The Role of Ocean Coupling in the Atmospheric Response to Arctic Sea Ice Loss

Clara Deser and Bob Tomas
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Latent & sensible heat, longwave radiation

$Q_{out}$

$\text{Sea Ice}$

$\text{Arctic Ocean}$

$\text{TEMP}\&\text{ALBEDO WATER} > \text{ICE}$
The Role of Ocean Coupling in the Atmospheric Response to Arctic Sea Ice Loss

1) Local ocean warming in areas of ice loss
2) Local and remote ocean T changes

1) Experiments with CAM4-1°
Atmosphere

Ocean

Land

Sea Ice

CCSM4-1° 20th & 21st C

GHG (RCP8.5)
& ozone, aerosols, solar
60 runs each (perturbed initial conditions)
CAM4 Temperature and Sea Level Pressure Response to Sea Ice Loss:

Sensitivity to Local SST Increase
CAM4 Response: SLP and Terrestrial Air Temperature

Weak response despite SST increase

Stronger T response w/SST'

SLP contour interval = 1 hPa

Air Temperature °C

Like CAM3
CAM4 Response: SLP and Terrestrial Air Temperature

Weaker High Pressure w/SST feedback

SLP’ lasts longer with SST’

Intensification of Negative T’ over Central Eurasia Associated with High Pressure Anomaly

Like CAM3

SLP contour interval = 1 hPa

Air Temperature °C
Arctic Amplification:
Role of Sea Ice Loss and Local SST Feedback

December Air Temperature (Land only) °C
The Role of Ocean Coupling in the Atmospheric Response to Arctic Sea Ice Loss

1) Local ocean warming in areas of ice loss
2) Local and remote ocean T changes

2) Experiments with CCSM4-1° (Laura Landrum)