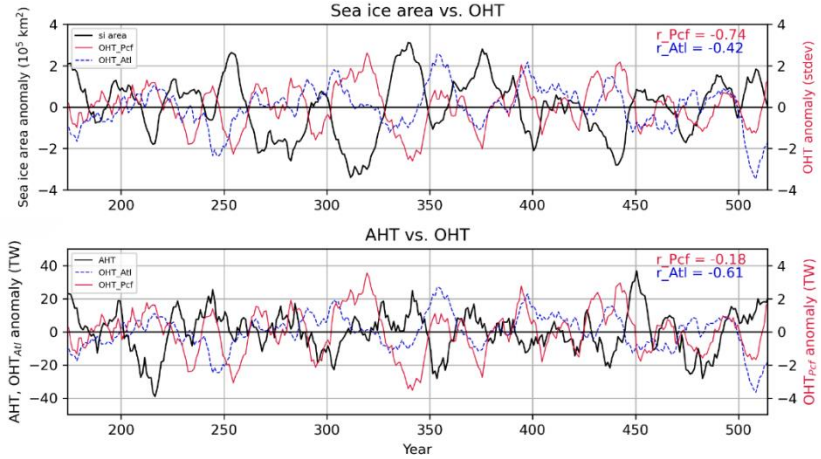
# The Role of Bering Strait Ocean Heat Transport in Arctic Warming

Wilbert Weijer, Los Alamos National Laboratory | HiLAT-RASM

Goal: Explore the impact of ocean heat transport (OHT) through the Bering Strait (North Pacific) and across the Greenland-Scotland Ridge (North Atlantic) on Arctic atmosphere and sea ice.




*Ocean heat transport (OHT) from the Pacific into the Arctic Ocean through the Bering Strait (red curves) has a stronger impact on Arctic surface temperatures and pan-Arctic sea ice extent (top) than OHT from the Atlantic Ocean across the Greenland-Scotland Ridge (blue). In contrast, the latter is strongly anti-correlated with atmospheric heat transport (bottom), suggesting that Atlantic OHT variability is compensated by the atmosphere (Bjerknes Compensation).*

Research

- We analyze a 500-year pre-industrial control integration with a high-resolution configuration of the Community Earth System Model (CESM1.3).
- We regress ocean heat transport time series on several atmosphere and sea ice quantities.
- We analyze the atmosphere energy budget in response to OHT variability from the North Pacific and North Atlantic Oceans.

Impact

- We demonstrate that OHT from the Pacific through the Bering Strait has a stronger impact on the Arctic atmosphere and sea ice than OHT from the Atlantic.
- The ice-albedo feedback strongly amplifies the impact of OHT through Bering Strait.
- OHT transport variability on the Atlantic side only is compensated by opposing anomalies in atmospheric heat transport (Bjerknes Compensation).

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- The Arctic Earth system is a strongly integrated system. Its evolution is controlled by complex, non-linear, and fine-scale interactions between Earth system components
  - Feedbacks can amplify seemingly small processes to significant effects!
- Grand Challenge: Improve understanding, model representation, of Earth system interactions and feedbacks
  - Modeling of such interactions is a strength of the EESM portfolio
  - Improving parameterizations requires targeted collaboration between modelers, observationalists (across inter-agency spectrum)
- Grand Challenge: Separate forced response from internal variability –and understanding their interaction
  - Large ensembles are key
  - Requires computational (and personnel) resources, intelligent analysis framework