Week4

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All codes and figures can be obtained from here: https://github.com/Aaron-Hsieh-0129/Workshop-of-Earth-System-Model/tree/main/hw3

Setting

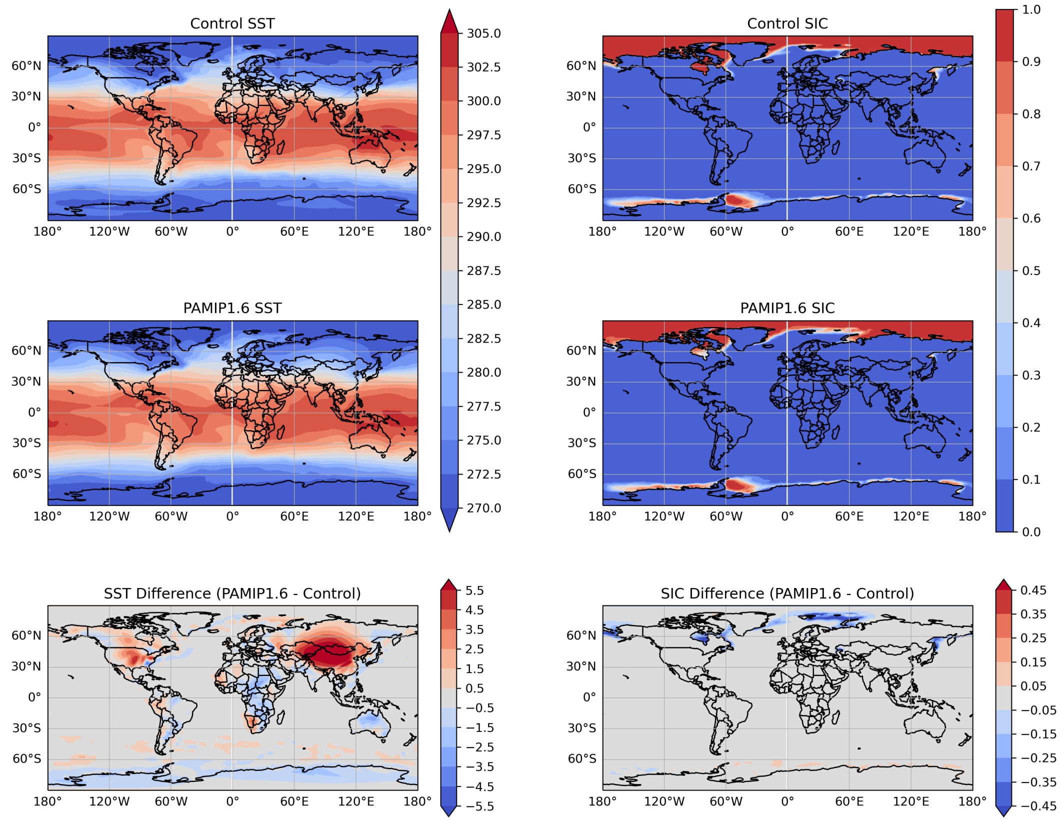
Setting	Case1	Case2
Case	F_2000_TAI	F_2000_TAI
Sea-Ice Forcing	PAMIP1.6	/work/youtingw11/ESM/SST-SIC/SST-SIC_PAMIP-1.6_cesm1.2_amipII.nc
Simulation Time	2000-01-01~2010-12-31	2000-01-01~2000-01-31
Output Var	LHFLX, SHFLX, PSL, ICEFRAC, SST	LHFLX, SHFLX, PSL, ICEFRAC, SST
Output Timestep	monthly	monthly

Output Data Path:

1. `/work/aaron900129/taiesm_work/archive/f09.F2000.Aaron_10years/atm/hist`

2. `/work/aaron900129/taiesm_work/archive/f09.F2000.Aaron_week4/atm/hist`

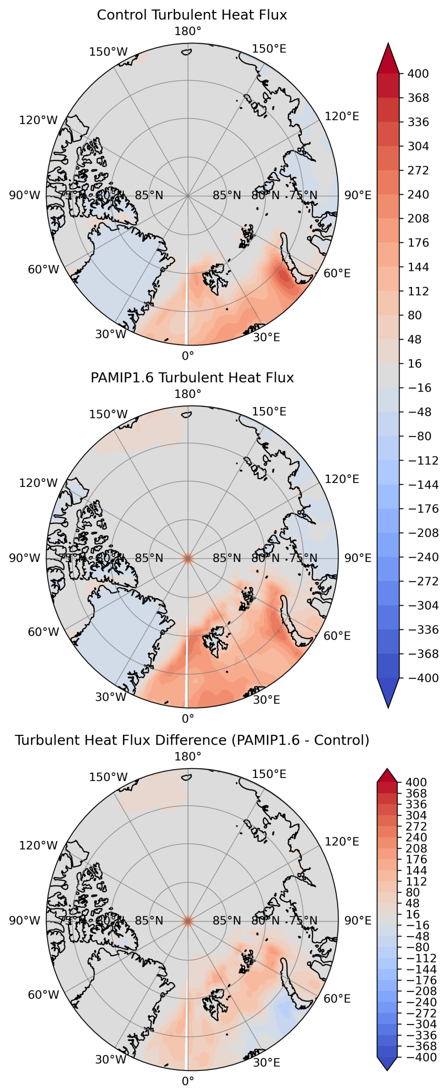
(1a). Check SIC/SST forcing profiles



- The left part of this graph shows the SST in control run, PAMIP1.6, and the differences between the PAMIP1.6 and control run.
    - While there are many features to consider, one of the most notable differences is the higher temperatures observed in Asia and North America. However, I am not sure about the SST appears in land areas, as SST

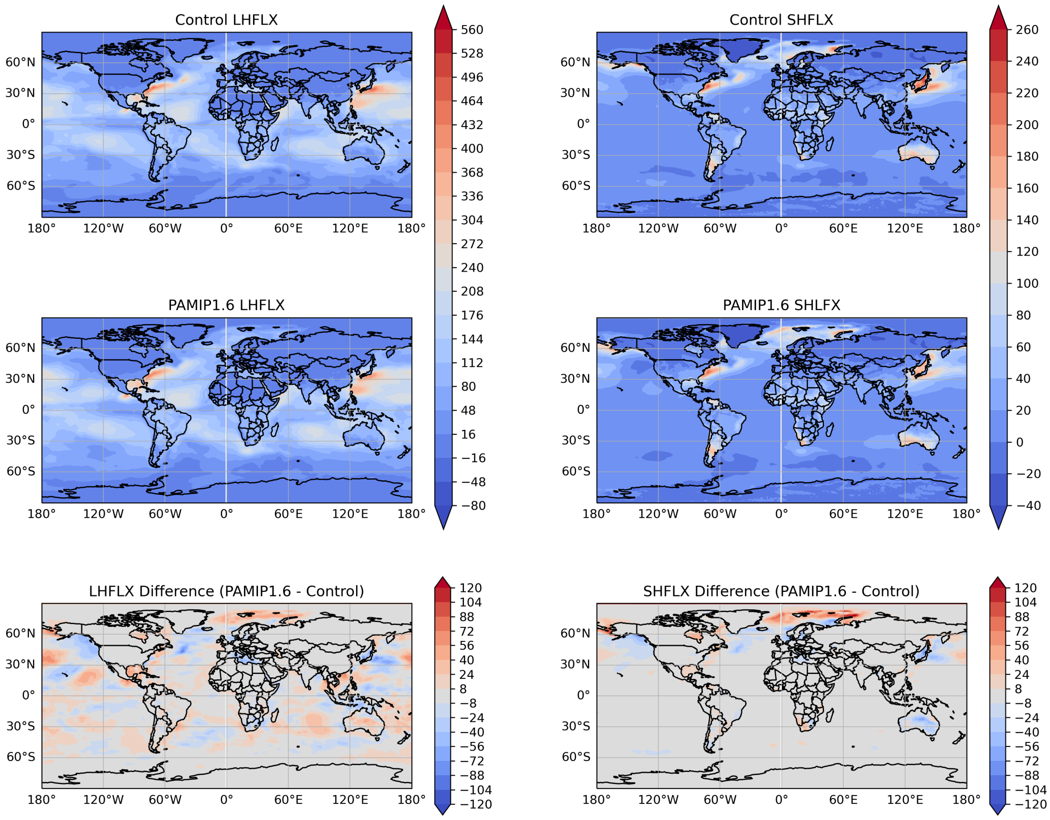
typically refers to sea surface temperatures, which doesn't have value in land area.
    - When considering only the effects on the ocean, the forcing tends to result in lower temperatures near the coast of Antarctica, the eastern coast of North America, and some regions near the North Pole. Conversely, it can also lead to higher temperatures in certain areas, such as the sea around $45^{\circ}S$ and $60^{\circ}N$.
- The right part of this graph indicates the SIC in control run, PAMIP1.6, and the differences between them
    - The most significant features are the large decreasing ice fraction in the North Pole and a little increasing near the Antarctica.

(1b). Check turbulent (sensible and latent) heat flux



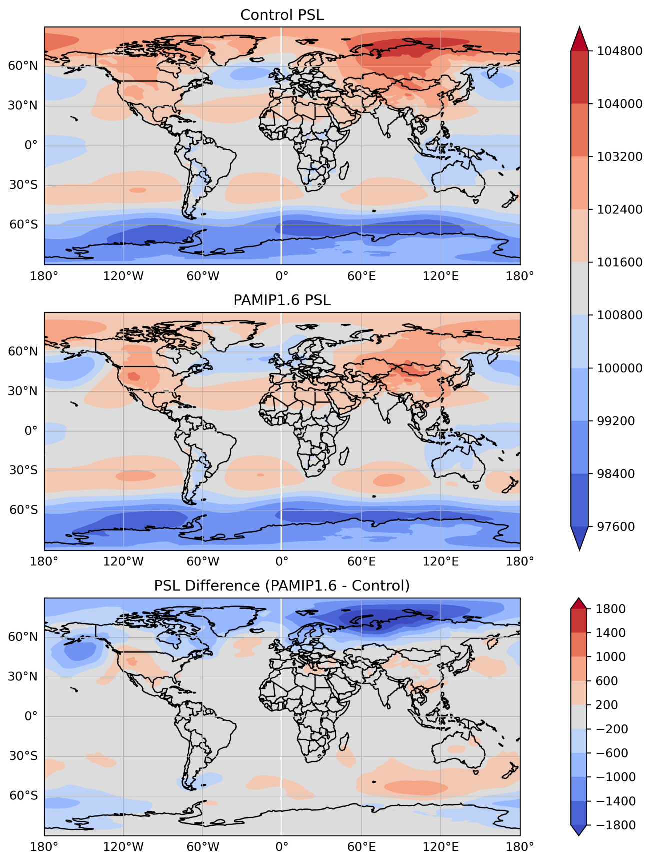
- This graph suggests the Turbulent Heat (Latent Heat + Sensible Heat) flux in control run, PAMIP1.6, and the differences between them.
  - It shows a larger turbulent flux pattern near the North Pole (especially from $75^\circ N$ to $90^\circ N$) and some lower

turbulent flux near $60^\circ N$~$75^\circ N$ in the region of $30^\circ E$ ~ $60^\circ E$



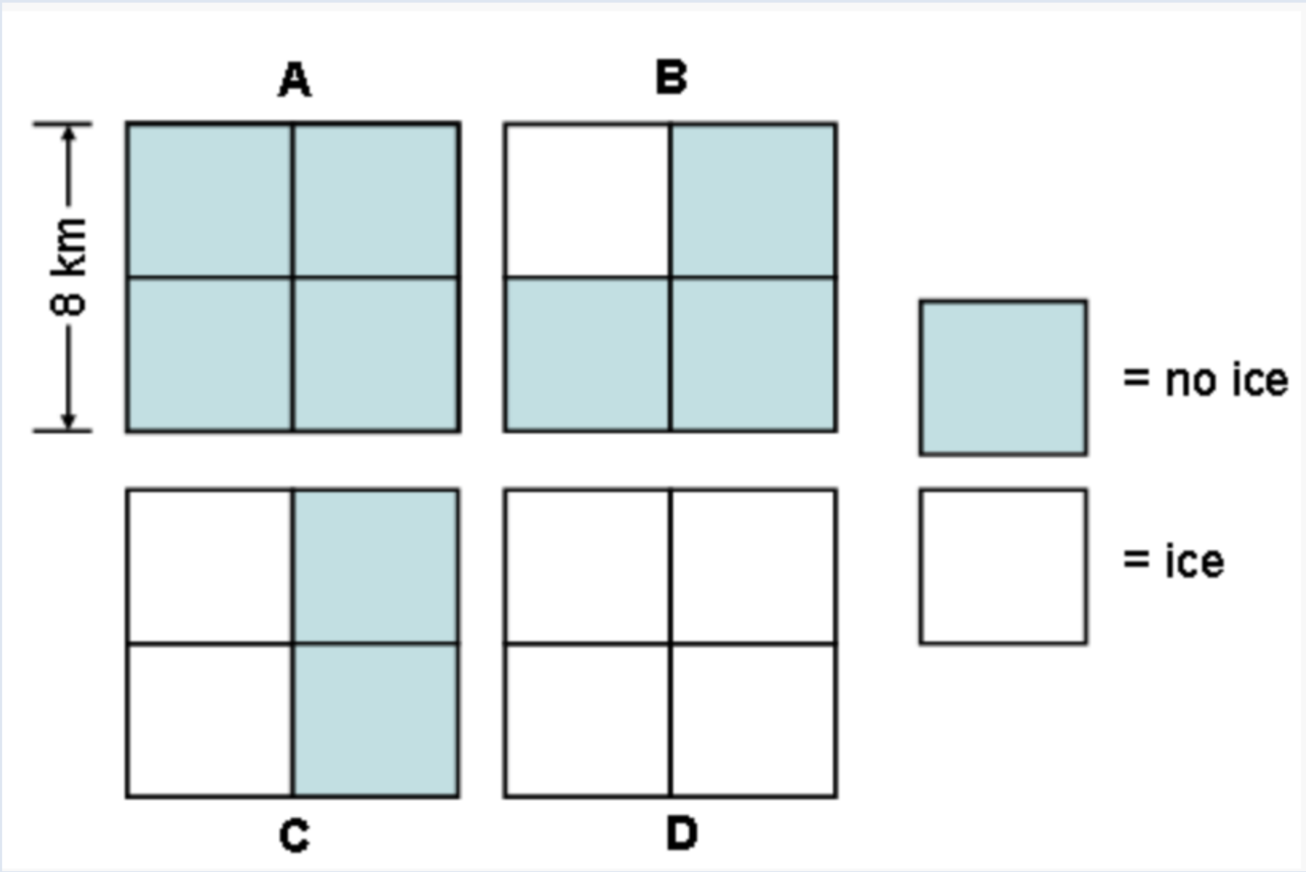
- This graph shows the global patterns of the LHFLX and the SHFLX in two runs and the differences between them.
  - The left part shows that there are large different in LHFLX globally and the main results are larger LHFLX.
  - The right part shows that the large fraction of higher SHFLX near the North Pole, which may result from the small ice fraction.

(1c). Check Sea-level pressure



- This graph suggests the Sea Level Pressure (PSL) in two runs and the differences between them.
  - A large area of significant lower PSL are observed in the North Pole region and some parts ($120^\circ E \rightarrow 180^\circ E, 120^\circ W \rightarrow 180^\circ W$) of Antarctica ($60^\circ S \rightarrow 90^\circ S$).
  - Some higher PSL near $45^\circ S$ and $45^\circ N$.

(2) Calculate sea ice concentration, sea ice area, and sea ice extent for scenarios A, B, C, and D, respectively.



	Sea Ice Concentration (SIC)	Sea Ice Area (SIA)	Sea Ice Extent (SIE)
A	0%	$8\ [km] \times 8\ [km] \times 0\% = 0\ [km^2]$	0
B	25%	$8\ [km] \times 8\ [km] \times 25\% = 16\ [km^2]$	1
C	50%	$8\ [km] \times 8\ [km] \times 50\% = 32\ [km^2]$	1
D	100%	$8\ [km] \times 8\ [km] \times 100\% = 64\ [km^2]$	1