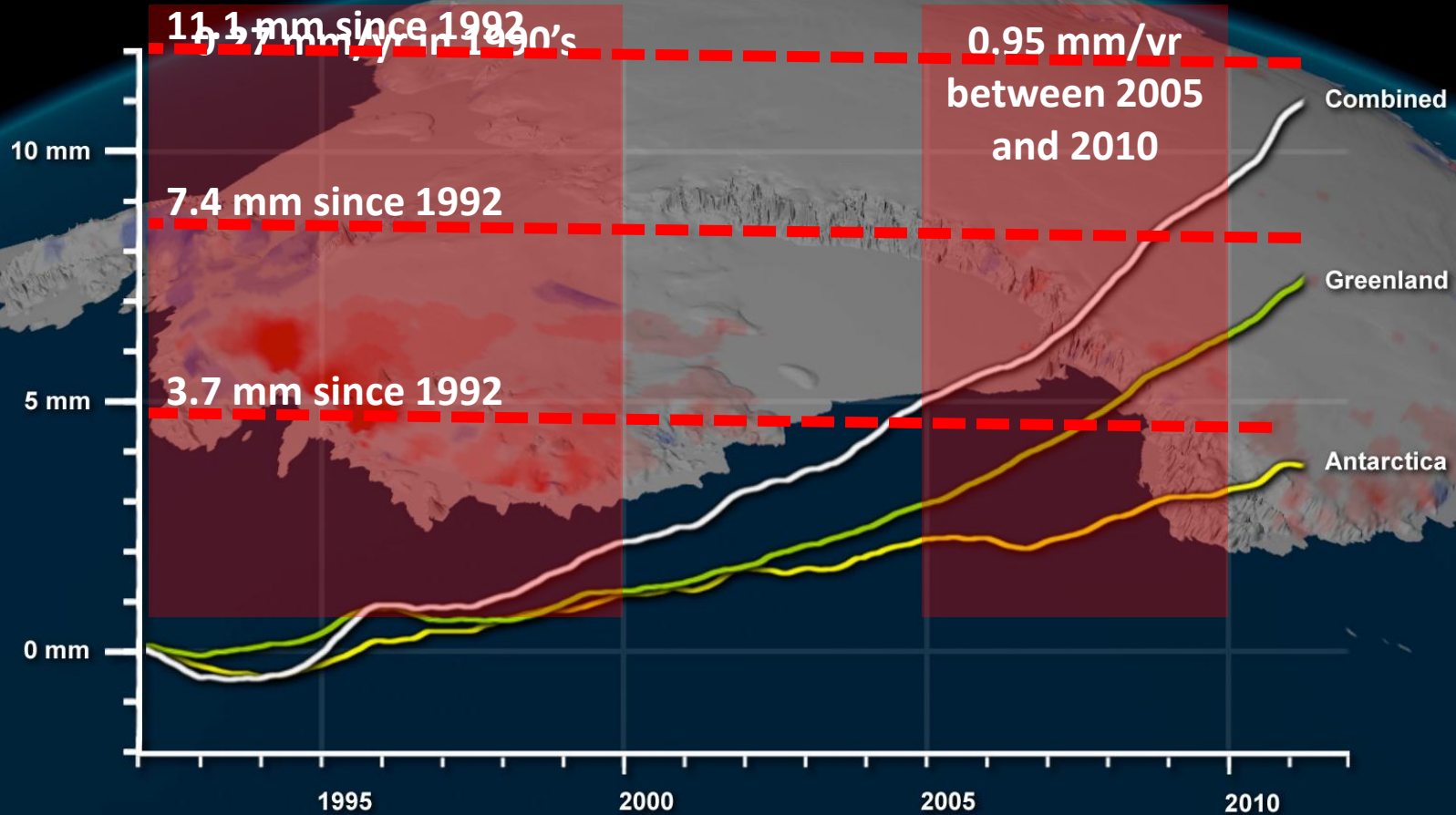




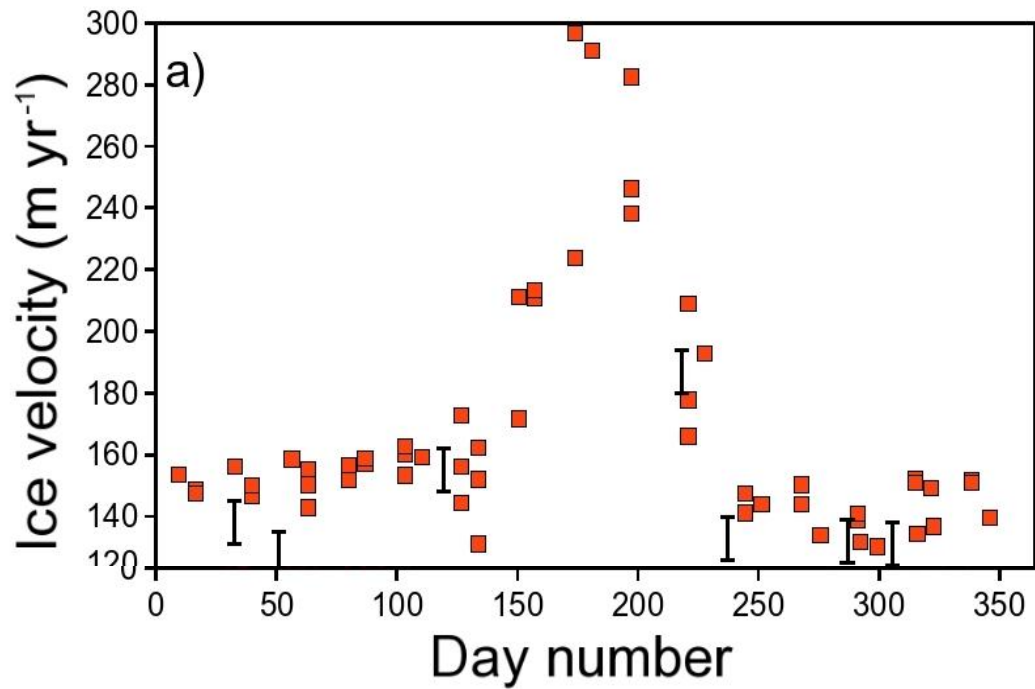
# Greenland



# Greenland

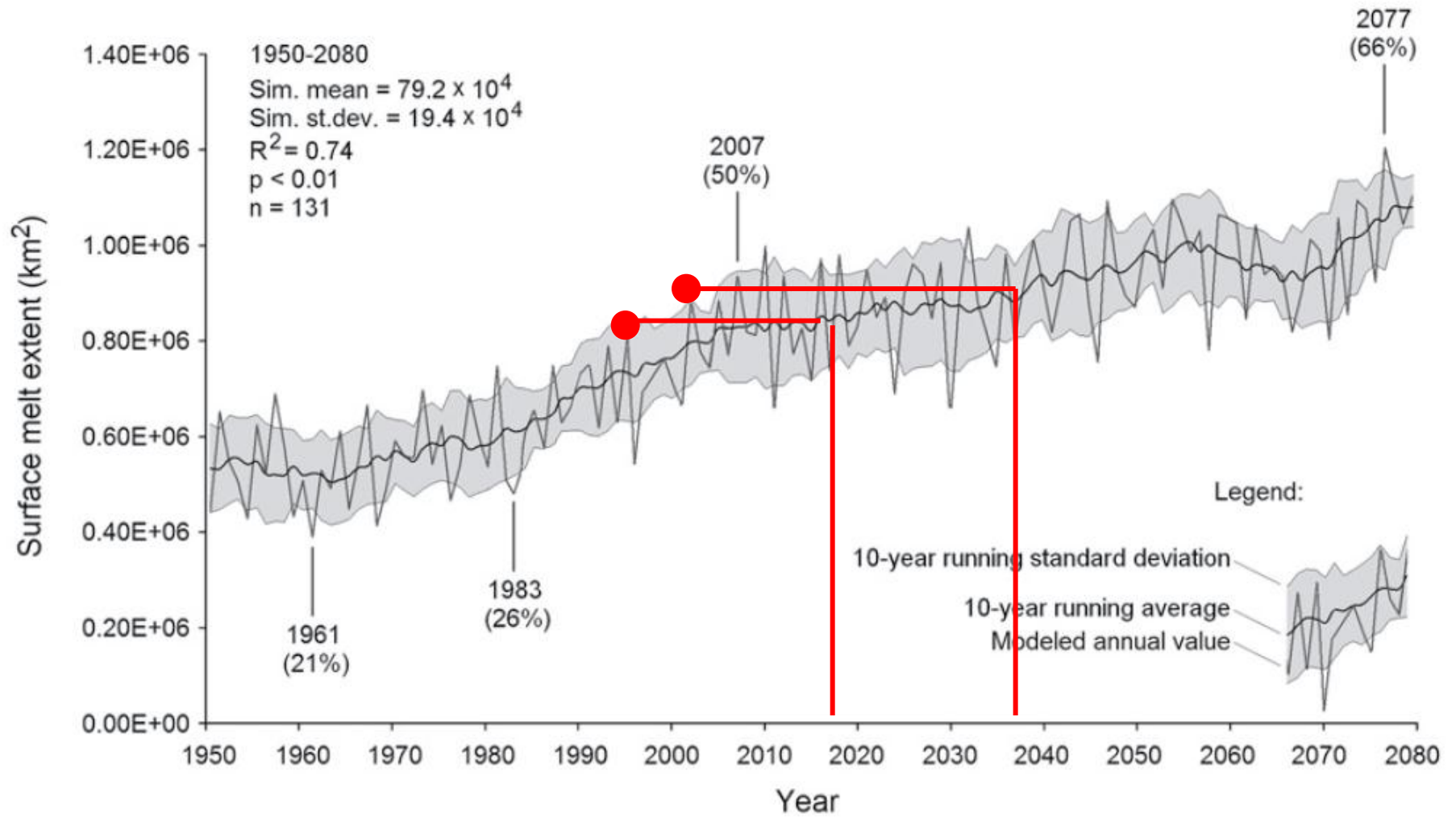


# Greenland

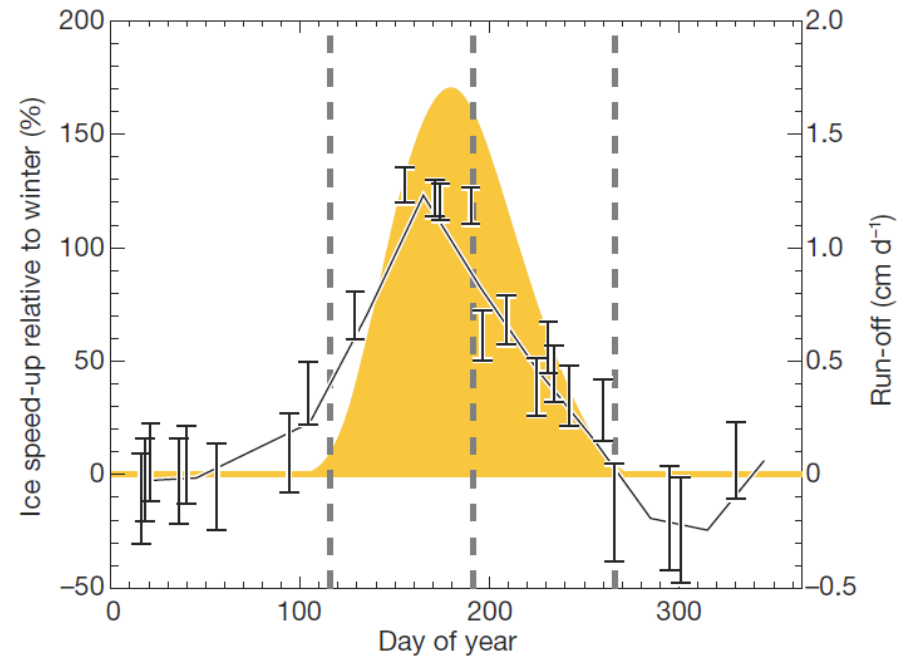
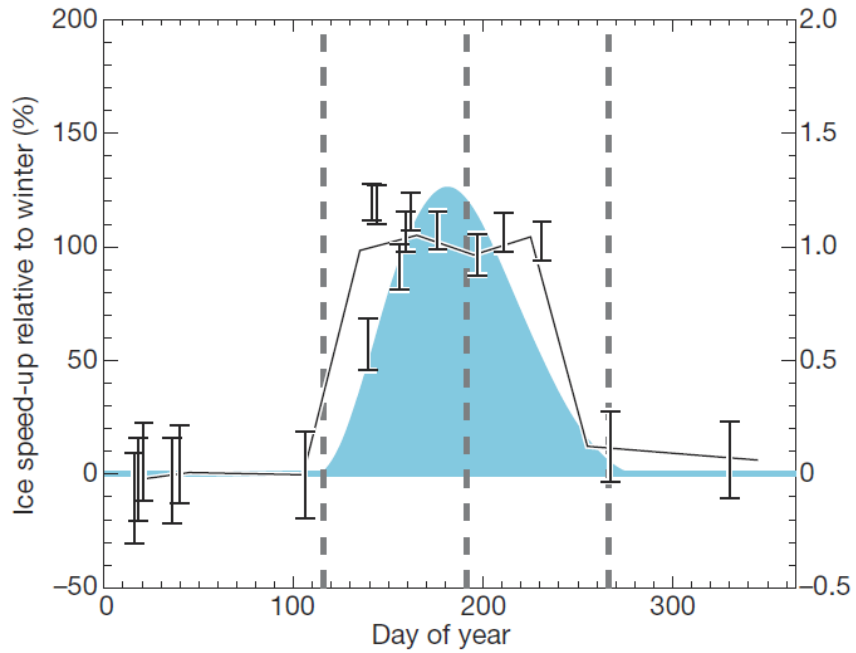




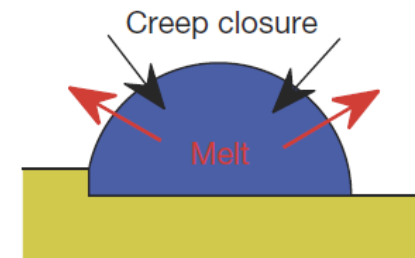
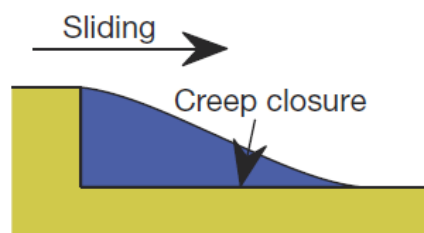
# Greenland



# Greenland

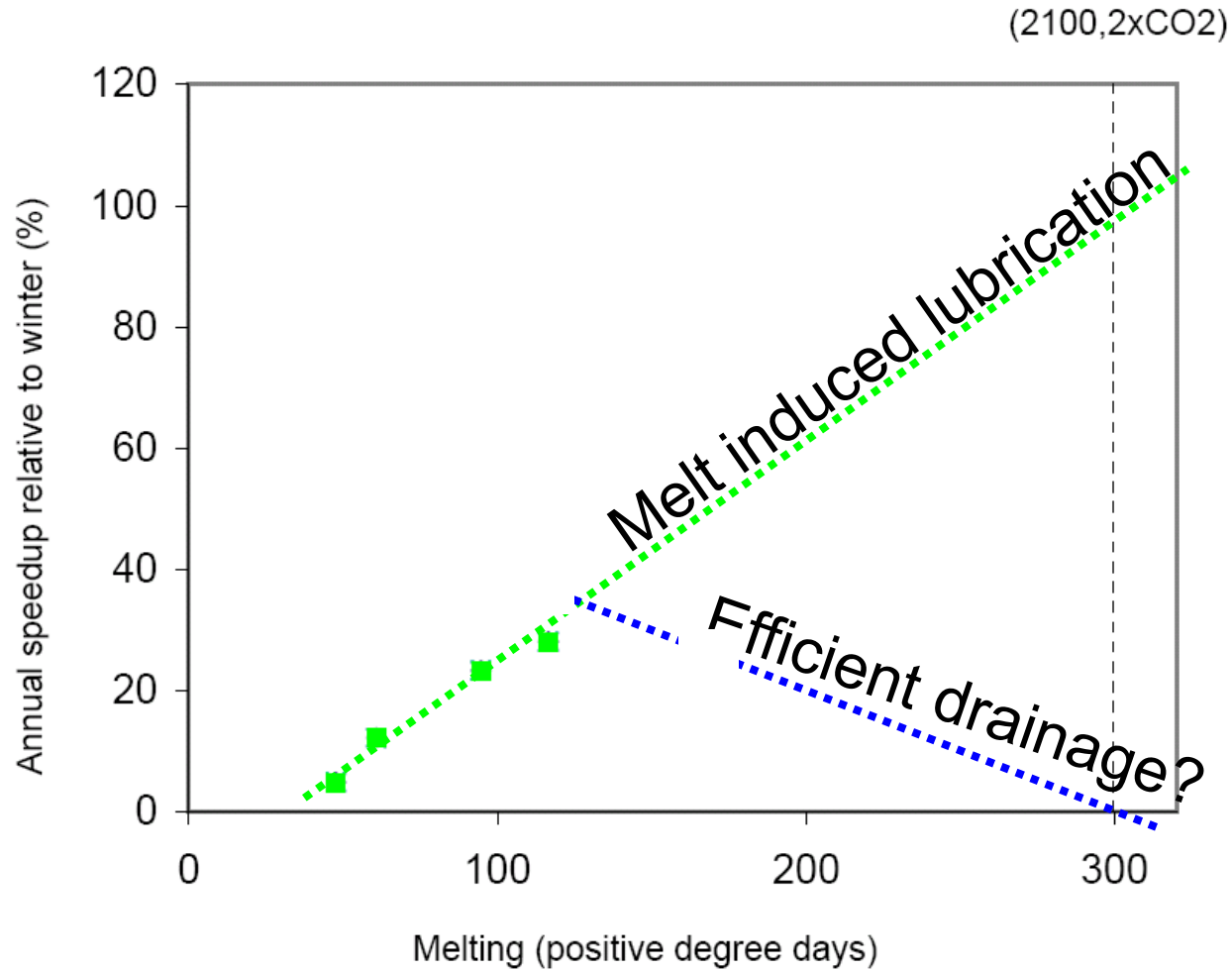


# Greenland





# Greenland



- ❄ Sea ice loss faster than models
- ❄ Due to area and thickness
- ❄ Arctic freshwater storage
- ❄ CS2 detects 10 x more leads
- ❄ Potential ocean mission
- ❄ 5 x acceleration since 1990's
- ❄ Melt-water feedback unlikely