

Baffin Bay surface flux perspectives on autumn Greenland blocking

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Linette Boisvert, Edward Hanna, and Timo Vihma

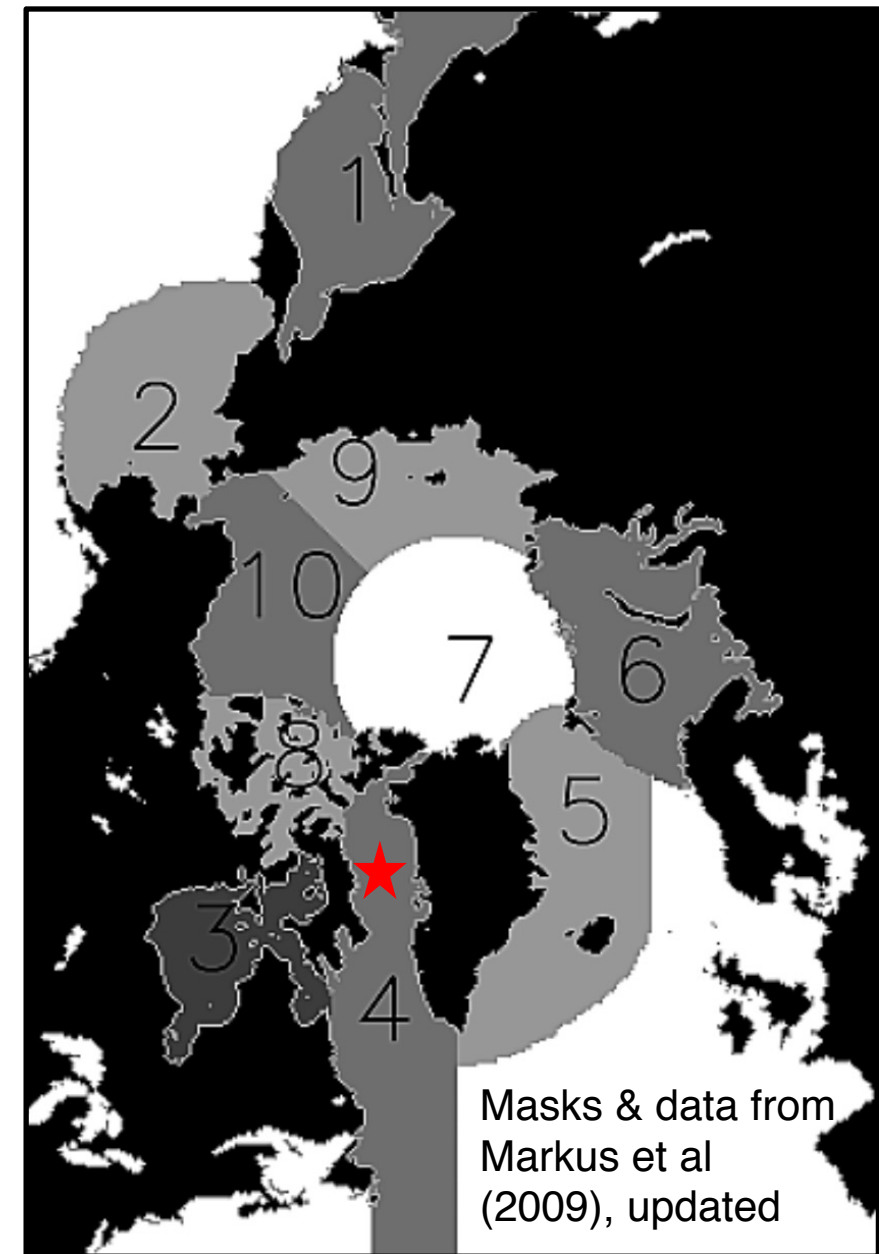
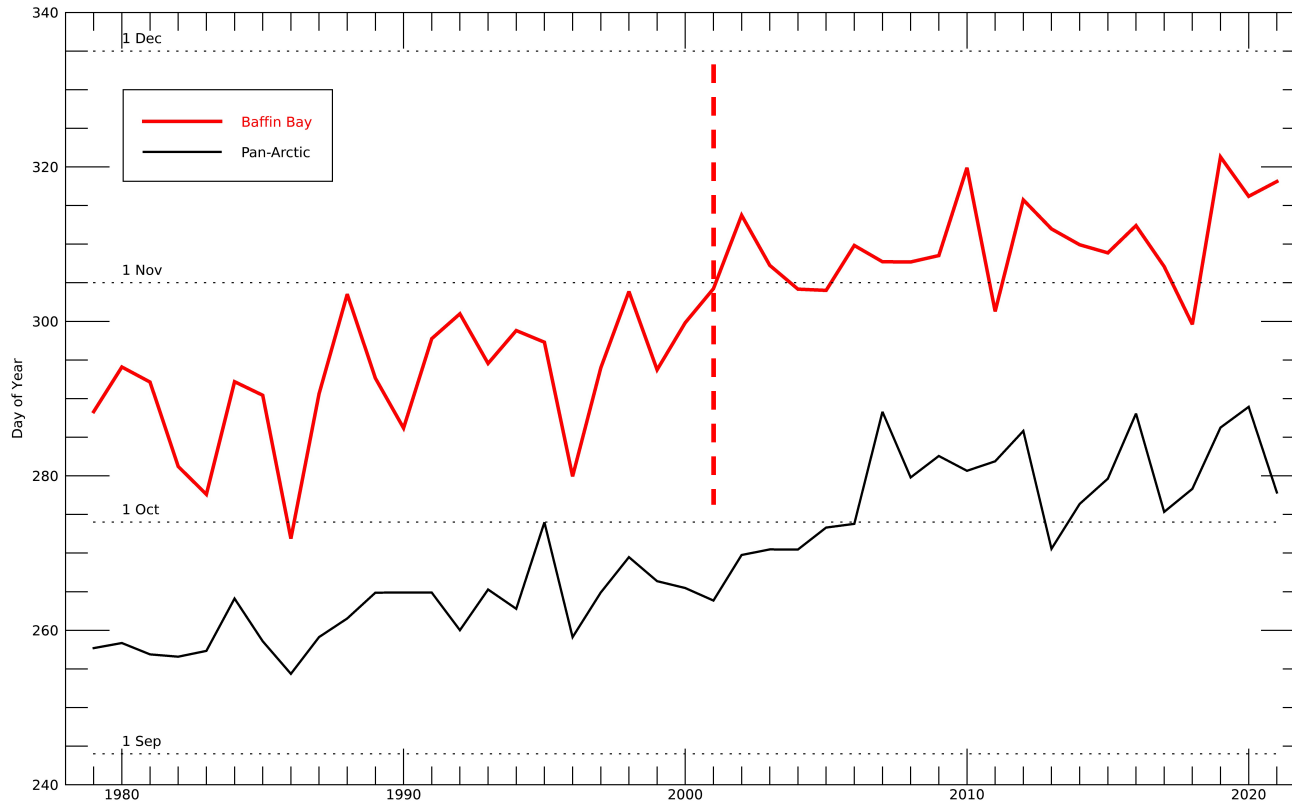
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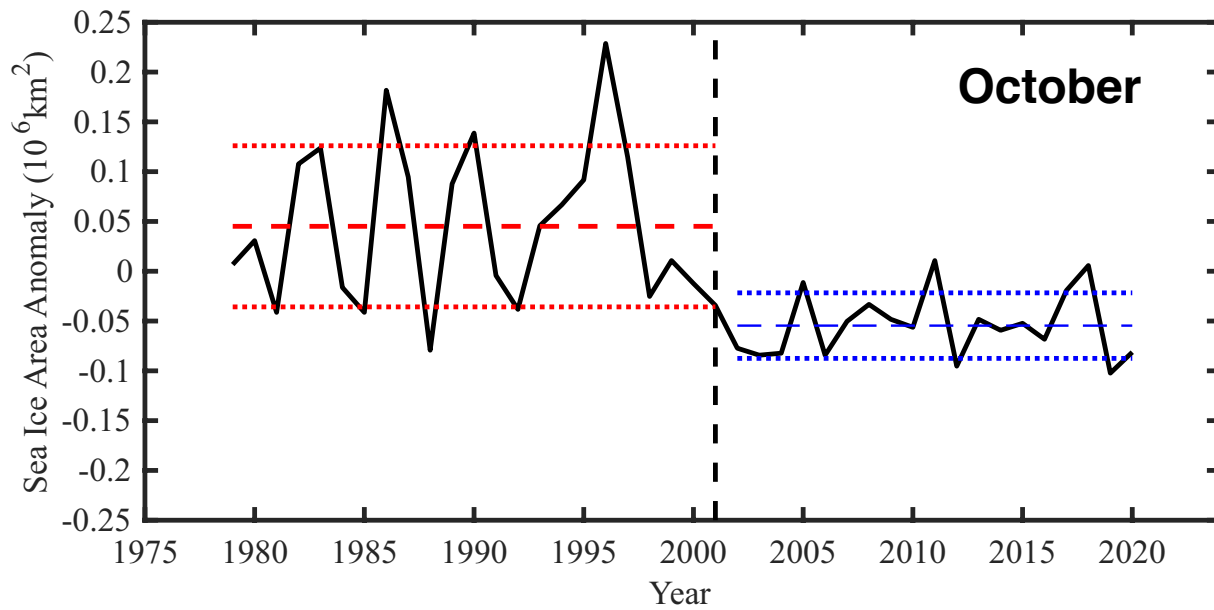
Arctic changes – processes and feedbacks in climate,
ocean and cryosphere (CL 4.9)



International Arctic
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Recent Baffin ice change: Later formation

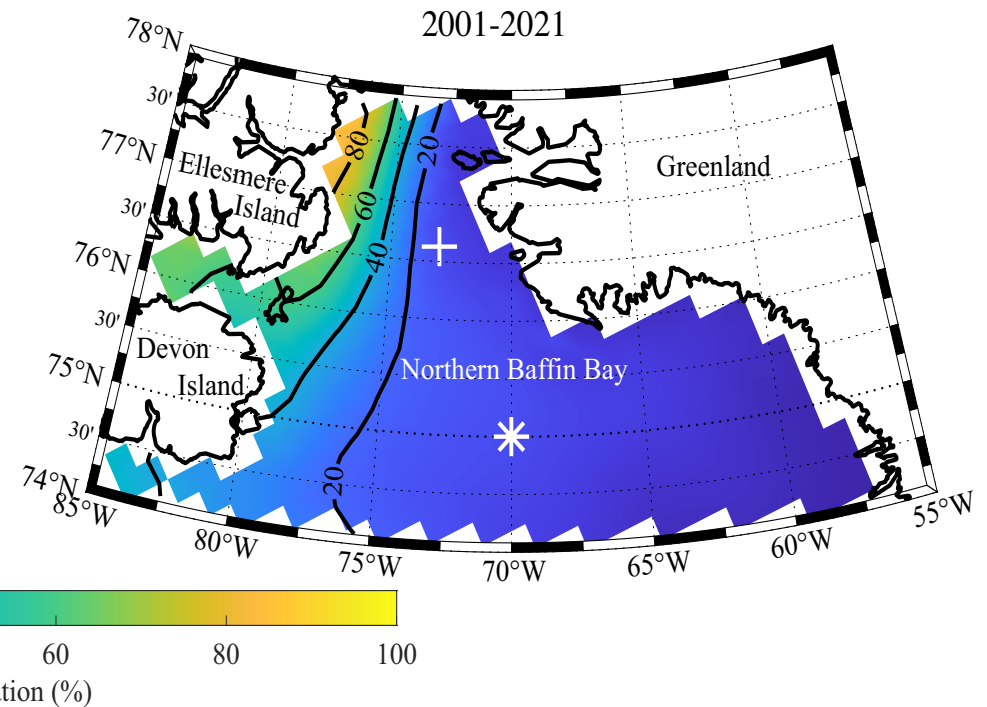
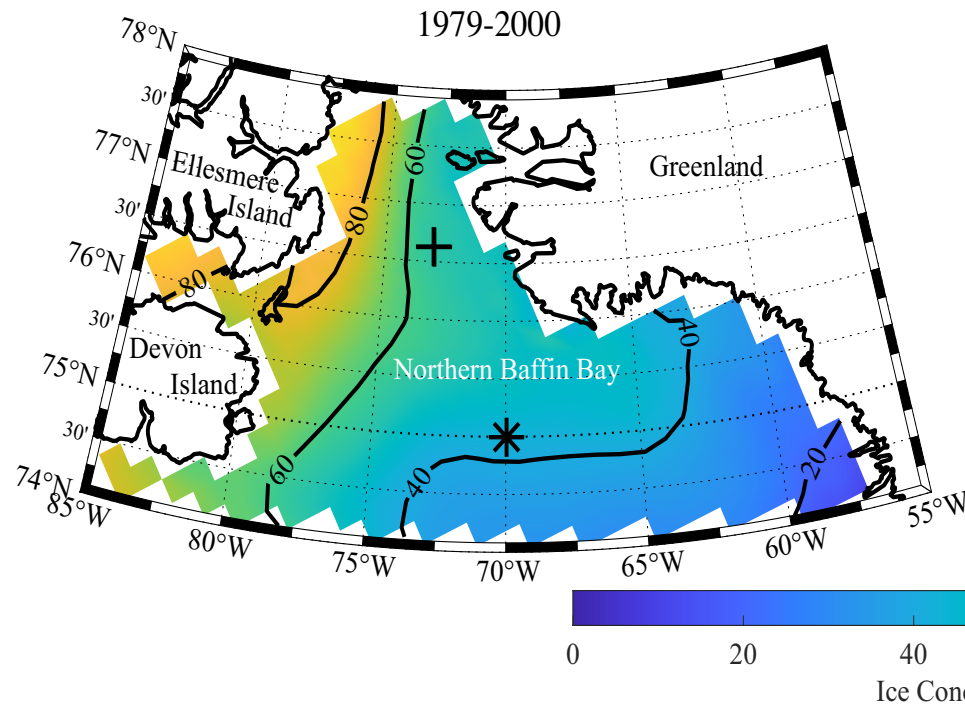




Recent Baffin ice change: Less coverage

Data from NSIDC/NOAA CDR (Meier et al., 2022)

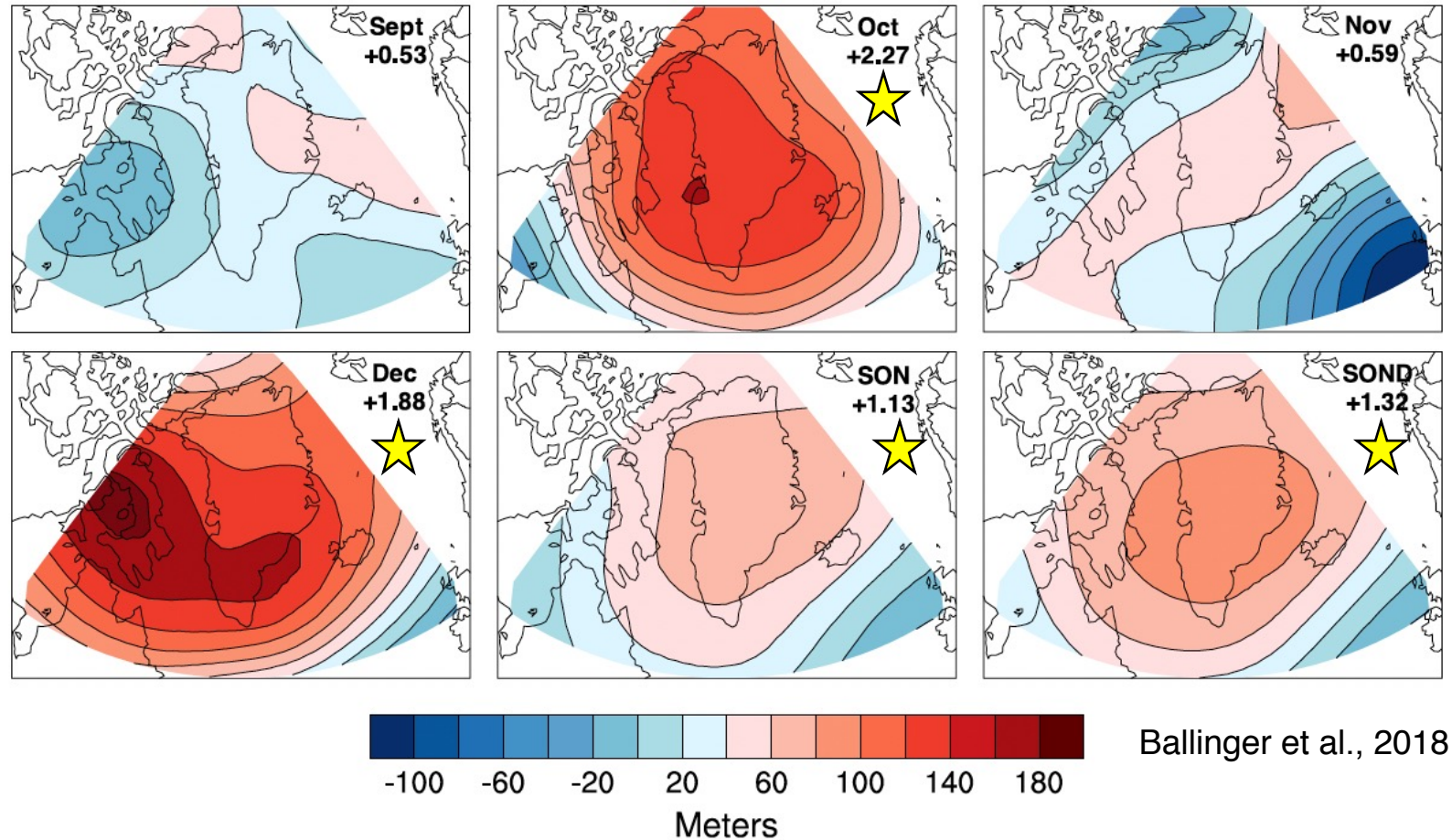
From Ballinger et al., in prep



A sea ice-heat flux feedback?

Delayed Baffin ice formation since 2001 favors an amplified z500 (i.e. “blocking” ★) pattern aloft...or vice versa

How do Baffin autumn surface fluxes interact with overlying circulation regimes?



Ballinger et al., 2018



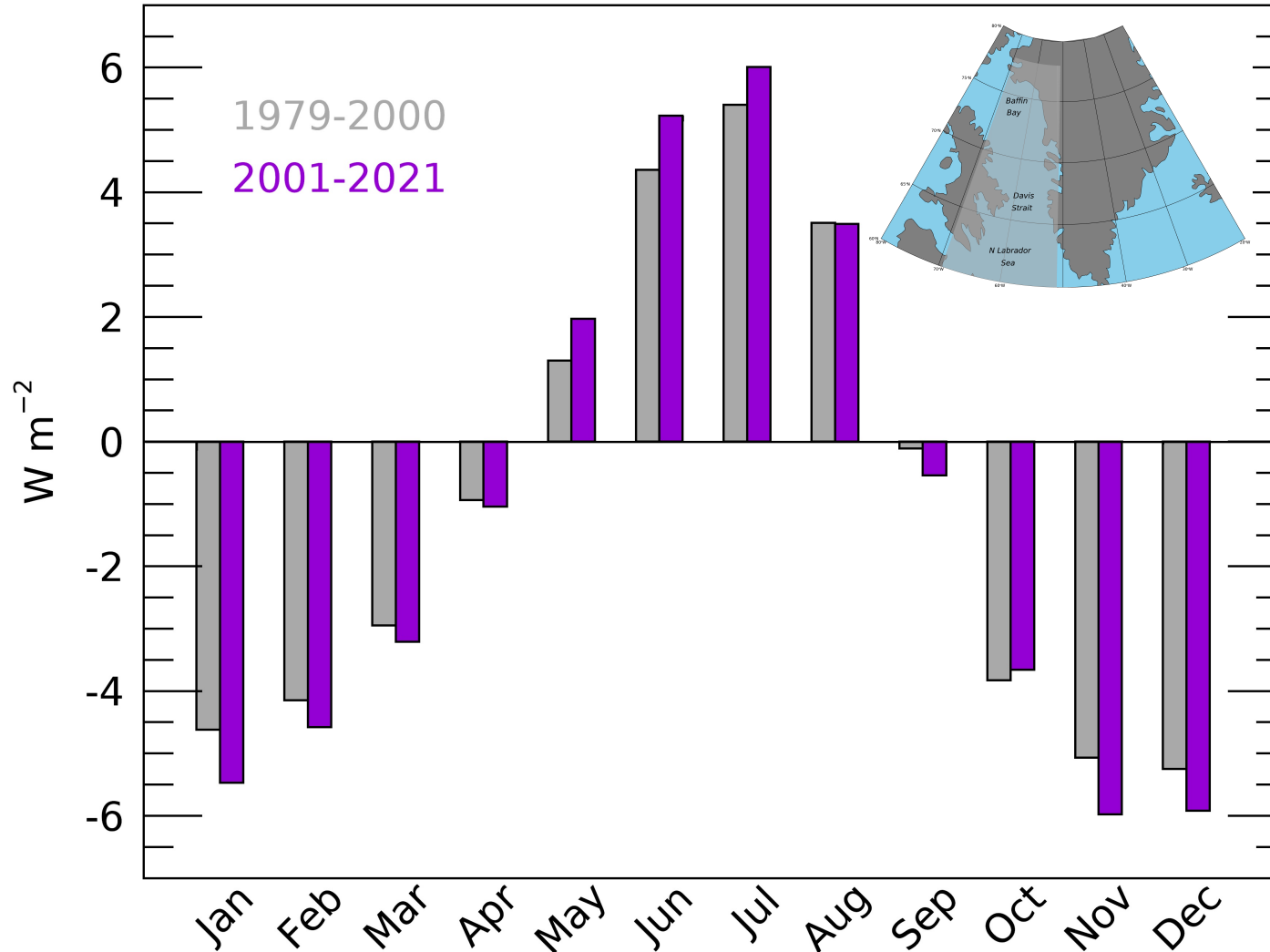
Results: Net Surface Heat Flux (Qnet)

Mean flux/day
within each
month; data from
ERA5

Note: ERA5
fluxes generally
agree with NASA
Atmospheric
Infrared Sounder
(AIRS) retrievals



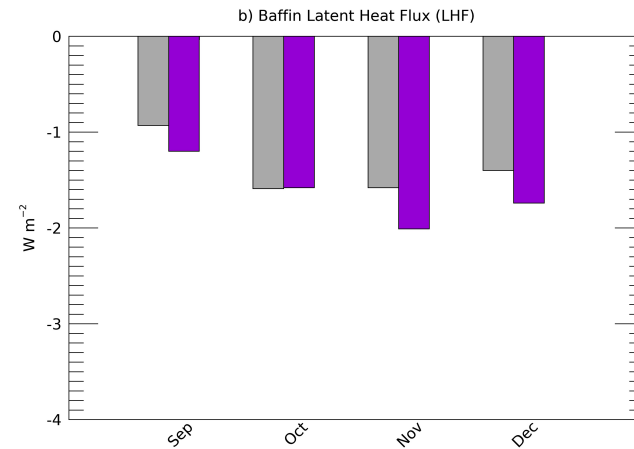
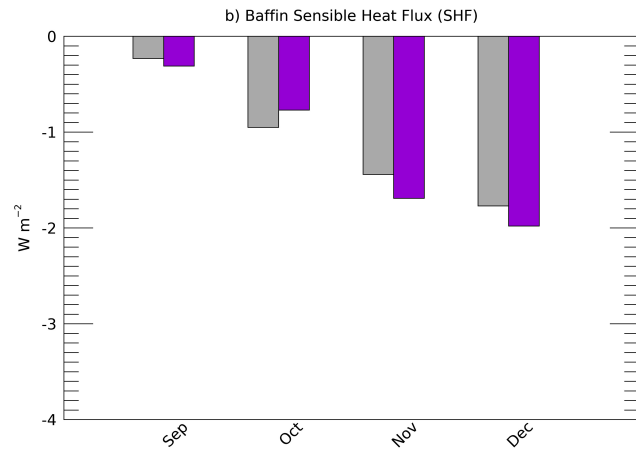
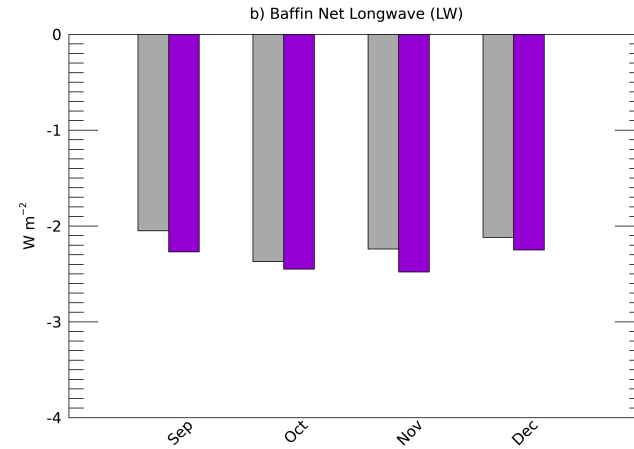
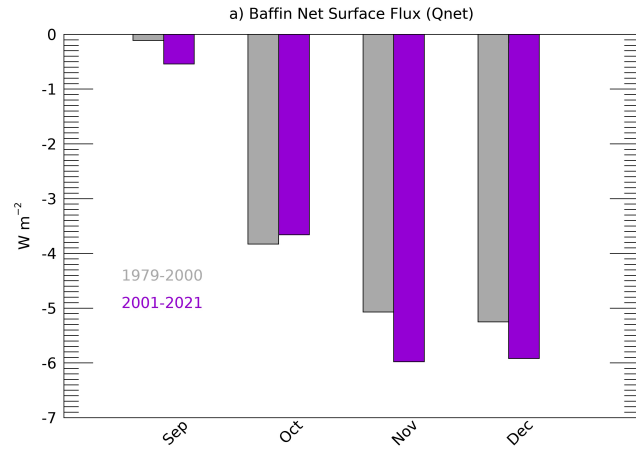
E Baffin-Davis-N Labrador Qnet Monthly Climatologies



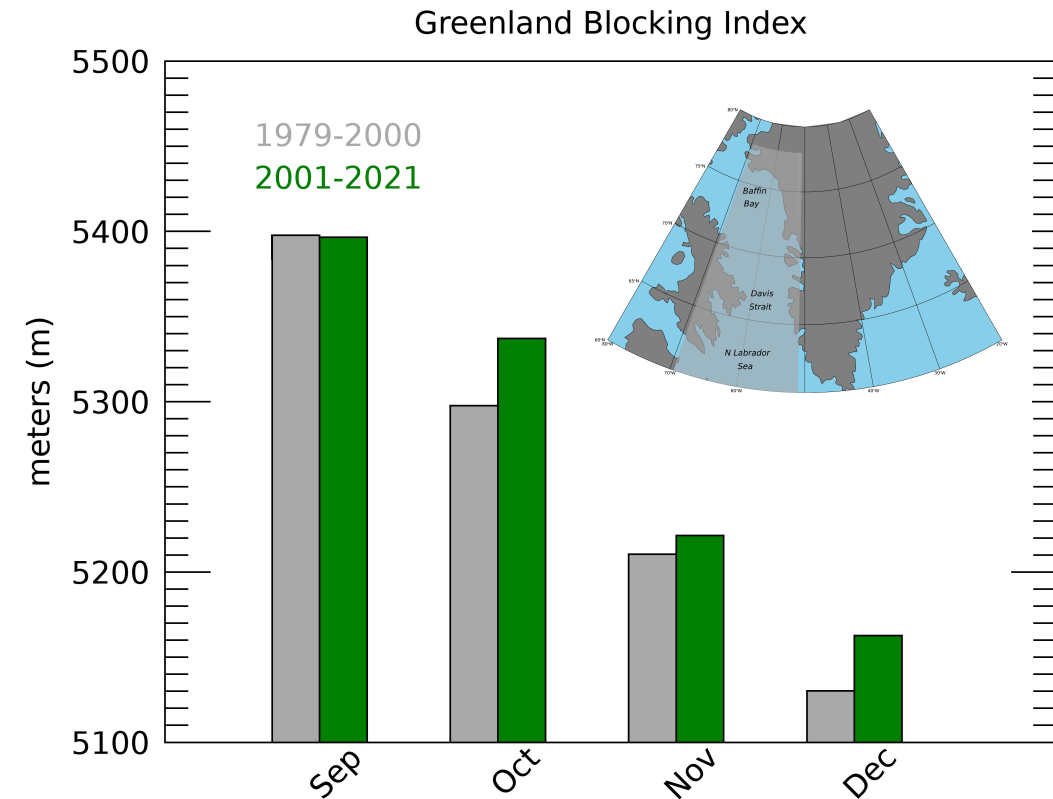
“+” =
Atmosphere
-to-ocean ↓

“-” =
Ocean-to-
atmosphere ↑

Flux terms & the GBI



Note: Fluxes are shown as mean values/day within each month



GBI data from Hanna et al. (2014); each month correlated with Hurrell NAO $r \leq -0.78$

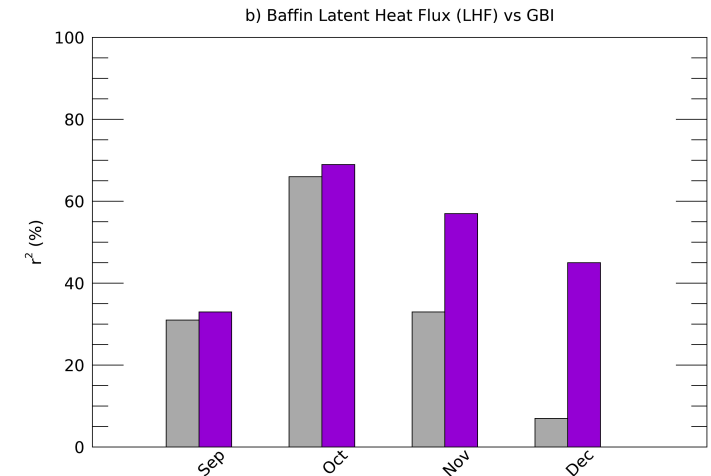
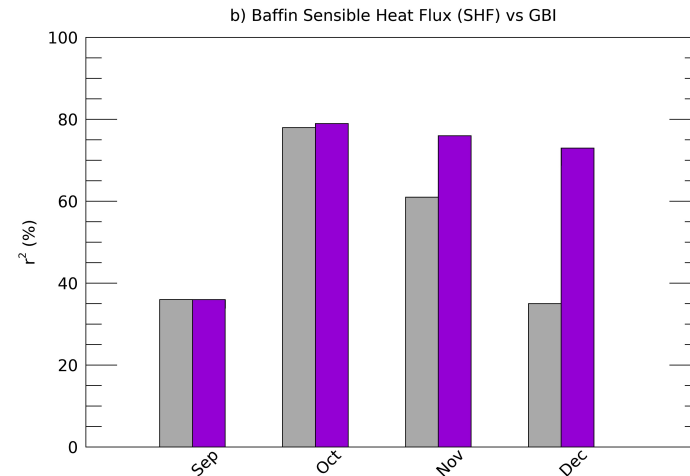
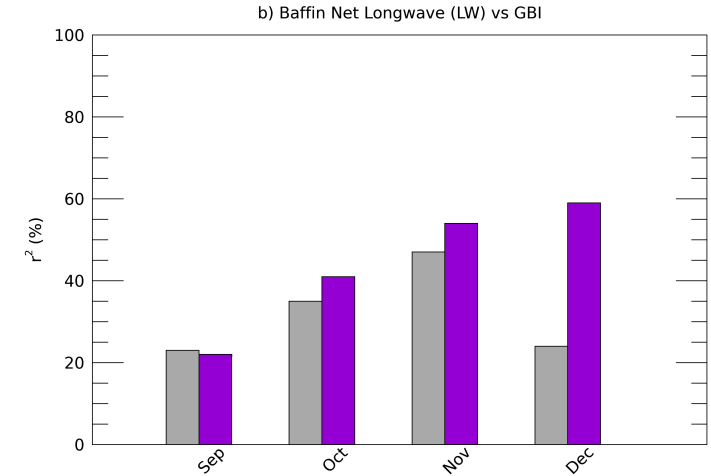
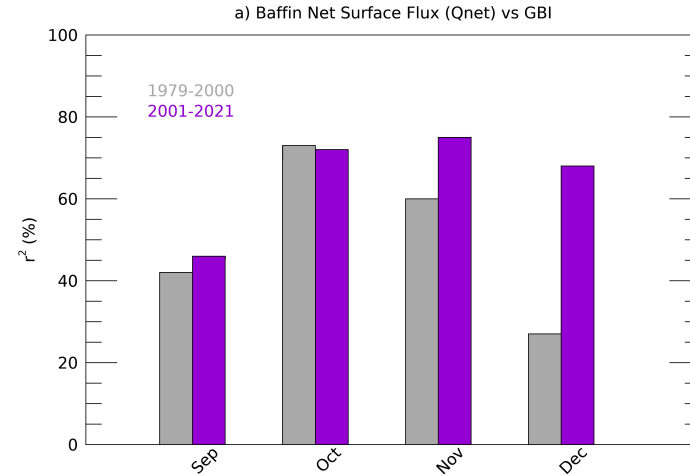


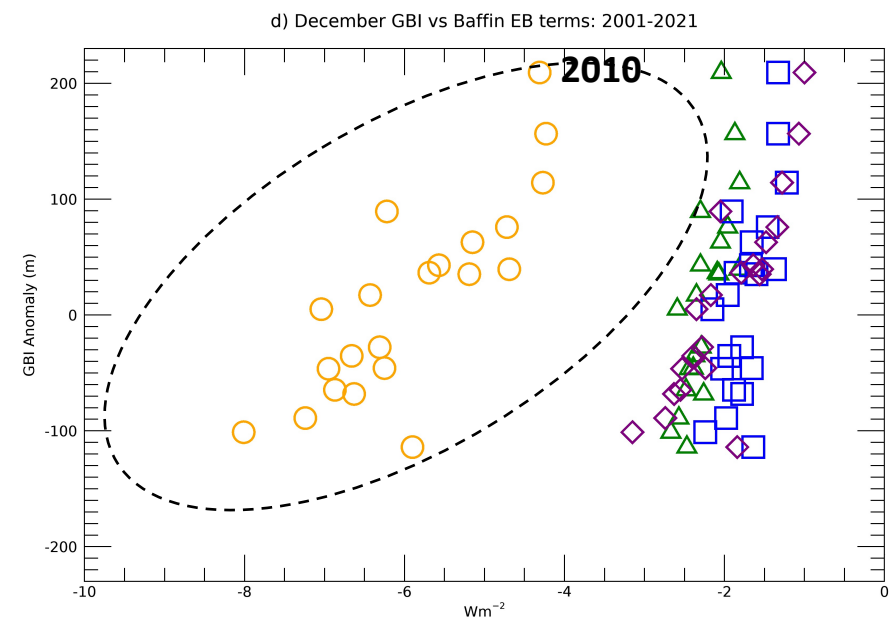
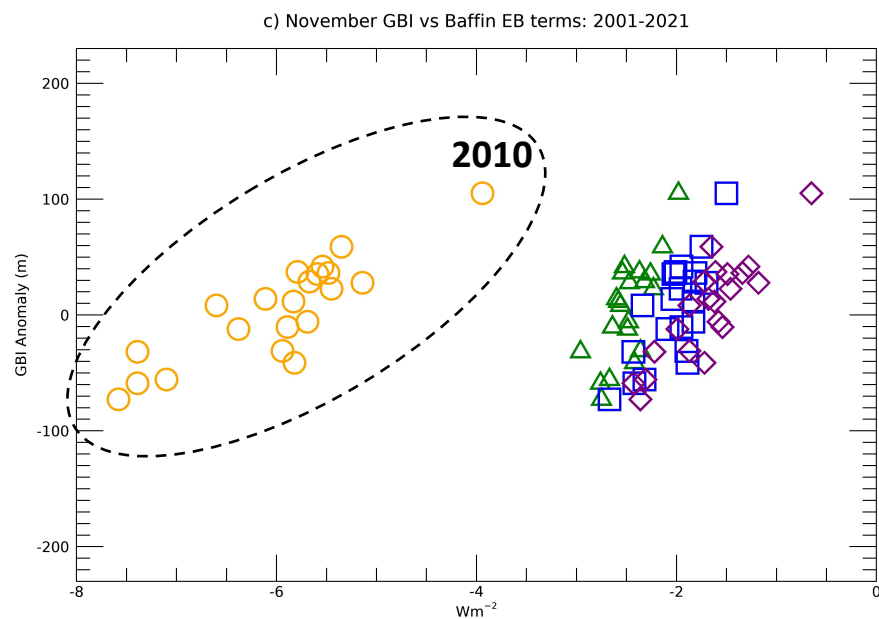
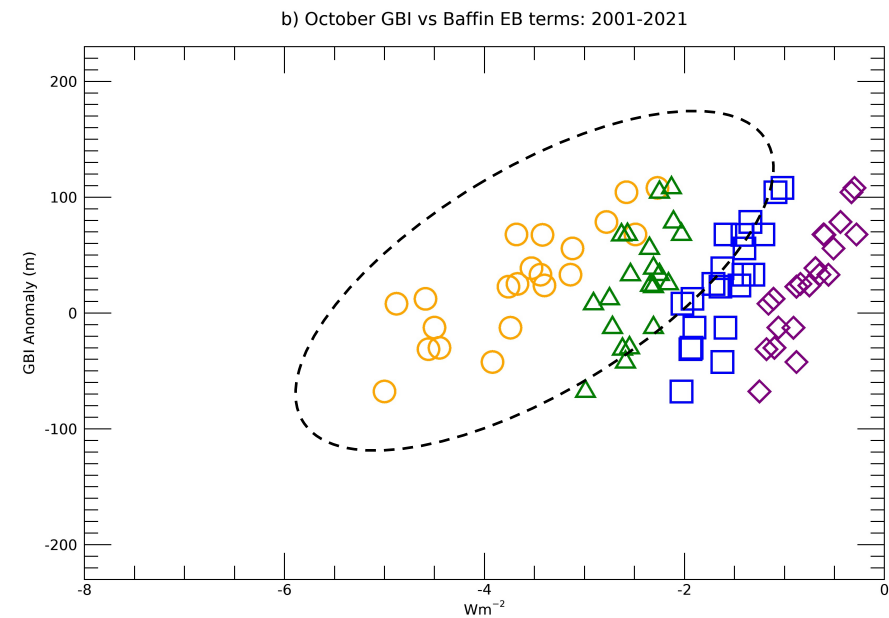
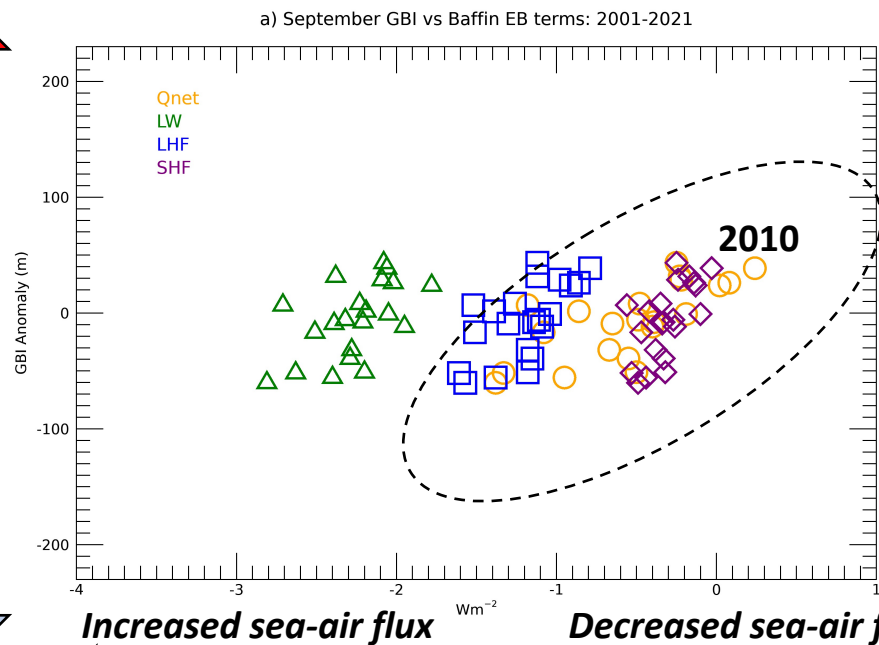
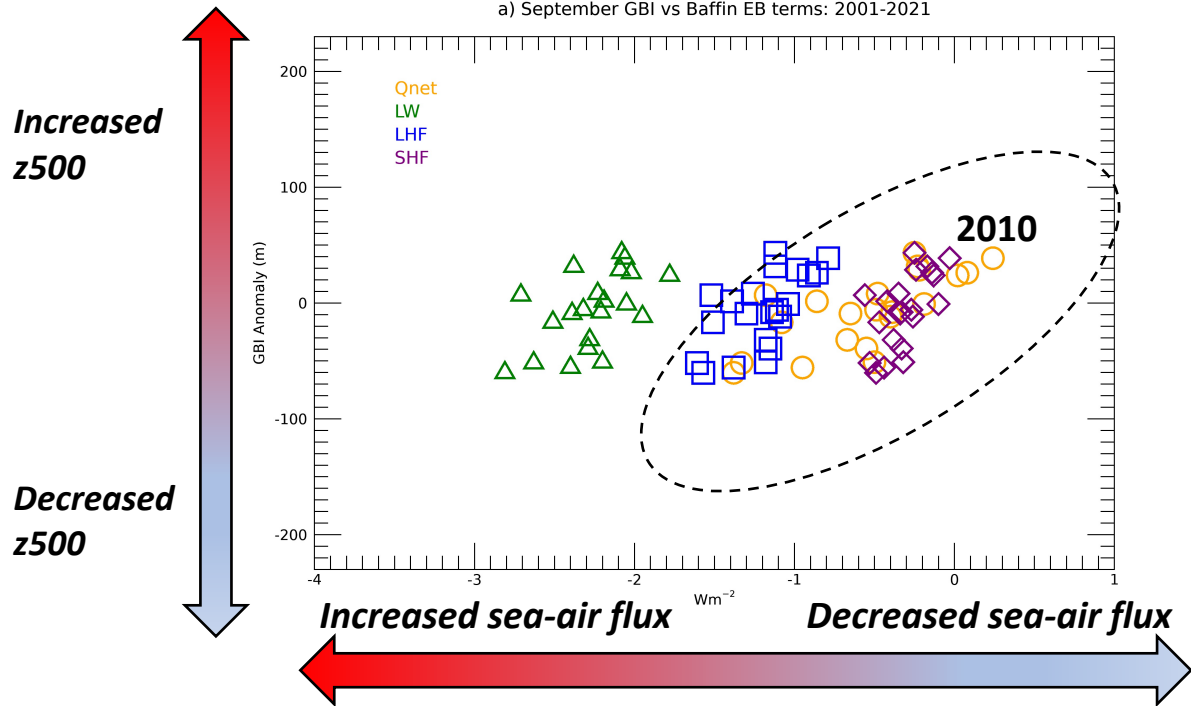
Flux terms vs GBI

Increased predictability
of GBI by EB terms

Largest Δ (%) in Dec;
 $r^2 \geq 35\%$

*All data are detrended



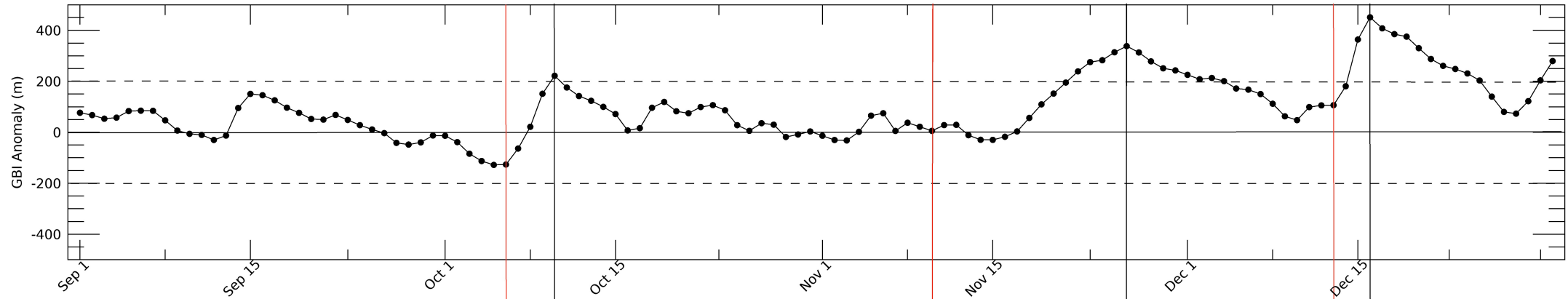


Extreme GBI Case: Fall 2010

+GBI extremes align with relatively weak upward Qnet

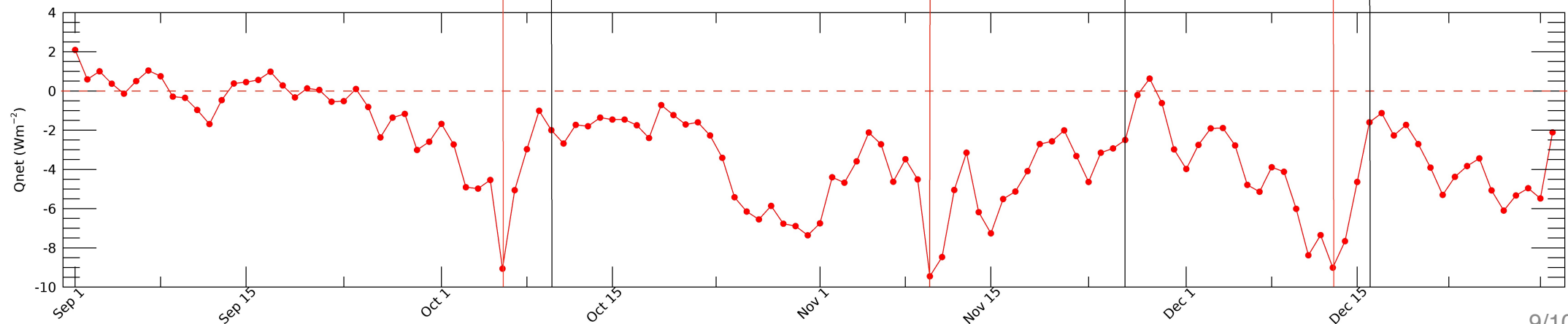
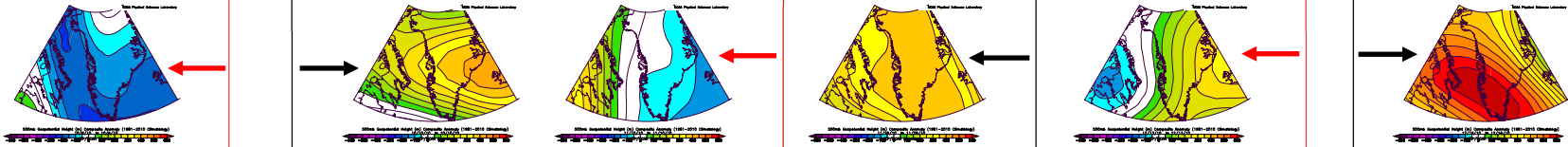
-Qnet extremes align with -GBI (Oct 6) and +GBI (Dec 13) anomalies and neutral values (Nov 10)

GBI vs Qnet: 1 Sep to 31 Dec



| GBI extrema (>200 m)

| Qnet extrema (3 lowest)



Summary

Since 2001:

- ERA5 suggests intensified autumn surface fluxes in Baffin Bay
- Energy balance terms explain more GBI variance through time, namely Qnet & SHF
 - decreased surface-to-atmosphere fluxes under +GBI

Future work:

- Similarly examine surface-atmosphere interactions in CAM6 (prescribed boundary conditions) and in CESM (nudging runs)



Questions/Comments, please reach out!

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