

On the role of internal atmospheric processes in equatorial Atlantic variability

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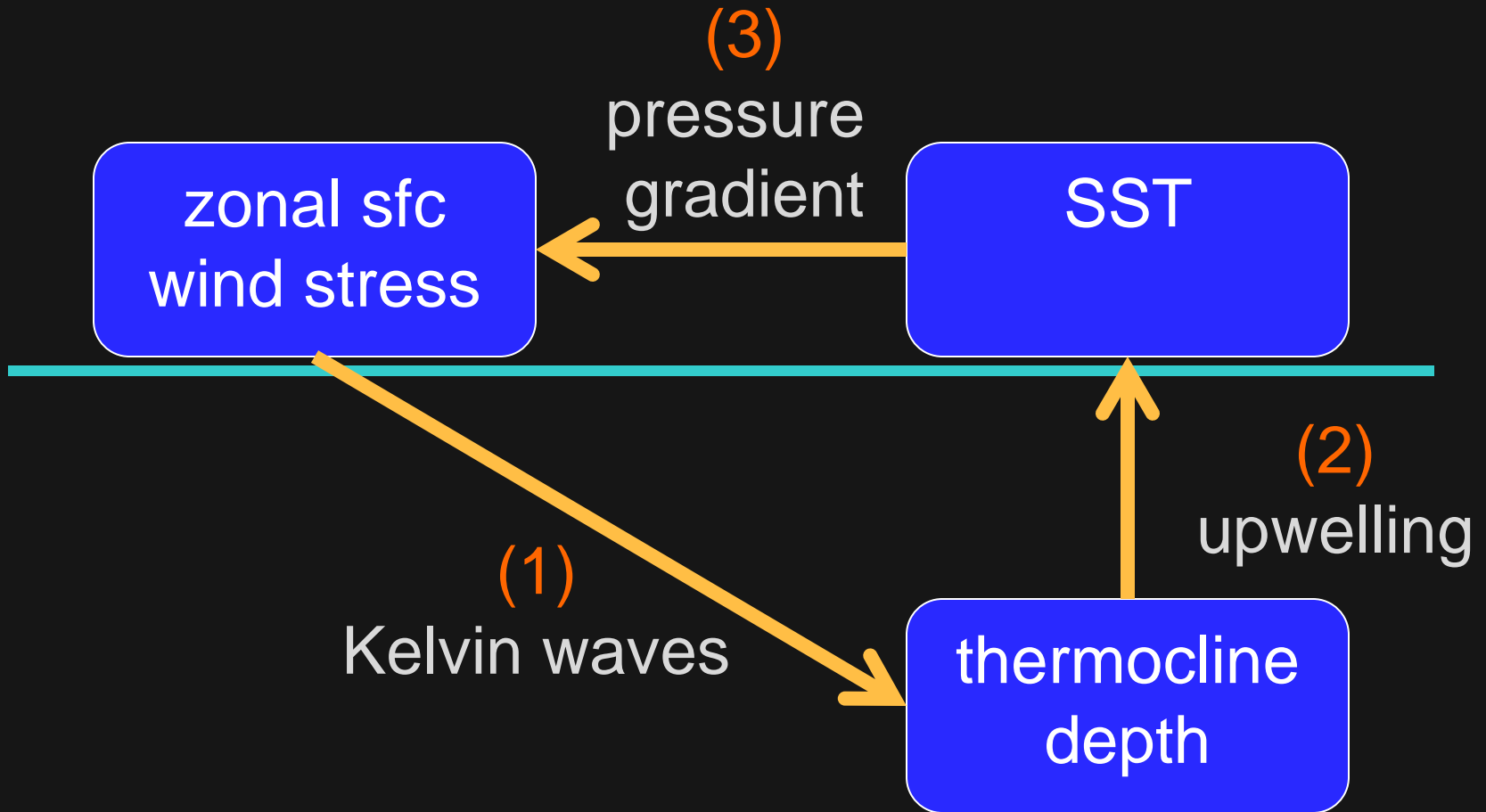
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Equatorial Ocean Variability

- three major modes: ENSO, IOD, Atlantic zonal mode
- coupled air-sea feedbacks thought to be crucial
→ Bjerknes feedback
- equatorial zonal winds respond to equatorial SST anomalies and reinforce them
- importance of such feedbacks has been debated (Moore and Kleeman 1999, Clement et al. 2011)

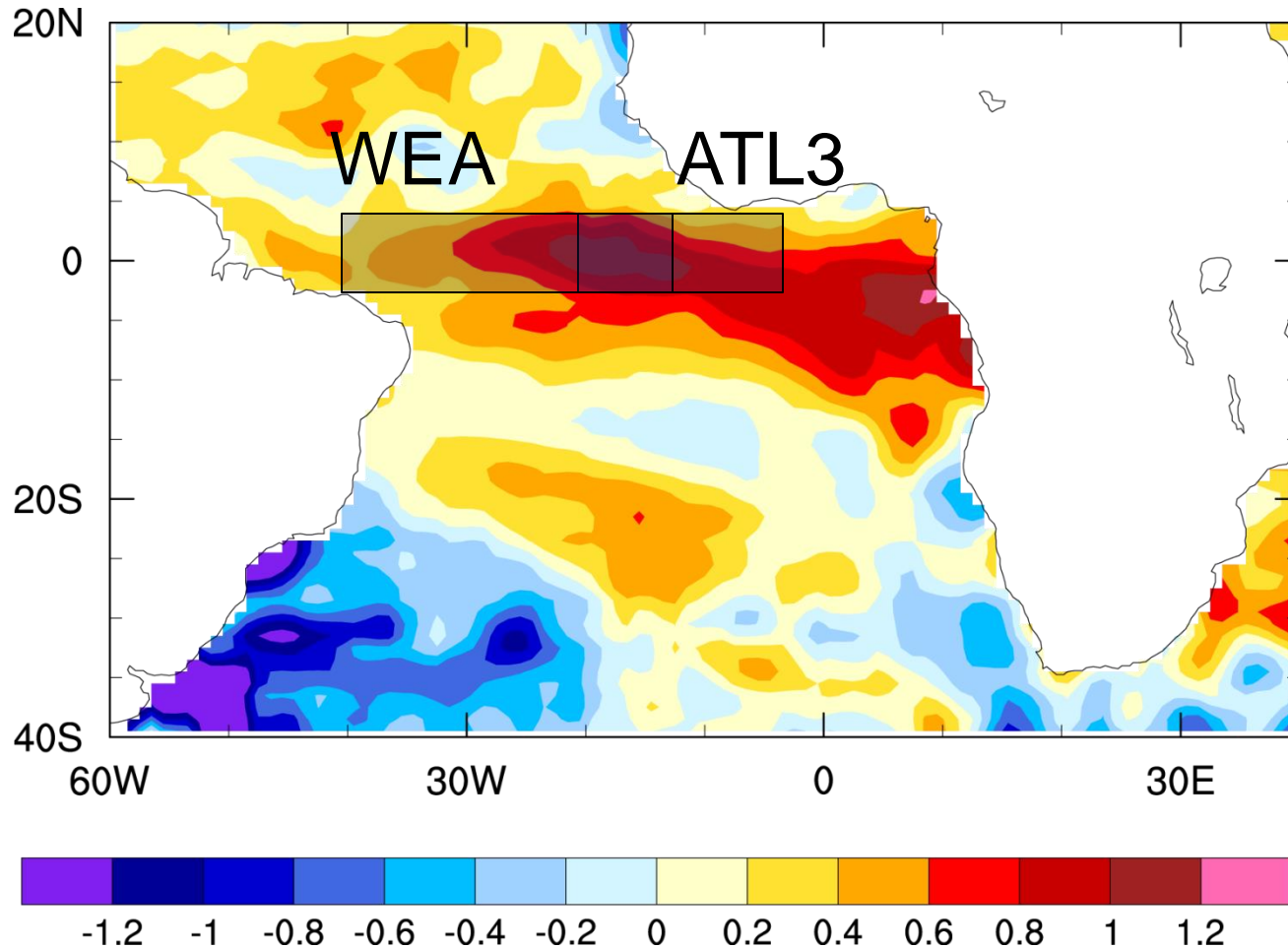
Bjerknes Feedback



1) The Atlantic basin

Example of an **Atlantic Niño**: 1988 event

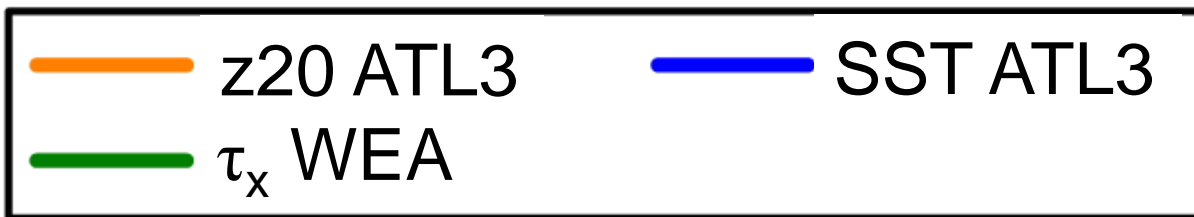
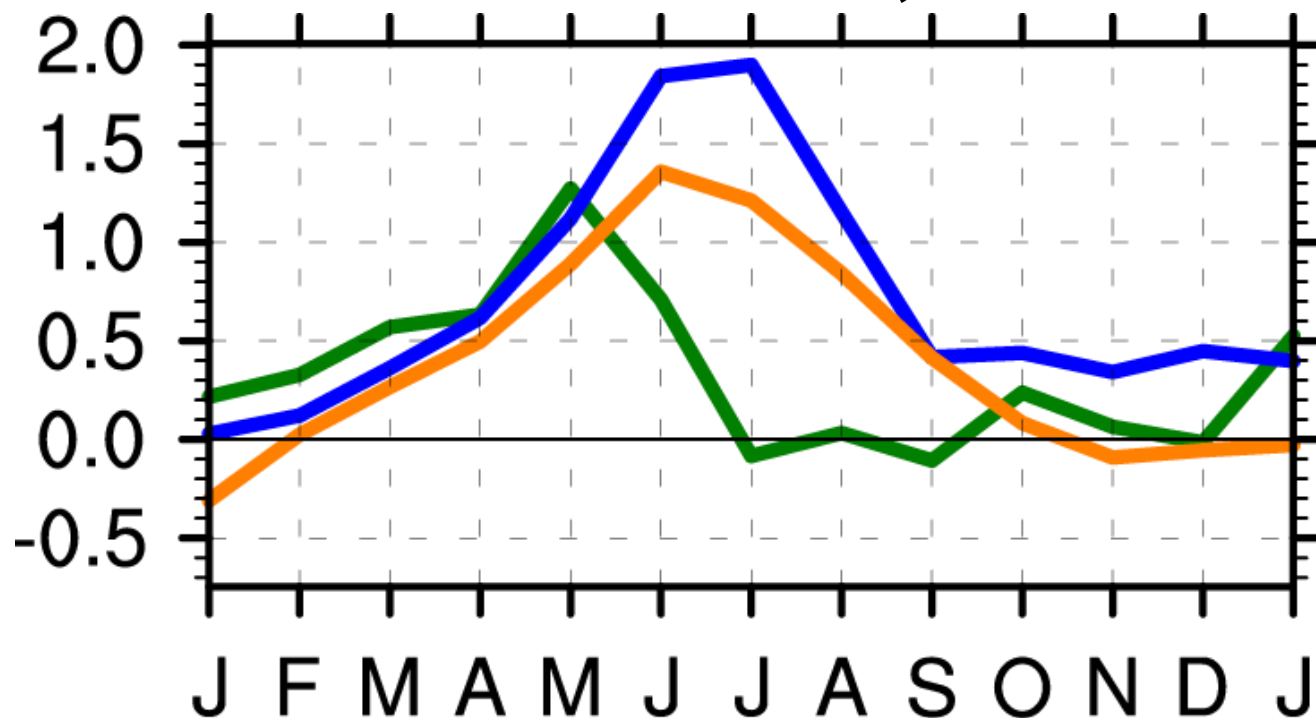
JJA SST anomalies [K]; dataset: OISST



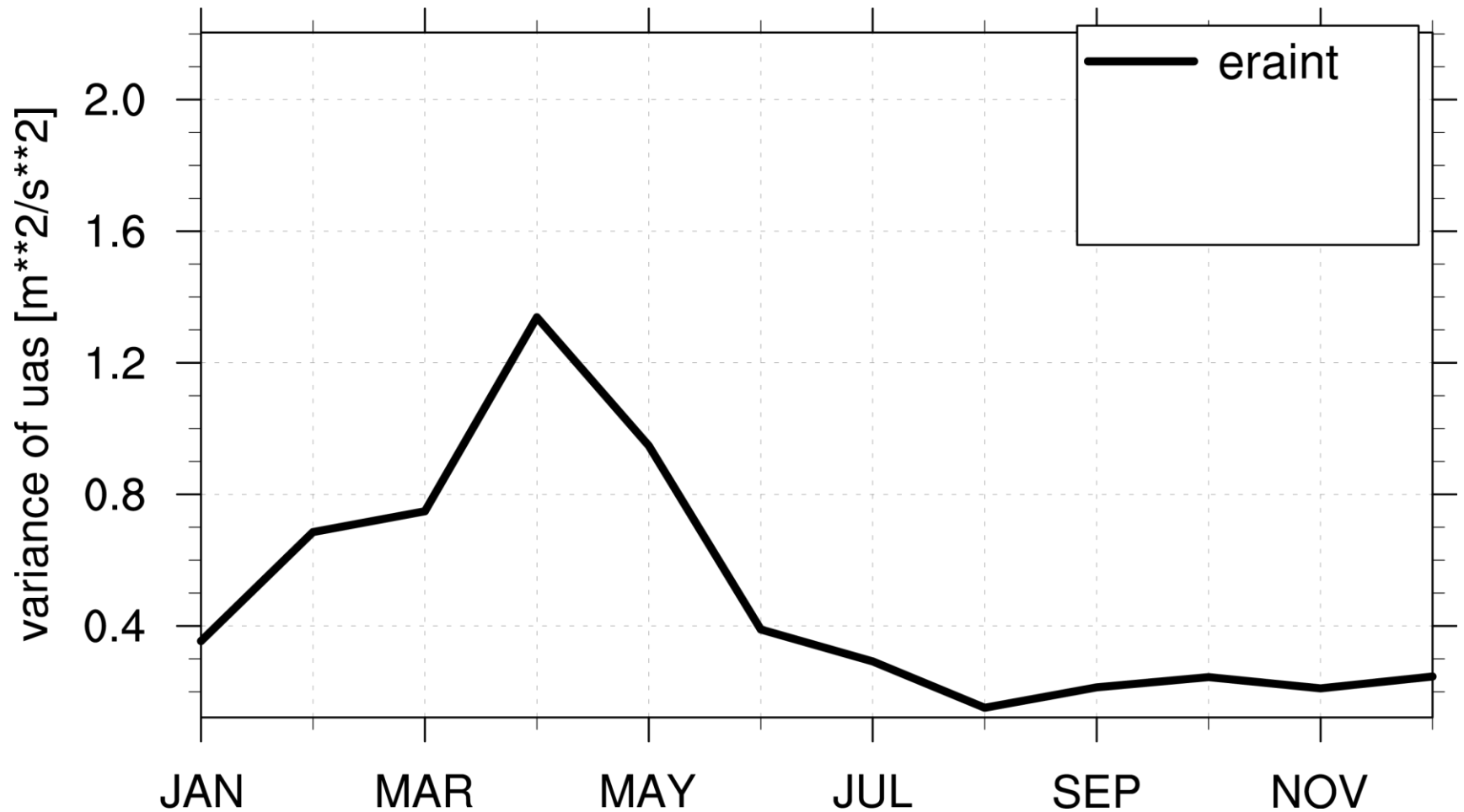
Composite evolution of Atlantic Niños

units: standard deviations

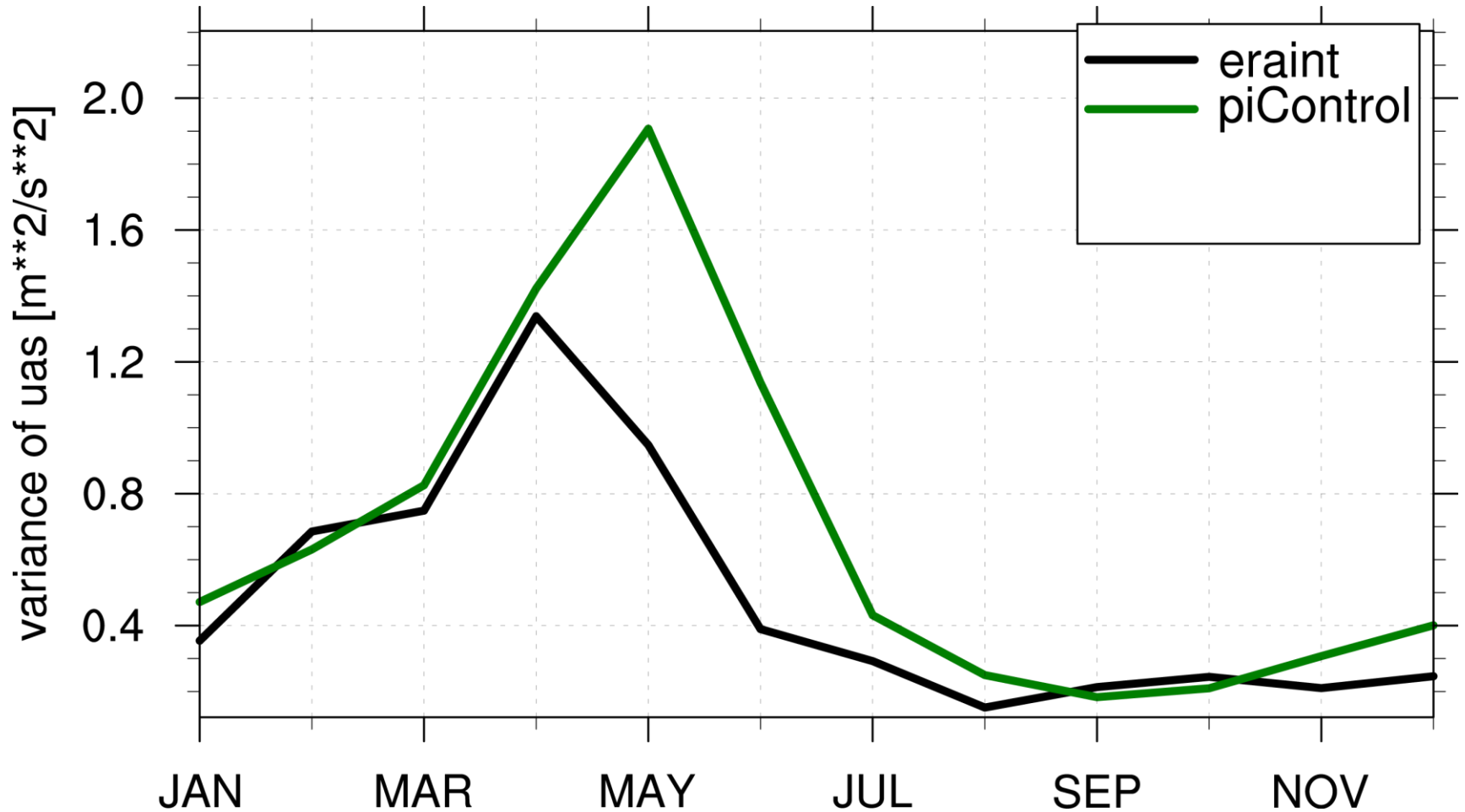
SODA 1958-2006; 7 events



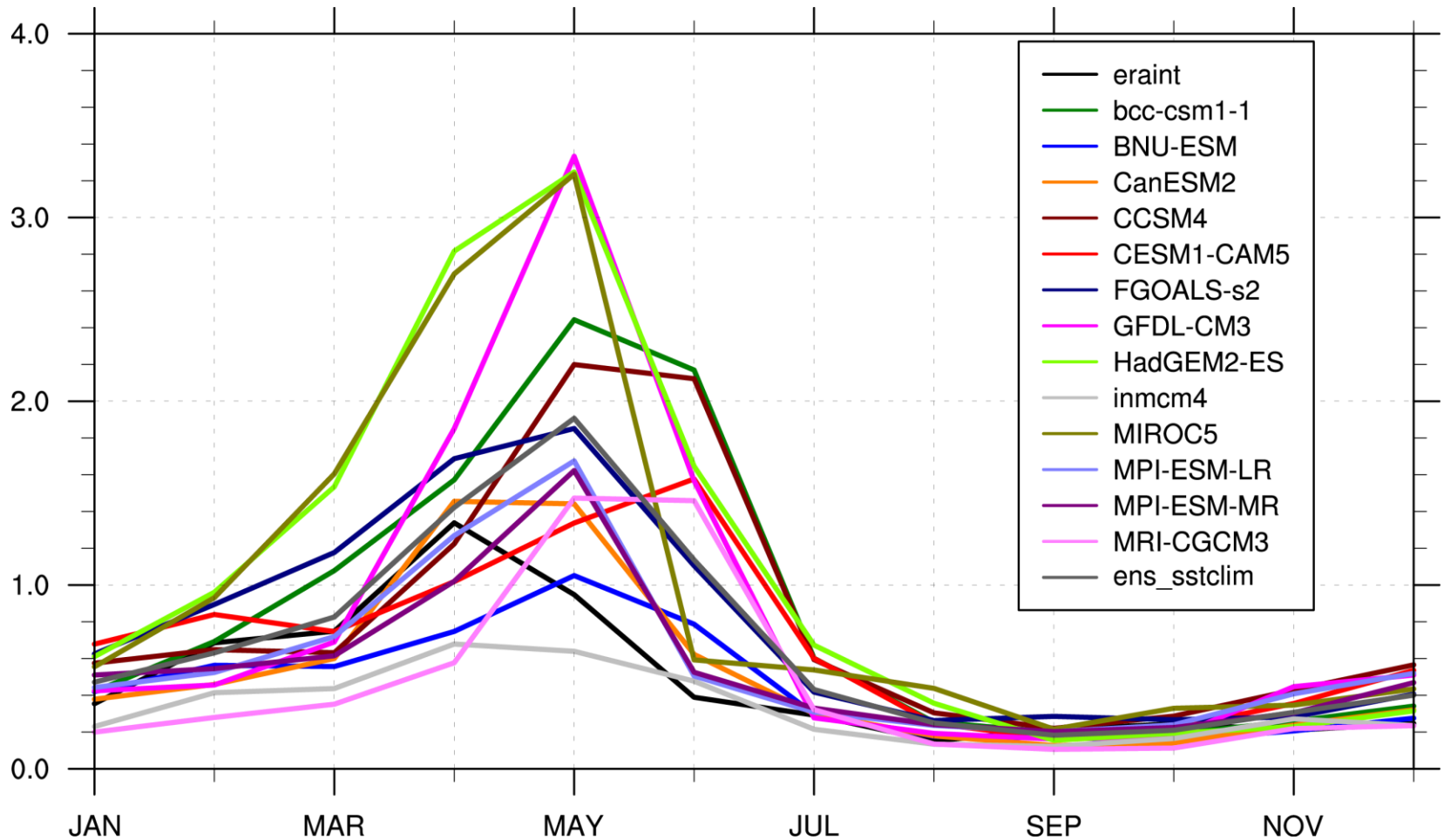
Variance of equatorial Atlantic u_{sfc}



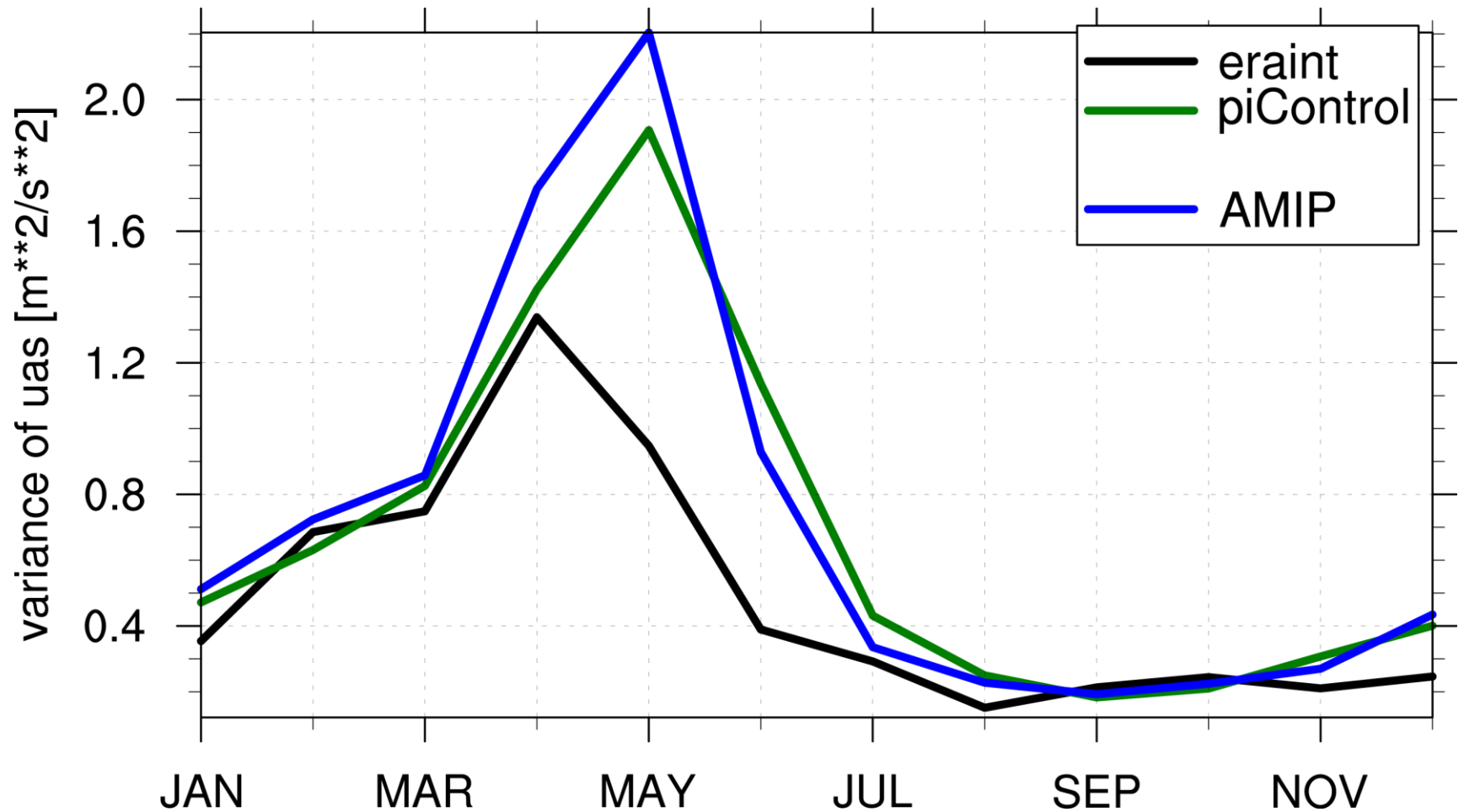
Variance of equatorial Atlantic u_{sfc}



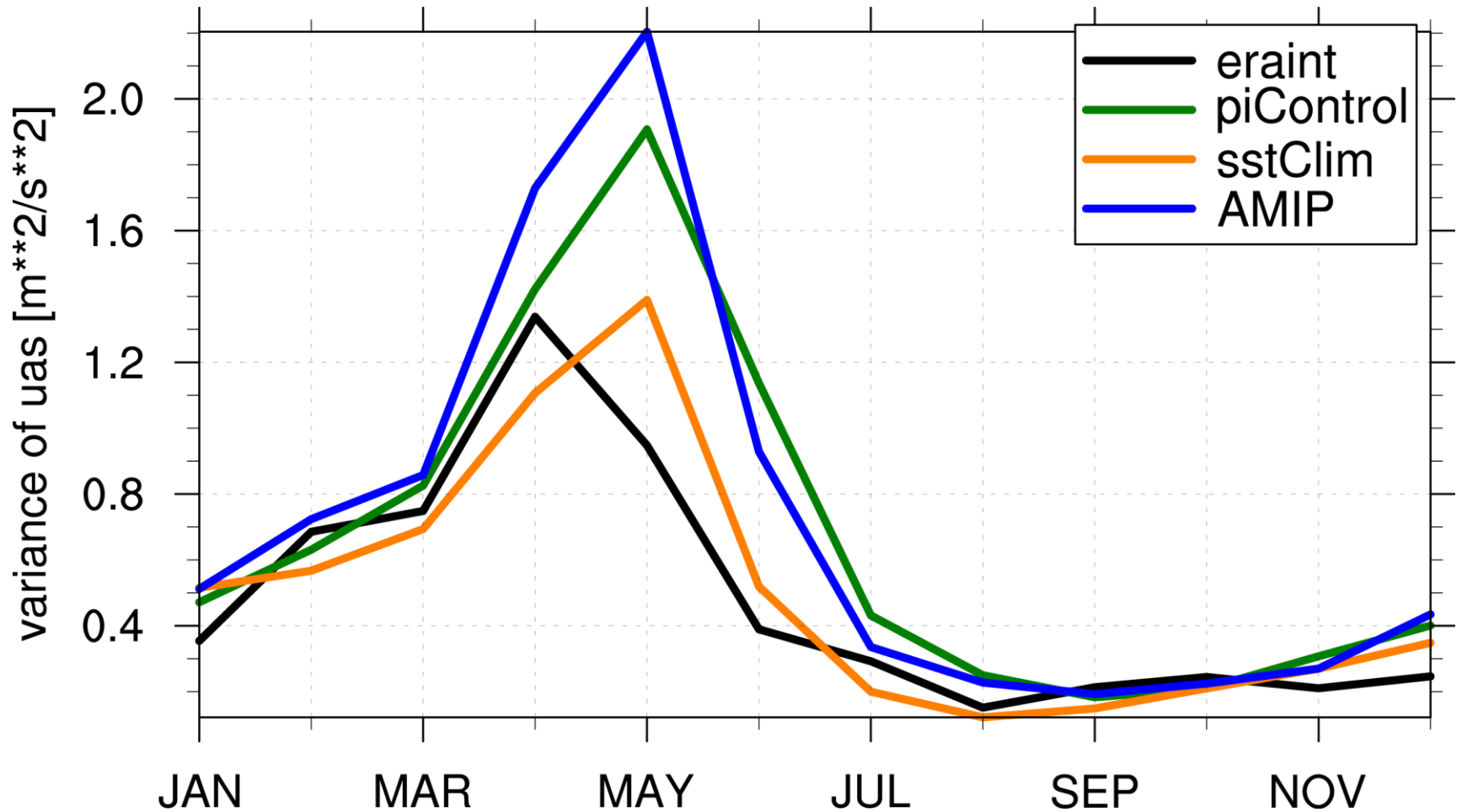
Variance for all ensemble members



Variance of equatorial Atlantic u_{sfc}

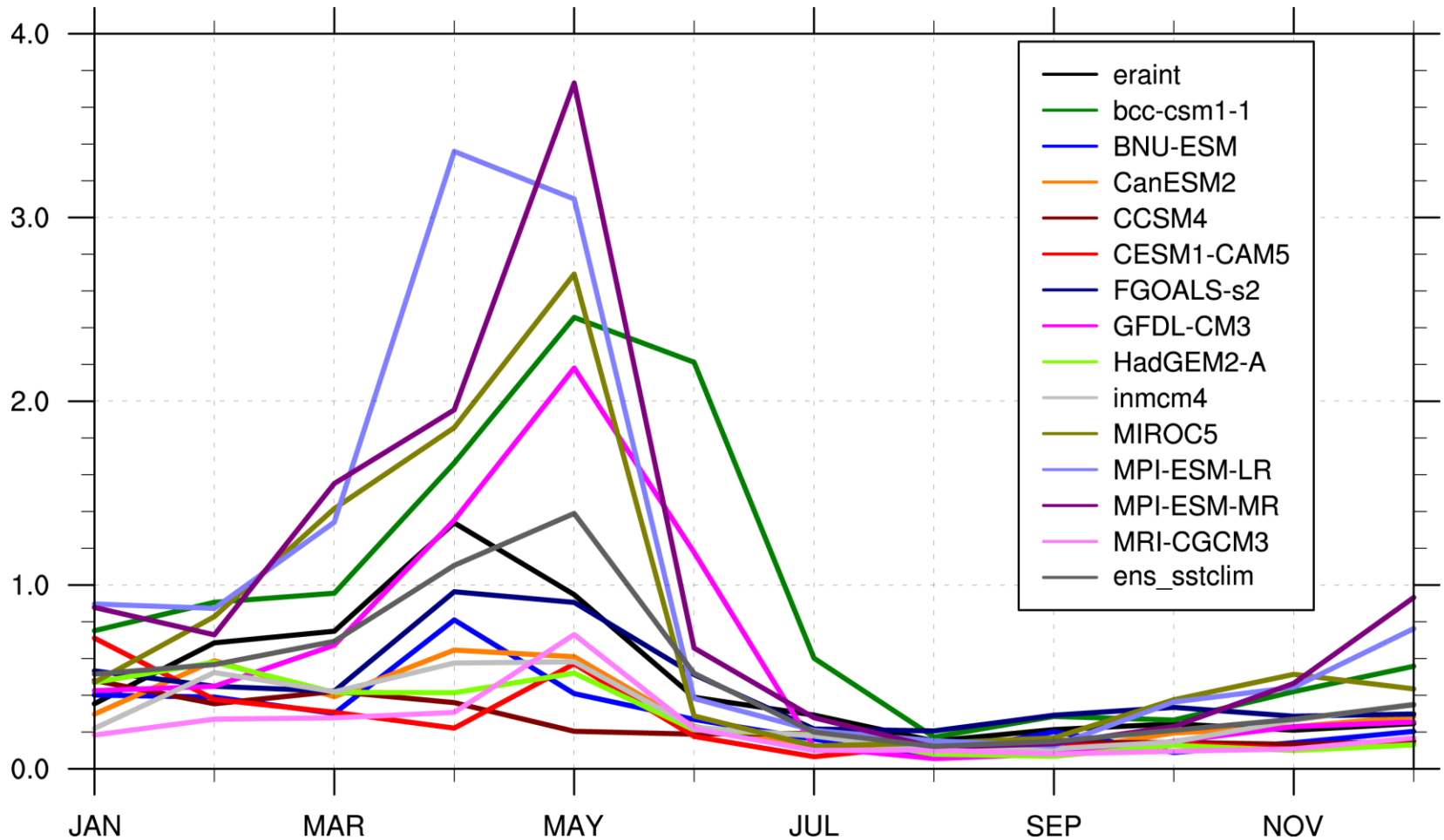


Variance of equatorial Atlantic u_{sfc}

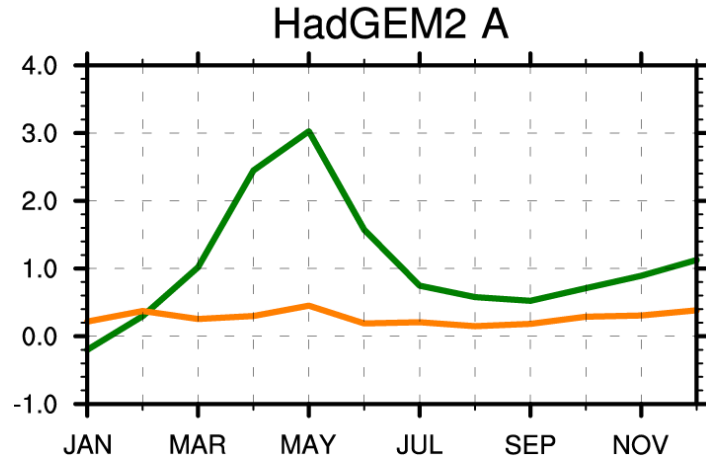
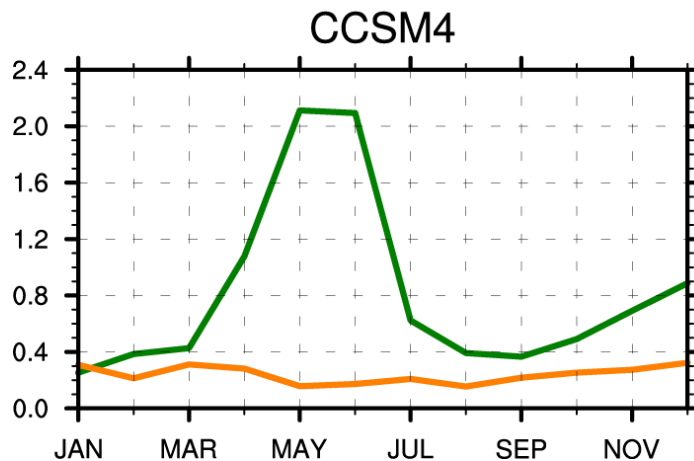
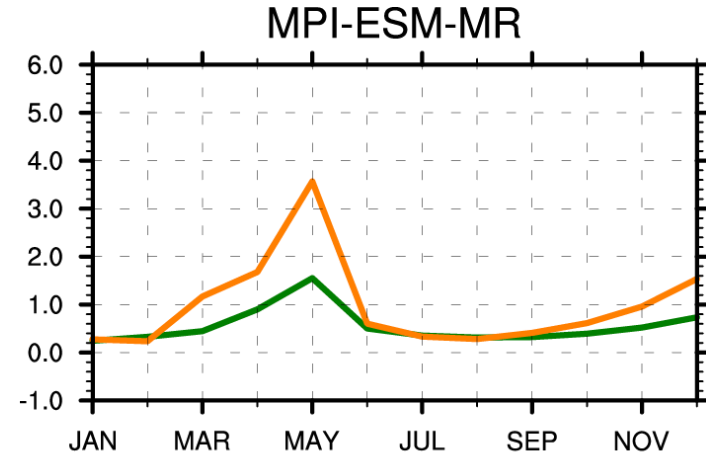
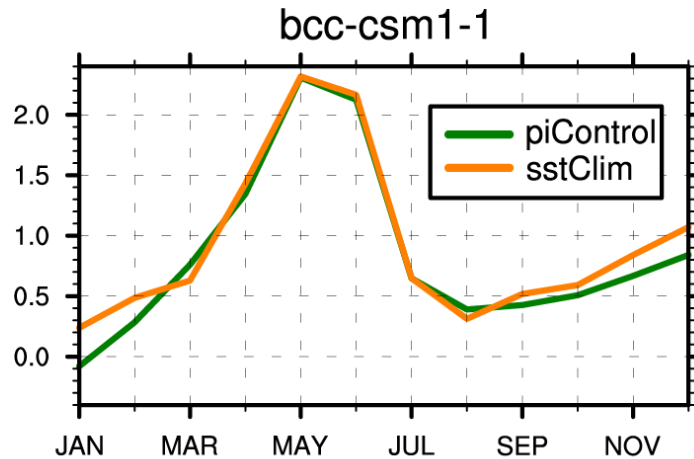


Richter et al. 2014b, CD

Spread of sstClim



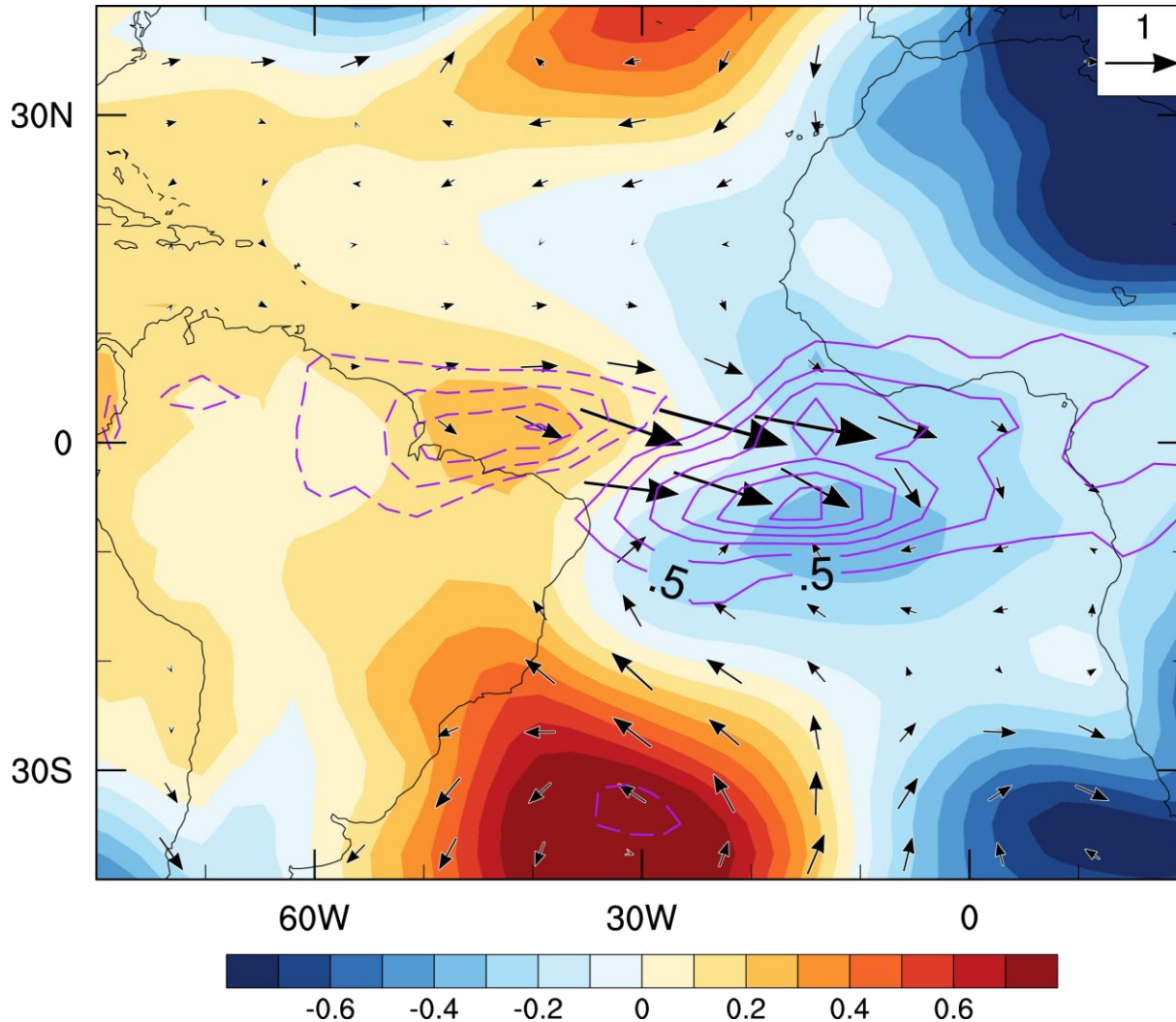
Wind response to SSTA varies greatly across models



SLP (shd), sfc wind (arr), and precip (cnt)

composited on 2 stddev of u_x

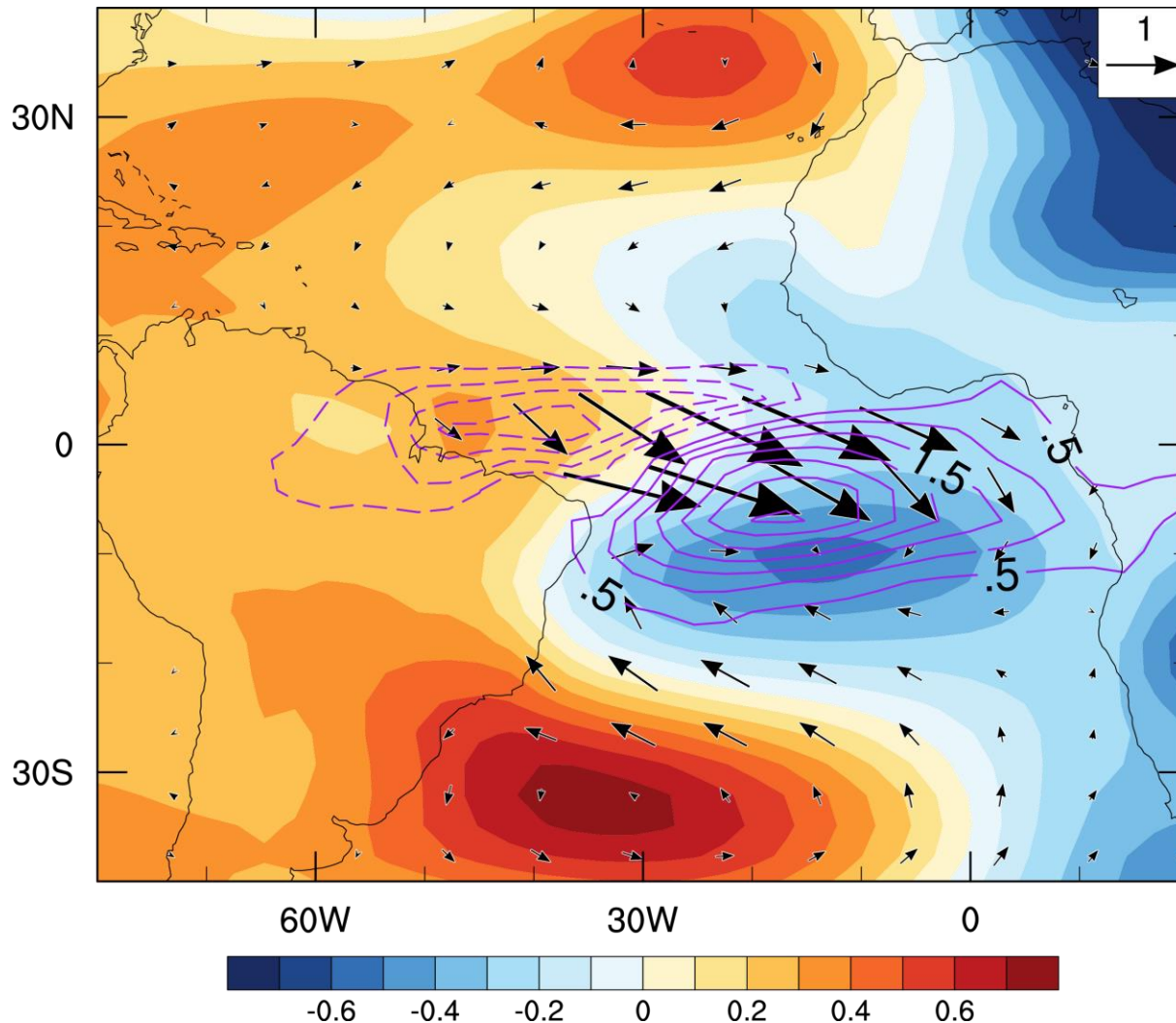
sstClim Ensemble



SLP (shd), sfc wind (arr), and precip (cnt)

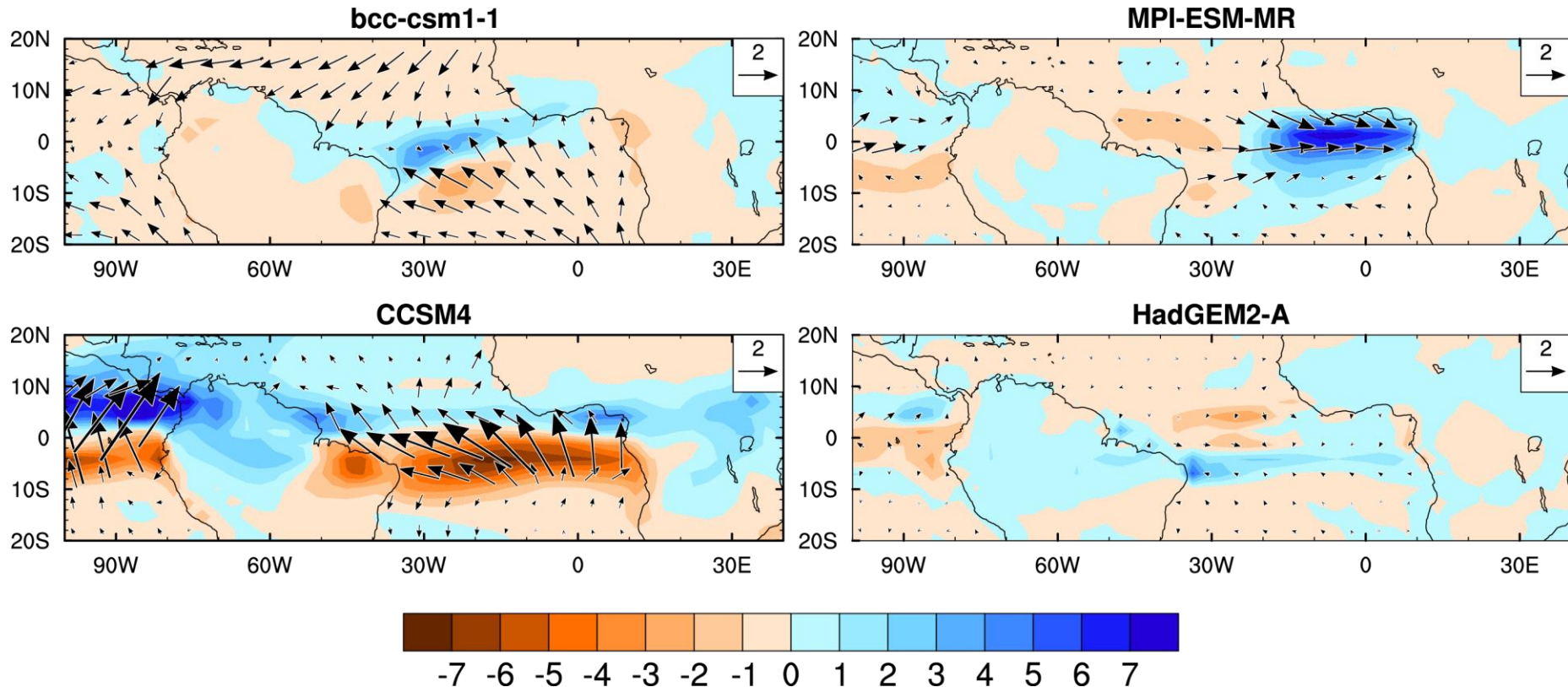
composited on 2 stddev of u_x

piControl Ensemble



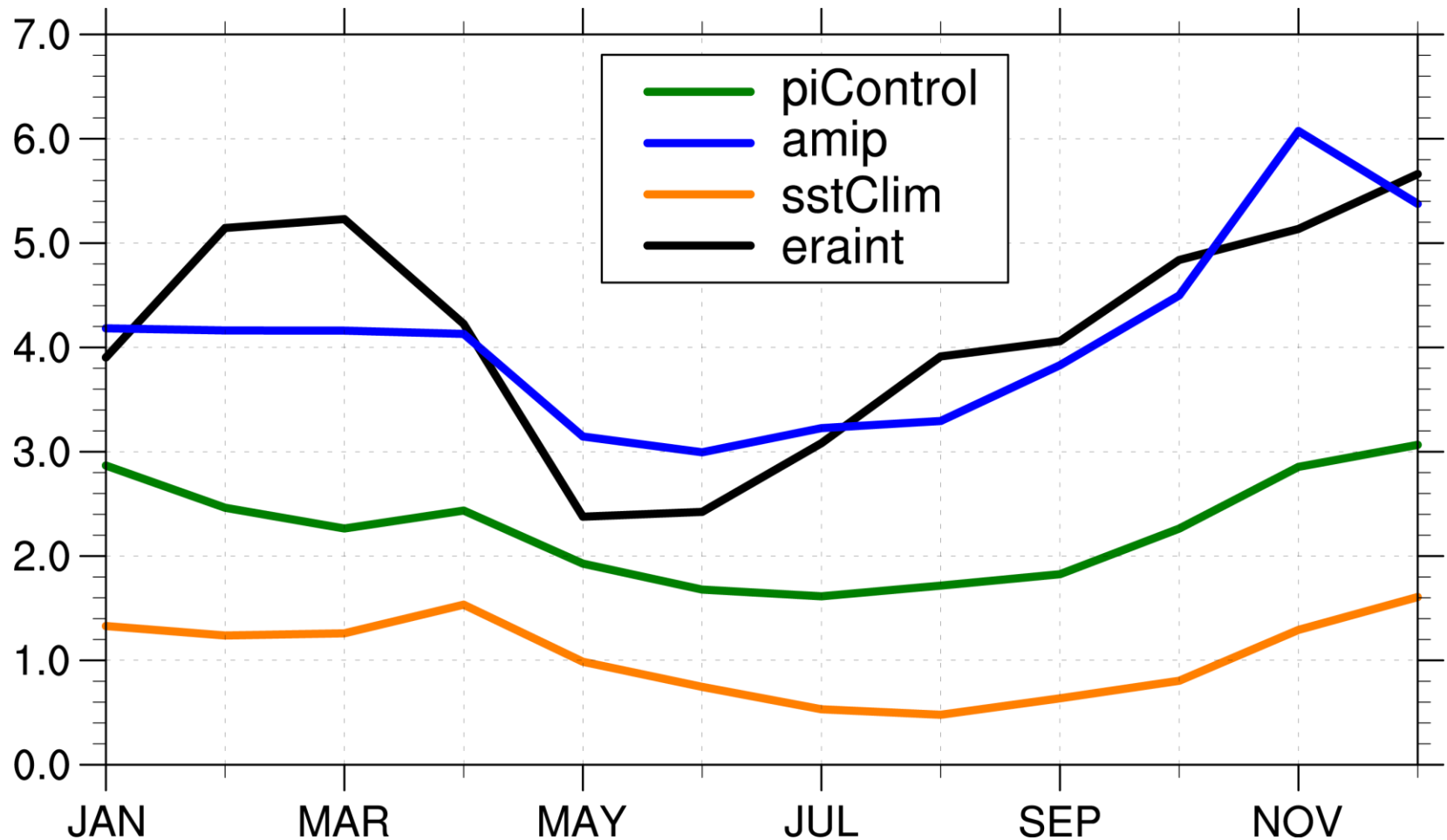
Impact on mean state

precip (shd; mm/d) and sfc wind (vectors; m/s)



2) A quick look at the Pacific

Variance of u_{sfc} in eq. western Pacific (140E-180, 5S-5N)



Conclusions

- zonal wind variability over equatorial Atlantic to some extent independent of underlying SST
- coupled feedbacks play limited role in zonal mode of variability
- MAM patterns of equatorial Atlantic variability very similar with or without SSTA (southward shift of Atlantic ITCZ, westward shift of South Atlantic high, Pacific influences)
- Pacific shows larger sensitivity of zonal wind to SSTA

Caveats

- large spread among GCMs
- GCMs appear to overestimate equatorial Atlantic wind variability relative to reanalysis → role of atmospheric noise overestimated?
- sstClim vs. piControl comparison cannot distinguish local vs. remote SST impacts
- usual caveats for AGCM-only runs apply (infinite heat source etc.)