

How Tibetan Plateau Determines the Formation of AMOC ? Part II

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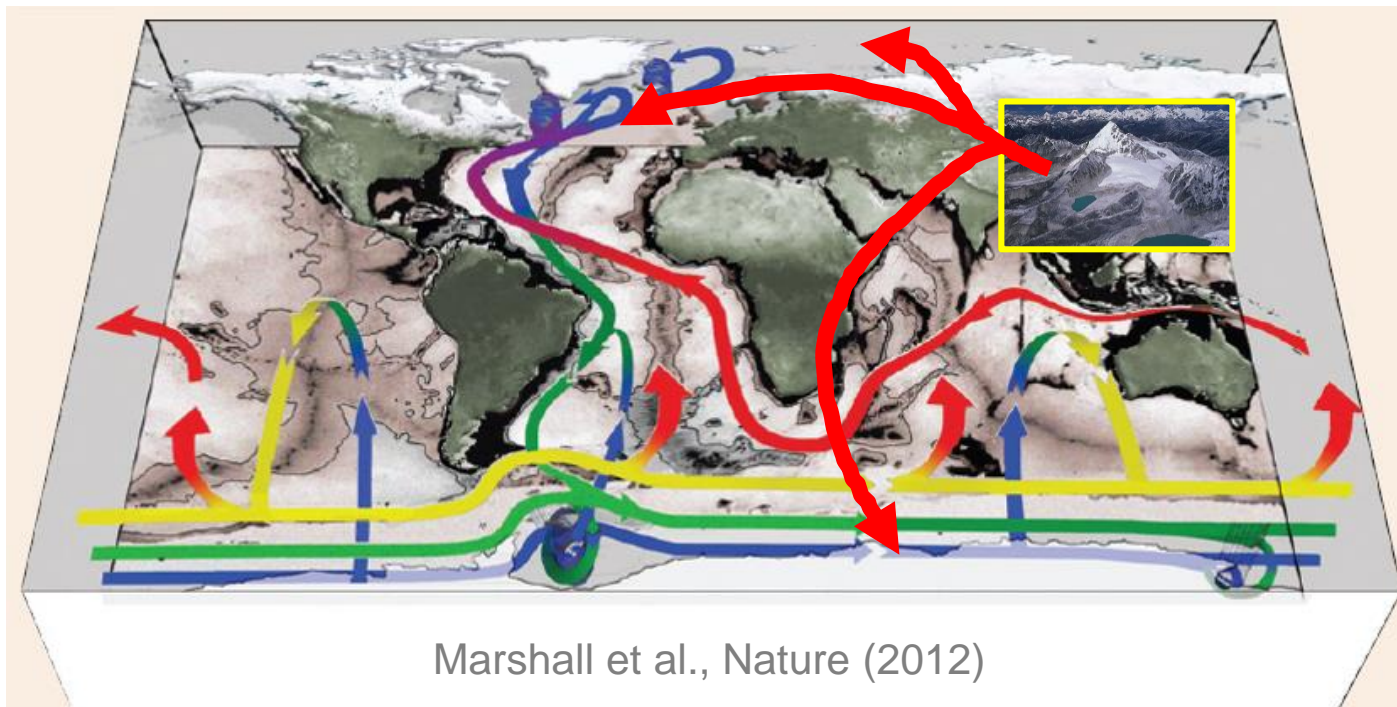
Tibetan Plateau (TP): the 3rd Pole

Total Area: 2.5 million km², Elevation: 4000 m



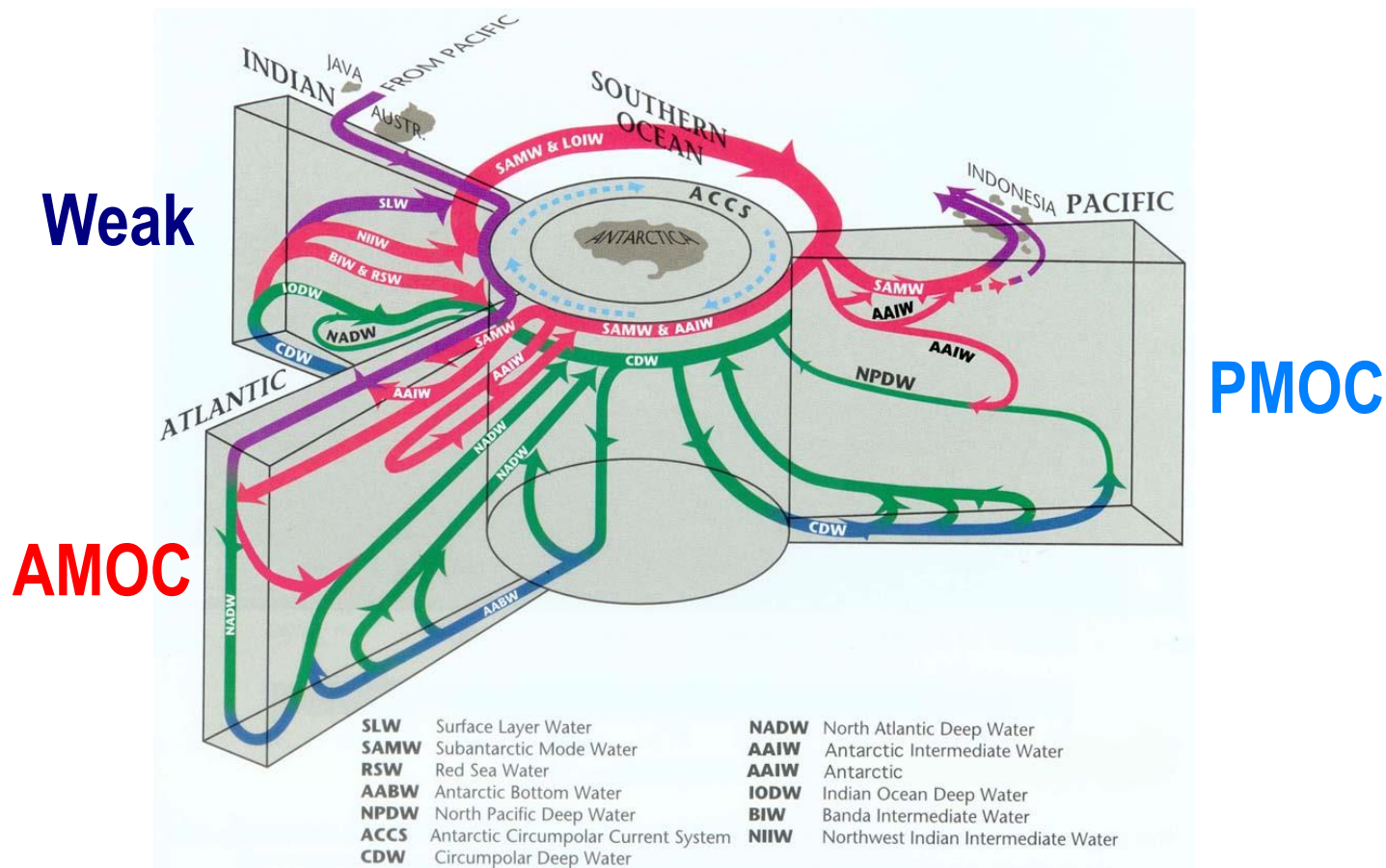
TP: A *Global* Perspective

How and to what extent?



Global Meridional Overturning Circulation

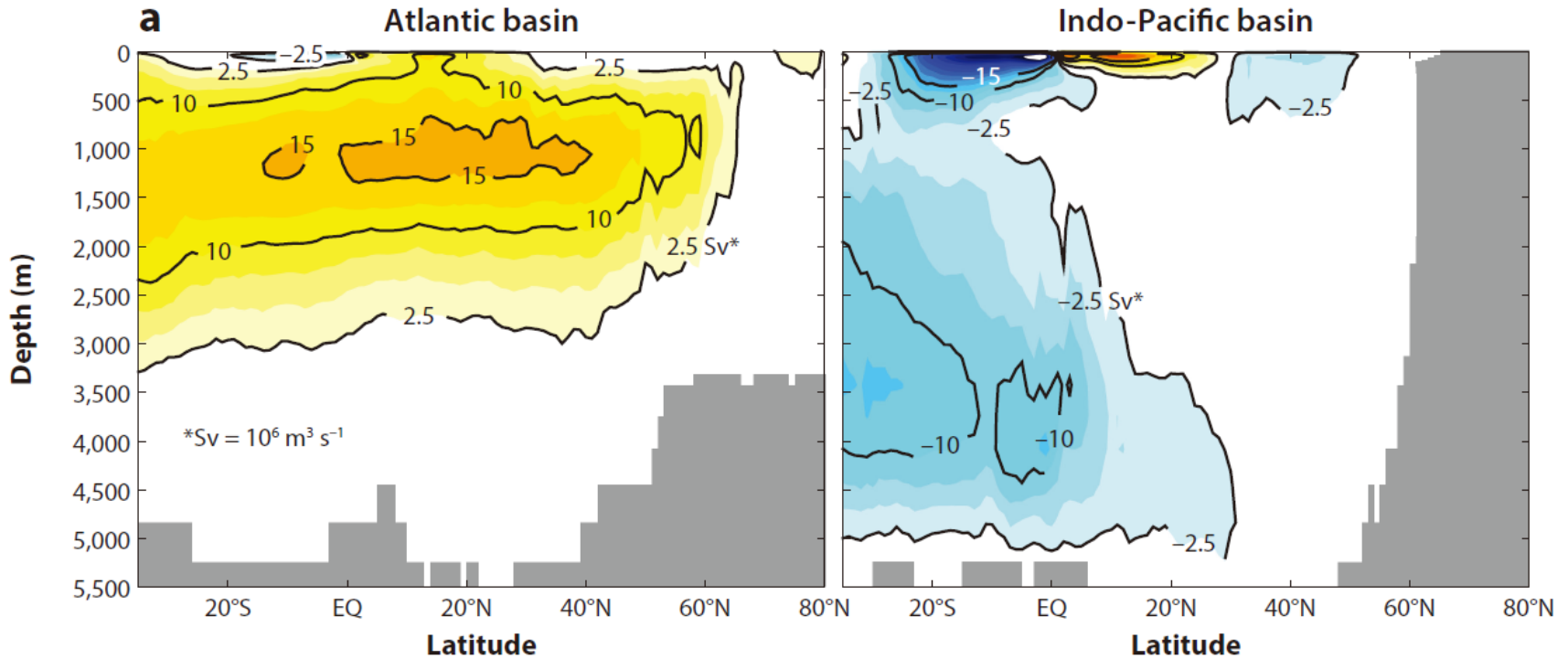
Energy and Freshwater Balance



Schmitz (1997) Overturning circulation: Southern Ocean View

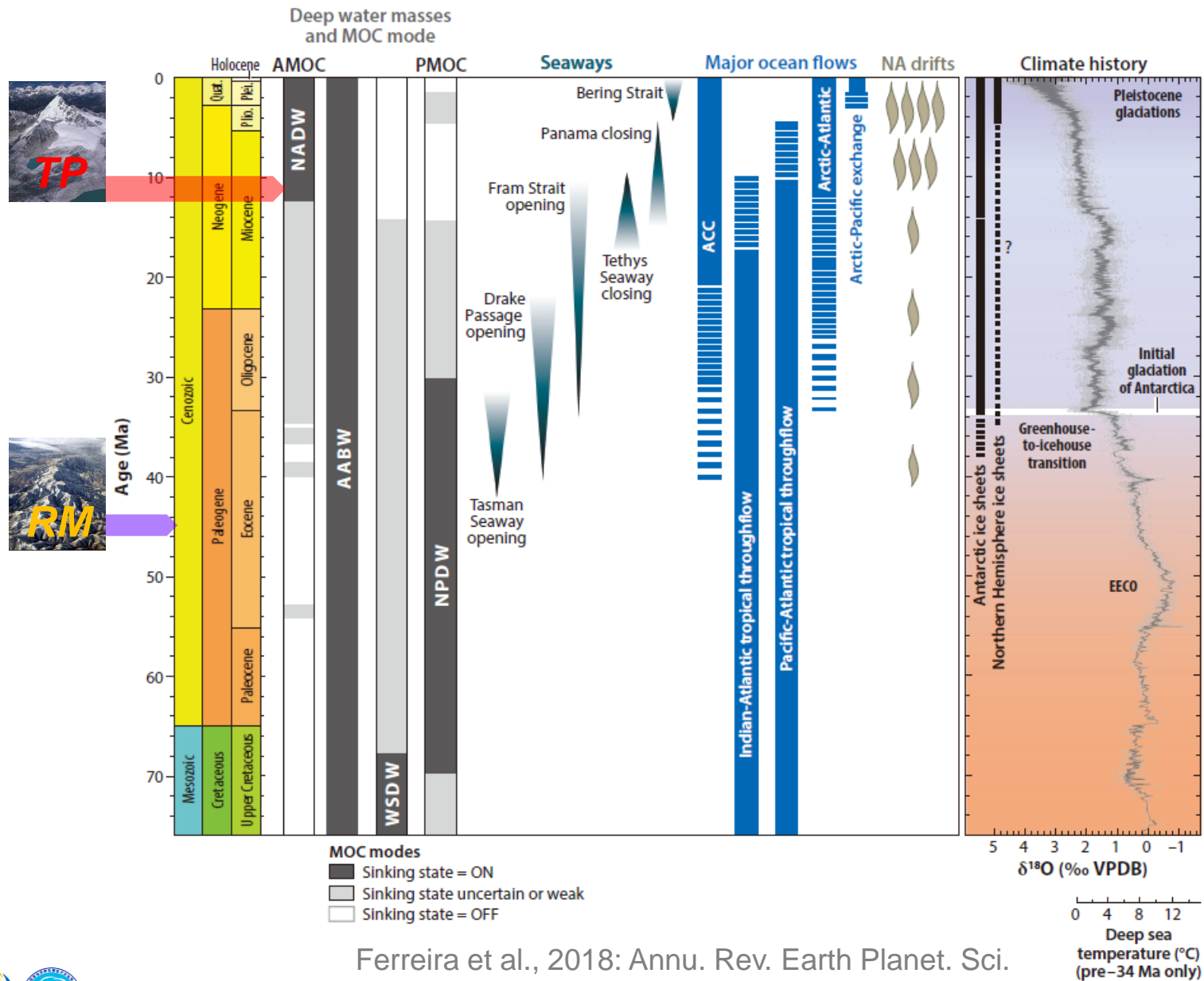
Strong AMOC

Weak PMOC



Ferreira et al., 2018: Annu. Rev. Earth Planet. Sci.

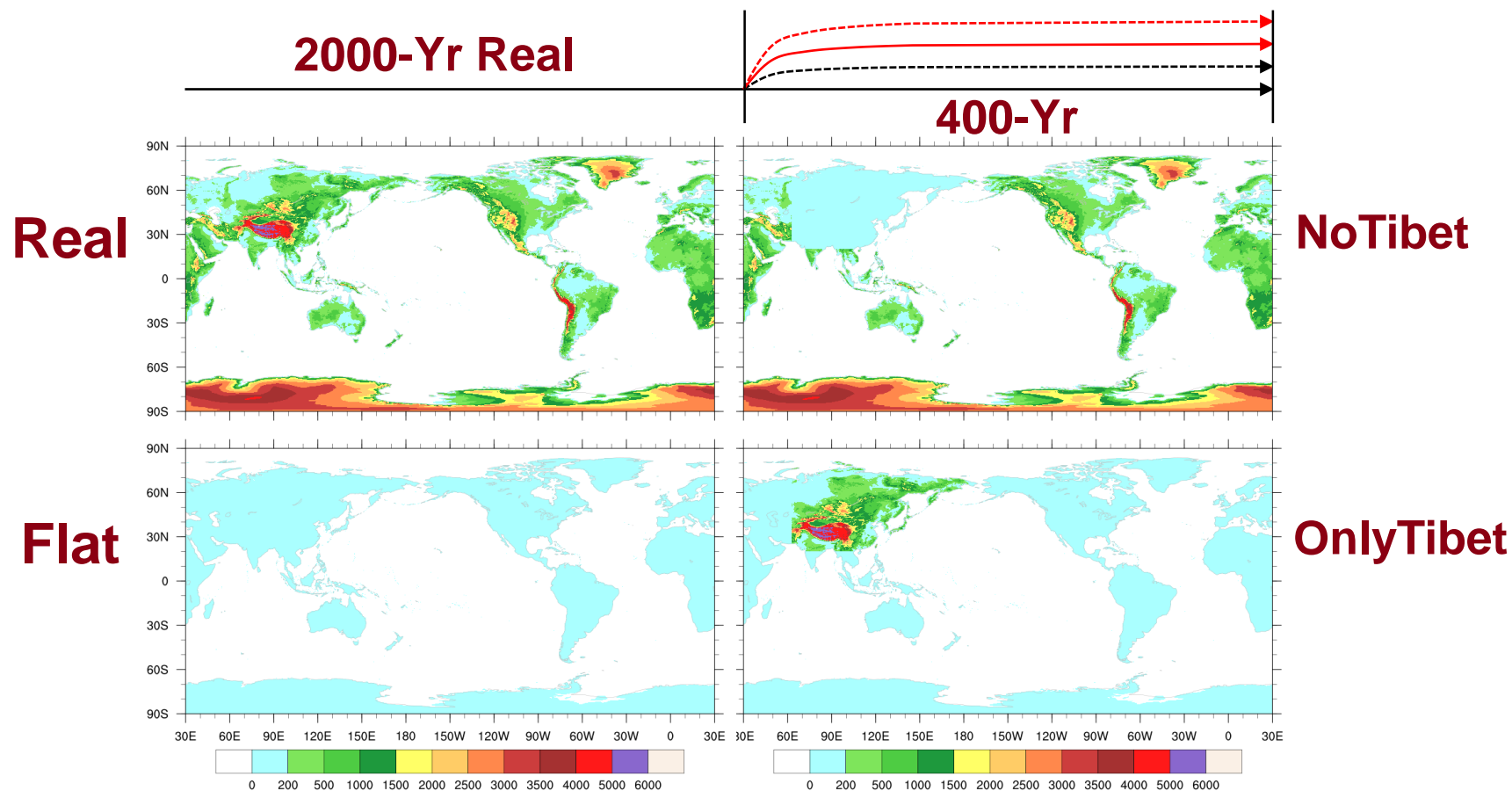
Geological History of *GMOC*



Ferreira et al., 2018: Annu. Rev. Earth Planet. Sci.

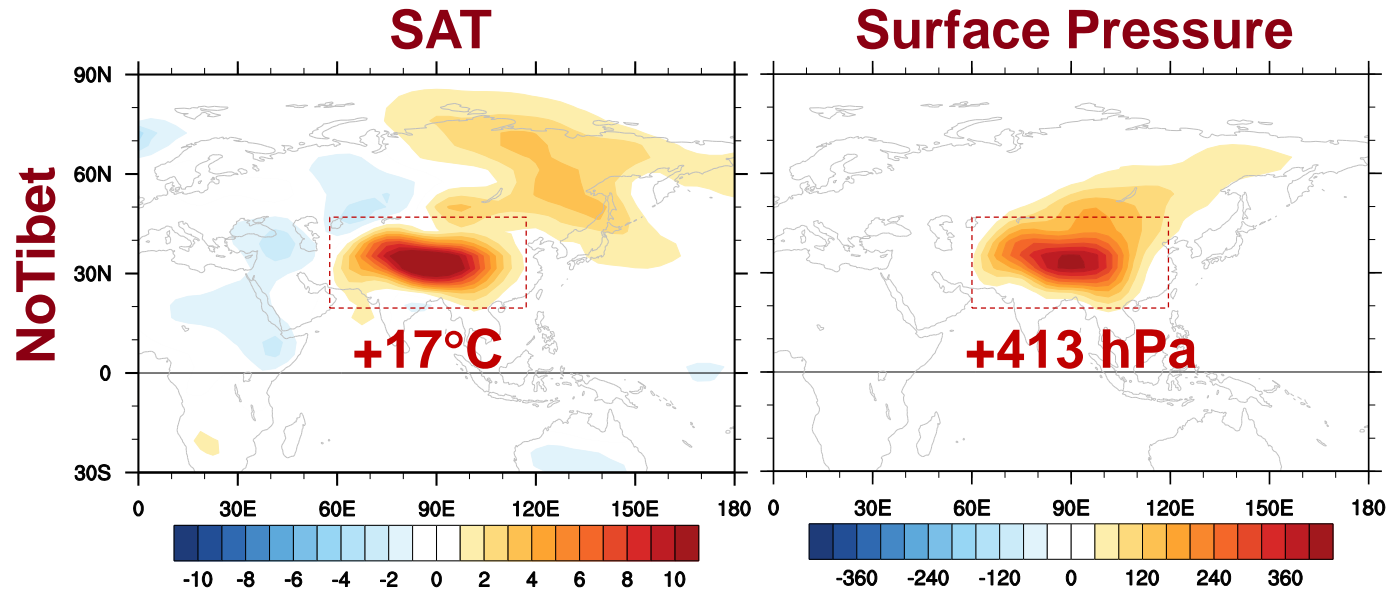
中国海洋大学物理海洋实验室学术年会, 2018.12.07, 青岛

Coupled Earth System Model

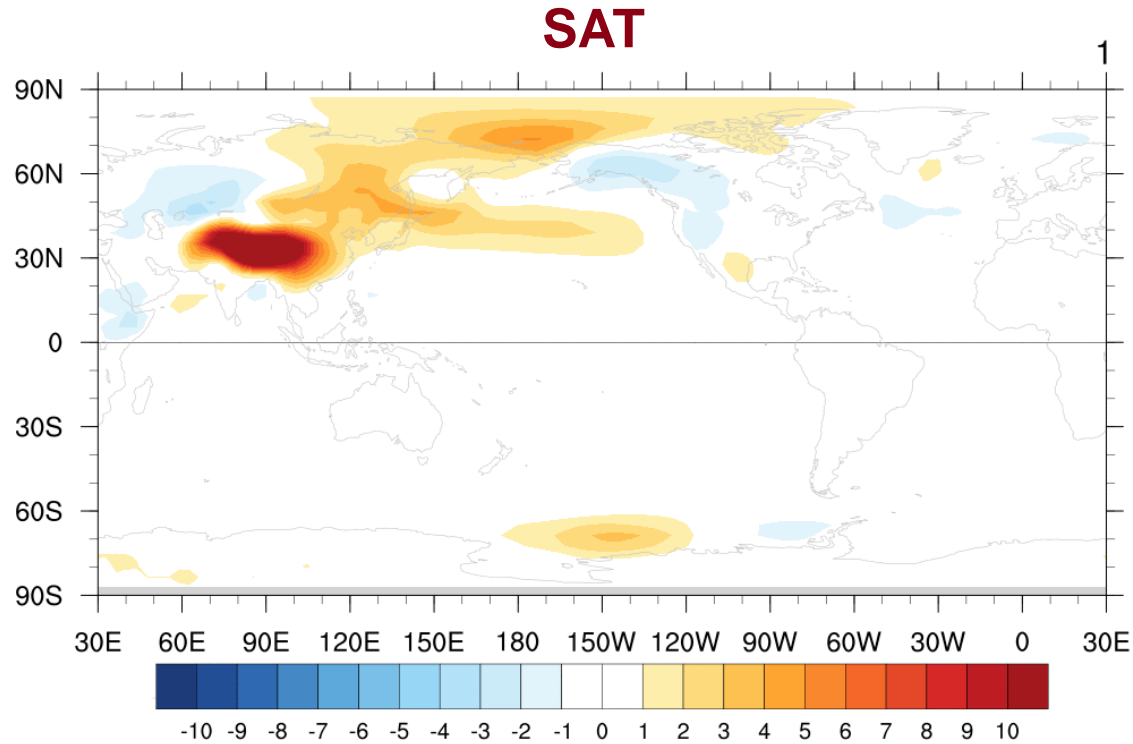


NCAR CESM1.0: CAM5 / POP2 / CLM4 / CICE4 / Glimmer-CISM

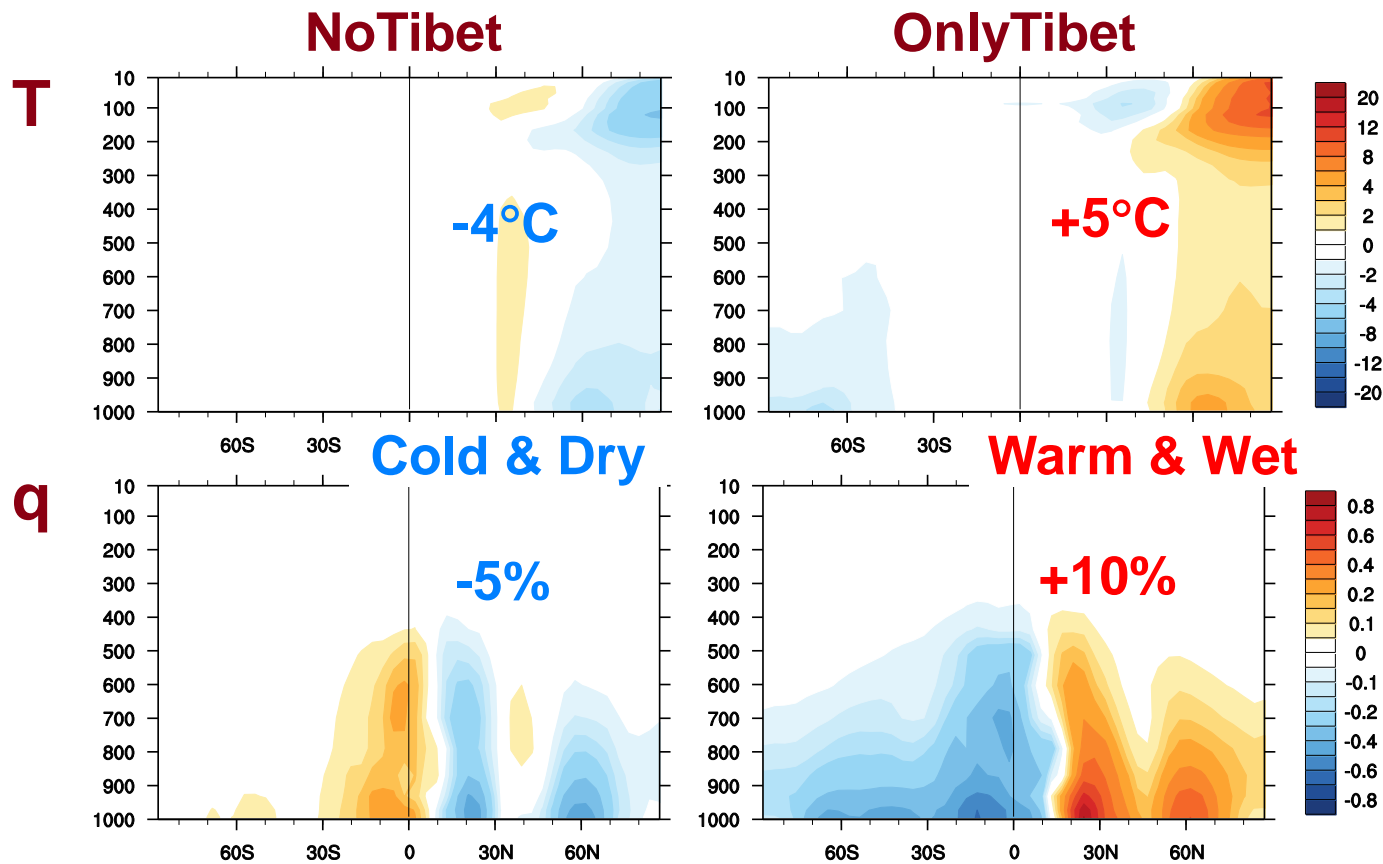
TP Forcing: *Thermal* and *Dynamical*



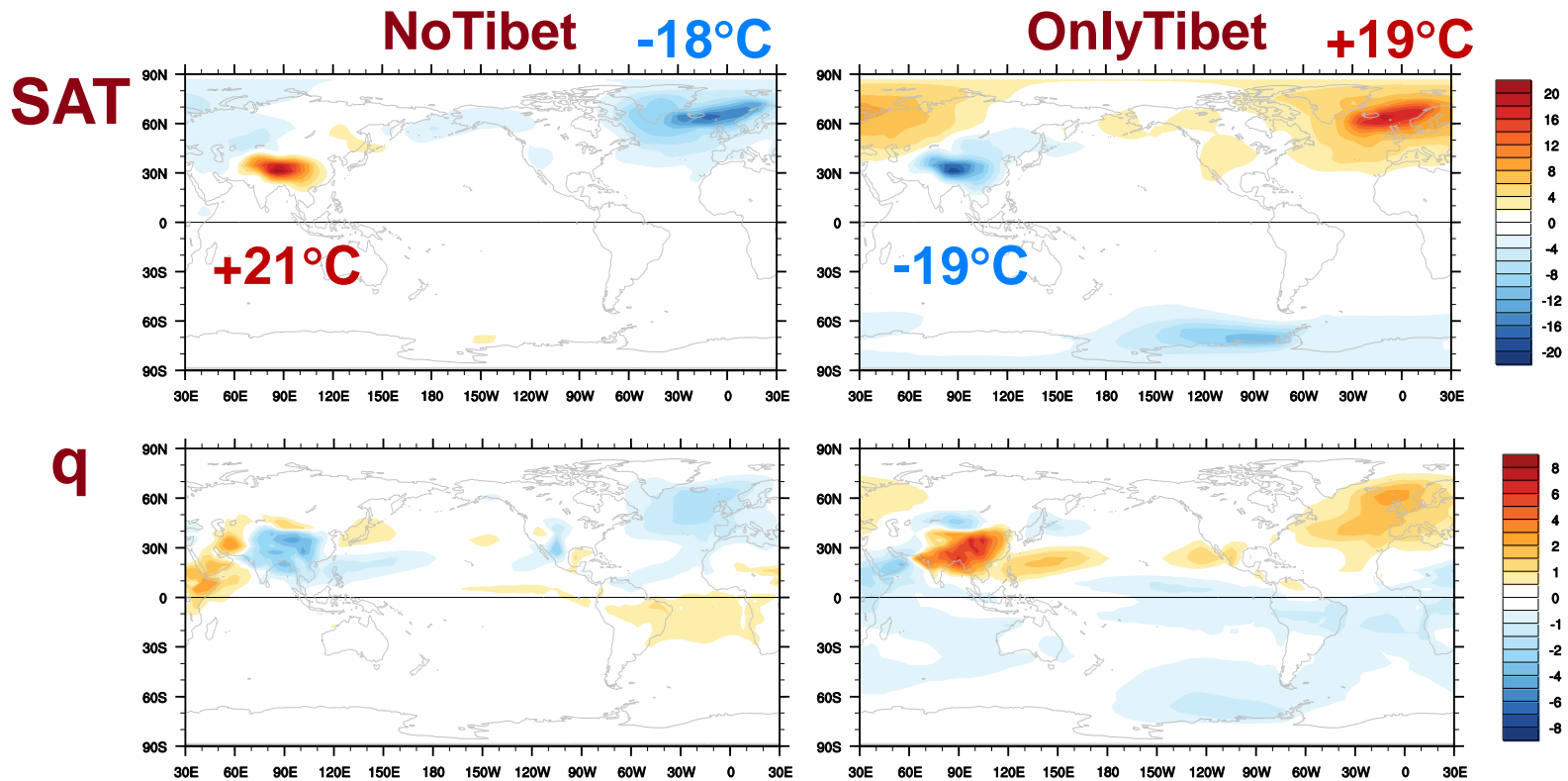
SAT Evolution w/o TP



Atmosphere T and Moisture

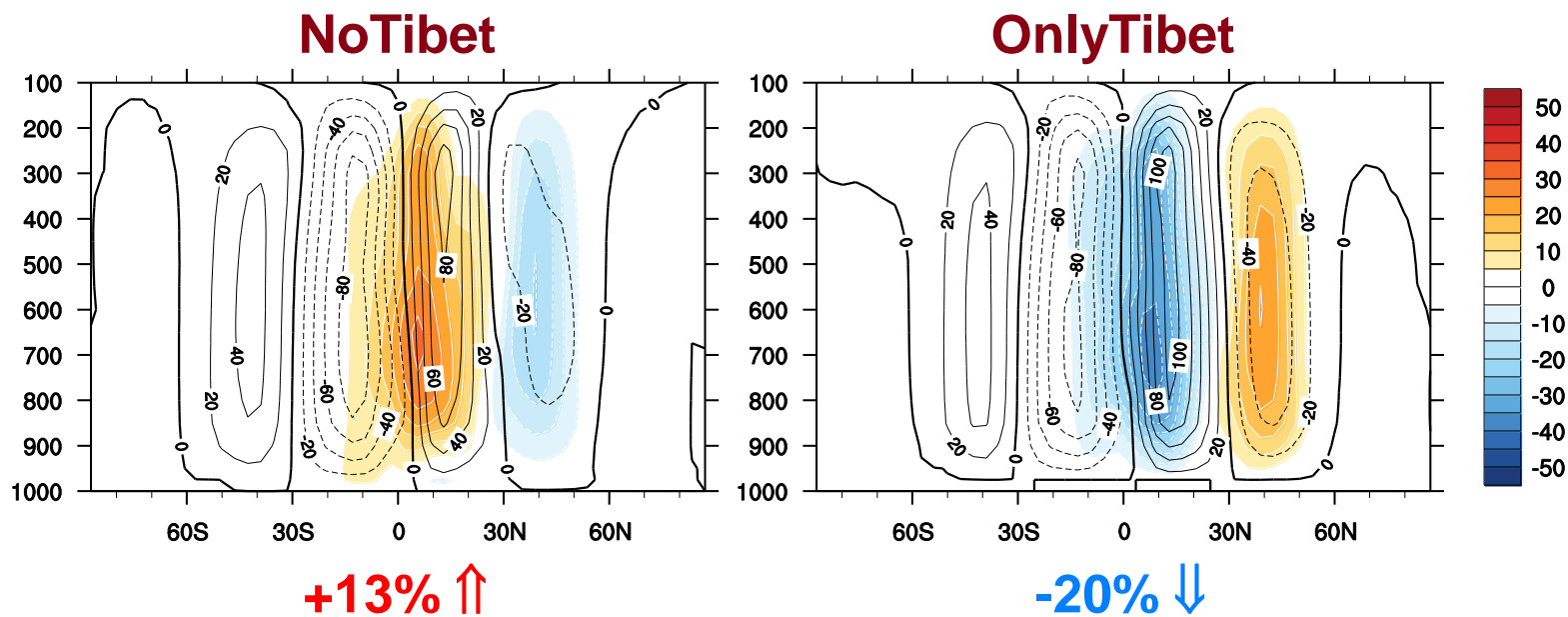


SAT and Specific Humidity

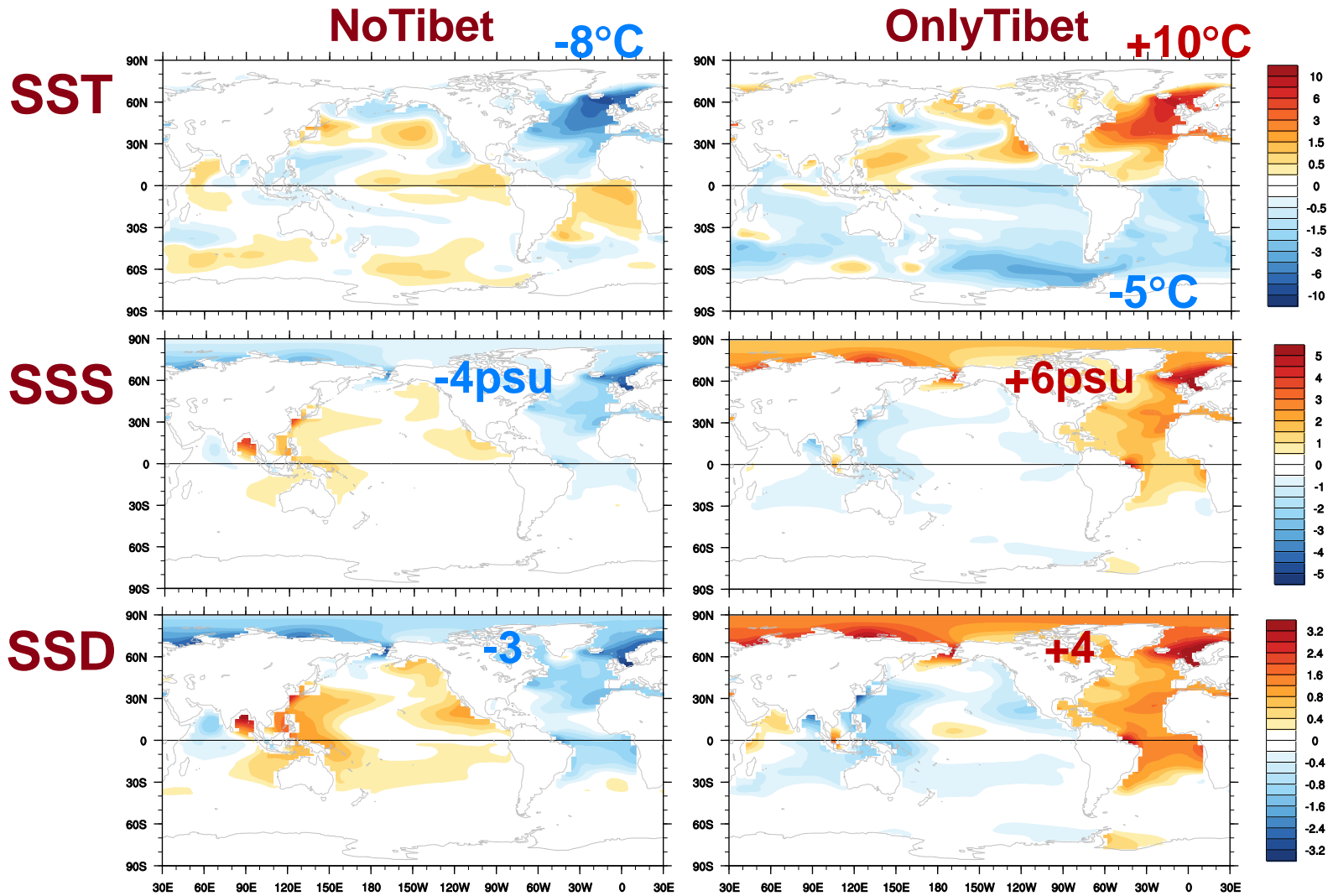


- Local: around Tibetan Plateau
- Remote: Atlantic & Southern Ocean

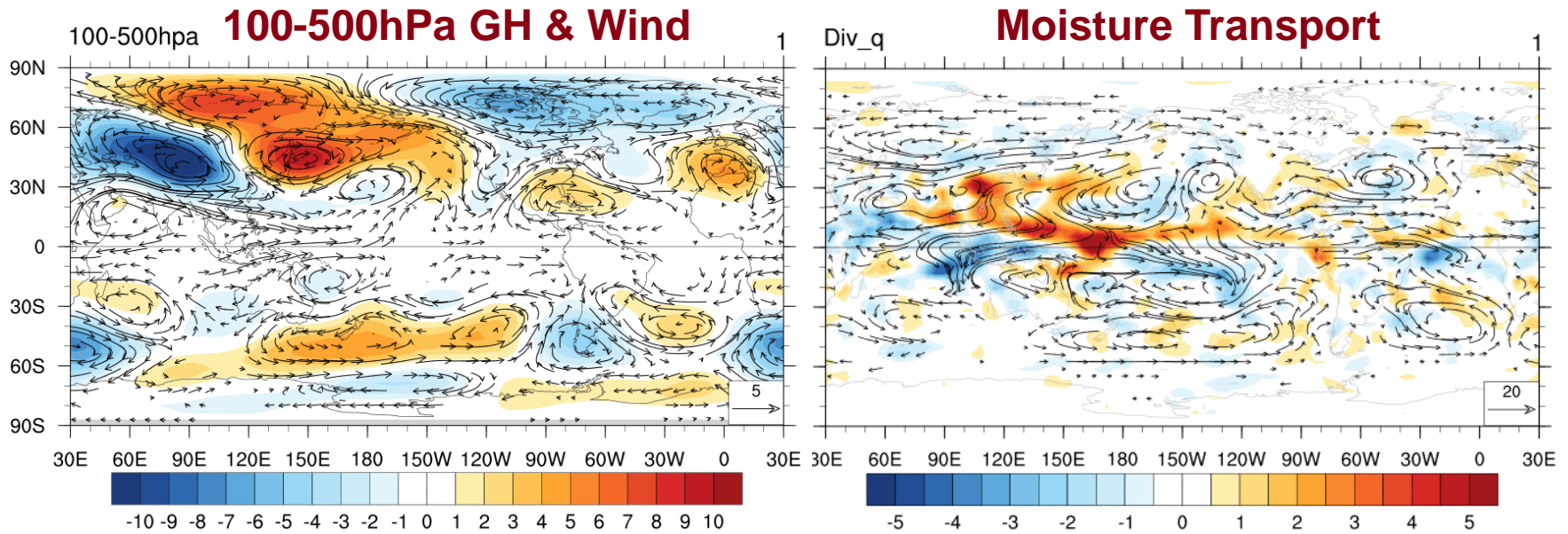
Hadley Cell



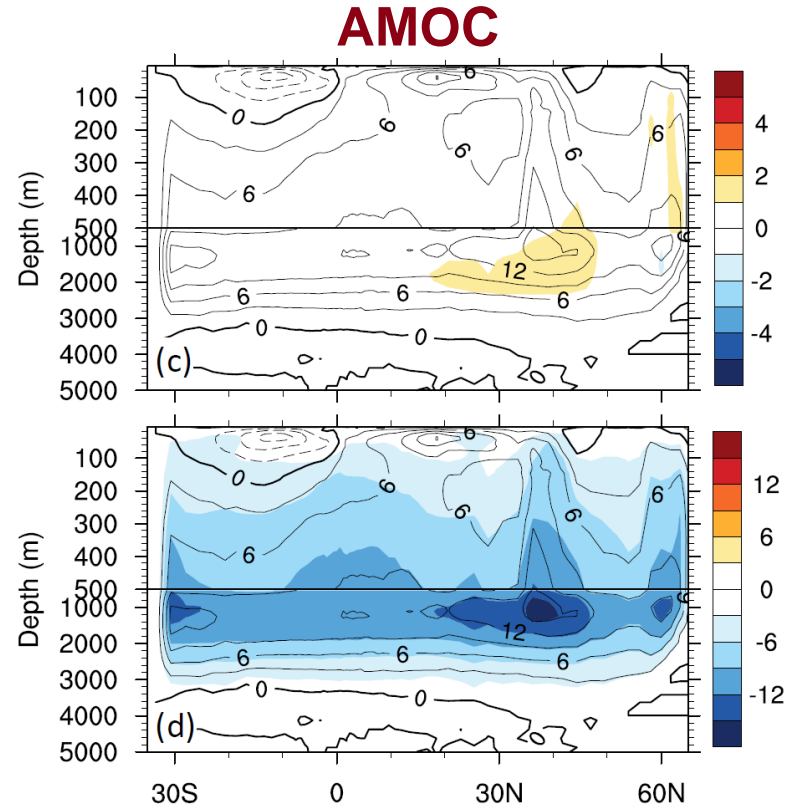
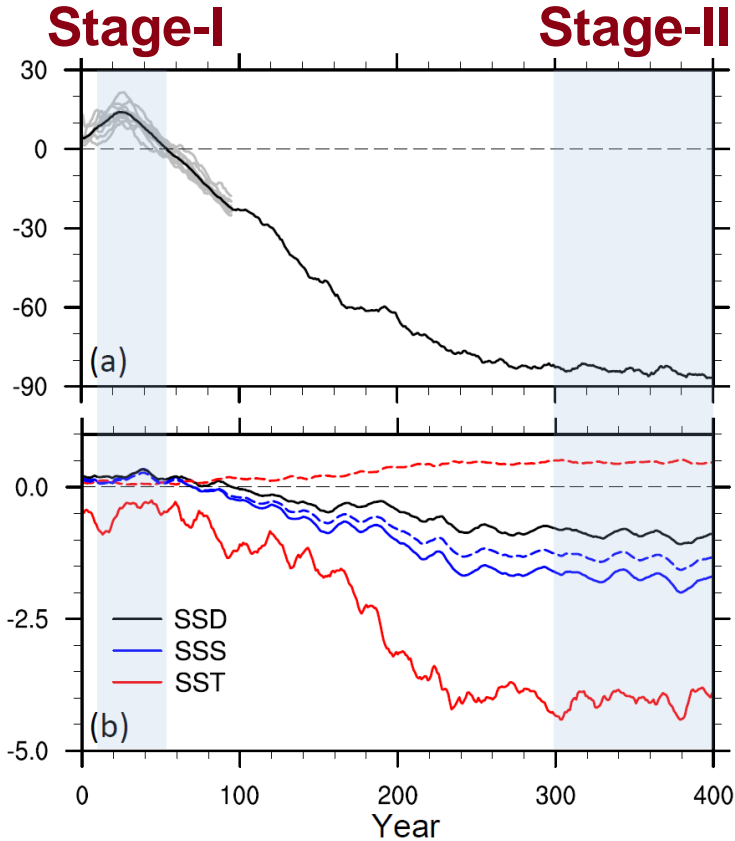
SST, SSS and SSD



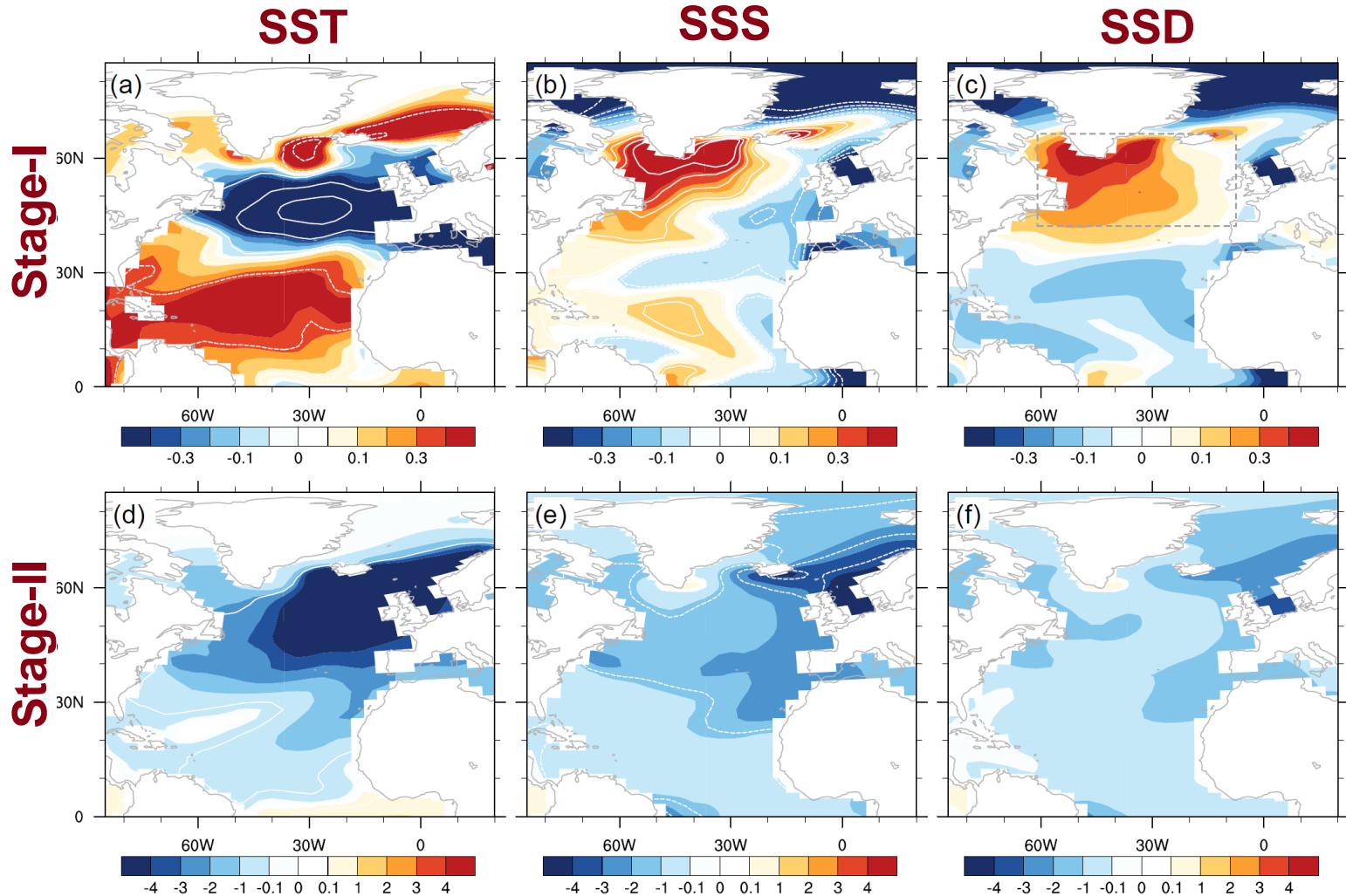
Planetary Wave and Moisture Transport



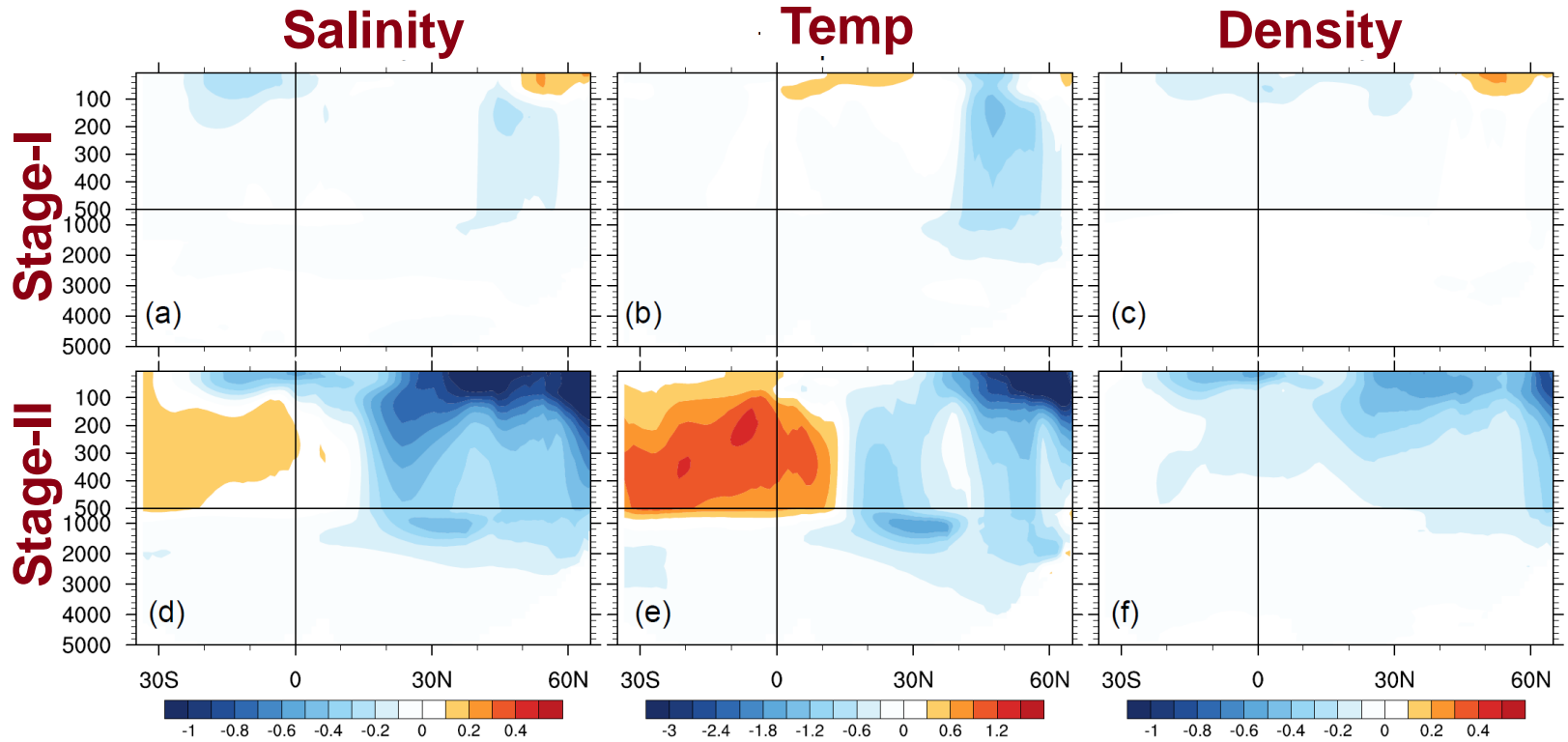
AMOC Evolution w/o TP



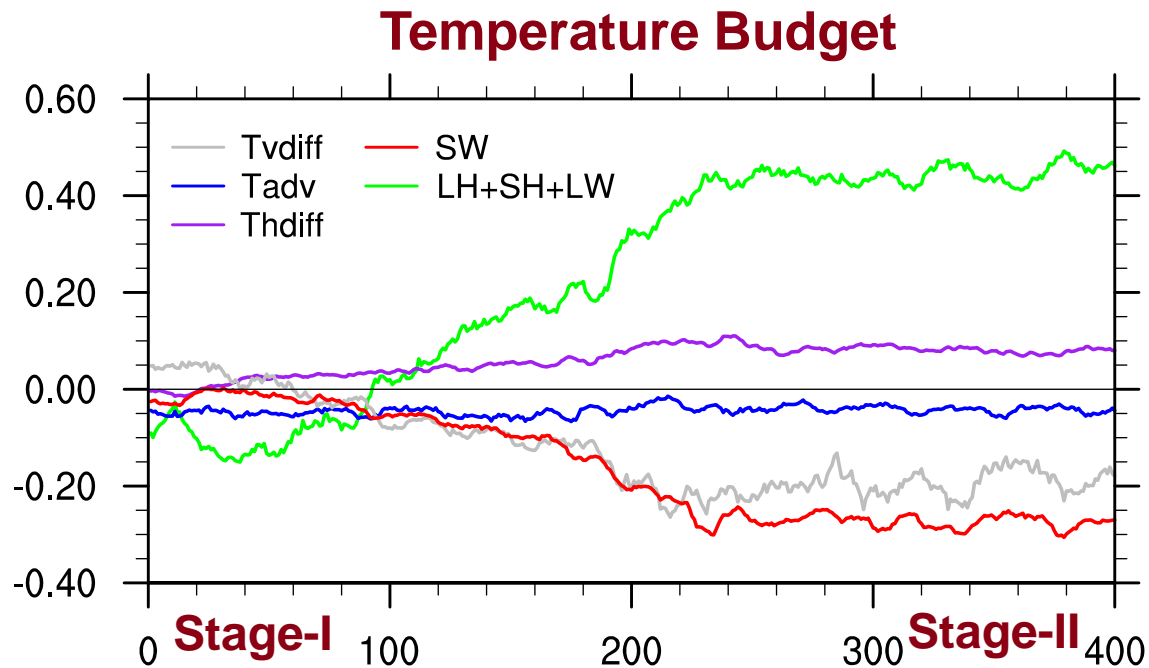
Ocean Change



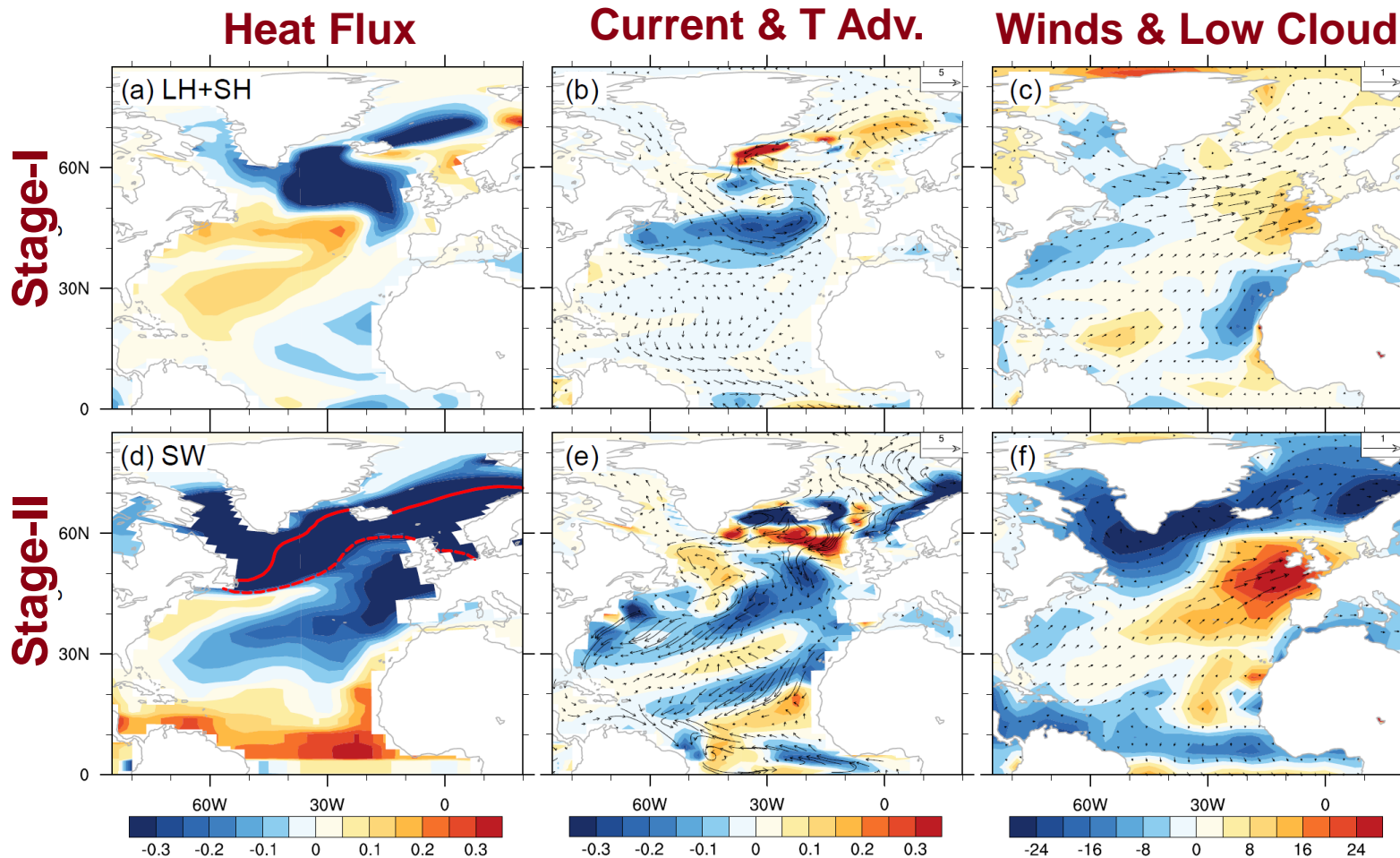
Ocean Change



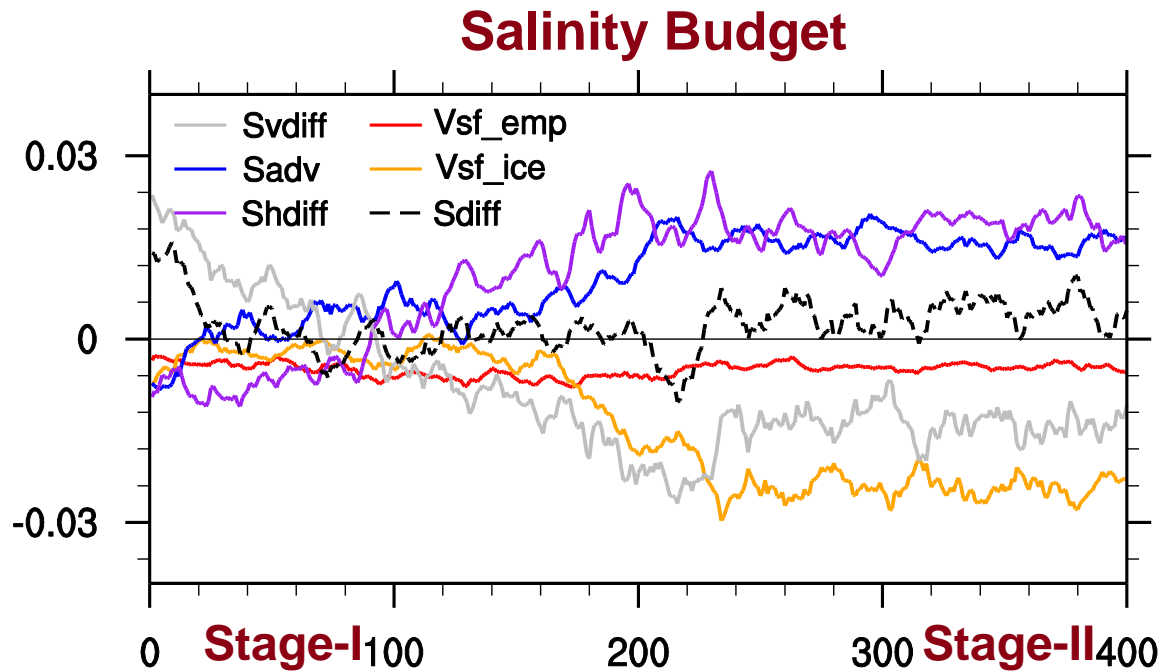
Mechanism for *Temp* Change



Mechanism for *Temp* Change

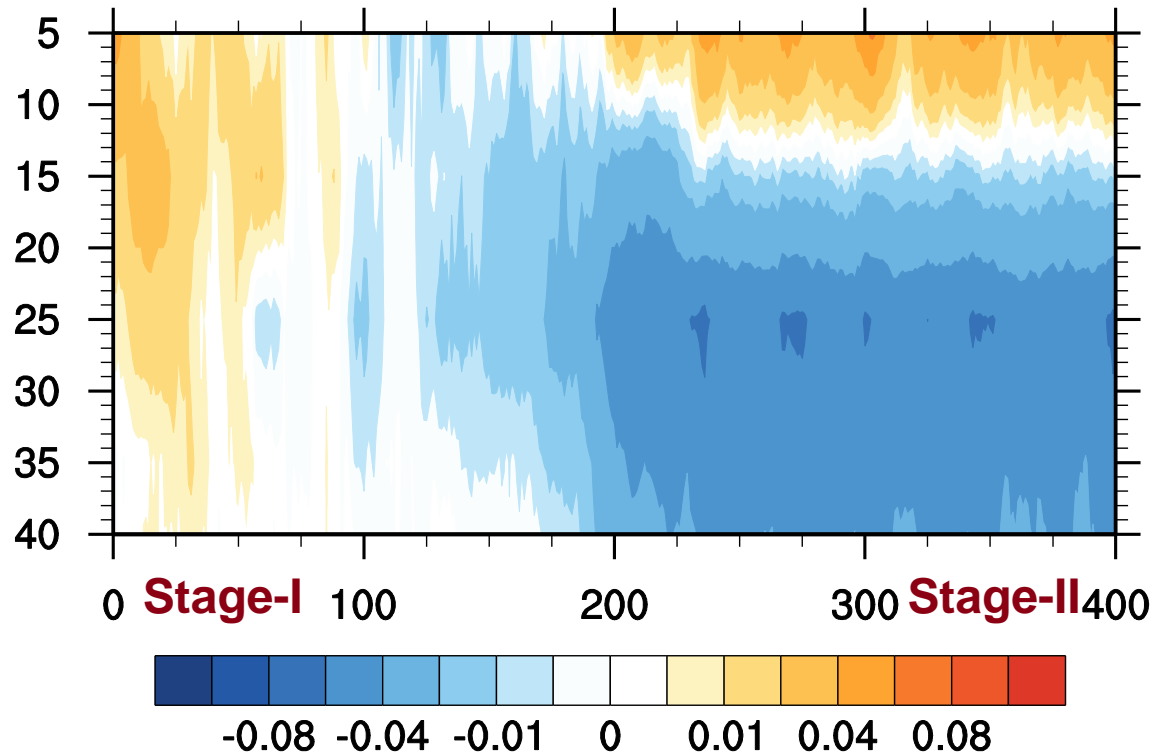


Mechanism for *Salinity* Change

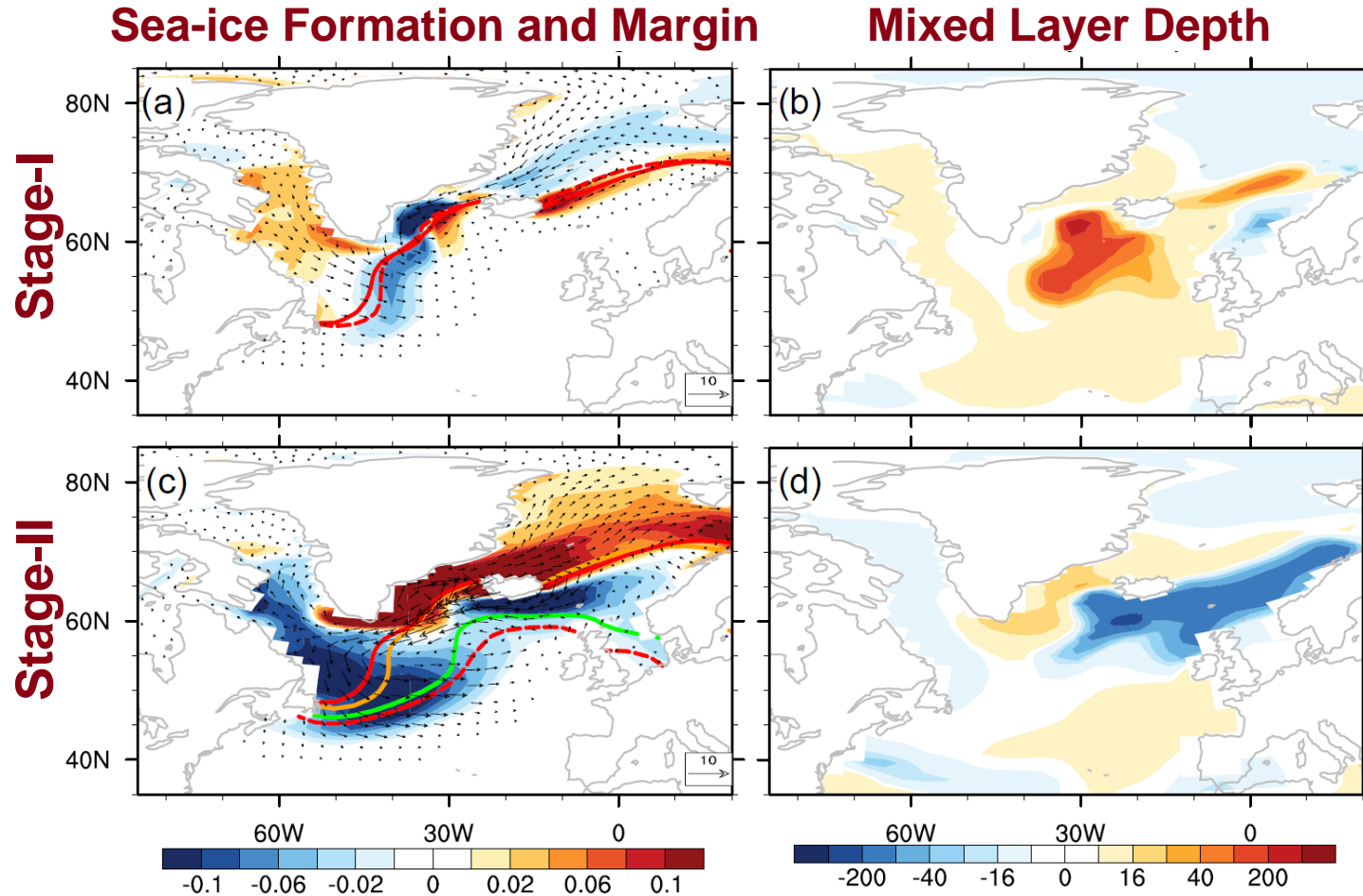


Mechanism for *Salinity* Change

Vertical Salinity Diffusion

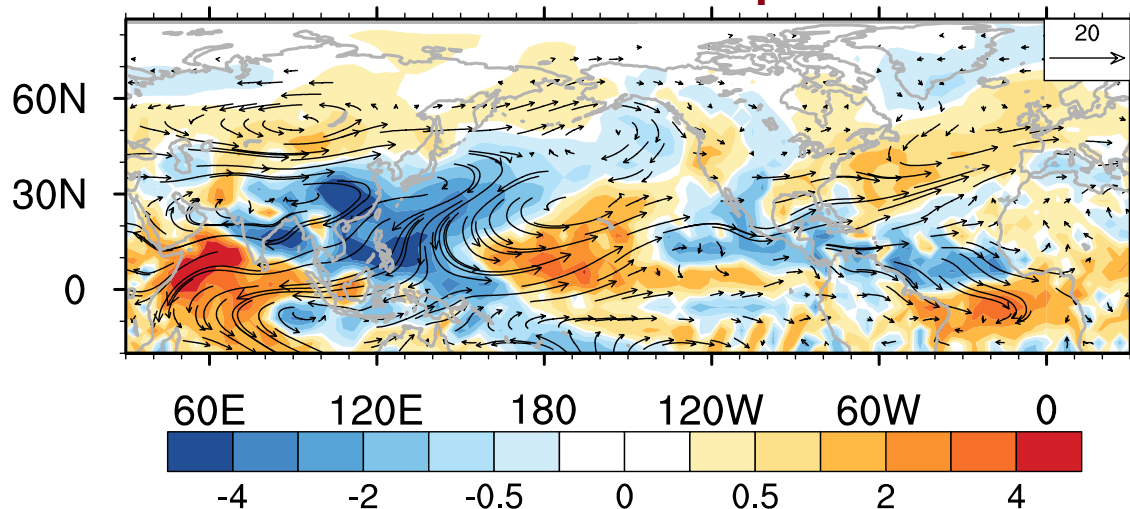


Mechanism for *Salinity* Change

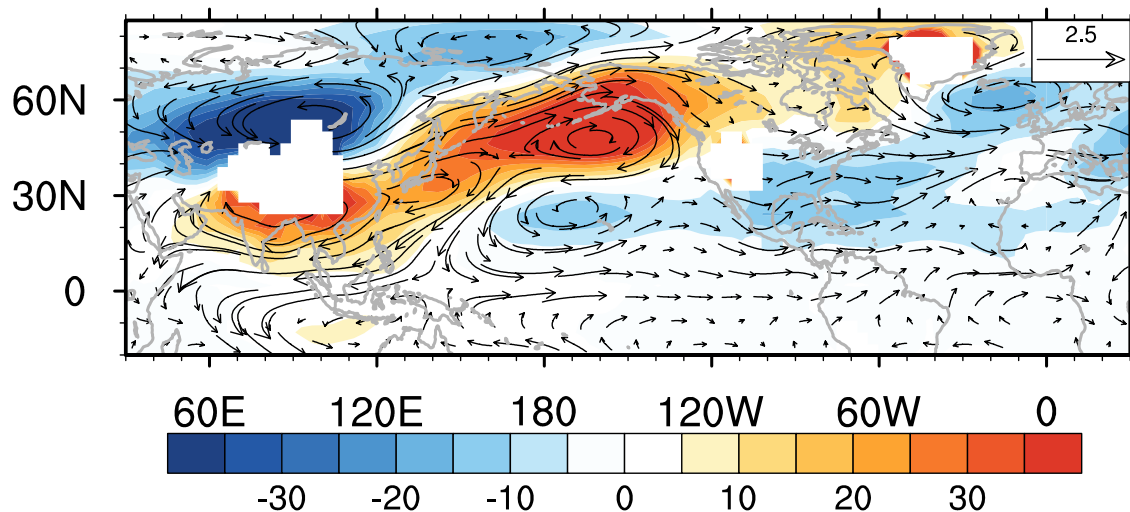


Teleconnection: From *TP* to *Atlantic*

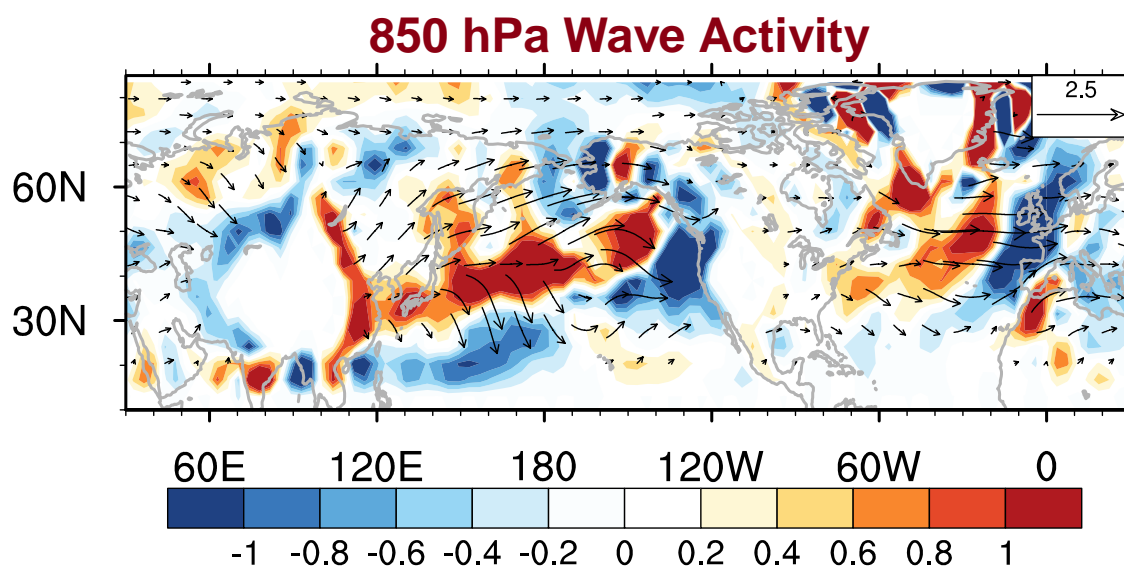
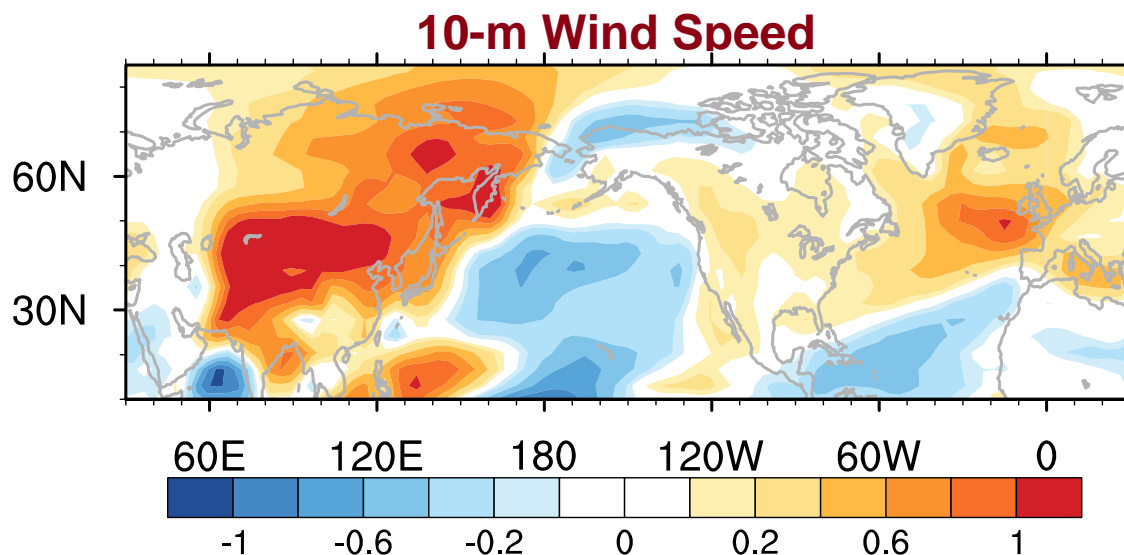
Moisture Transport



850 hPa GH and Wind



Teleconnection: From *TP* to *Atlantic*

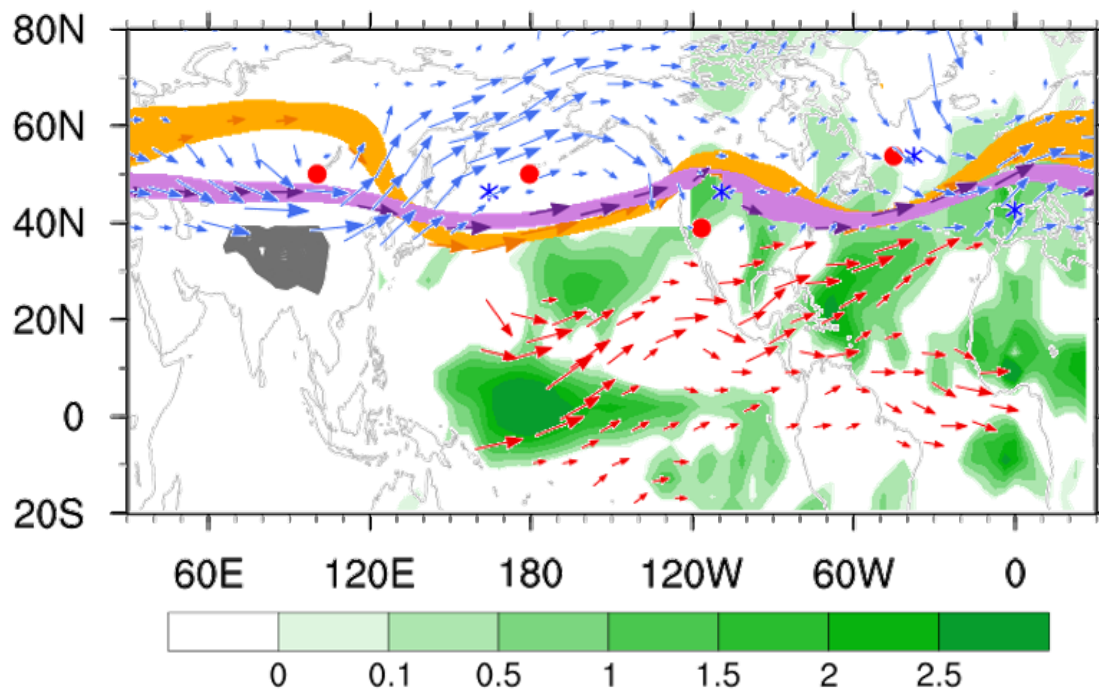


Alan Plumb, JAS, 1985
Takaya & Nakamura,
JAS, 1998



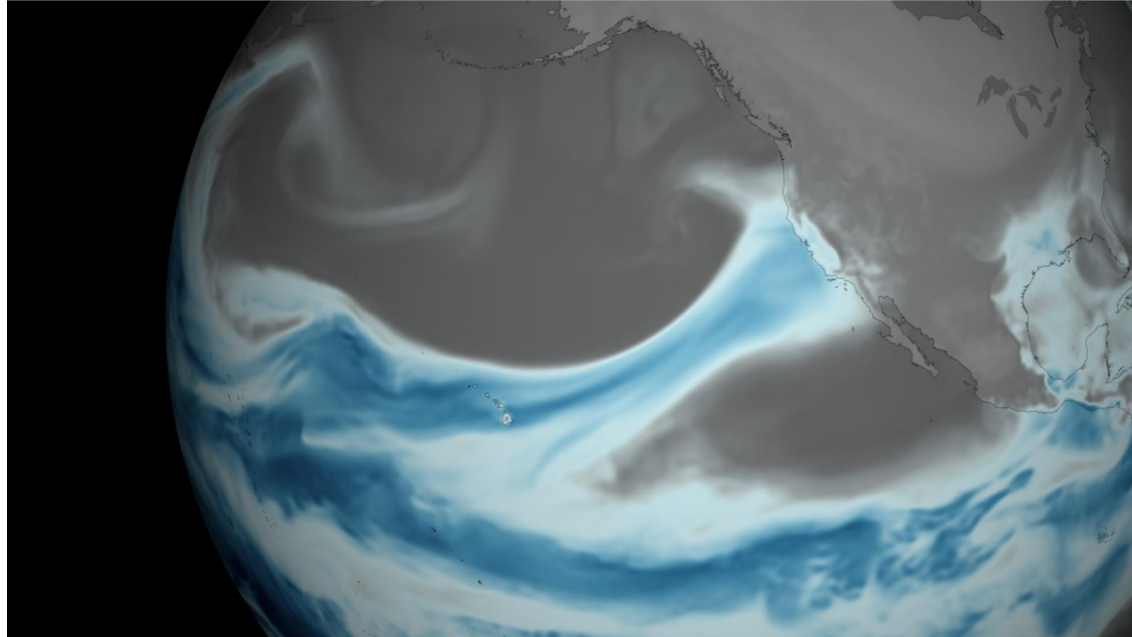
From *TP* to *AMOC*: Atmosphere Dynamics

Stationary Waves with Tibetan Plateau



Atmosphere River

Precipitable water forecast for mid-day, April 6, 2018



Apr 6, 2018, 11am (PDT)
model run on
Apr 5, 2018, 11pm (PDT)

Precipitable Water (mm)



NOAA Climate.gov
Data: NESDIS

Summary

0 → **1** : Critical to **AMOC**, **PMOC**,

Energy and moisture transport

in / between SH and NH

1 → **∞**



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谢谢