



# Tropical Cyclones in PRIMAVERA HighResMIP Simulations

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A. Baker, D Peano, P Kreussler, M Roberts, E Scoccimarro, B Vanni re, PL Vidale, and many others.

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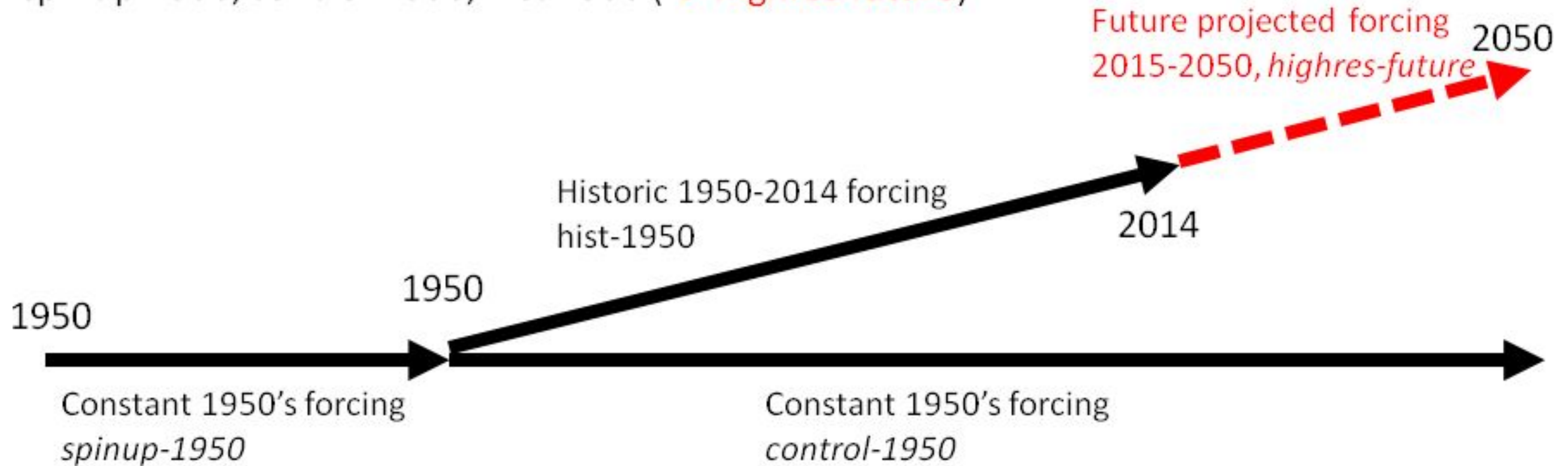


# HighResMIP Protocol

Coupled climate, 1950-2014 (→ 2050)

Forced by constant 1950 and historic forcings (→ projected)

Initial coupled spin-up period ~ 30-50 years from 1950 EN4 ocean climatology  
spinup-1950, control-1950, hist-1950 (→ highres-future)



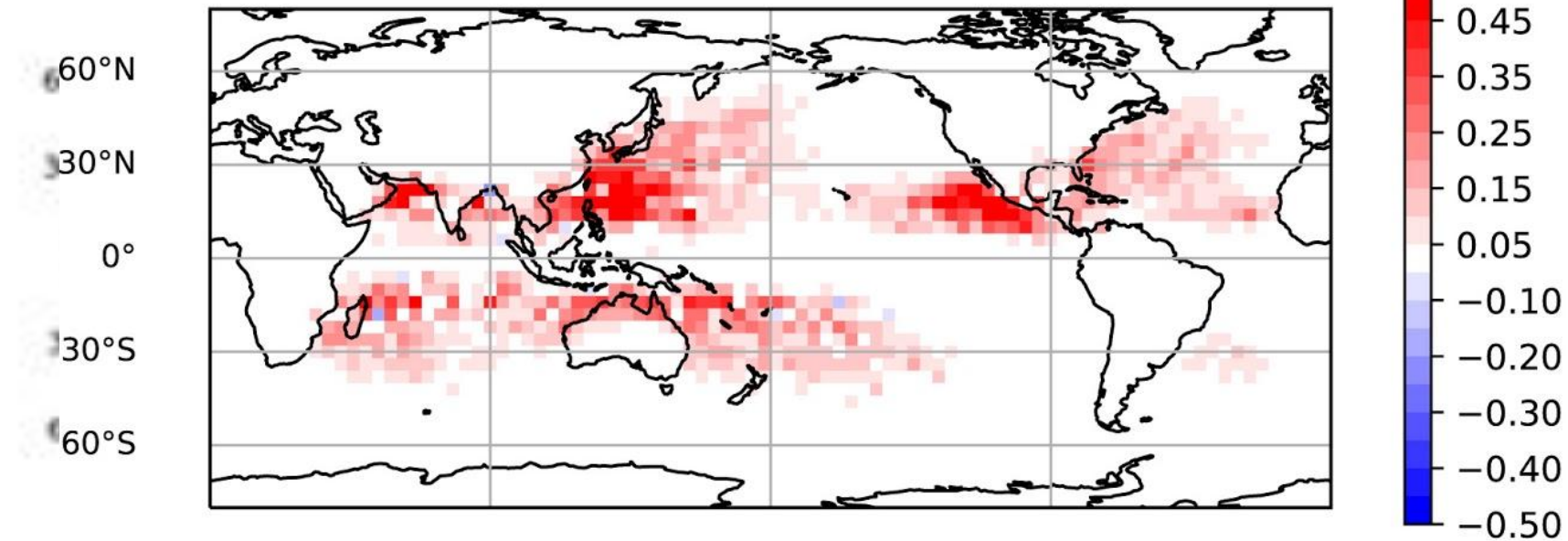
7 GCMS // 2 Trackers



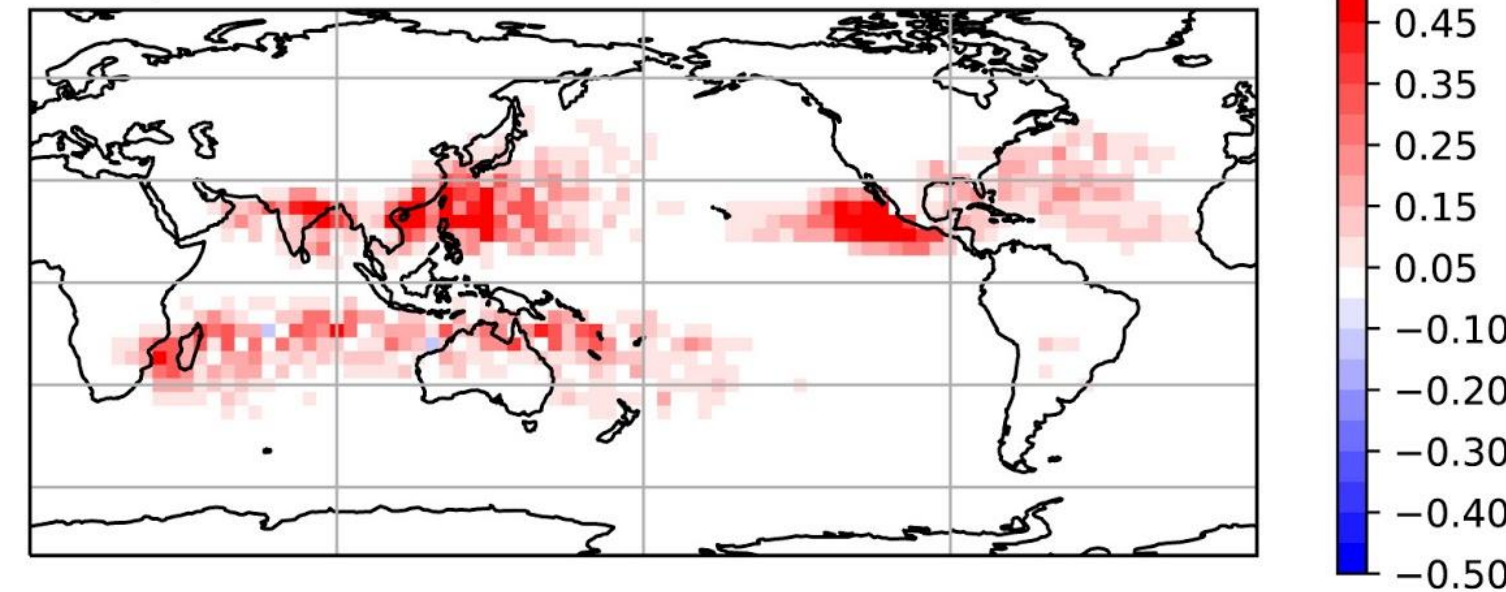
# Impact of Resolution on Track Density

HR - LR

(a) TRACK: HR - LR ensemble

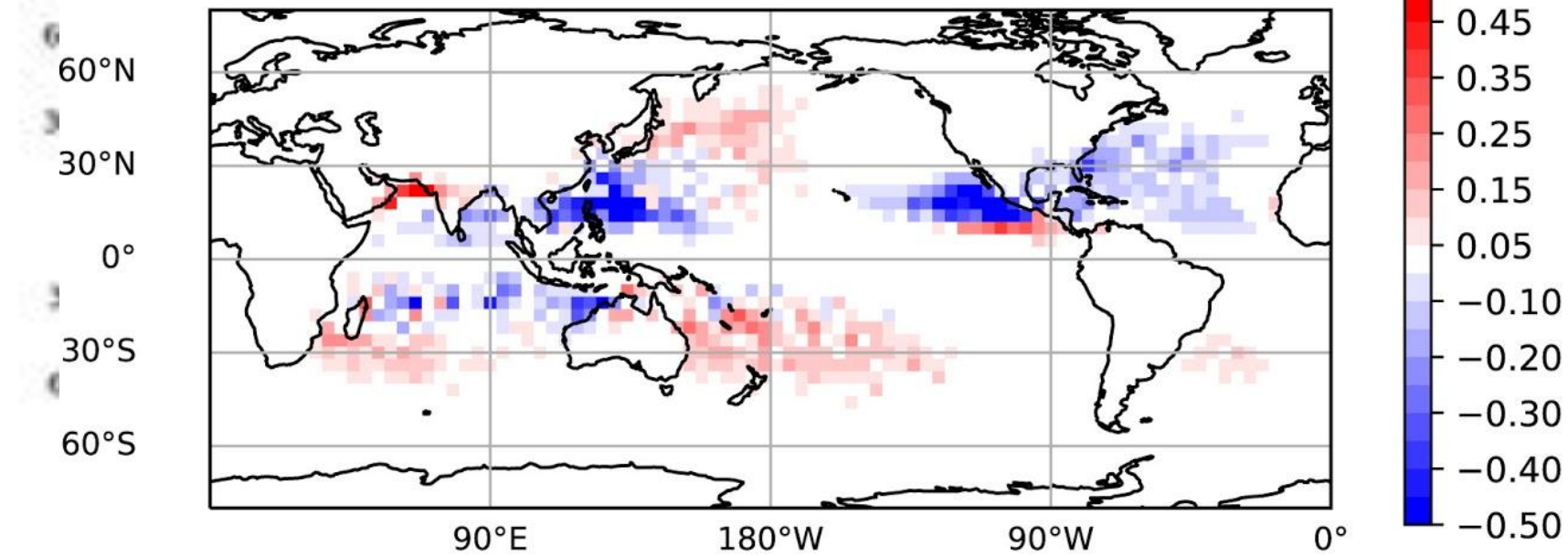


(b) TempestExtremes: HR - LR ensemble

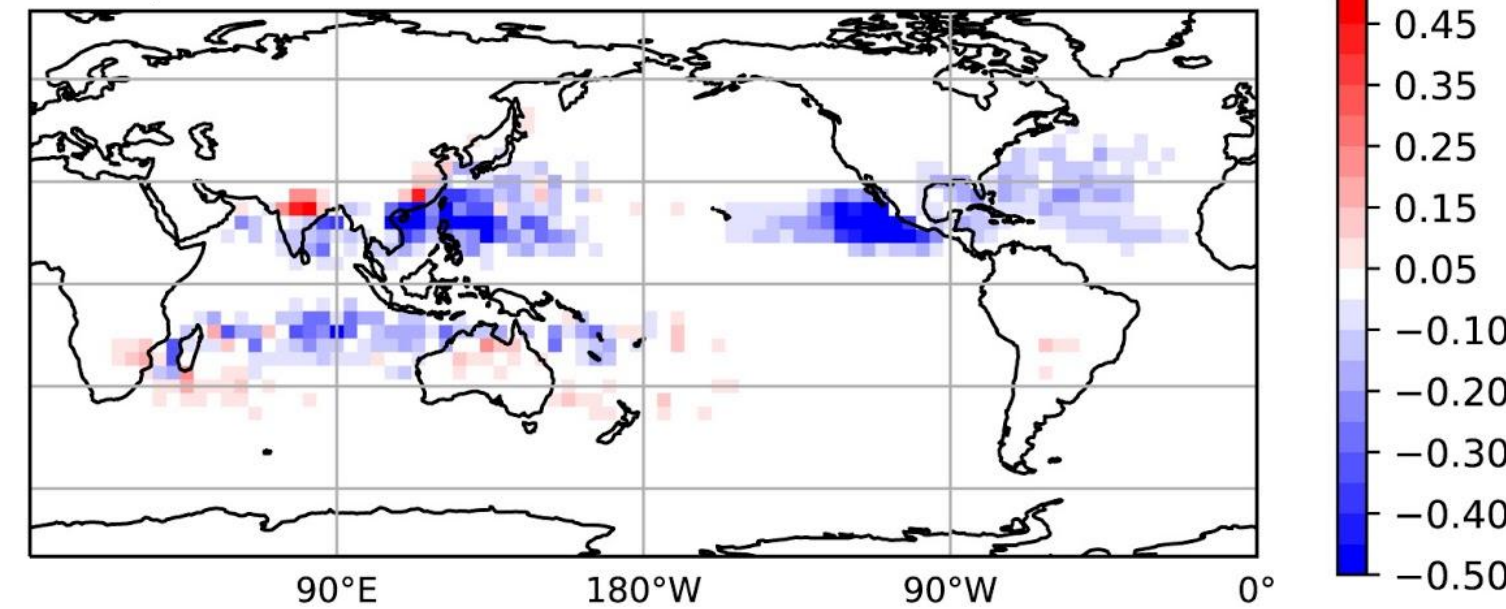


Change in RMSE

(c) TRACK: RMSE HR - LR ensemble



(d) TempestExtremes: RMSE HR - LR ensemble

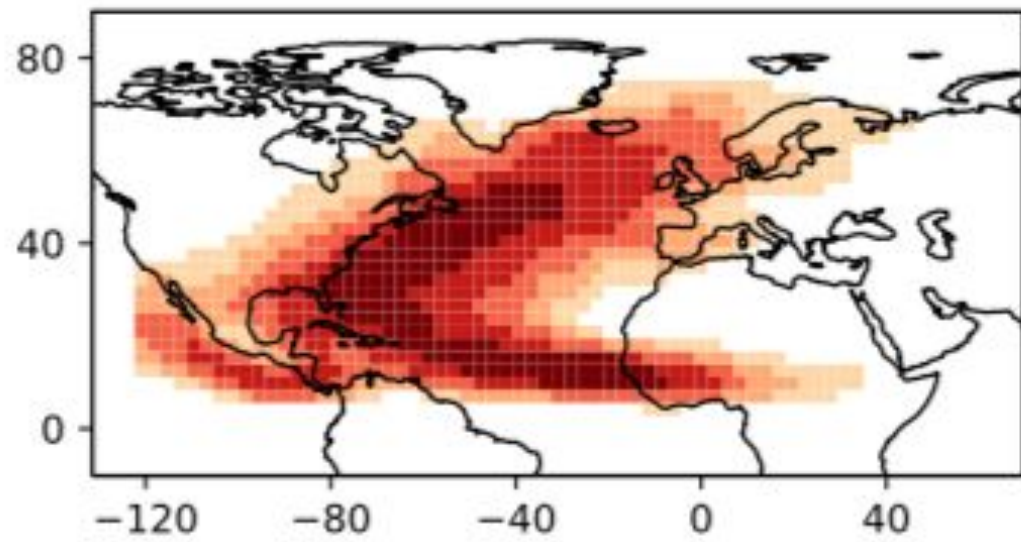


Roberts et al. (2020a)

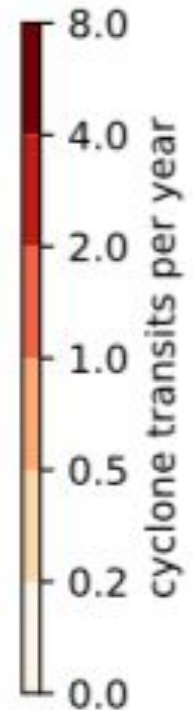


# Impact of Resolution on Extra-Tropical Transitions

REANALYSES

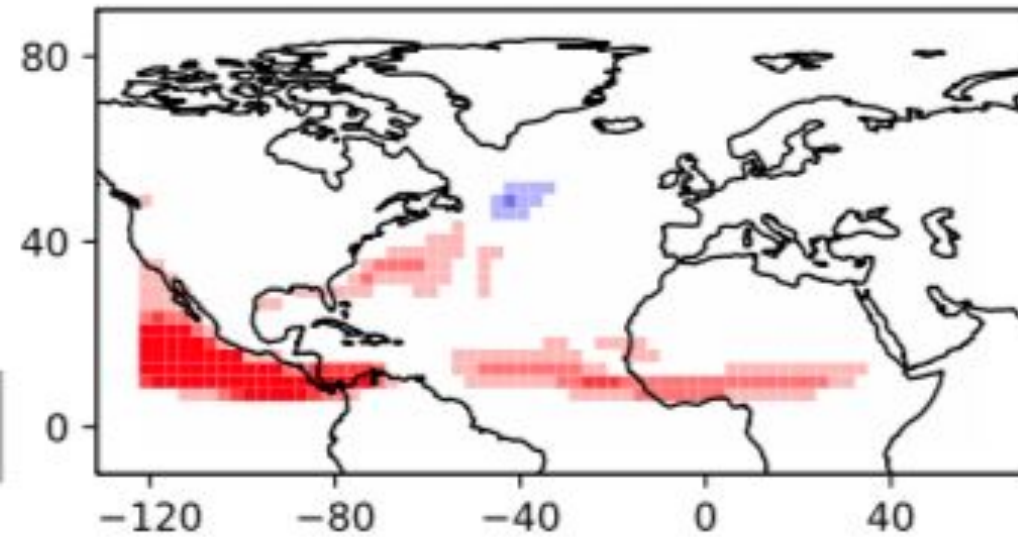
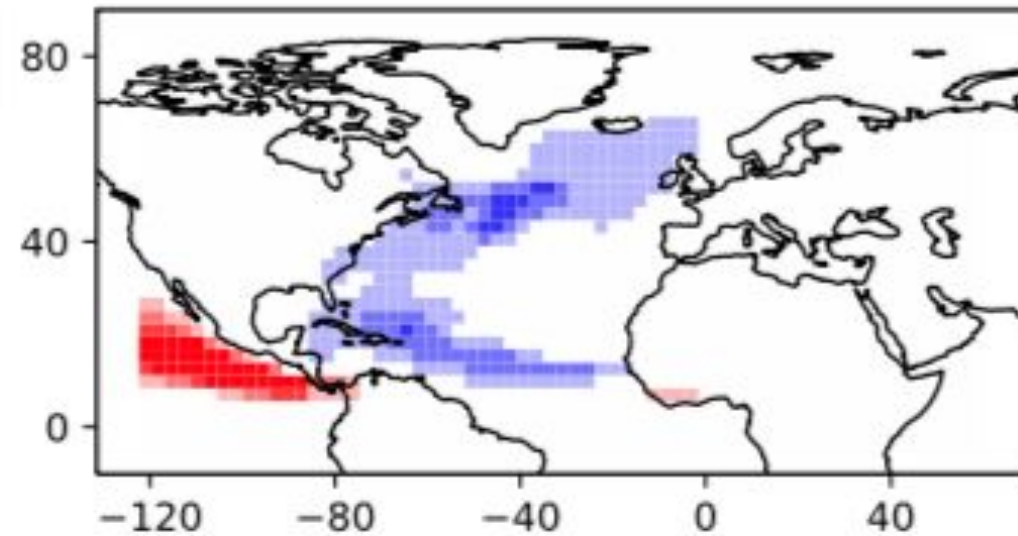


LR

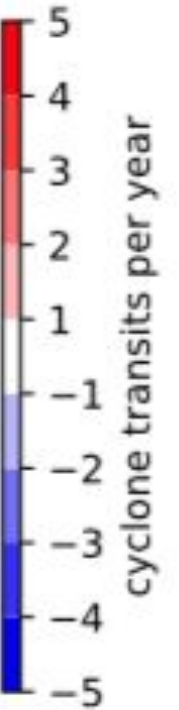
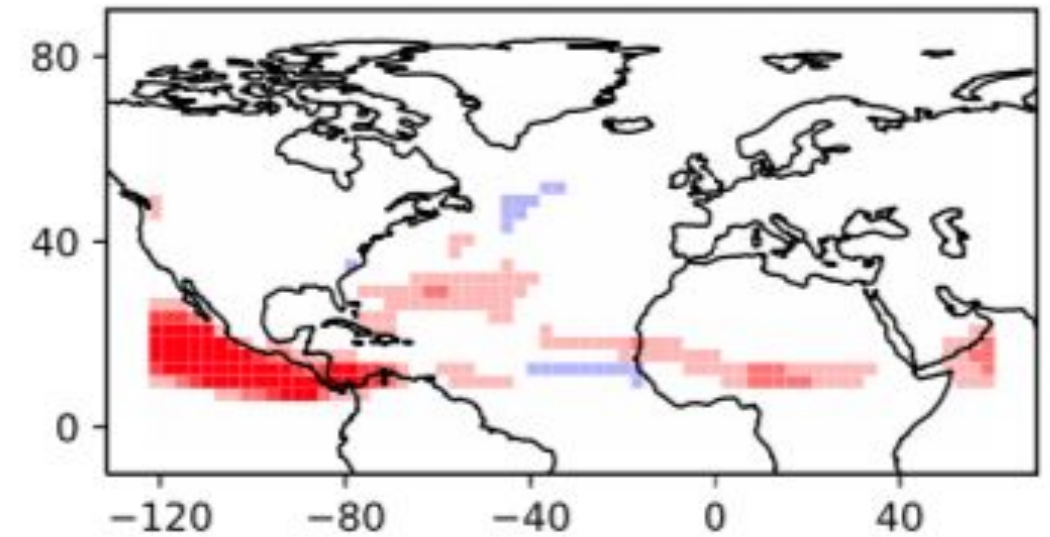
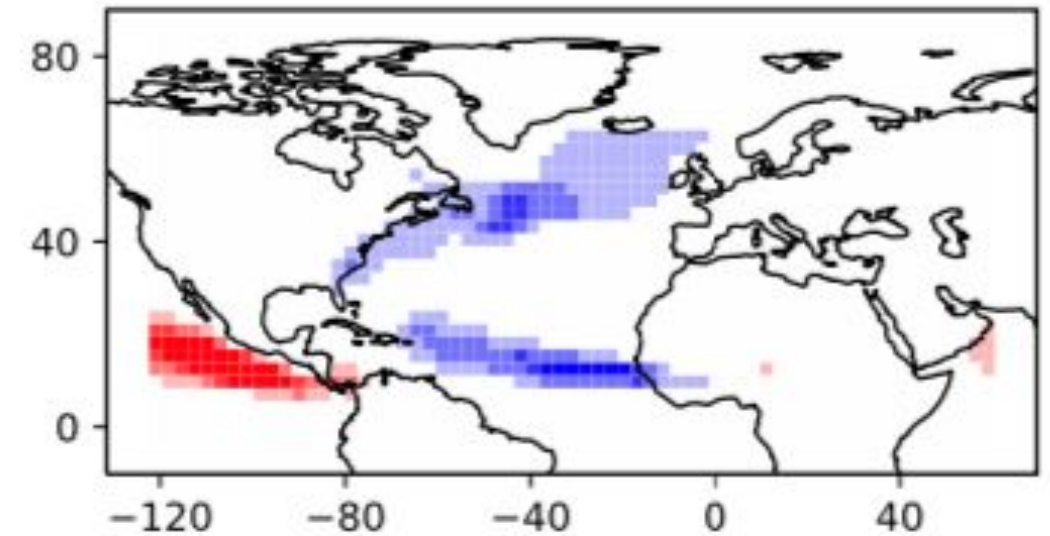


HR

AMIP



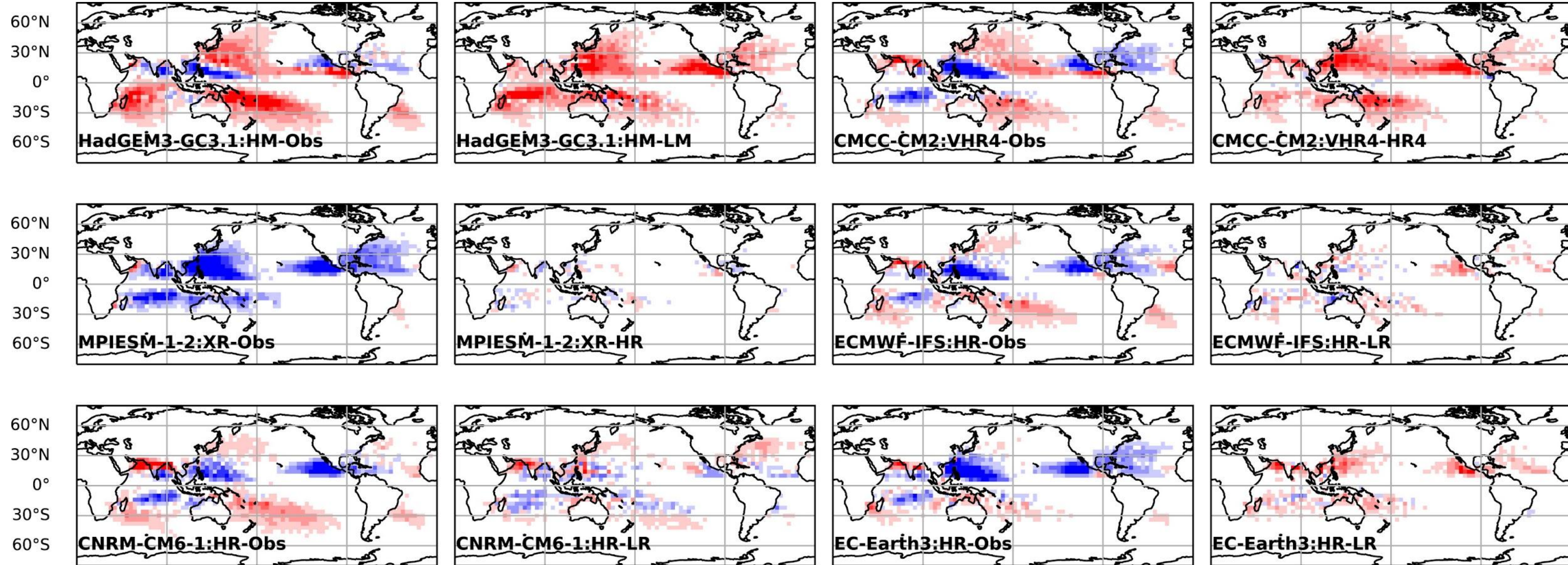
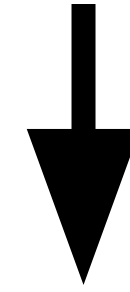
COUPLED



Credit: A. Baker



# Impact of Resolution on Track Density

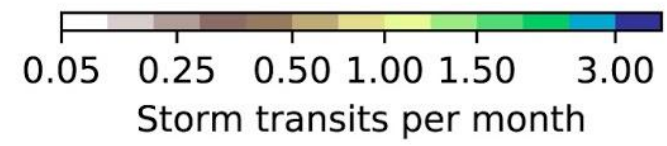
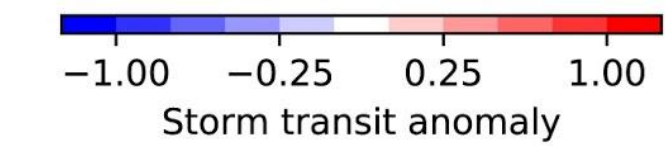
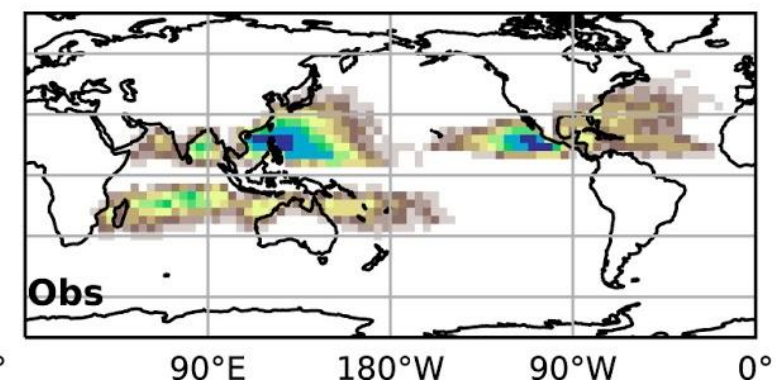
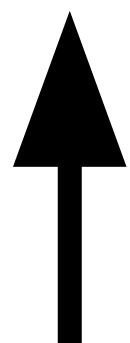


60°N  
30°N  
0°  
30°S  
60°S

60°N  
30°N  
0°  
30°S  
60°S

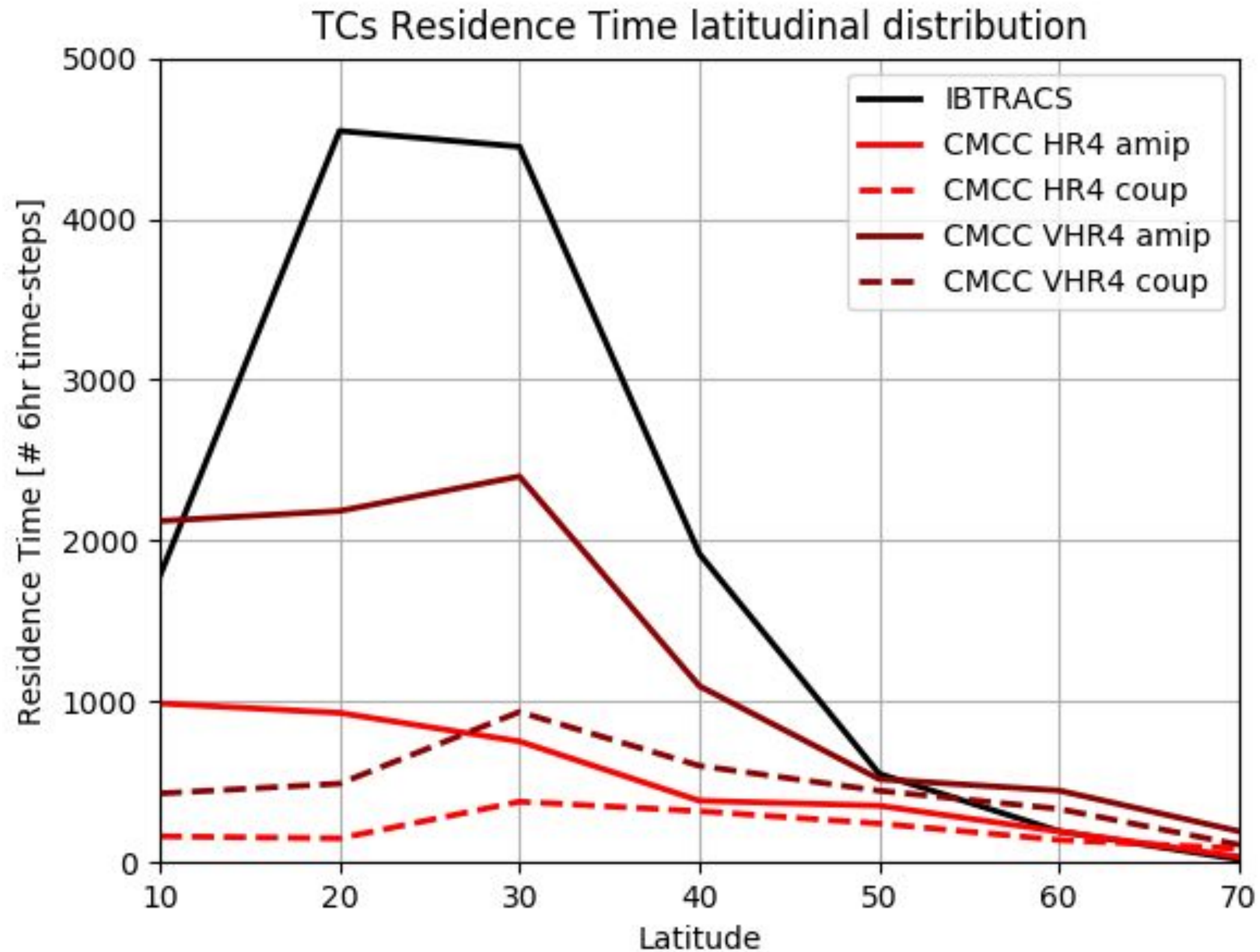
60°N  
30°N  
0°  
30°S  
60°S

Roberts et al. (2020a)



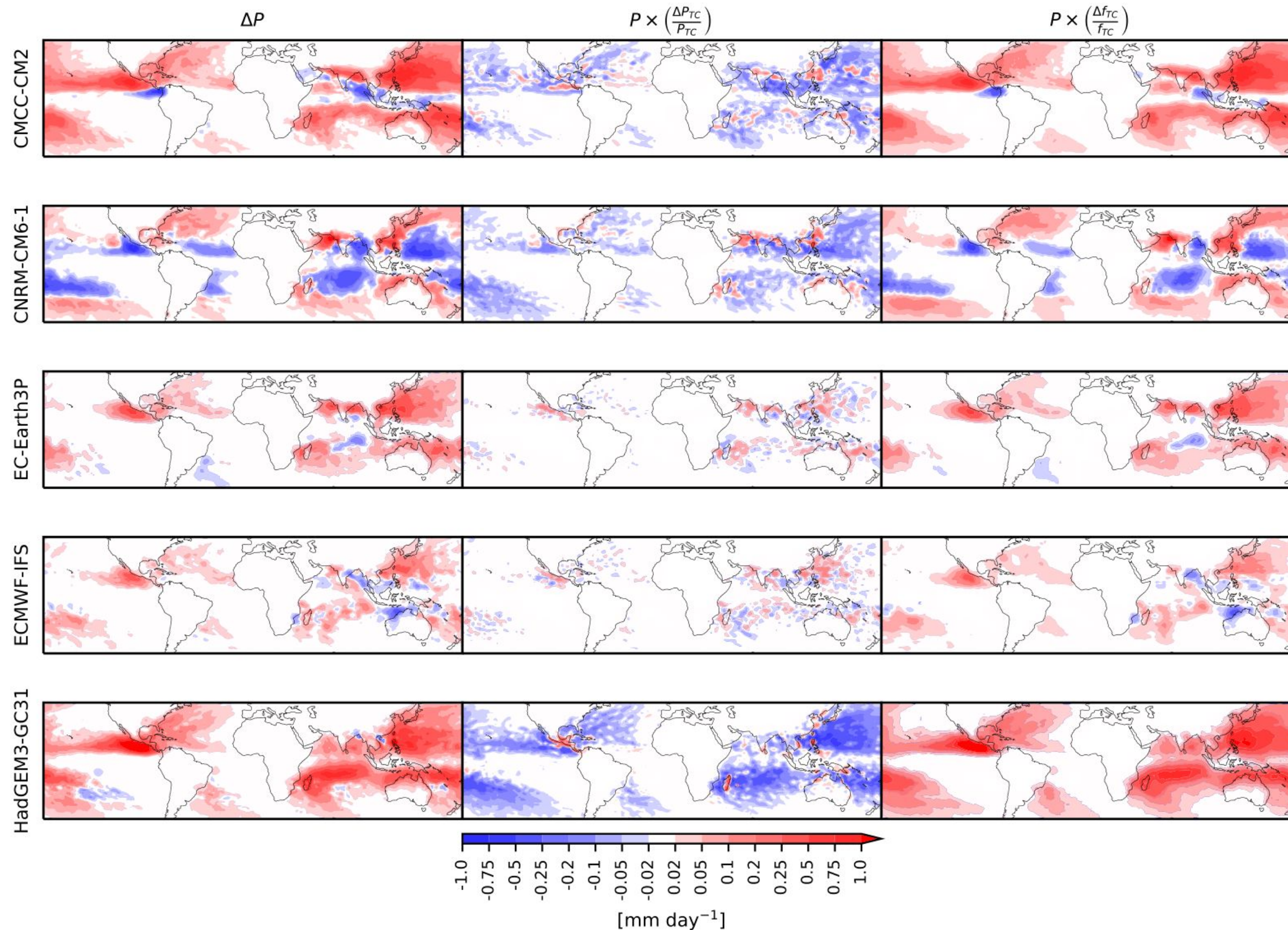


# Impact of Resolution on Residence



Peano et al. (in prep)

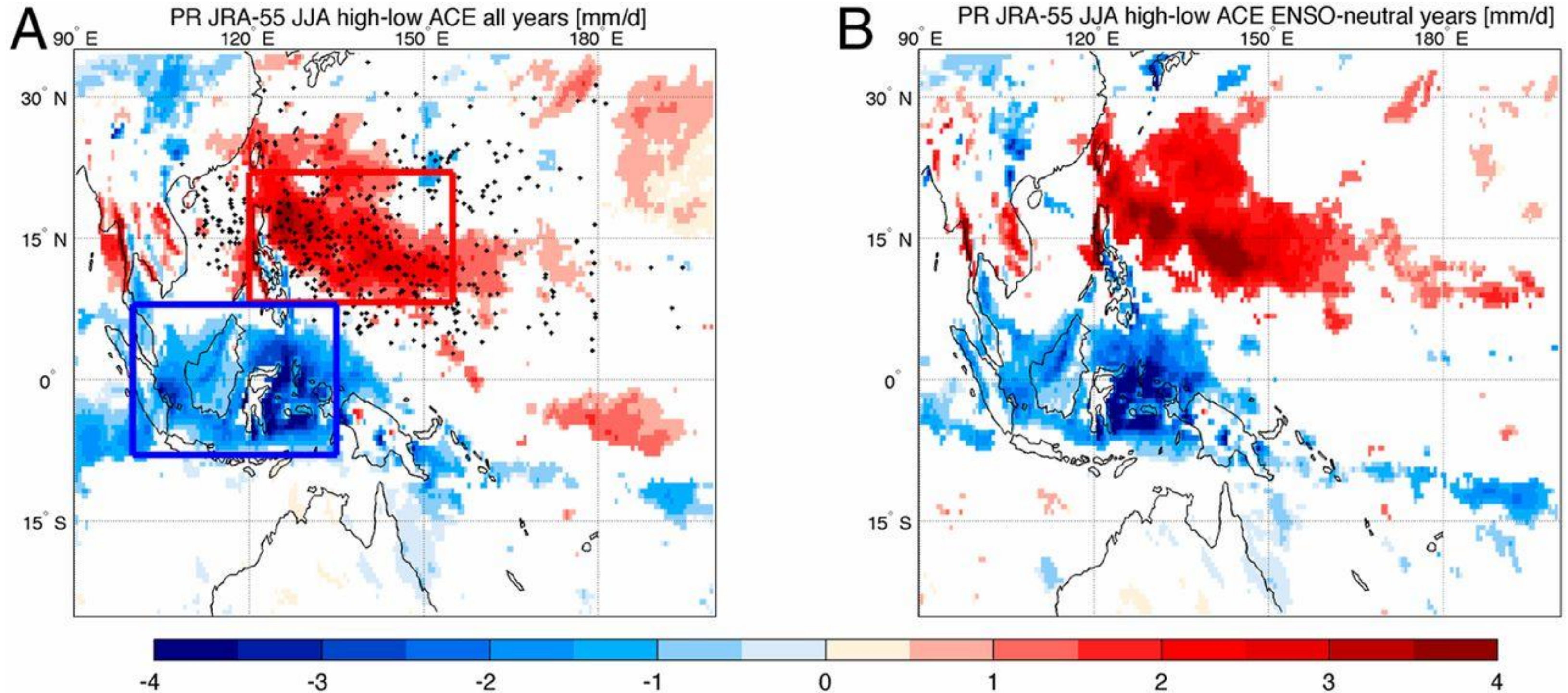
# Impact of Resolution on TC-induced Precipitation



Vanni re et al. (2020),  
under review.



# Drying of the Maritime Continent

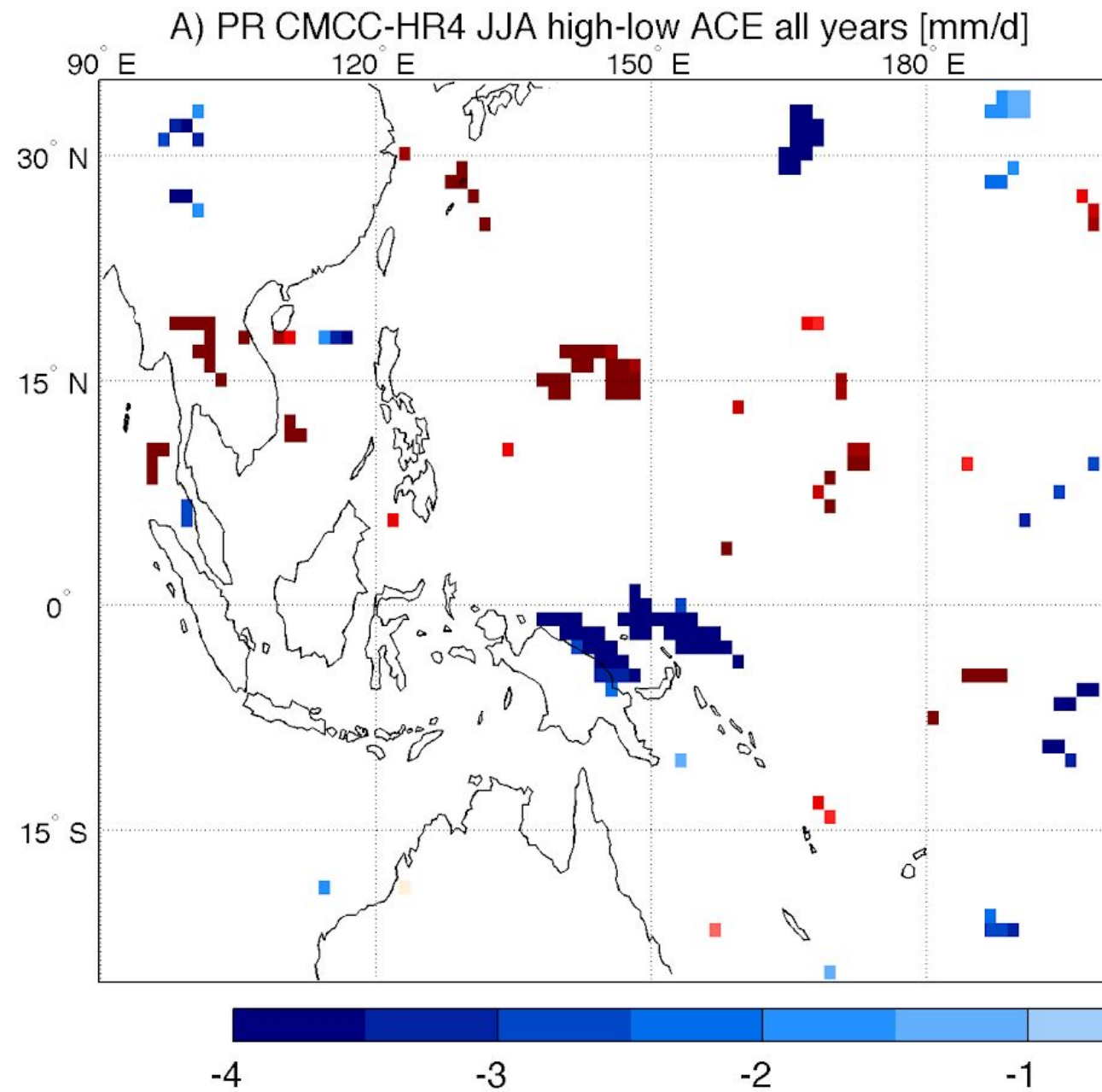


Scoccimarro et al. (2020)

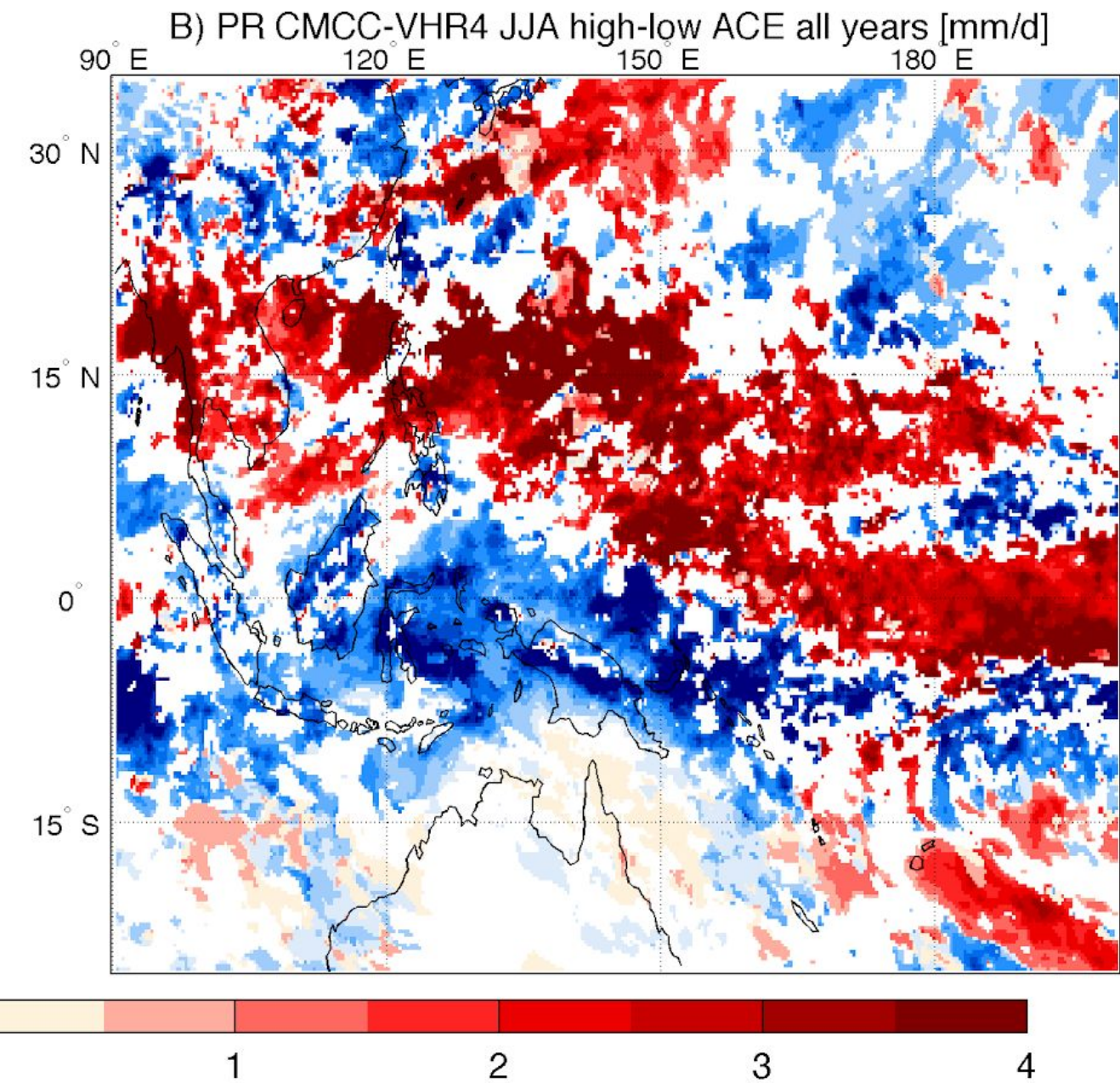


# Drying of the Maritime Continent

LR



HR

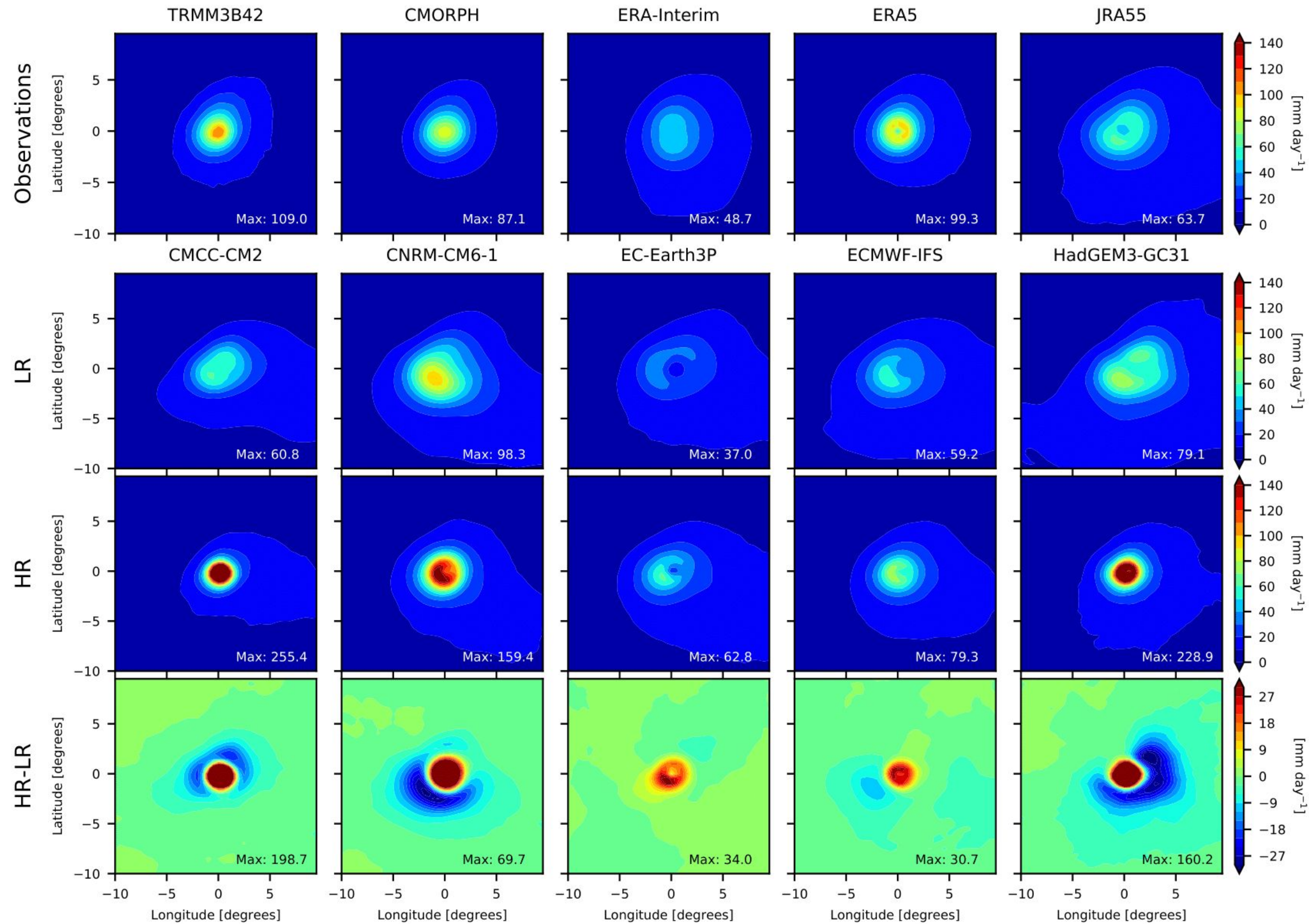


Scoccimarro et al. (2020)



# Impact of Resolution on TC-induced Precipitation

Obs



LR

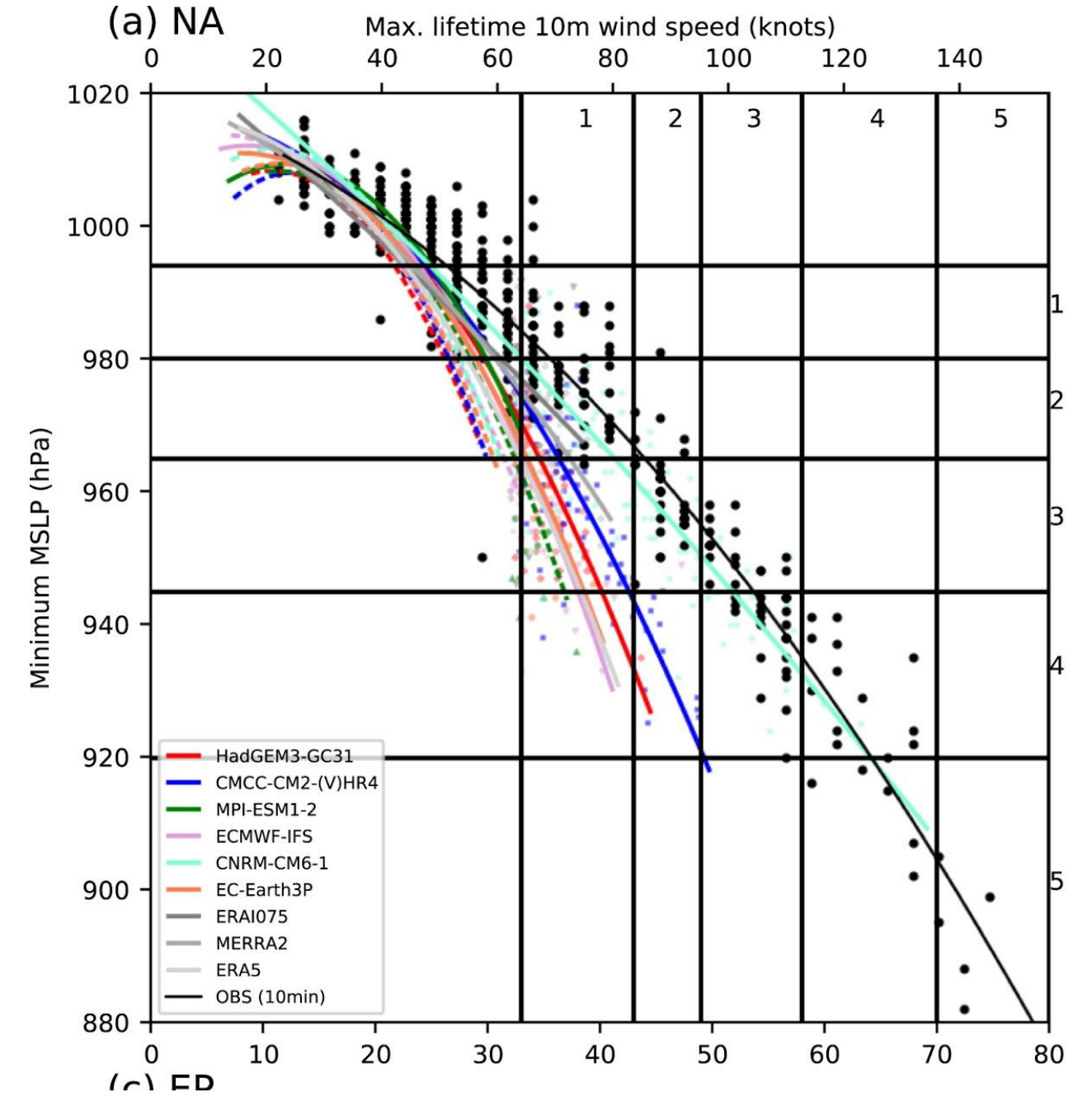
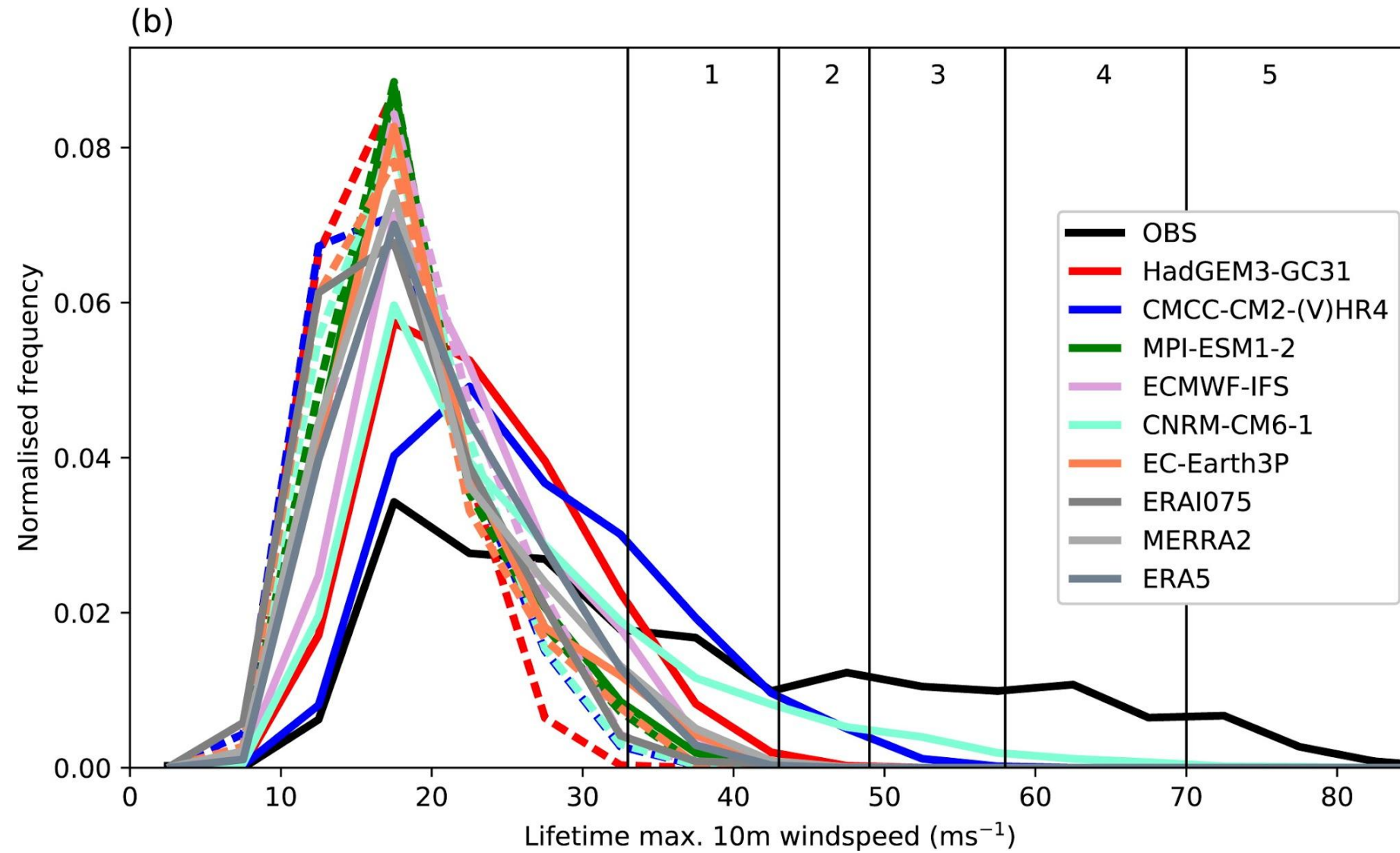
HR

HR-LR

Vannière et al.  
(2020), under  
review



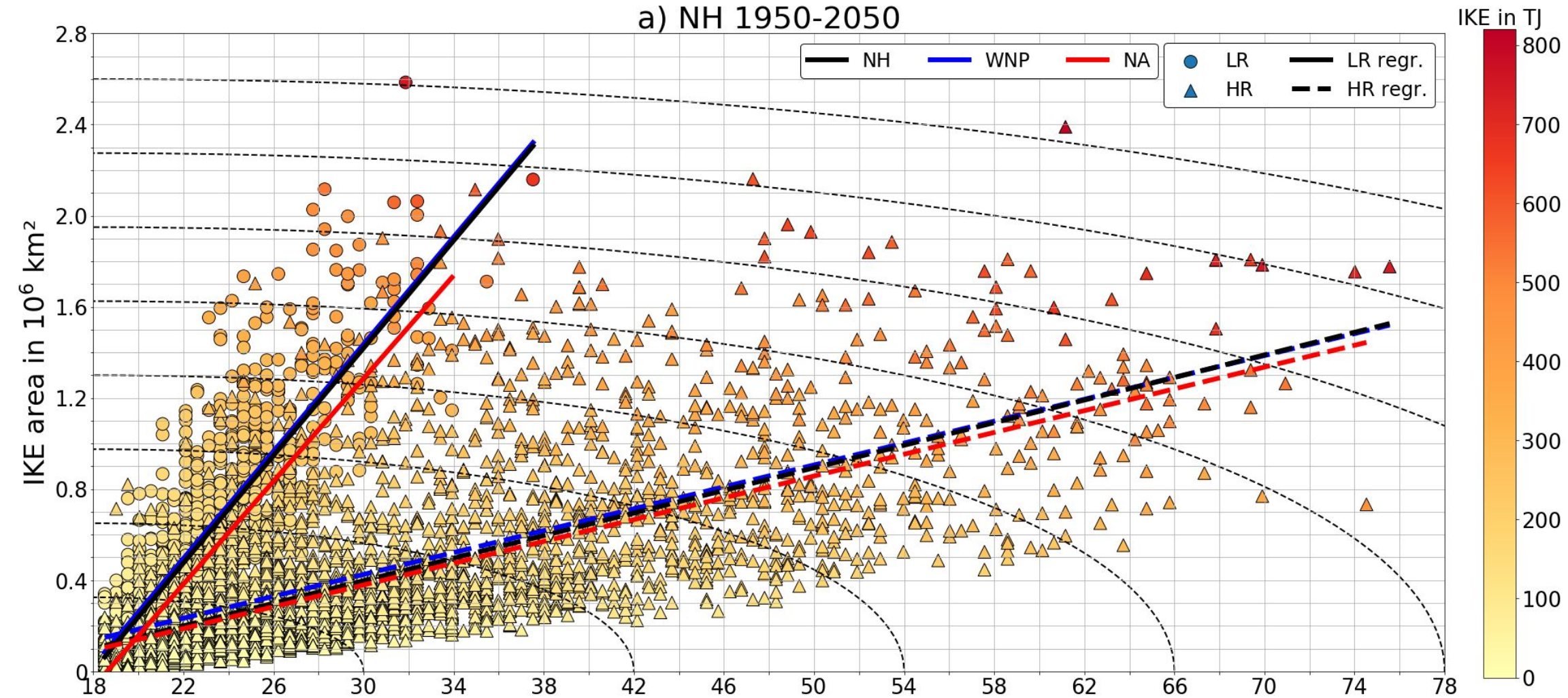
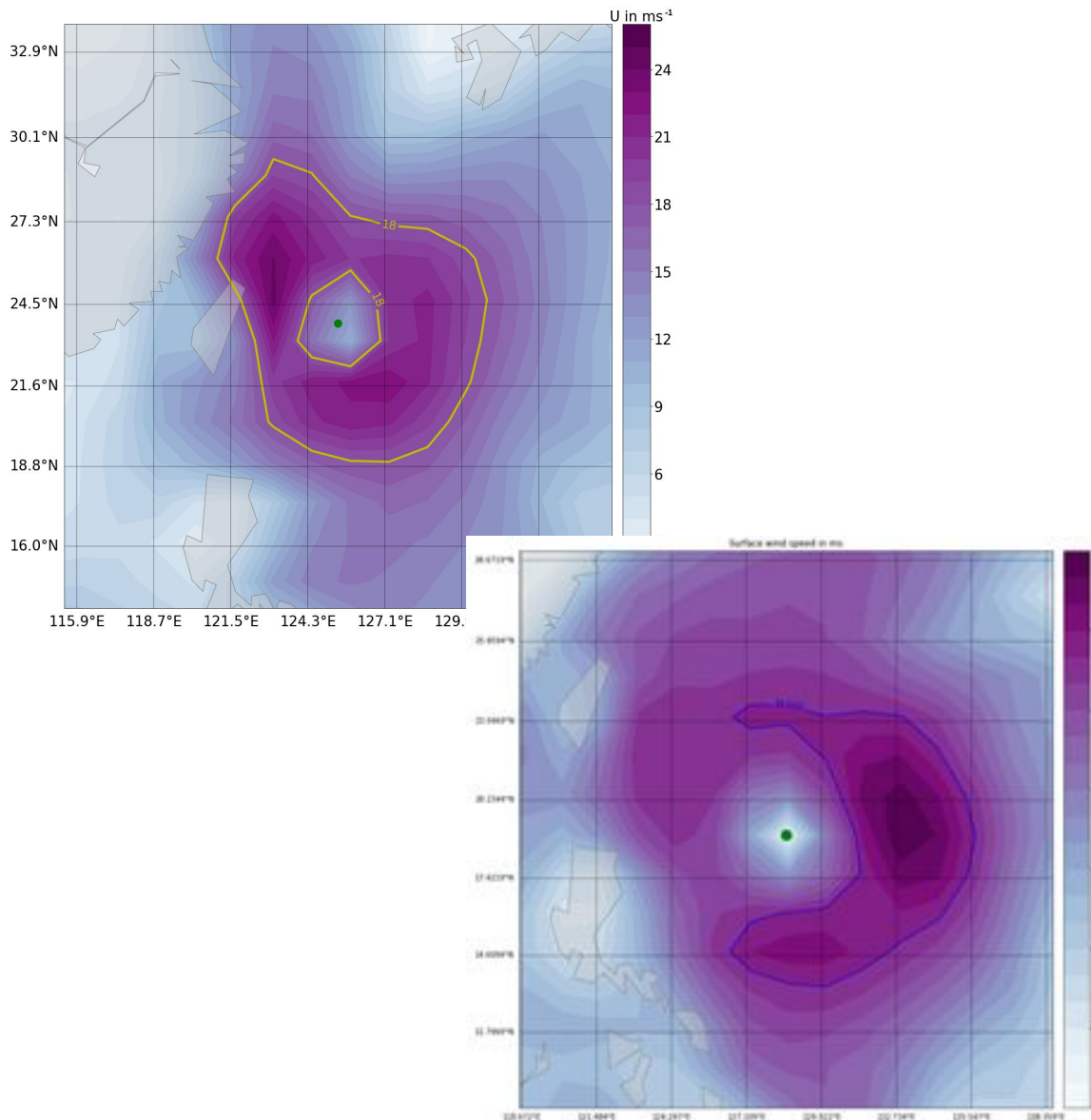
# Impact of Resolution on Intensity



Roberts et al. (2020a)



# Impact of Resolution on Integrated Kinetic Energy



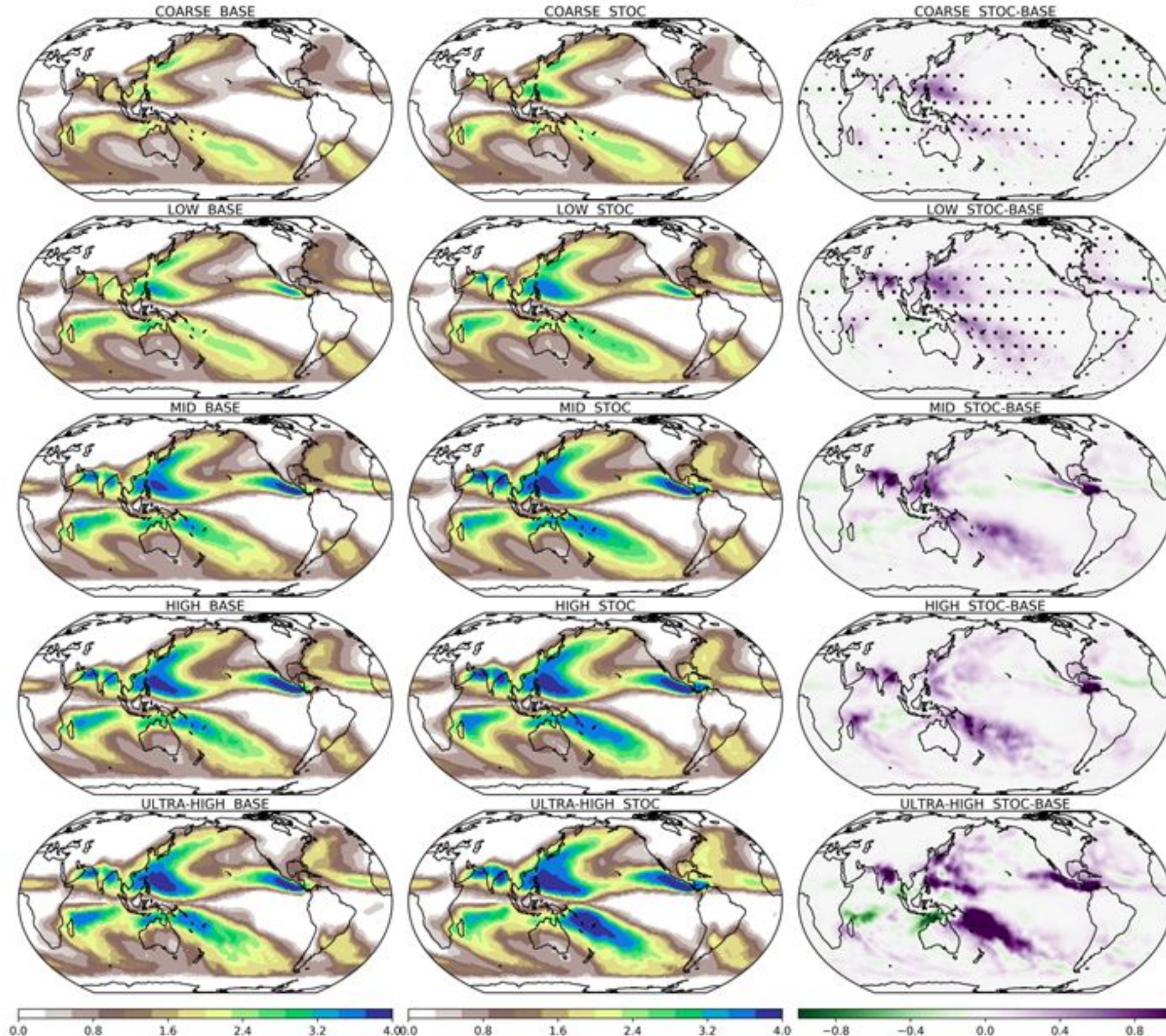
Correlation IKE w/	LR	HR
maximum surface wind speed	0.87	0.82
IKE area	0.99	0.96
minimum MSLP	-0.78	-0.85

Kreussler et al., in prep.



# Impact of Stochastic Physics on TC track density

PRESENT Track Densities: annual climatologies

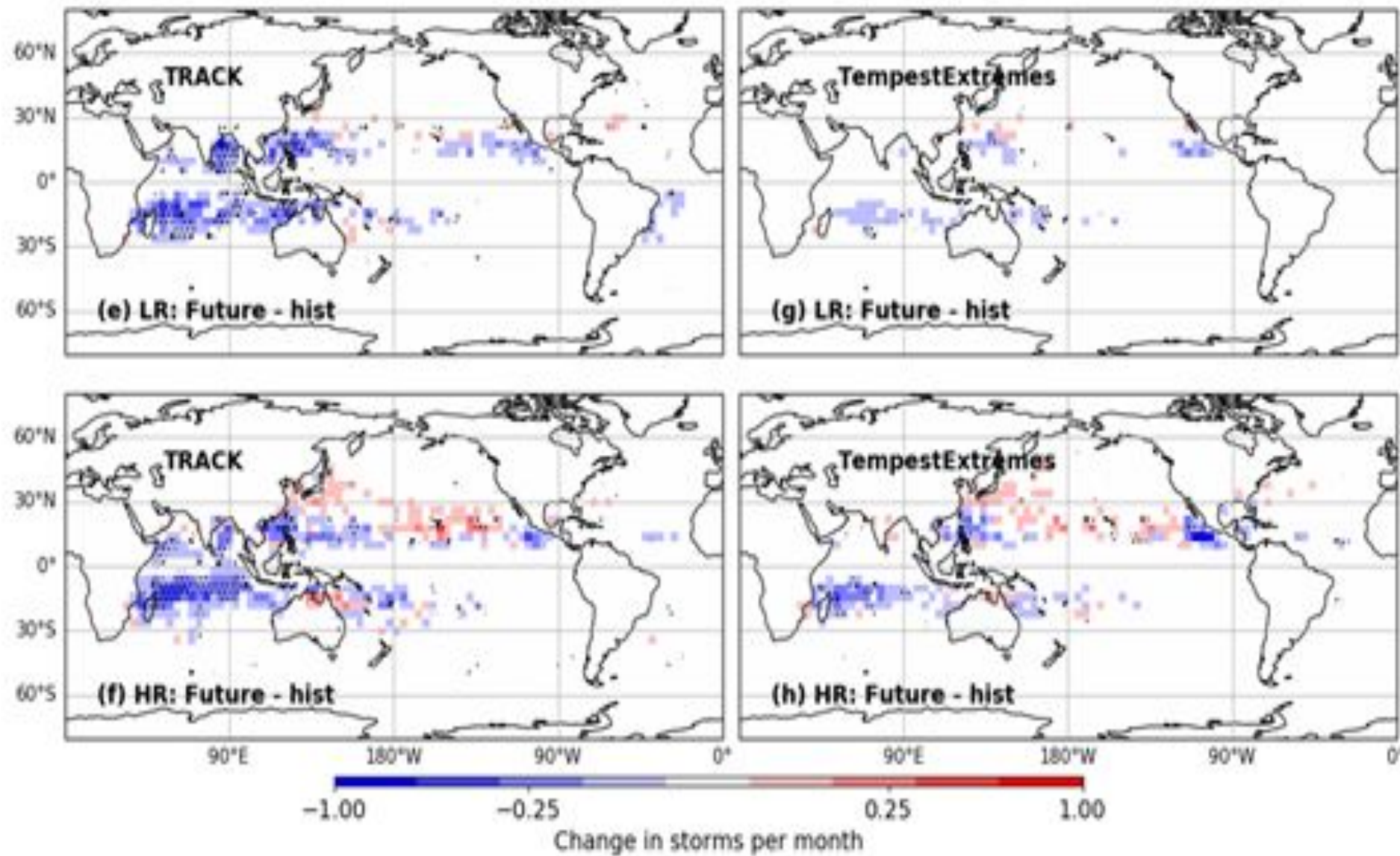


Up to 30%  
increase using SP

Vidale et al., in prep.

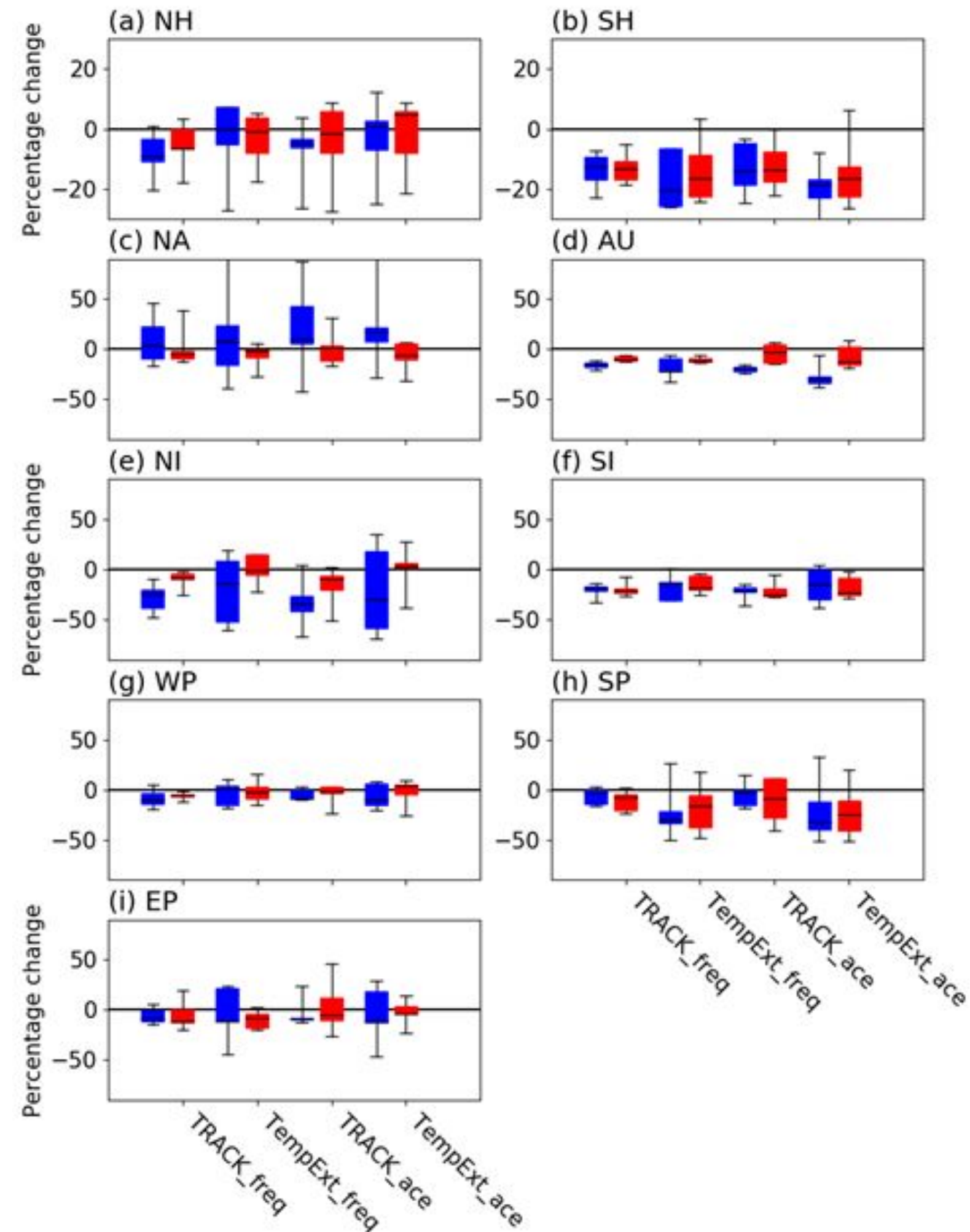


# Future TC Activity



(2020-2050) - (1950-1980)

Roberts et al. (2020b), under review.





# References

Roberts, MJ, (2020) Projected Future Changes in Tropical Cyclones using the CMIP6 HighResMIP Multi-model Ensemble. Geophys Res Lett. Under review.

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Vanniere, B, (2020) The moisture budget of tropical cyclones: large scale environmental constraints and sensitivity to model horizontal resolution. J Climate. Under review.

Vidale et al. Impact of stochastic physics and model resolution on the simulation of tropical cyclones in Climate GCMs. In prep.



Thank you