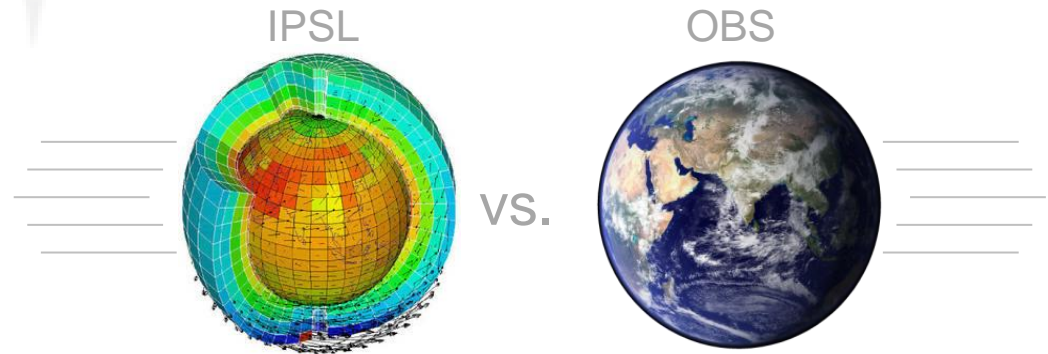
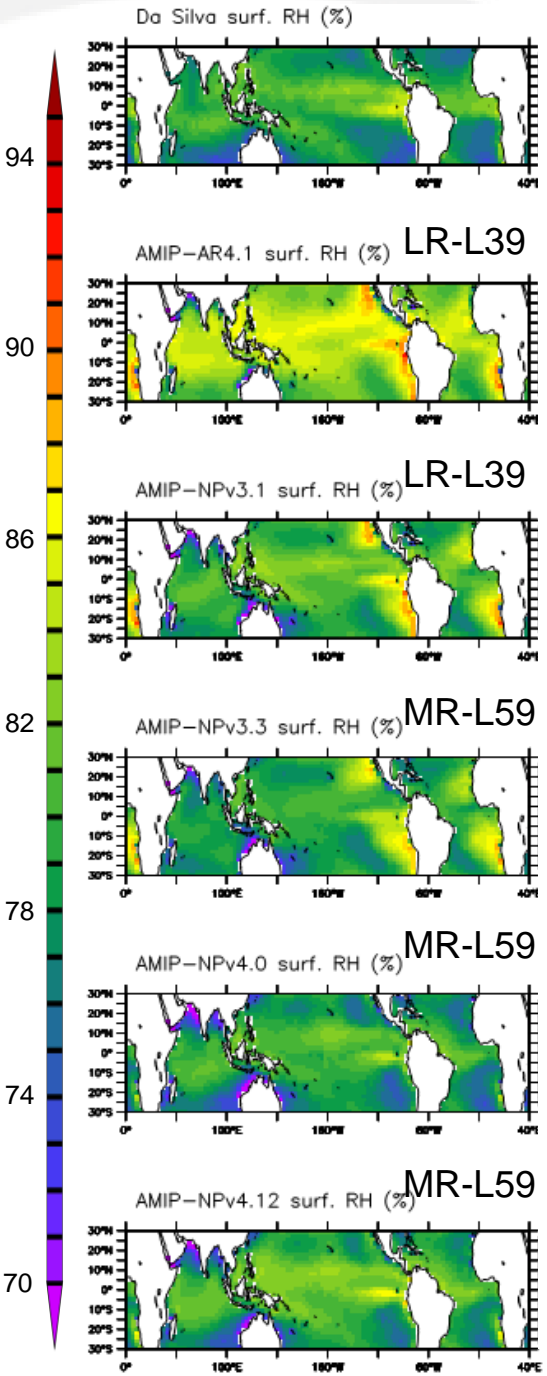


Evaluation of IPSL model intertropical turbulent air-sea fluxes

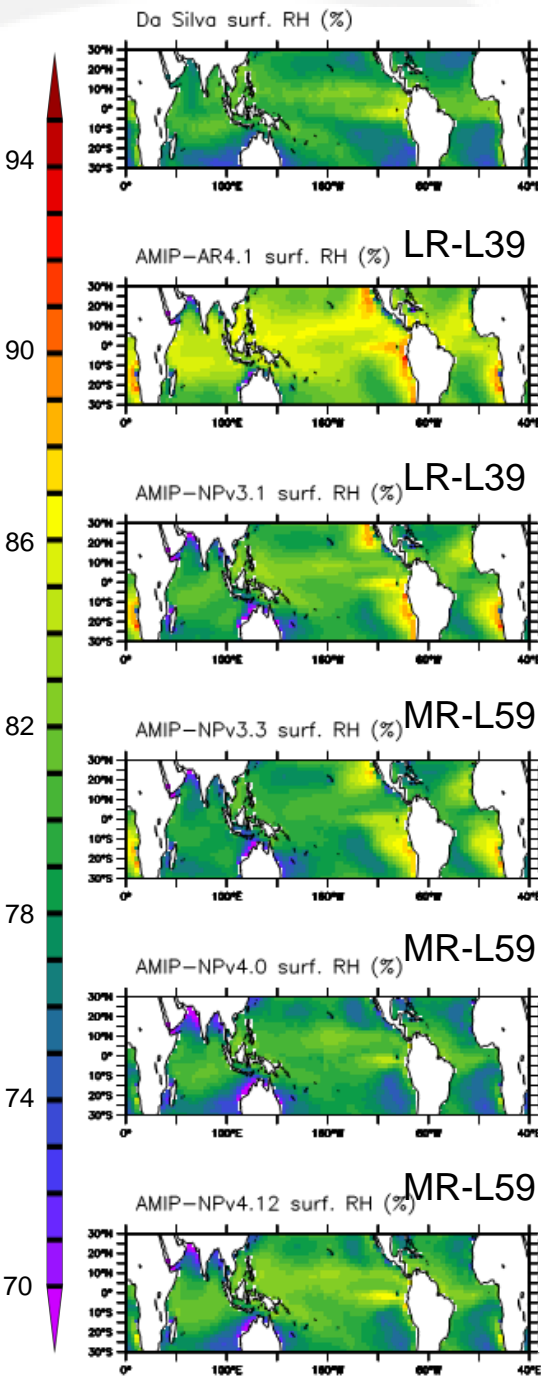




← No thermals

← Thermals active, EXCEPT for stratocumulus regions

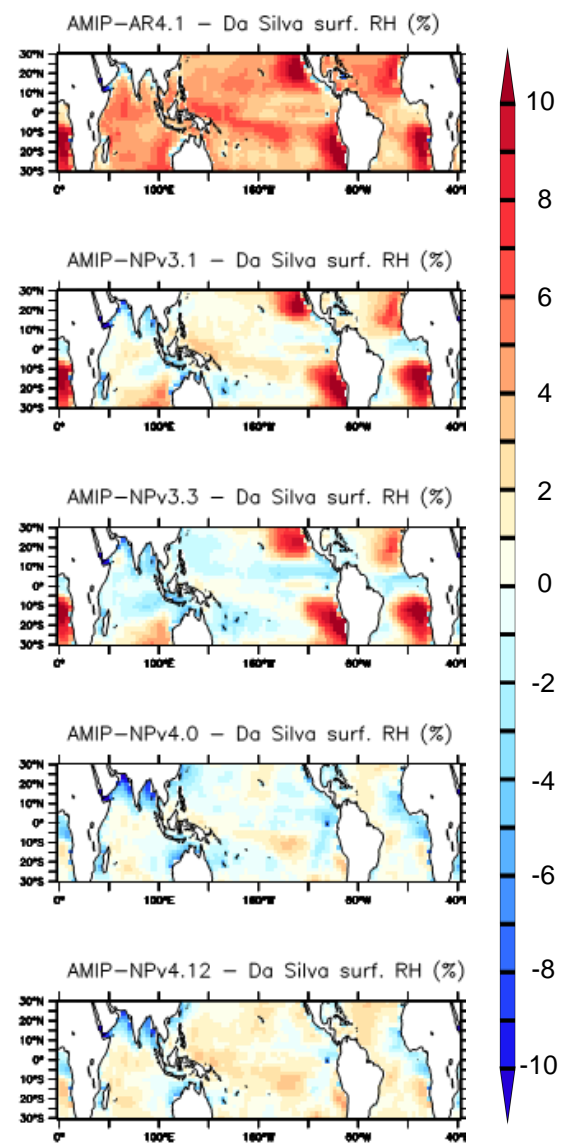
← Thermals active, everywhere



No thermals

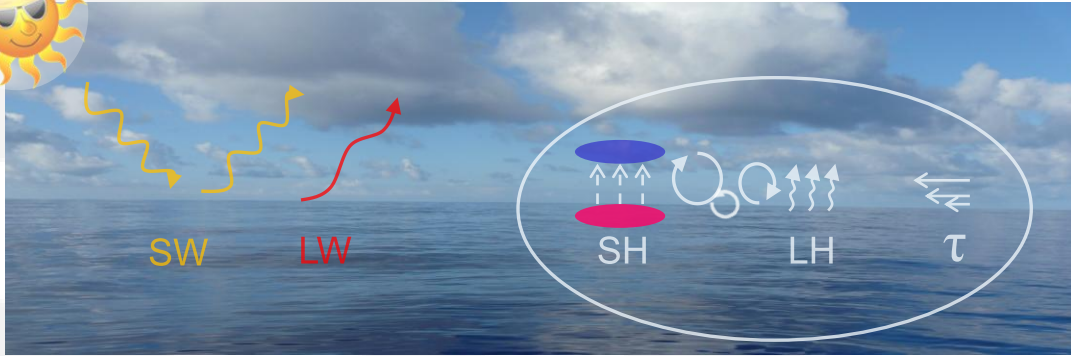
Thermals active, EXCEPT for stratocumulus regions

Thermals active, everywhere





Observational data



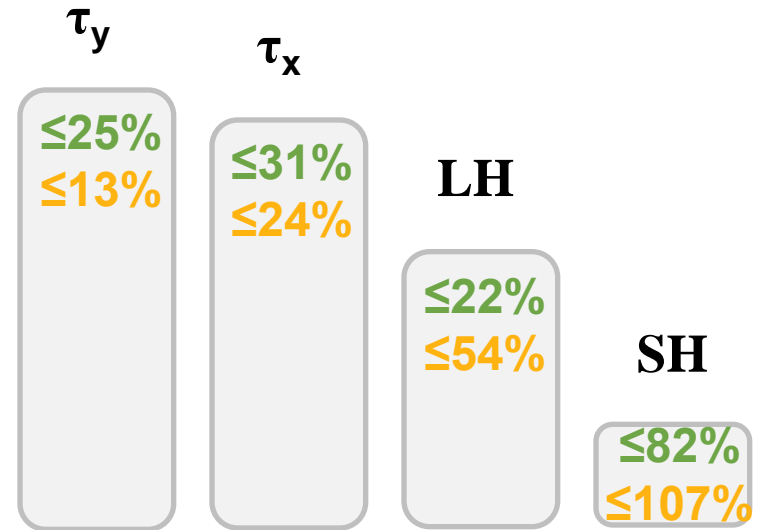
Observational agreement

δ relative to mean magnitudes
 δ relative to mean seasonal cycle amplitude

Large observational uncertainties for turbulent air-sea fluxes



Need to account for OBS uncertainty



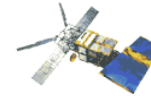
Our approach

In situ



NOC2
FSU3
Da Silva

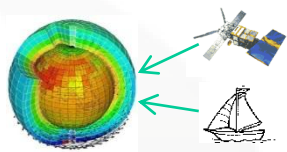
Satellite



IFREMER
J-OFURO
HOAPS3
GSSTF2



Reanalysis



ERA-Interim
NCEP/NCAR
JRA25

Blended



OAFlux
TropFlux
CORE2
DFS4

Compare model results with observational **ensemble**

→ Identify robust model biases

Assess fluxes and flux-related surface state variables:

LH, SH, τ_x , τ_y ,

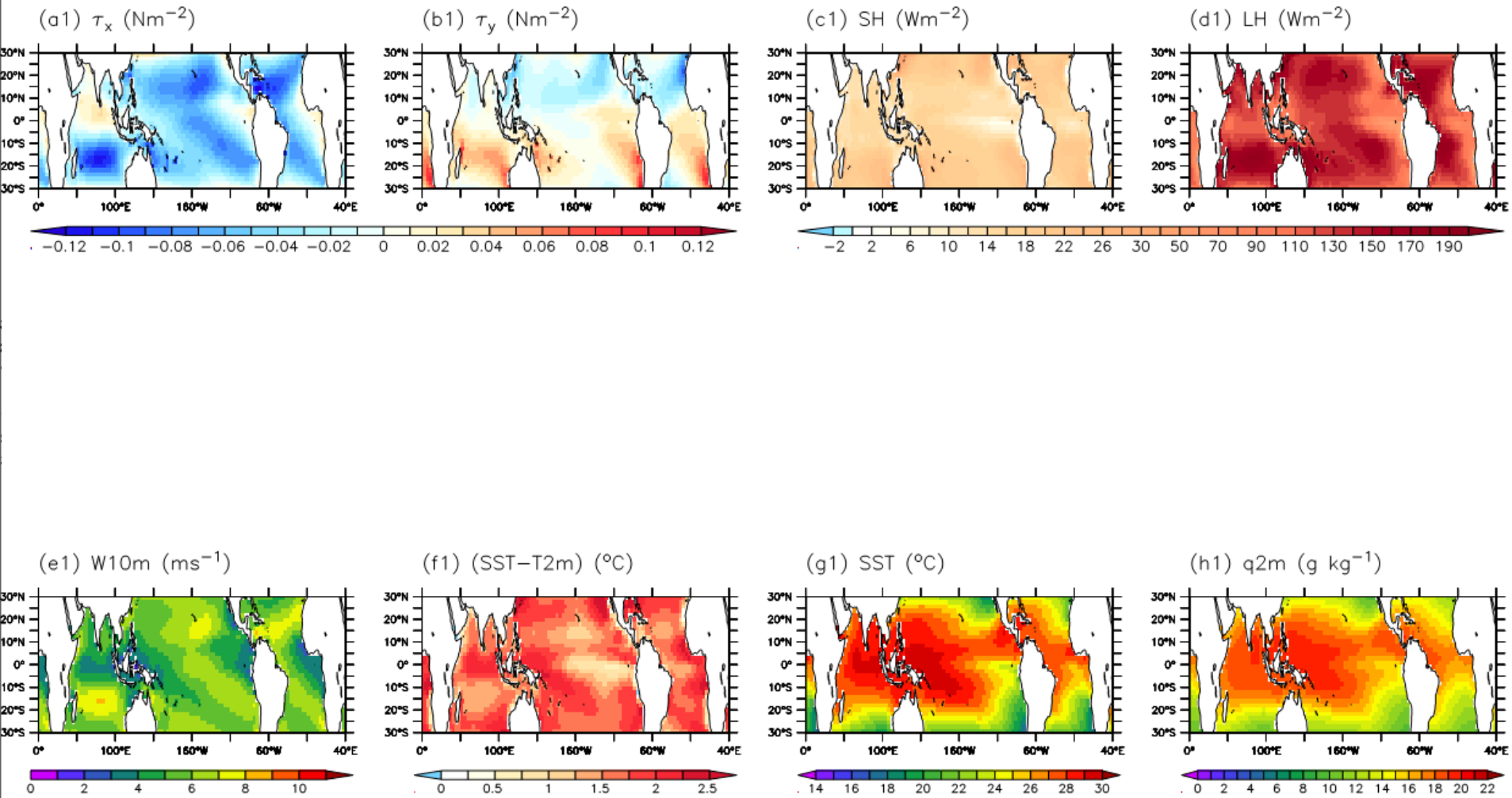
U10m, SST, ΔT_{2m} , q2m

Analyze:

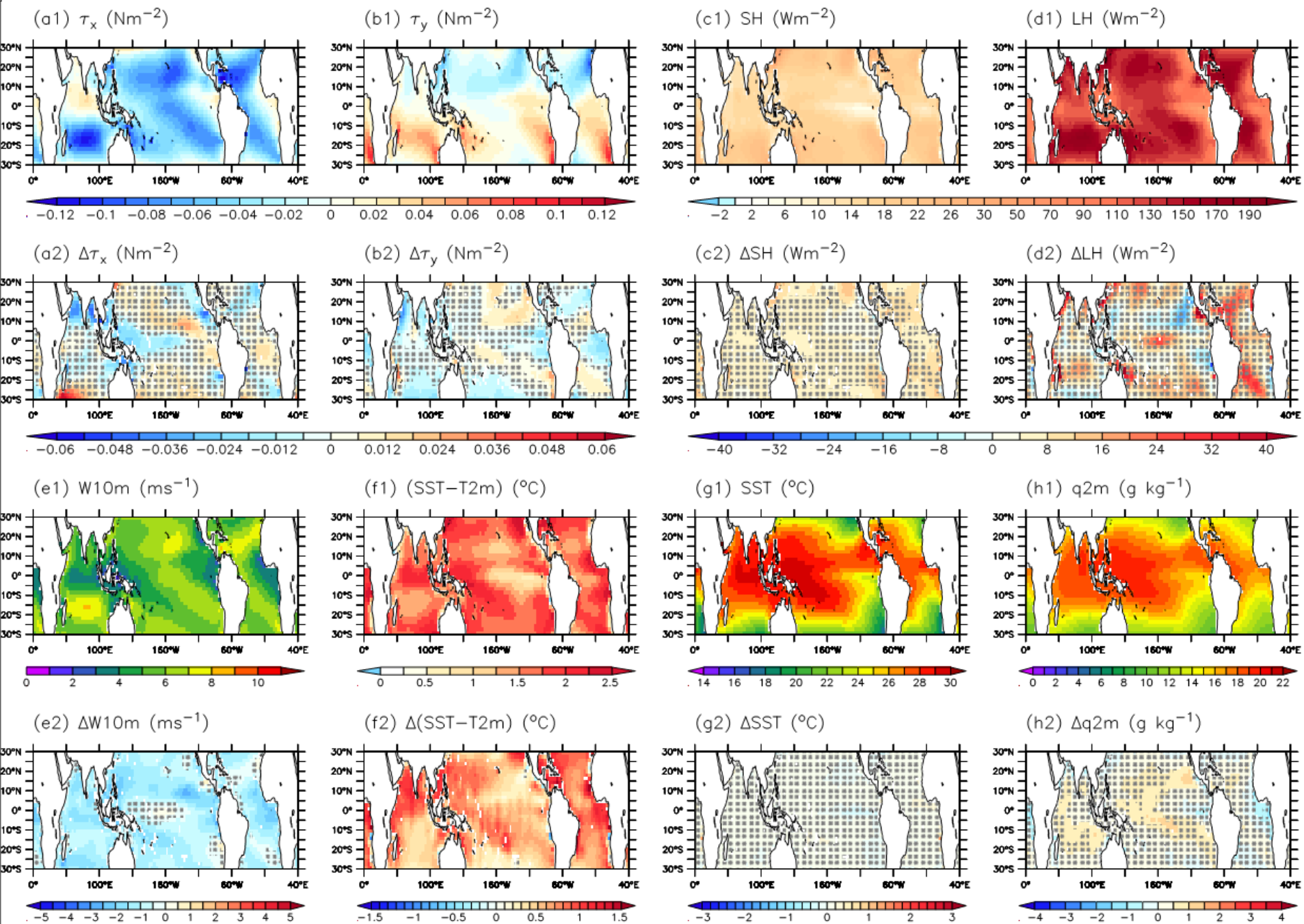
annual means
(ANM)

seasonal variations
around ANM

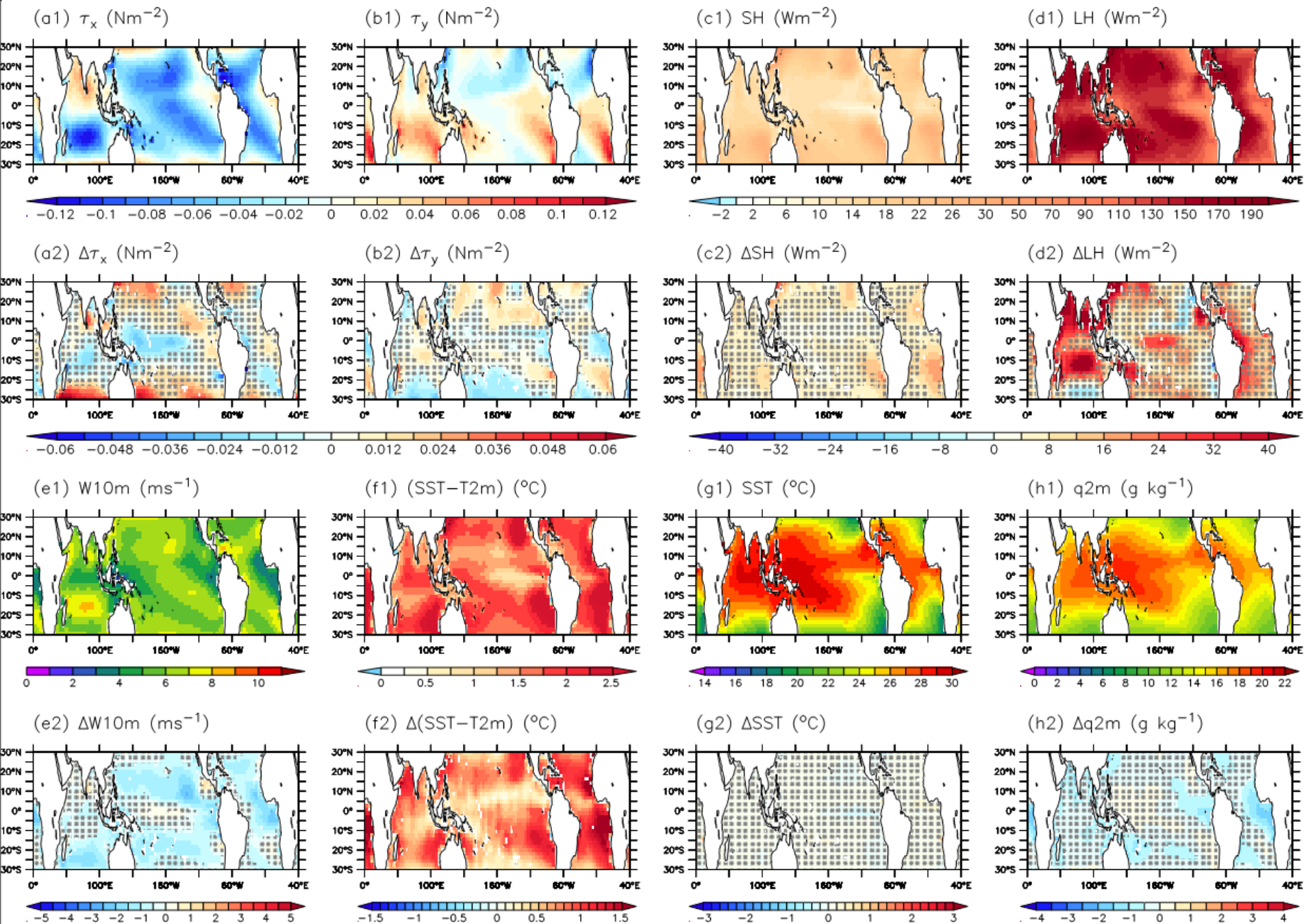
AMIP – AR4.1 (SP, LR - L39)



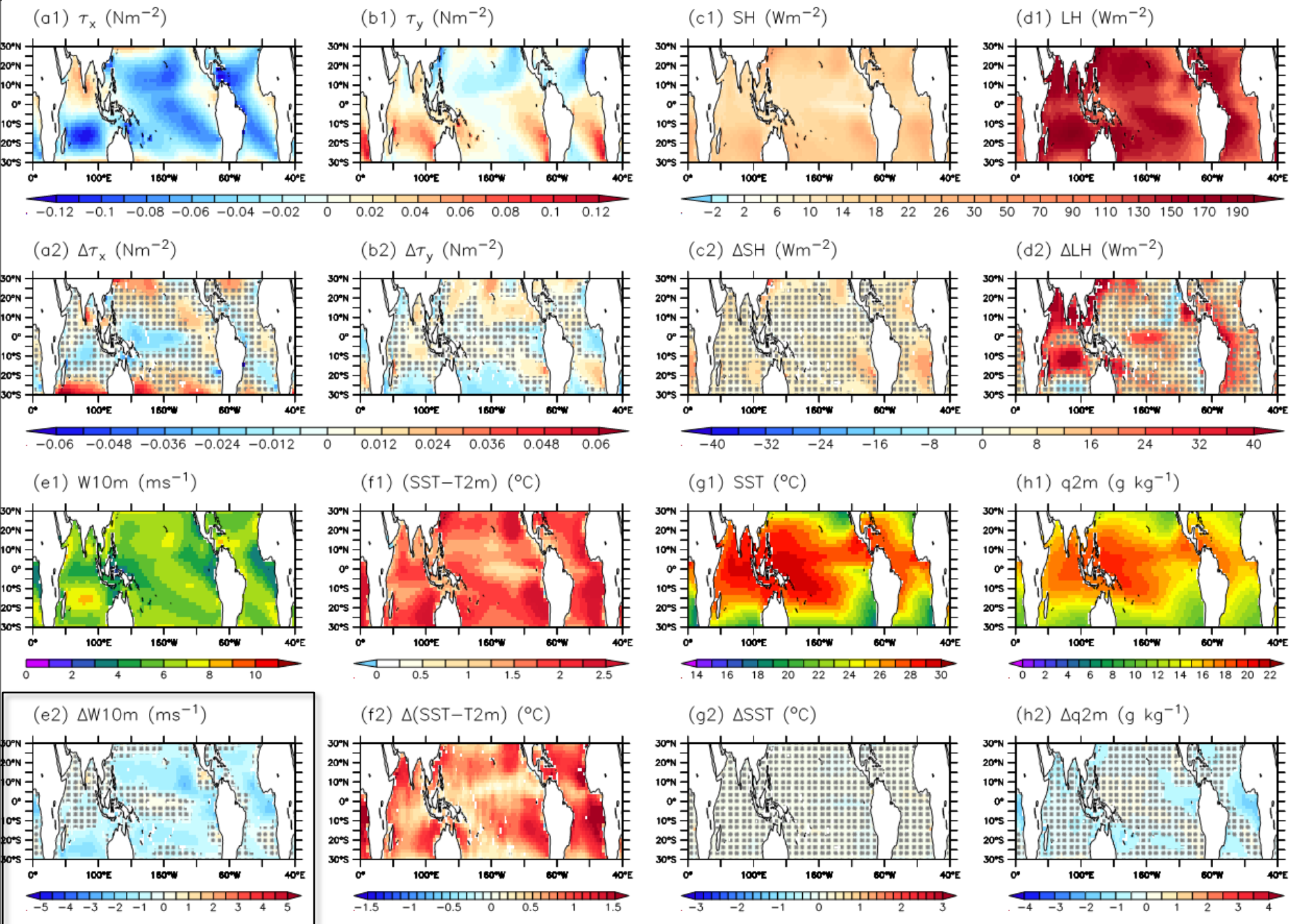
AMIP – AR4.1 (SP, LR - L39)



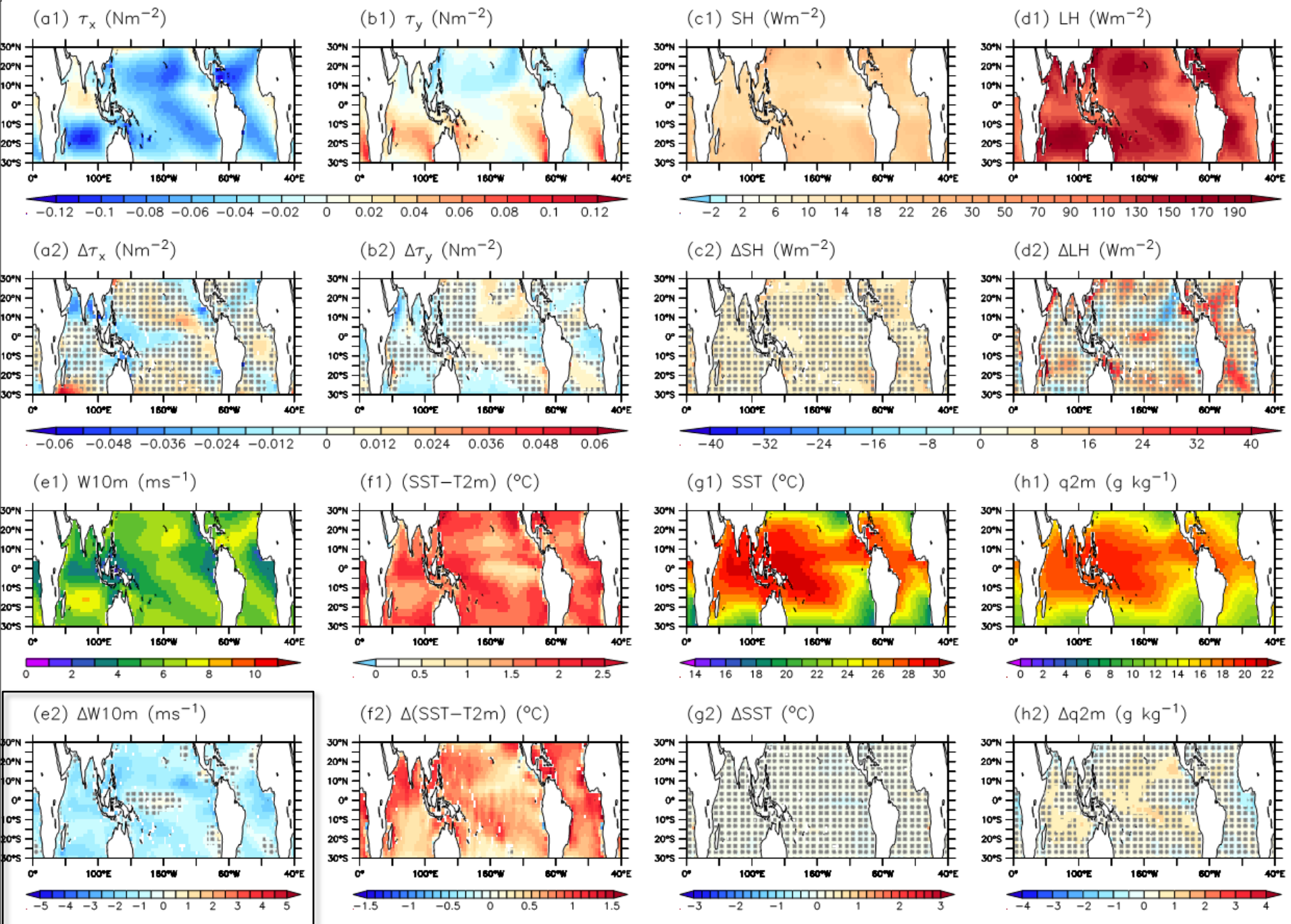
AMIP – NPv3.1 (NP, LR - L39)



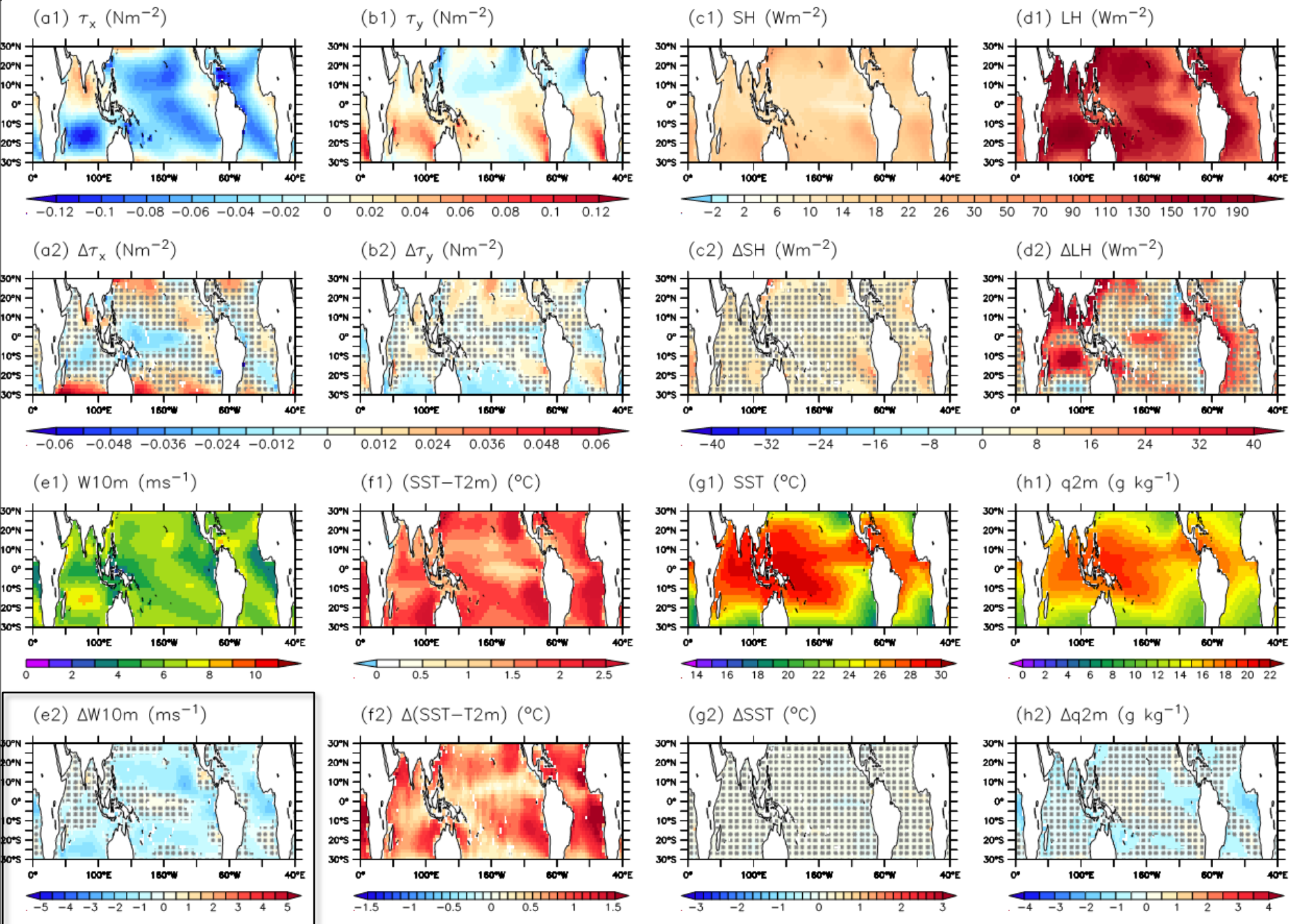
AMIP – NPv3.1 (NP, LR - L39)



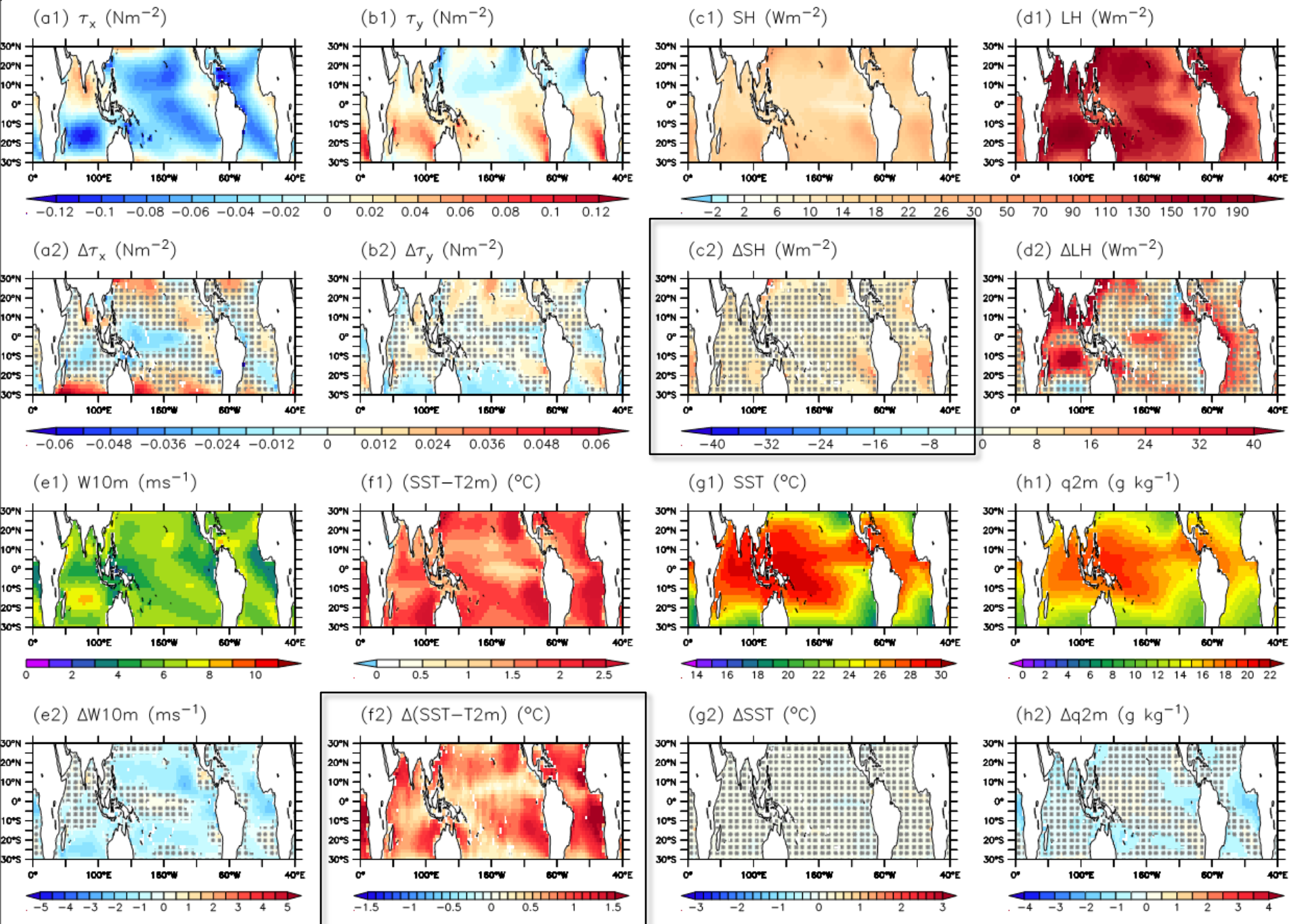
AMIP – AR4.1 (SP, LR - L39)



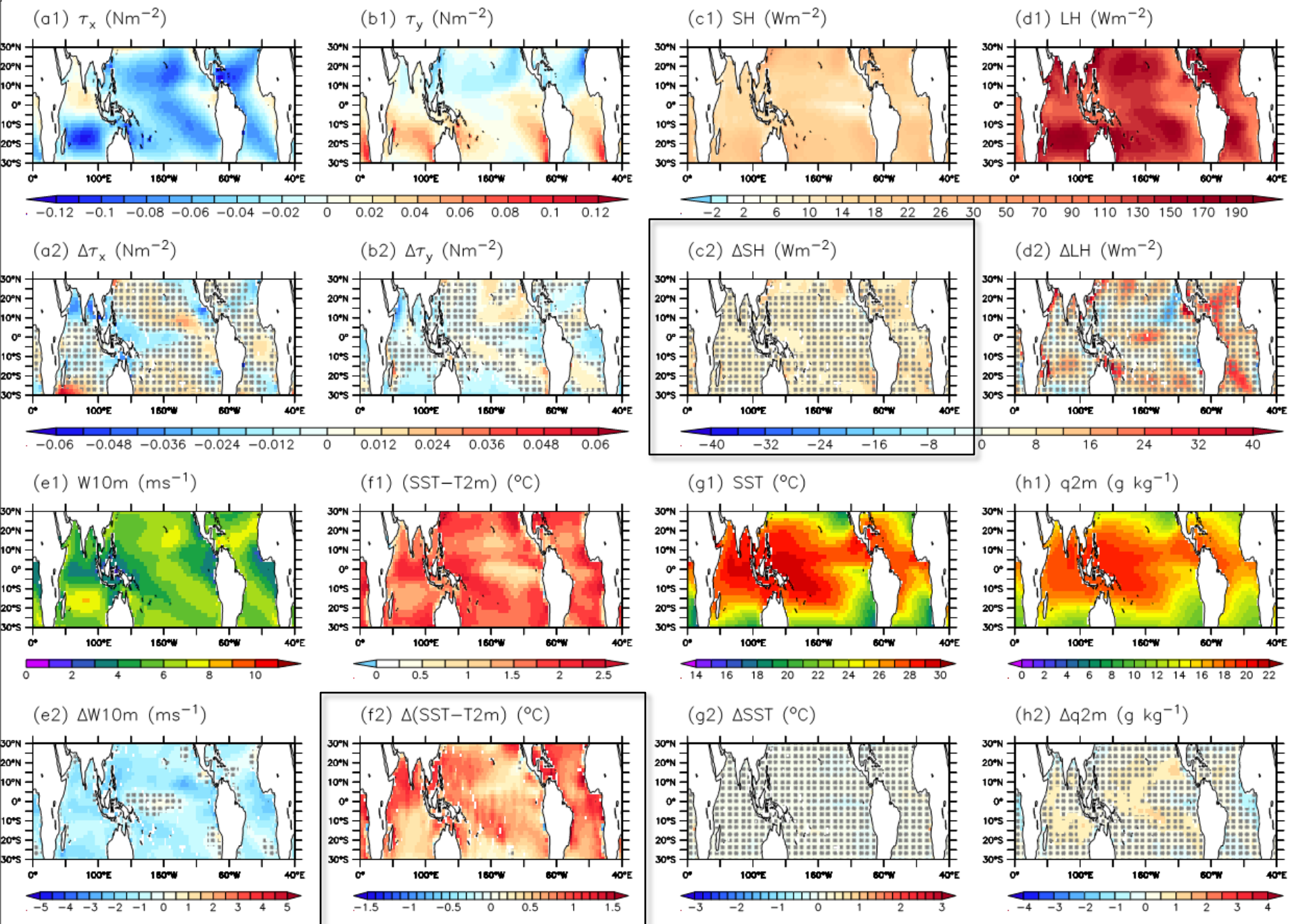
AMIP – NPv3.1 (NP, LR - L39)



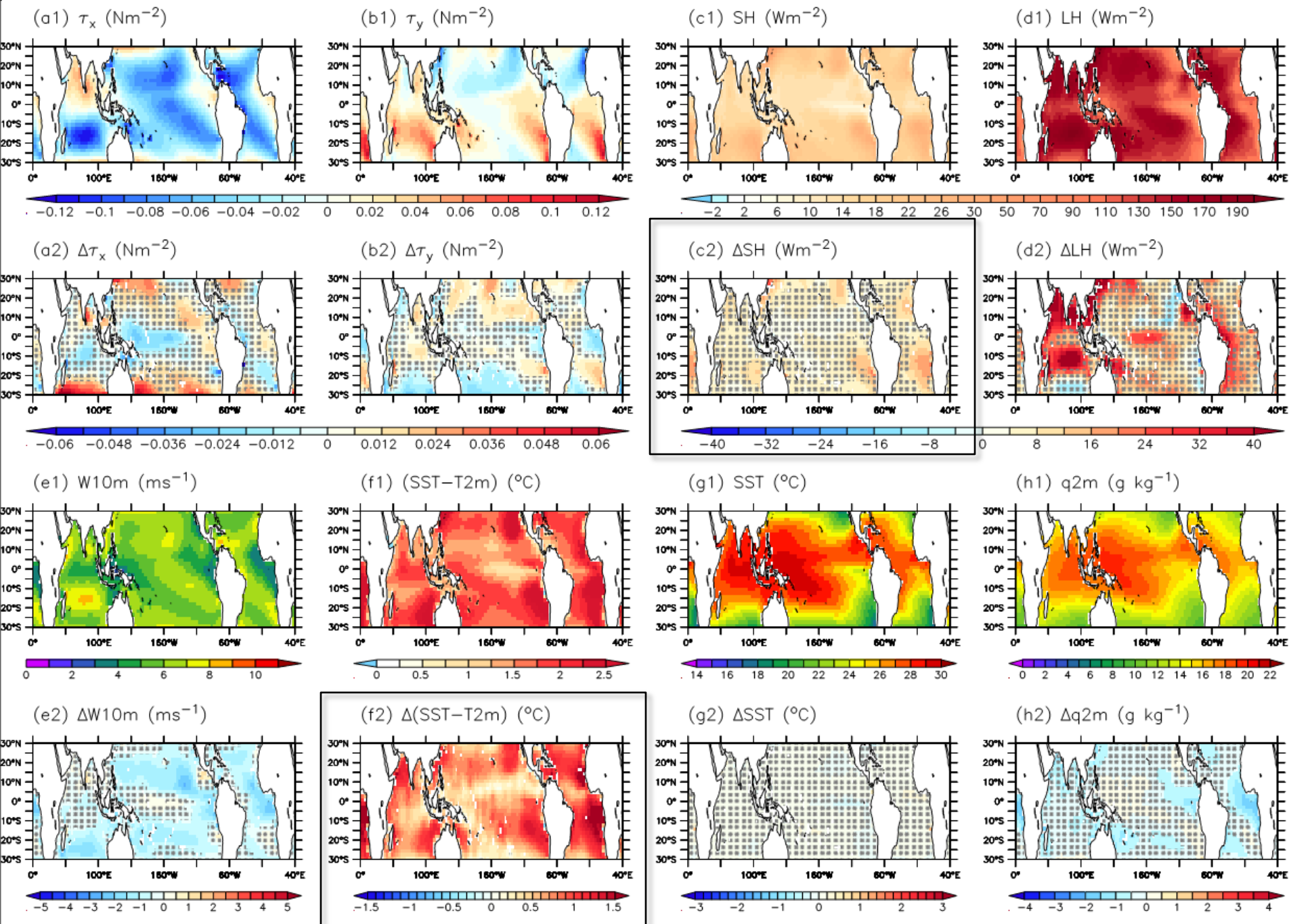
AMIP – NPv3.1 (NP, LR - L39)



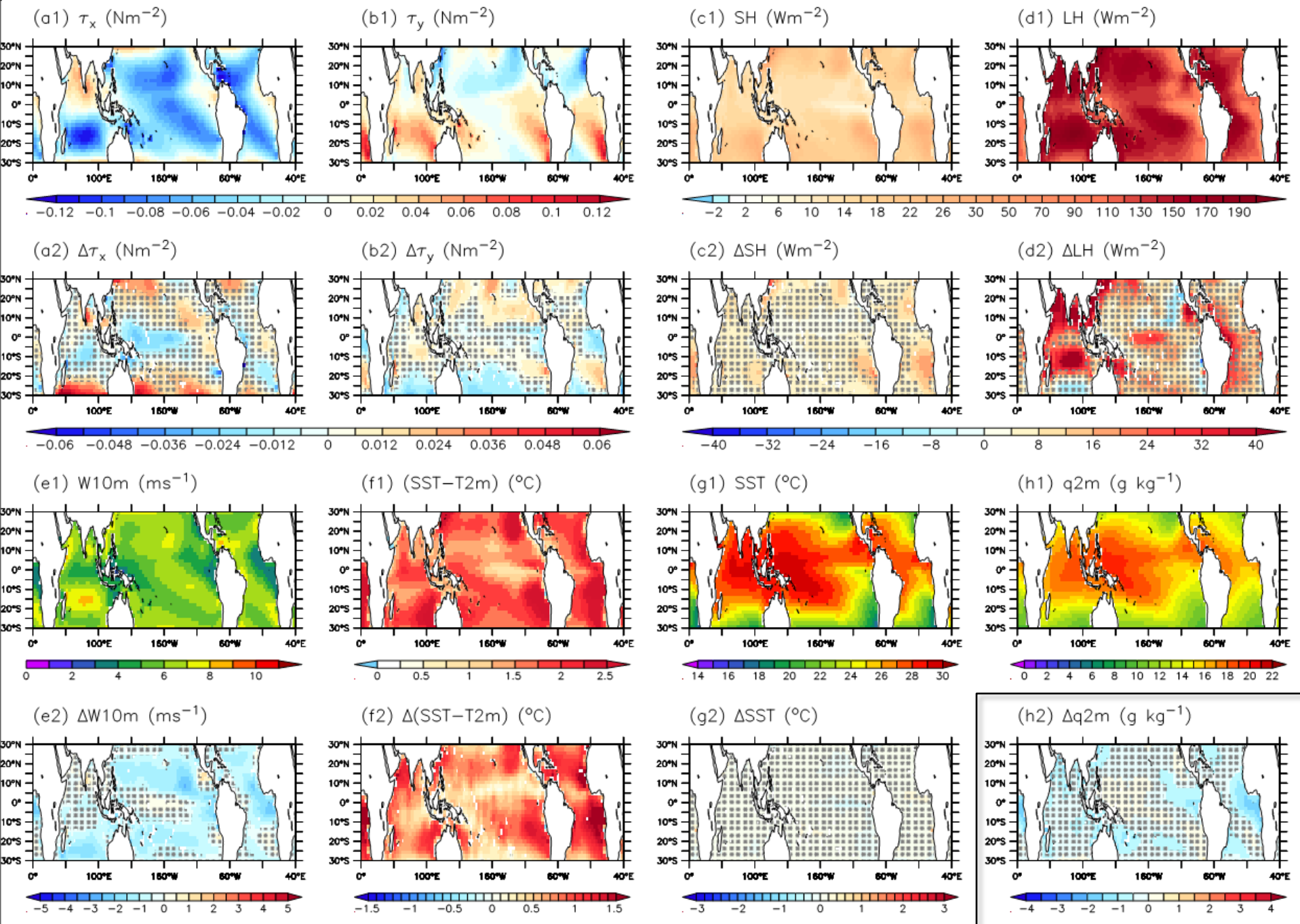
AMIP – AR4.1 (SP, LR - L39)



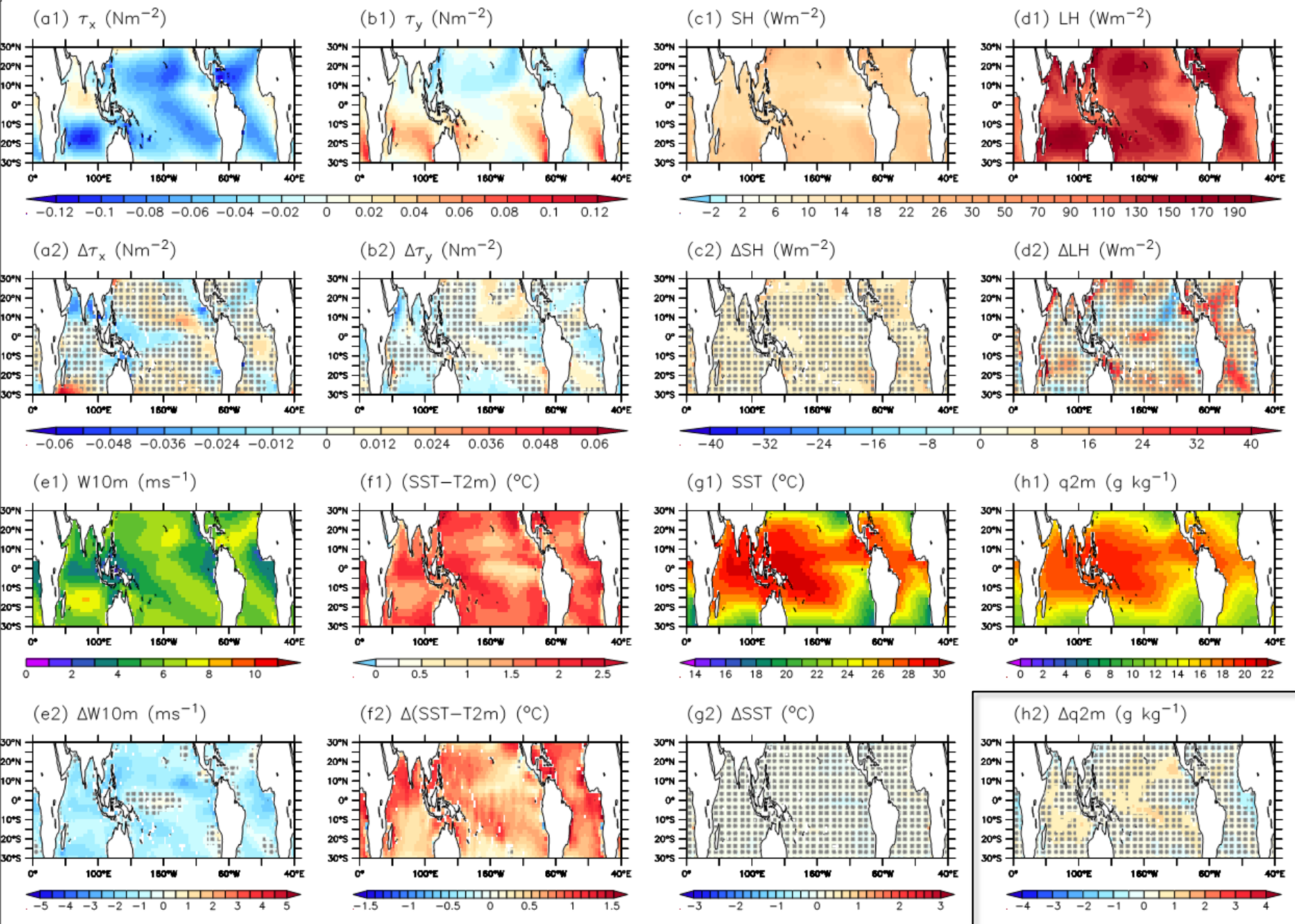
AMIP – NPv3.1 (NP, LR - L39)



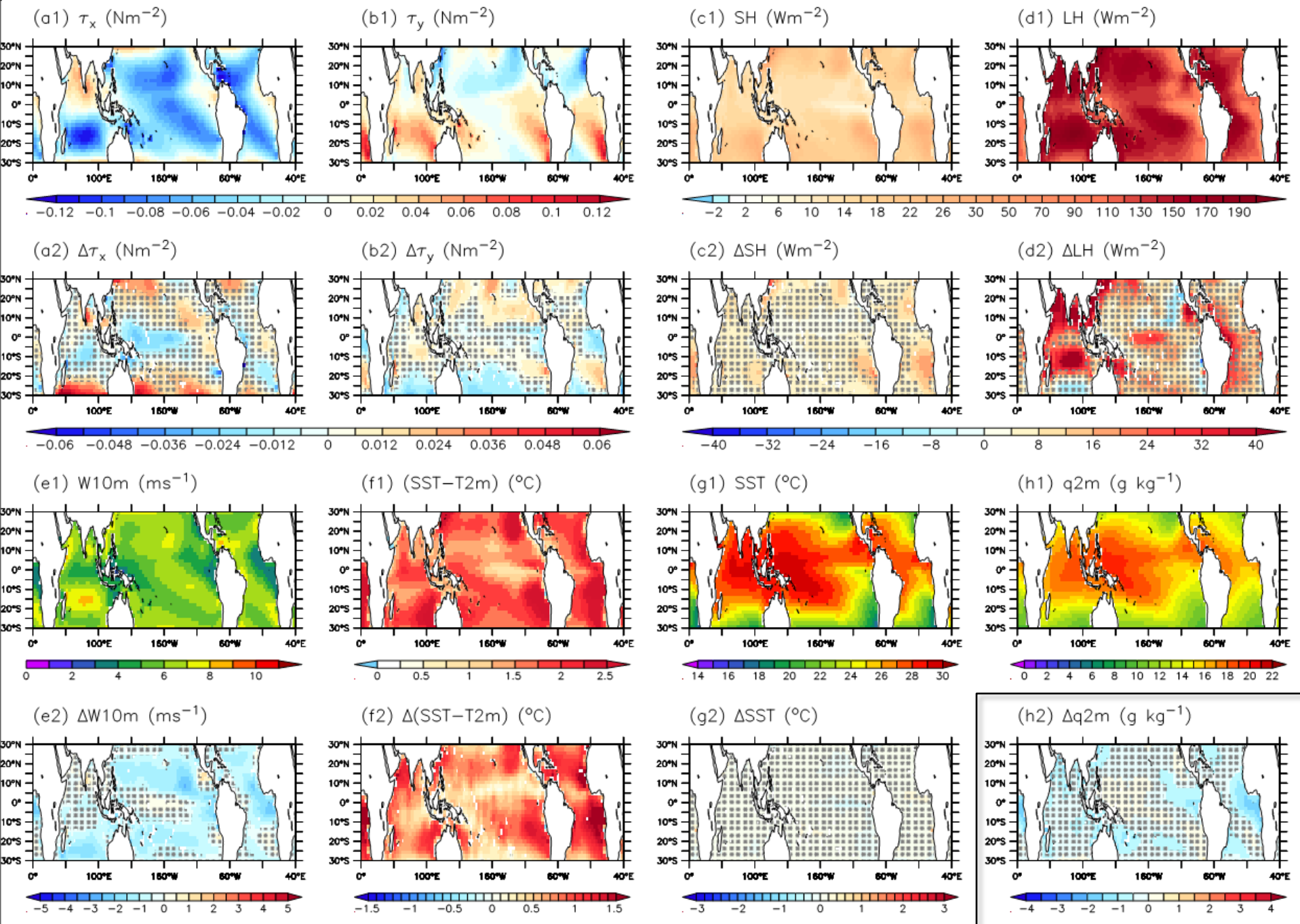
AMIP – NPv3.1 (NP, LR - L39)



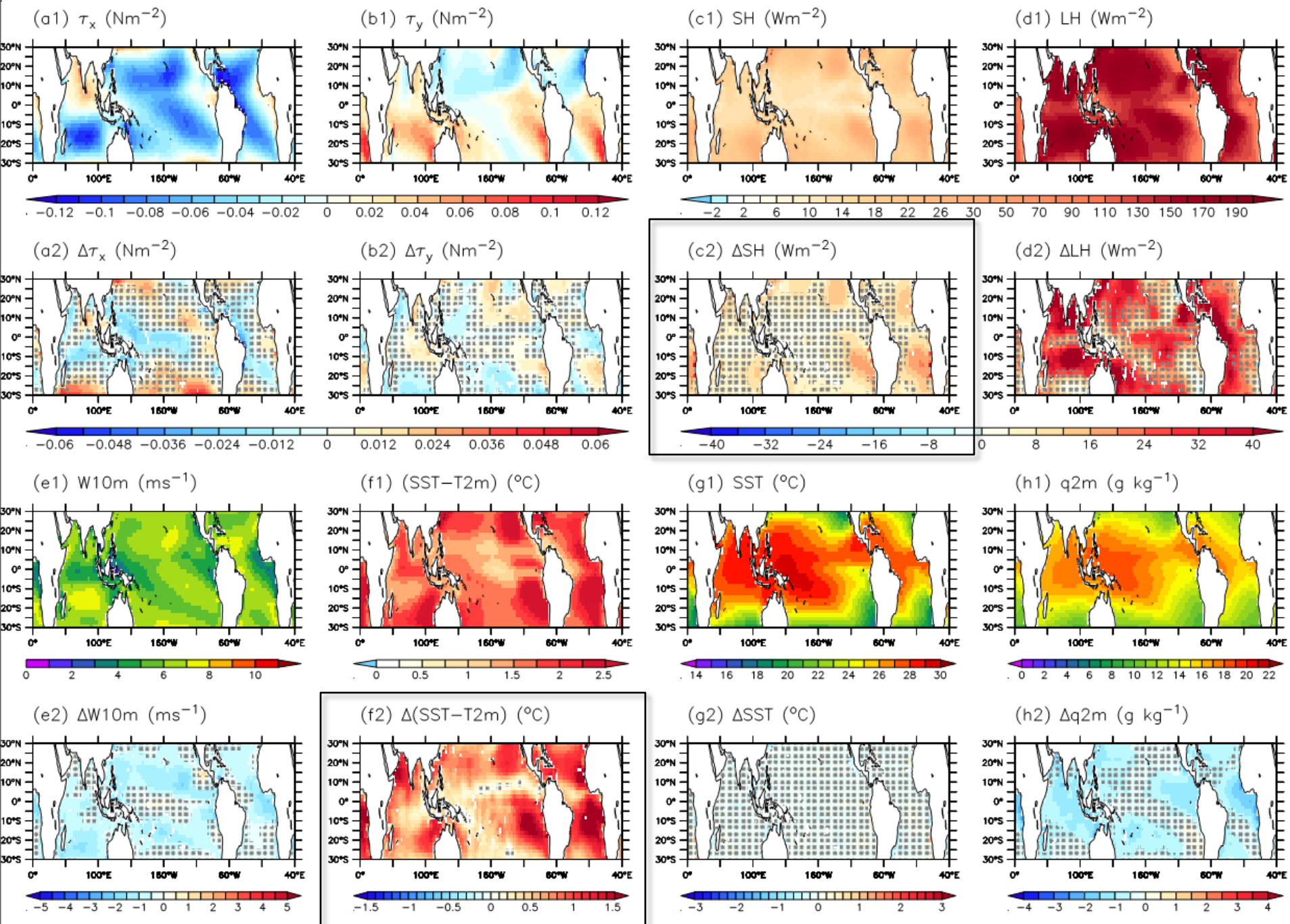
AMIP – AR4.1 (SP, LR - L39)



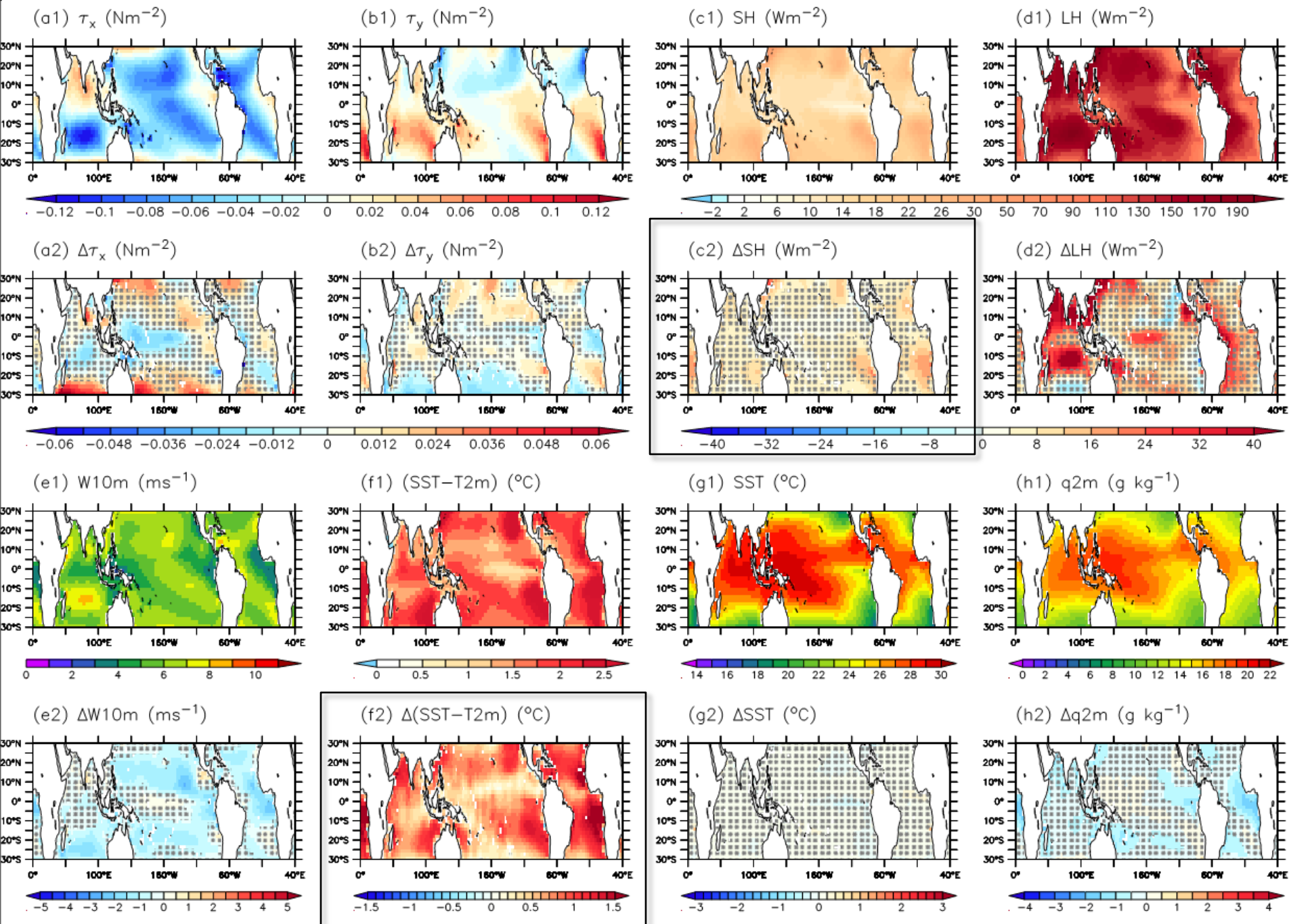
AMIP – NPv3.1 (NP, LR - L39)



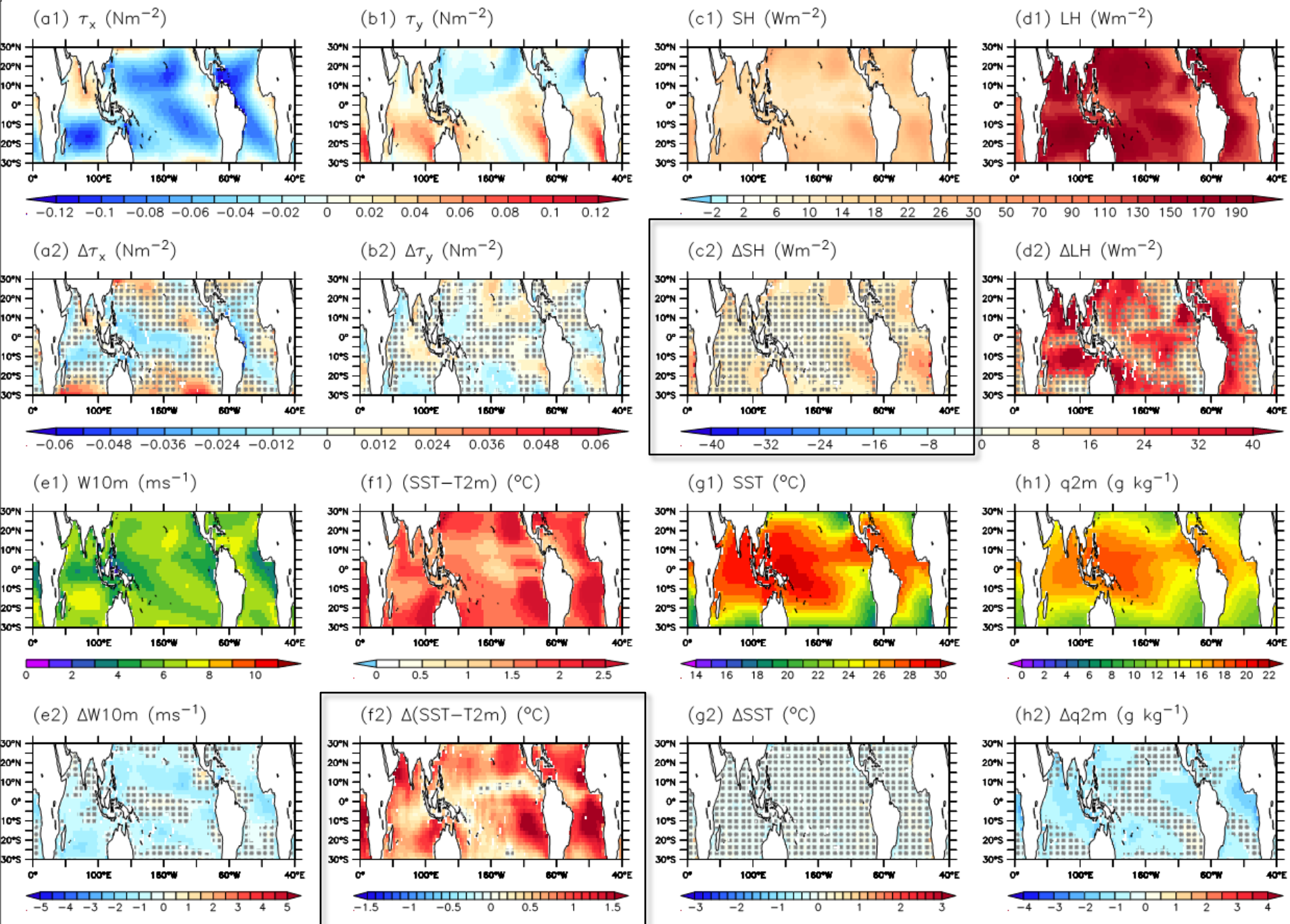
AMIP – NPv3.3 (NP + num. stab., MR-L59)



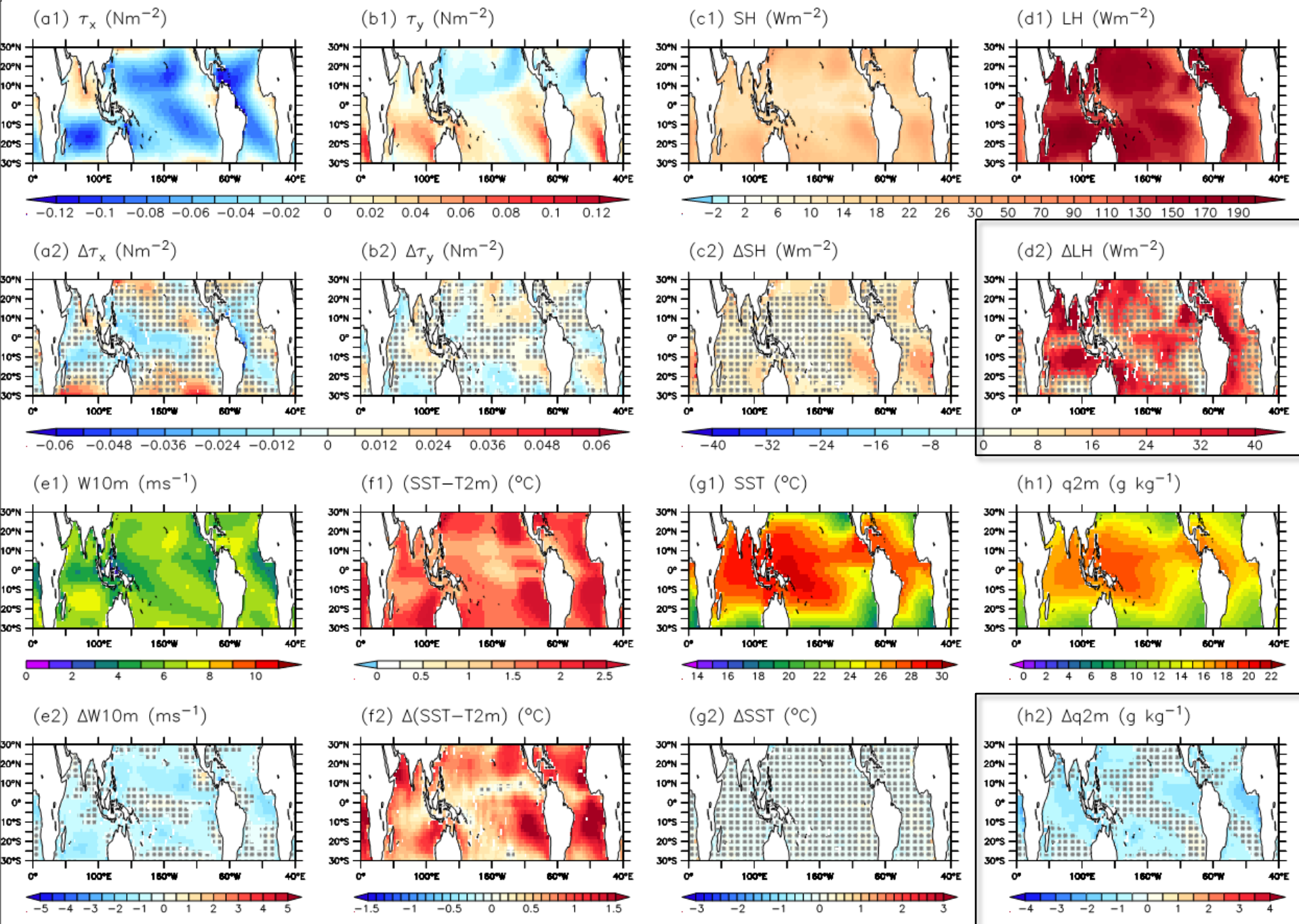
AMIP – NPv3.1 (NP, LR - L39)



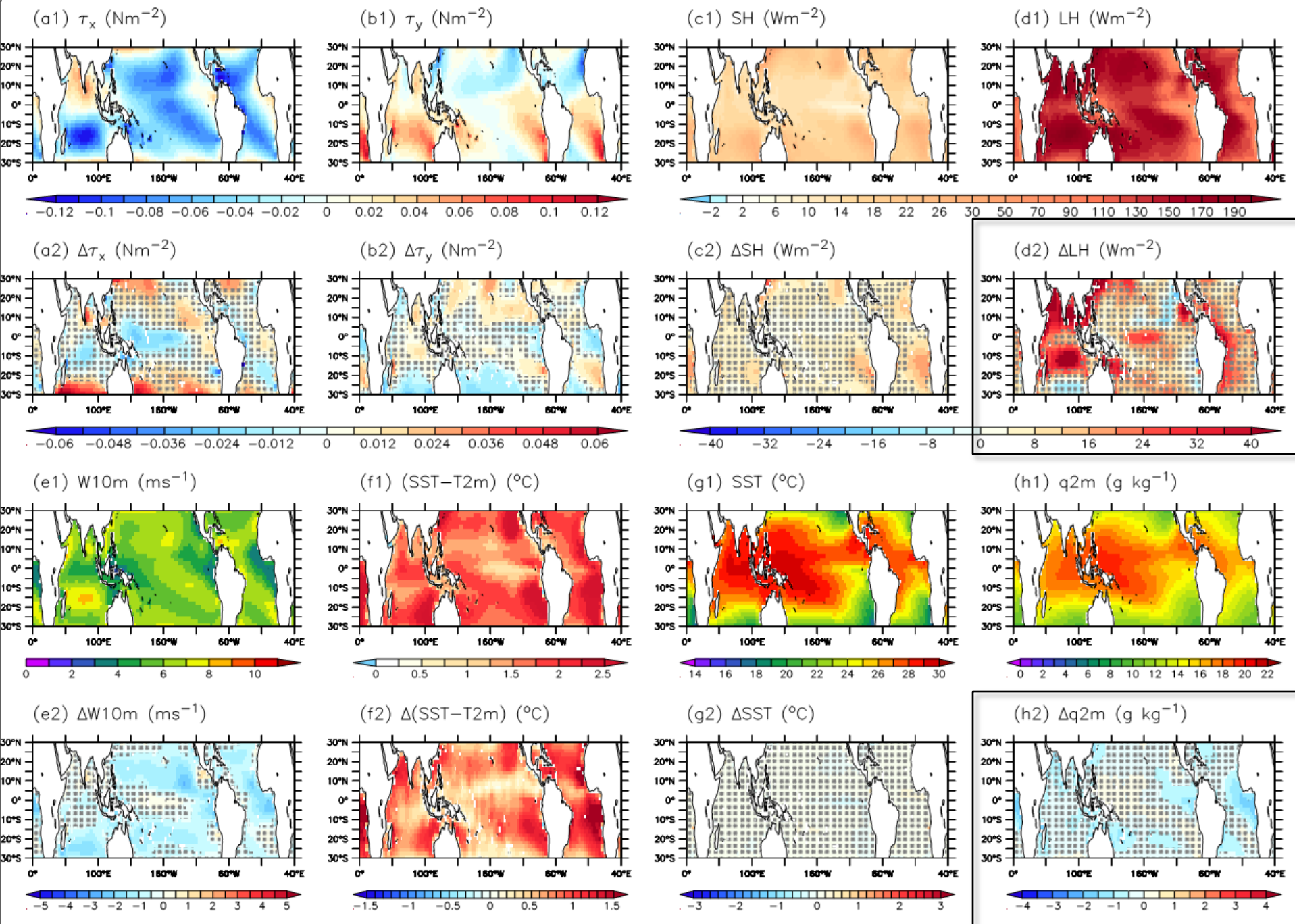
AMIP – NPv3.3 (NP + num. stab., MR-L59)



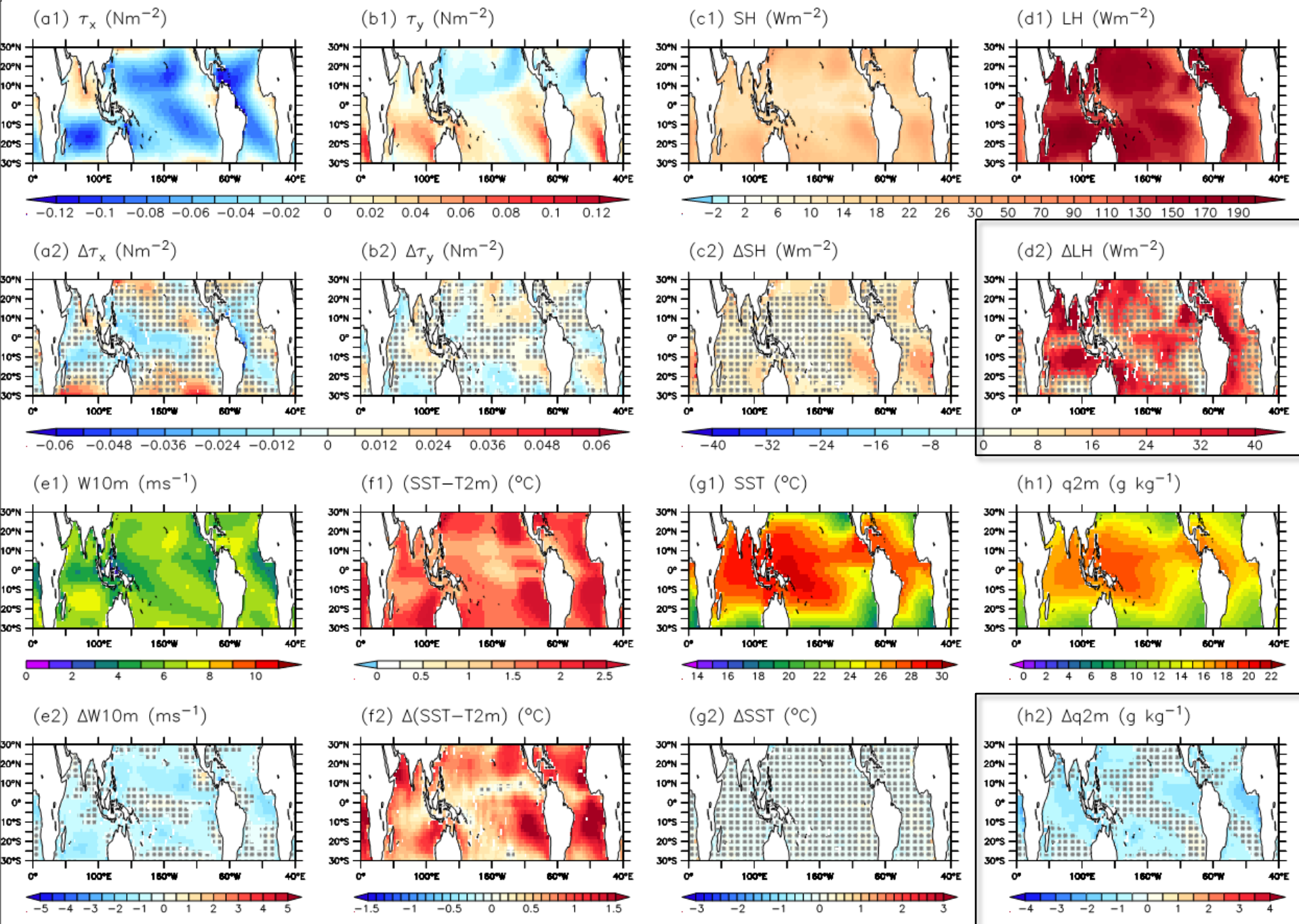
AMIP – NPv3.3 (NP + num. stab., MR-L59)



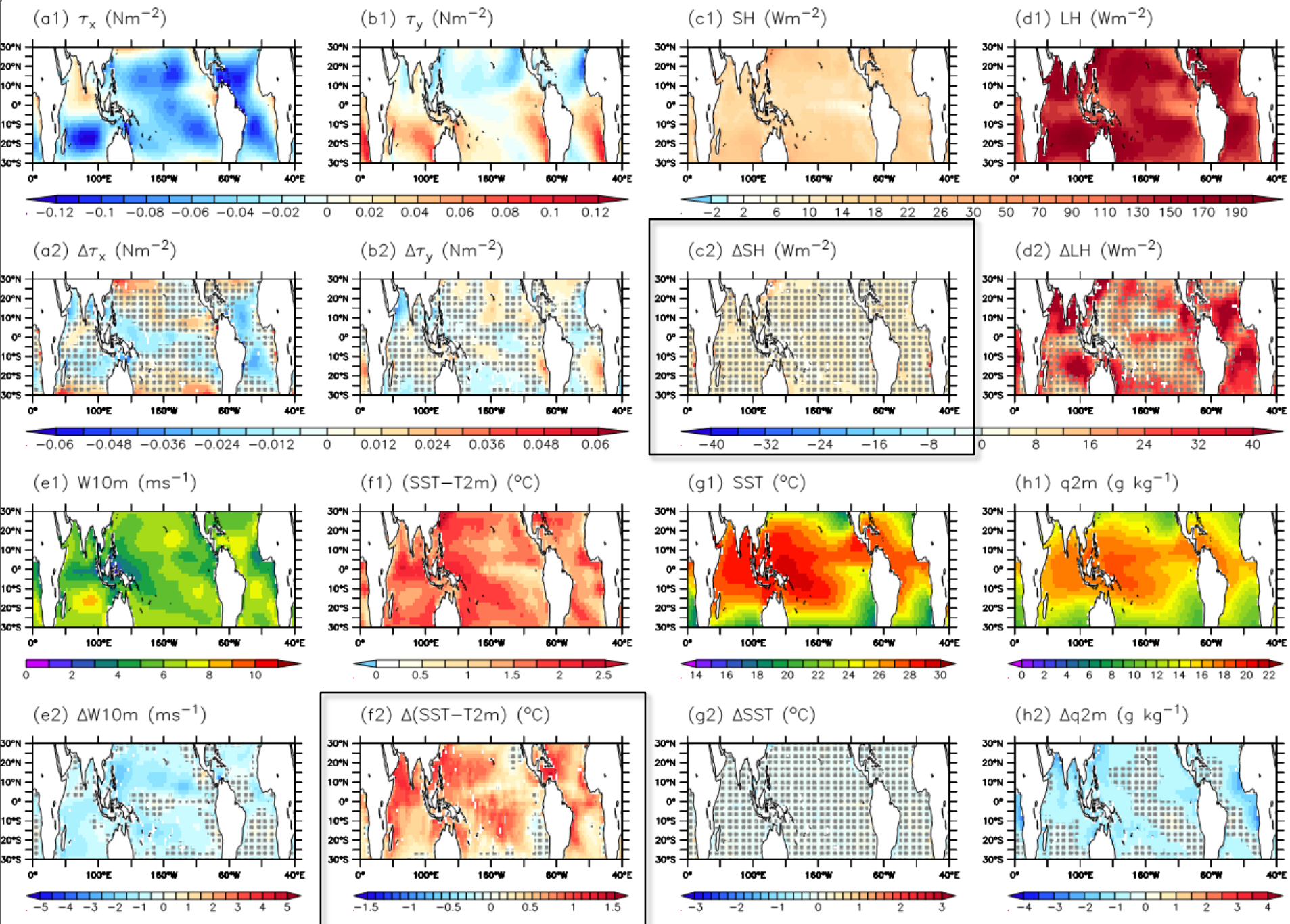
AMIP – NPv3.1 (NP, LR - L39)



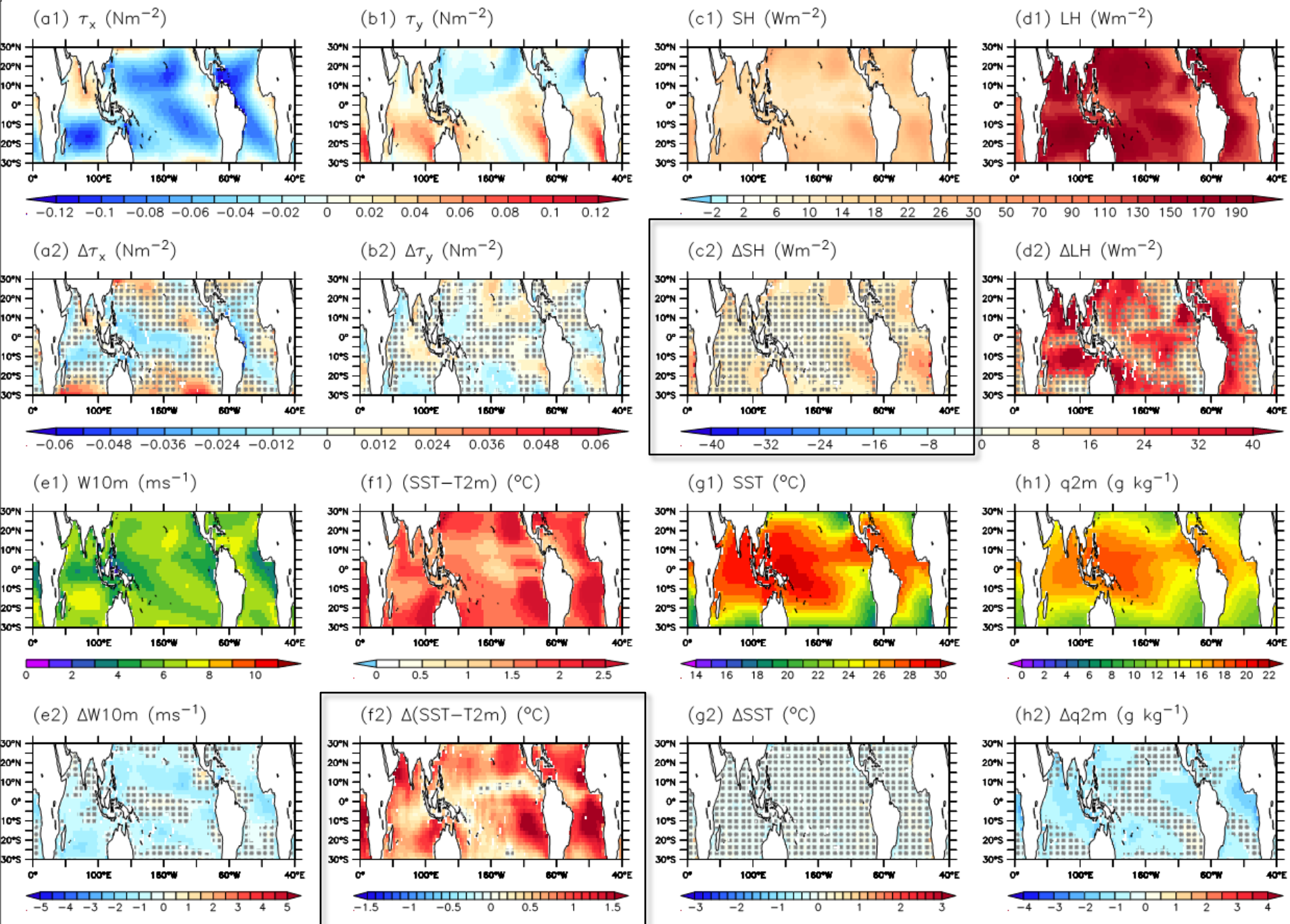
AMIP – NPv3.3 (NP + num. stab., MR-L59)



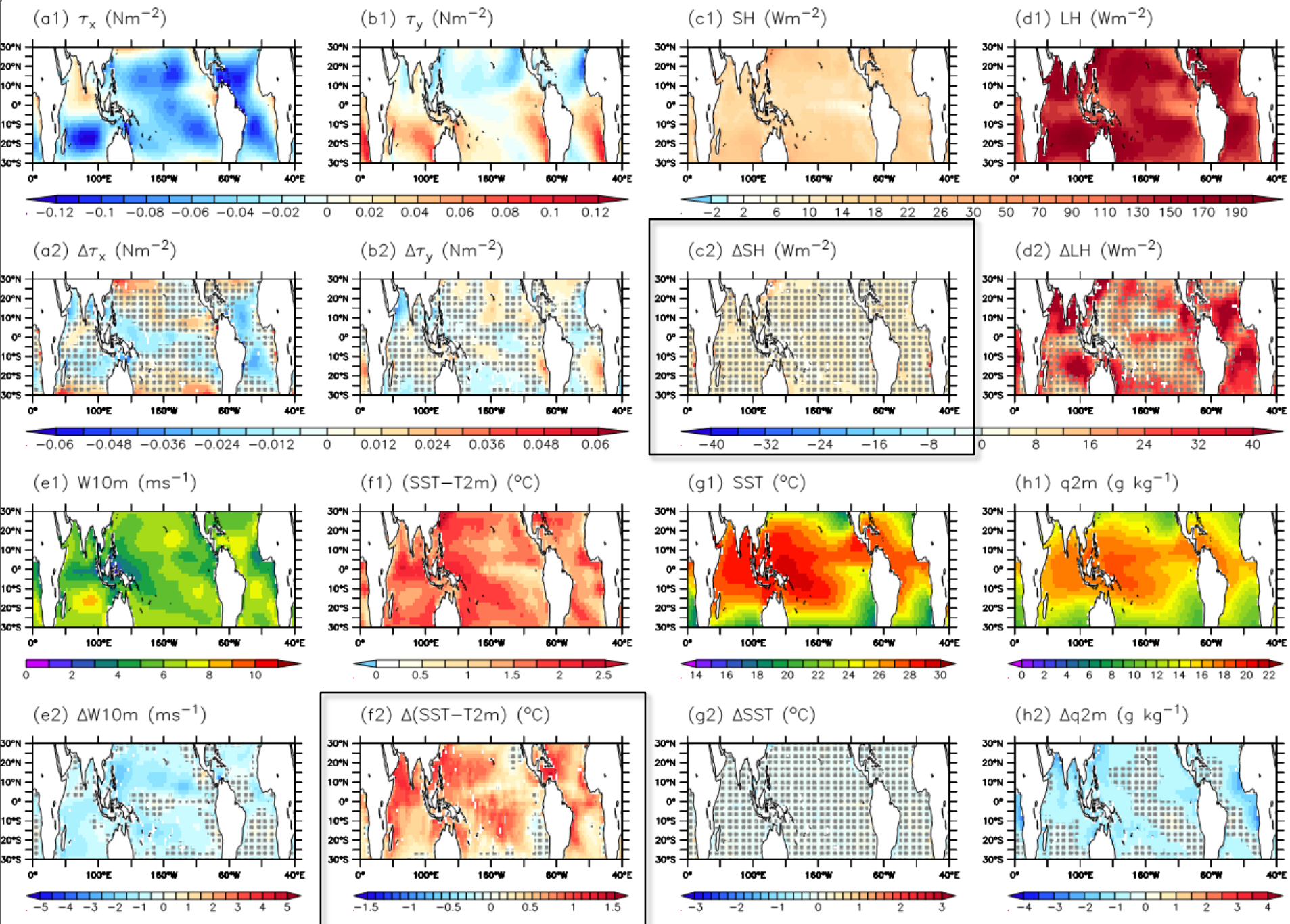
AMIP – NPv4.0 (Stoch. Phys., MR-L59)



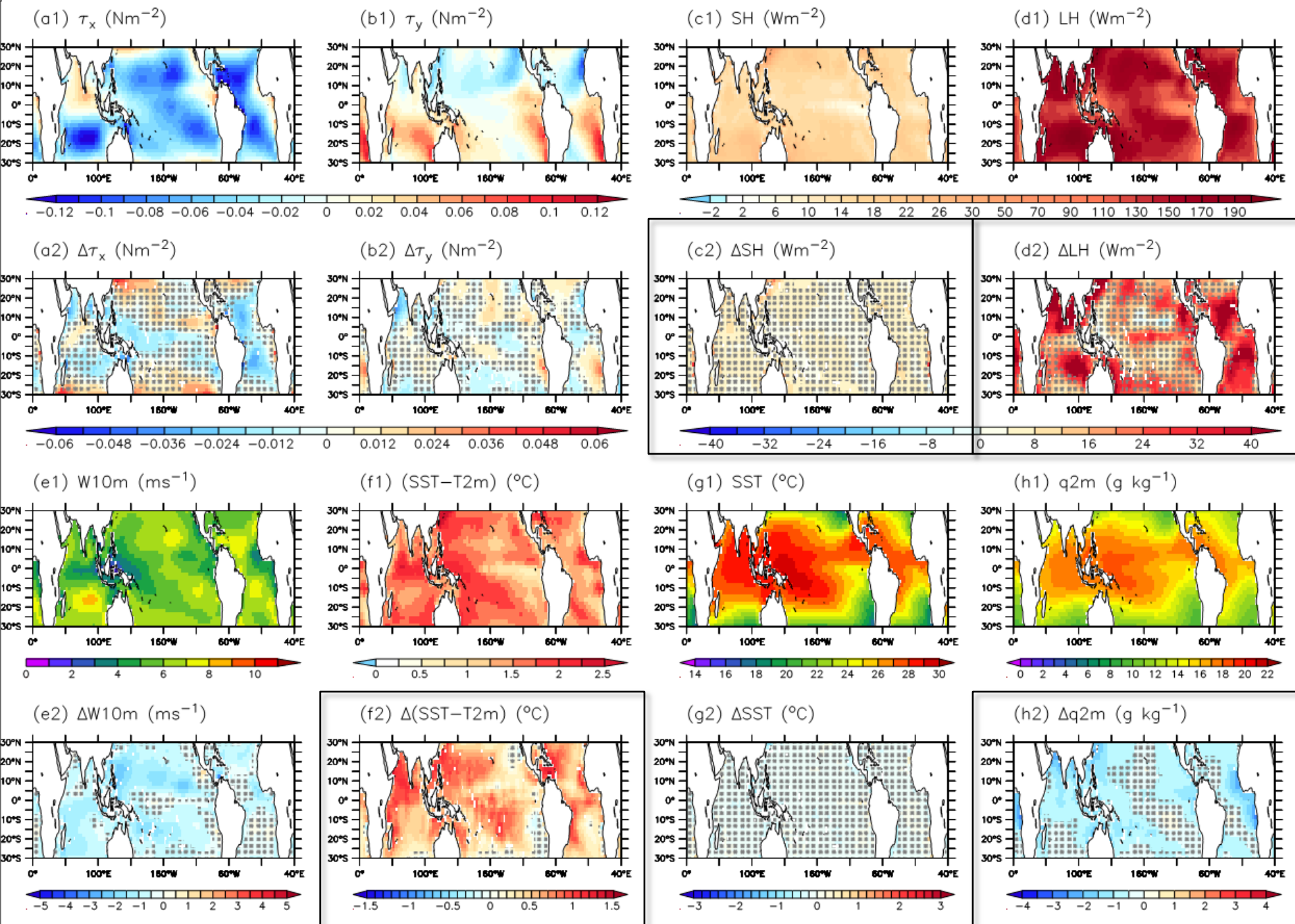
AMIP – NPv3.3 (NP + num. stab., MR-L59)



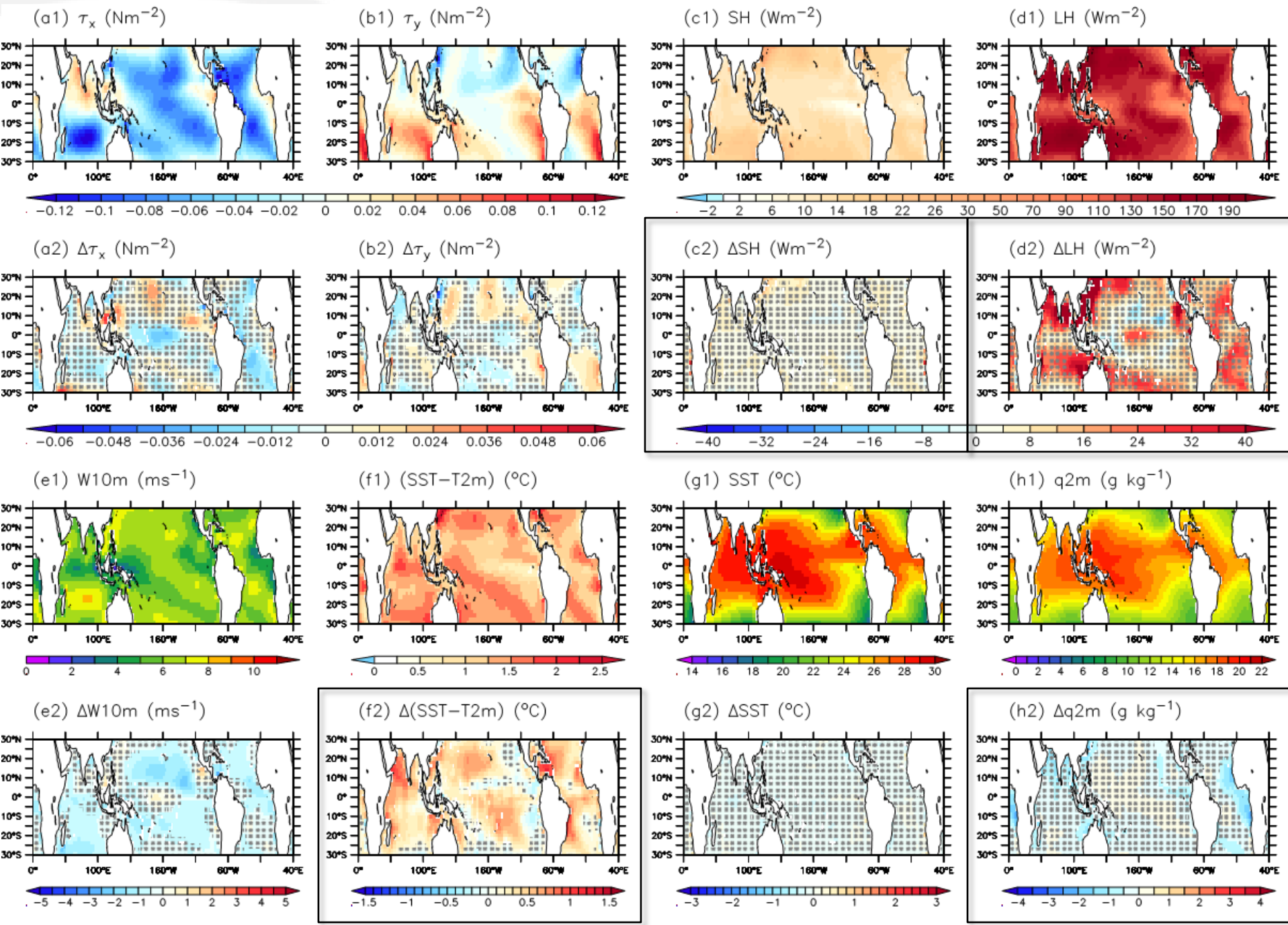
AMIP – NPv4.0 (Stoch. Phys., MR-L59)



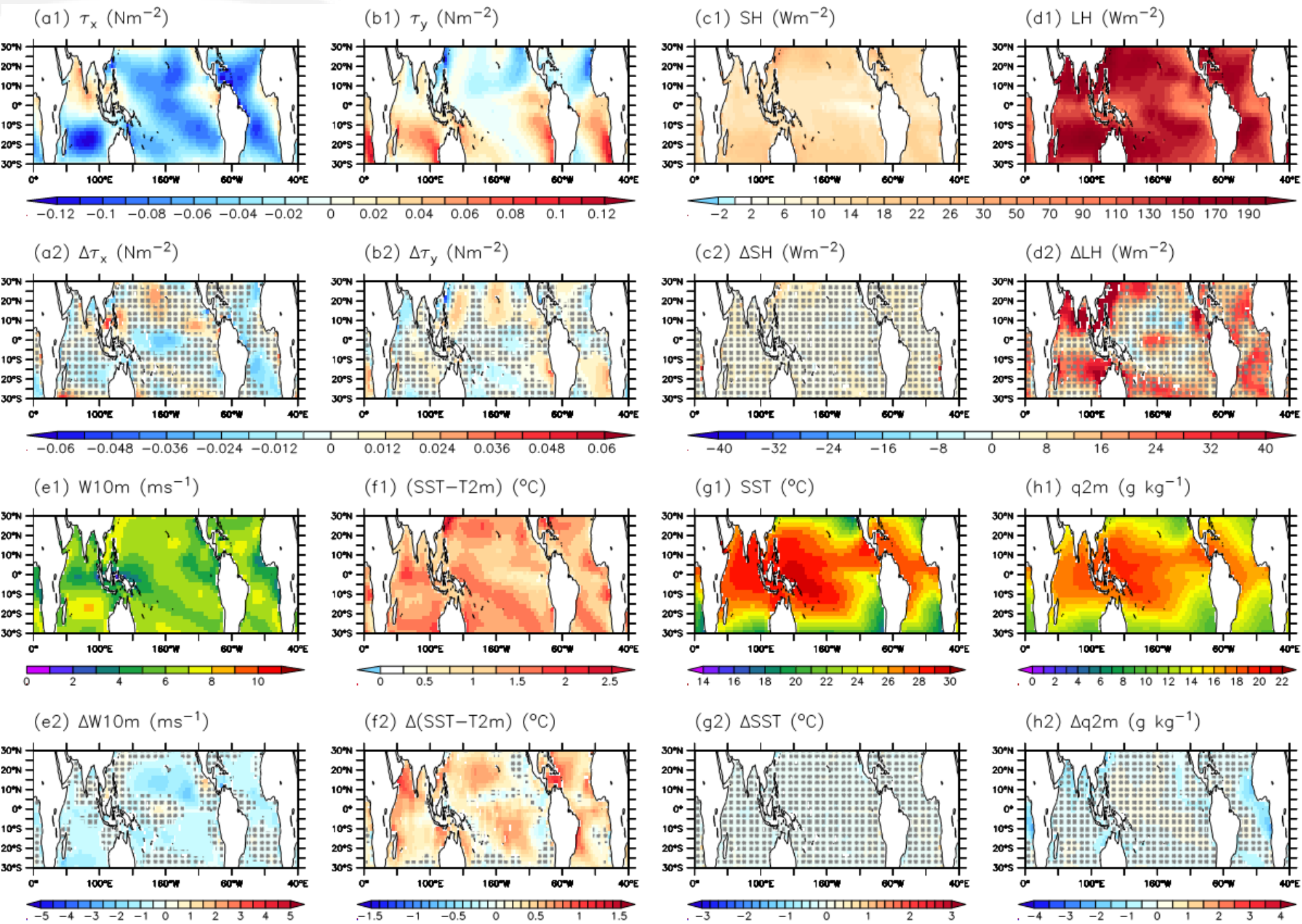
AMIP – NPv4.0 (Stoch. Phys., MR-L59)



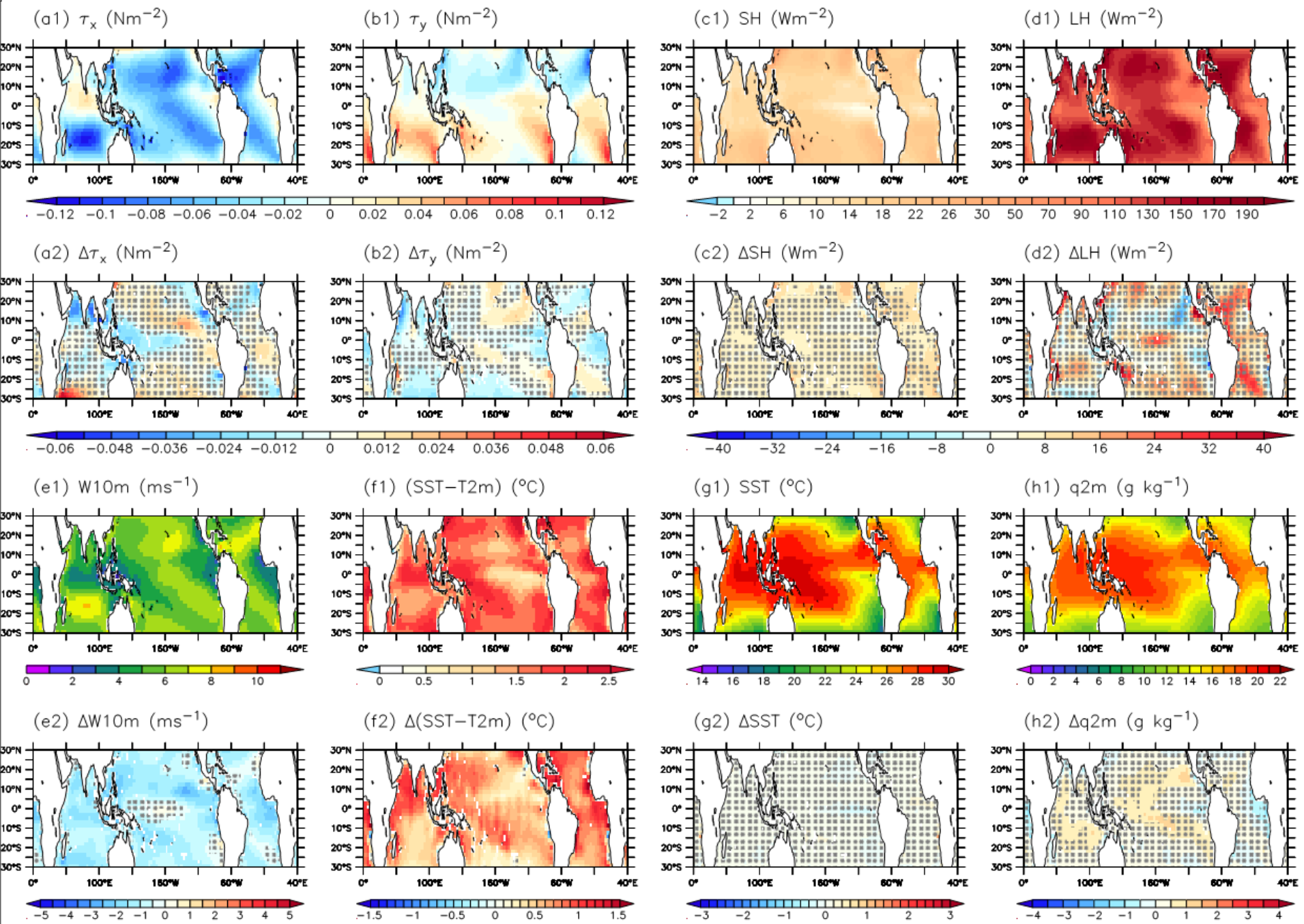
AMIP – NPv4.12 (Stoch. Phys. + en. adj., MR-L59)



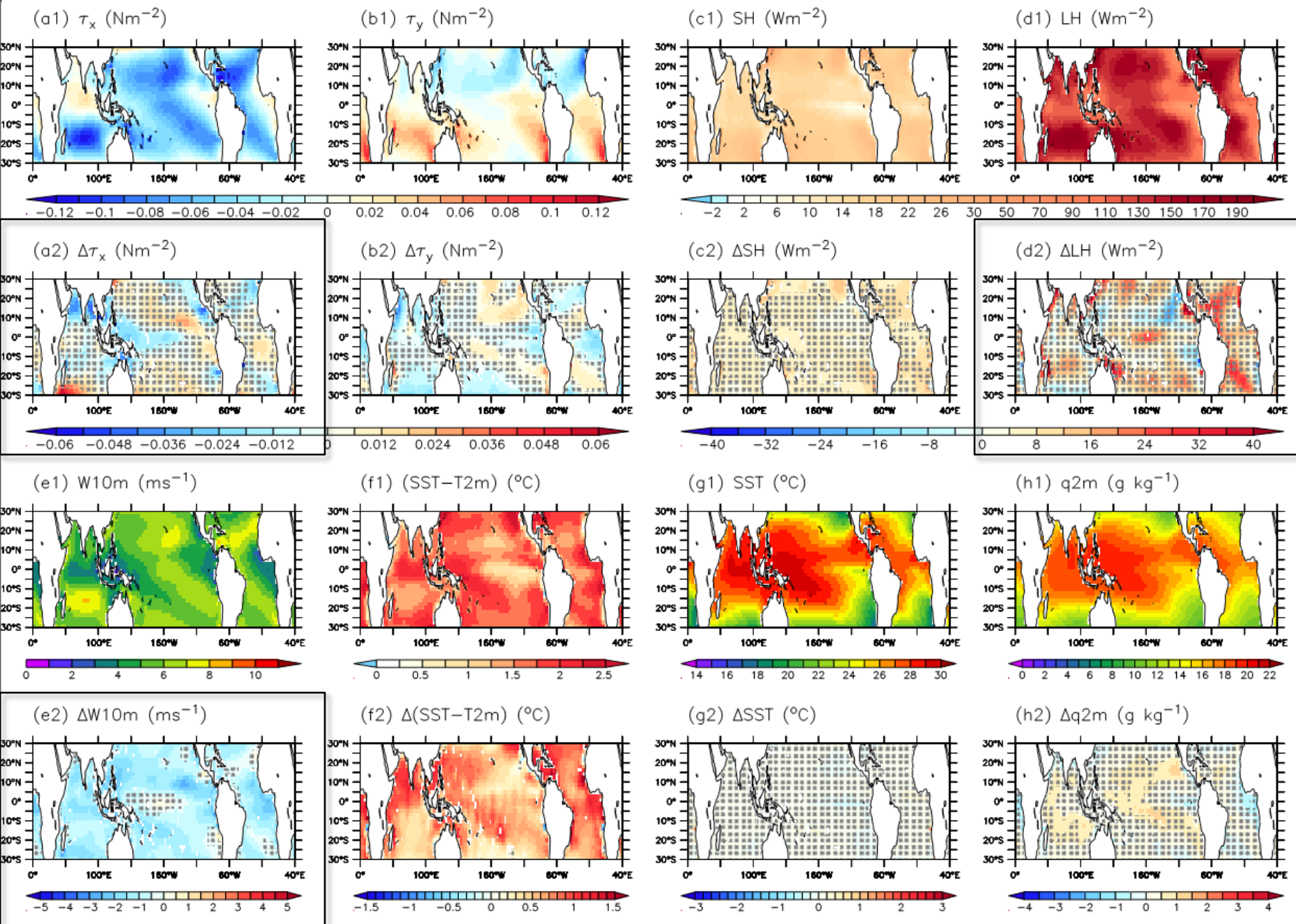
AMIP – NPv4.12 (Stoch. Phys. + en. adj., MR-L59)



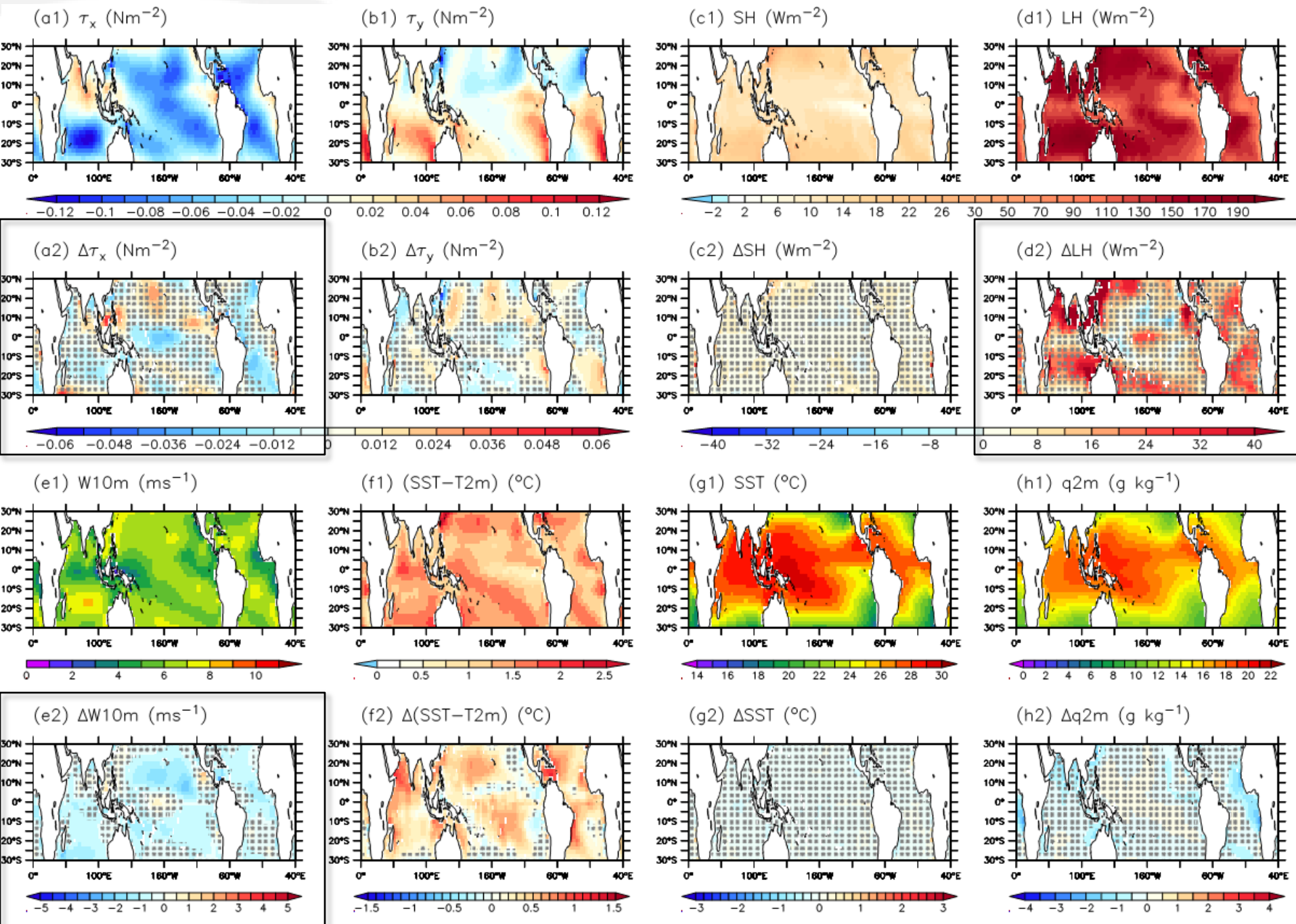
AMIP – AR4.1 (SP, LR - L39)



AMIP – AR4.1 (SP, LR - L39)

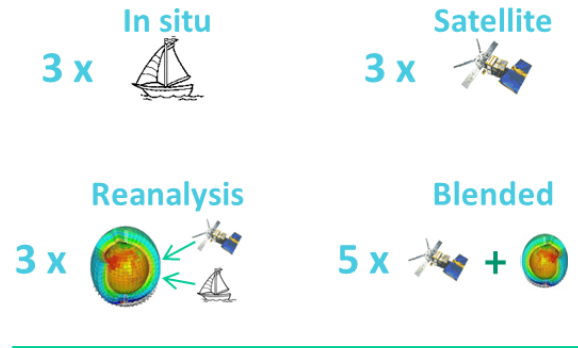


AMIP – NPv4.12 (Stoch. Phys. + en. adj., MR-L59)



Conclusions

- ❑ Large OBS uncertainties for fluxes
- ✅ ❑ OBS ensemble evaluation approach – in place
- ! ❑ 2 systematic, large flux-related biases in the IPSL model – improving in latest LMDZ versions
- ✅ ❑ Significant improvements in tropical eastern ocean boundary (stratocumulus) regions in recent LMDZ versions (v4.0, v4.12...)
- ! ❑ Persisting regional q2m underestimation + associated LH biases
- ! ❑ Persistent overestimation of central eq. Pacific W10m, τ_x , LH
- ? ❑ W10m – fluxes reconciliation



14 flux products
 W10m – AR4.1

