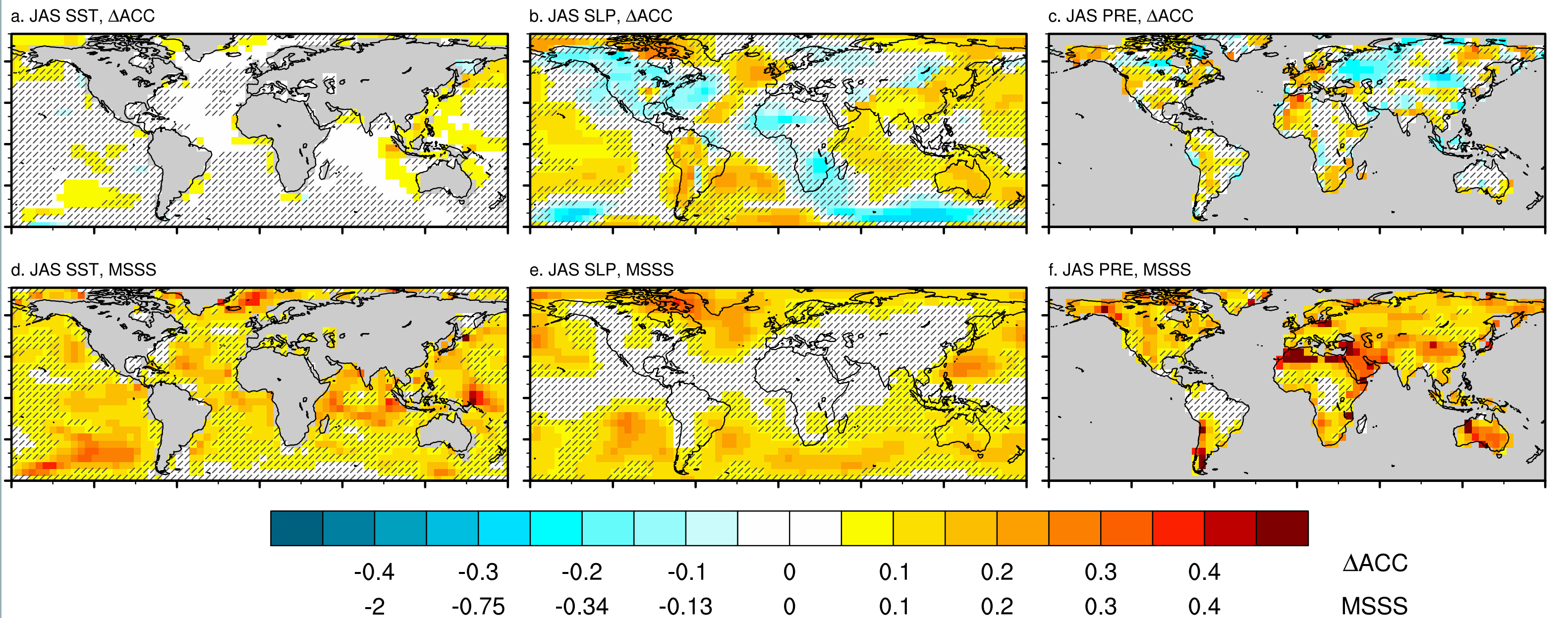
Sensitivity to ensemble size

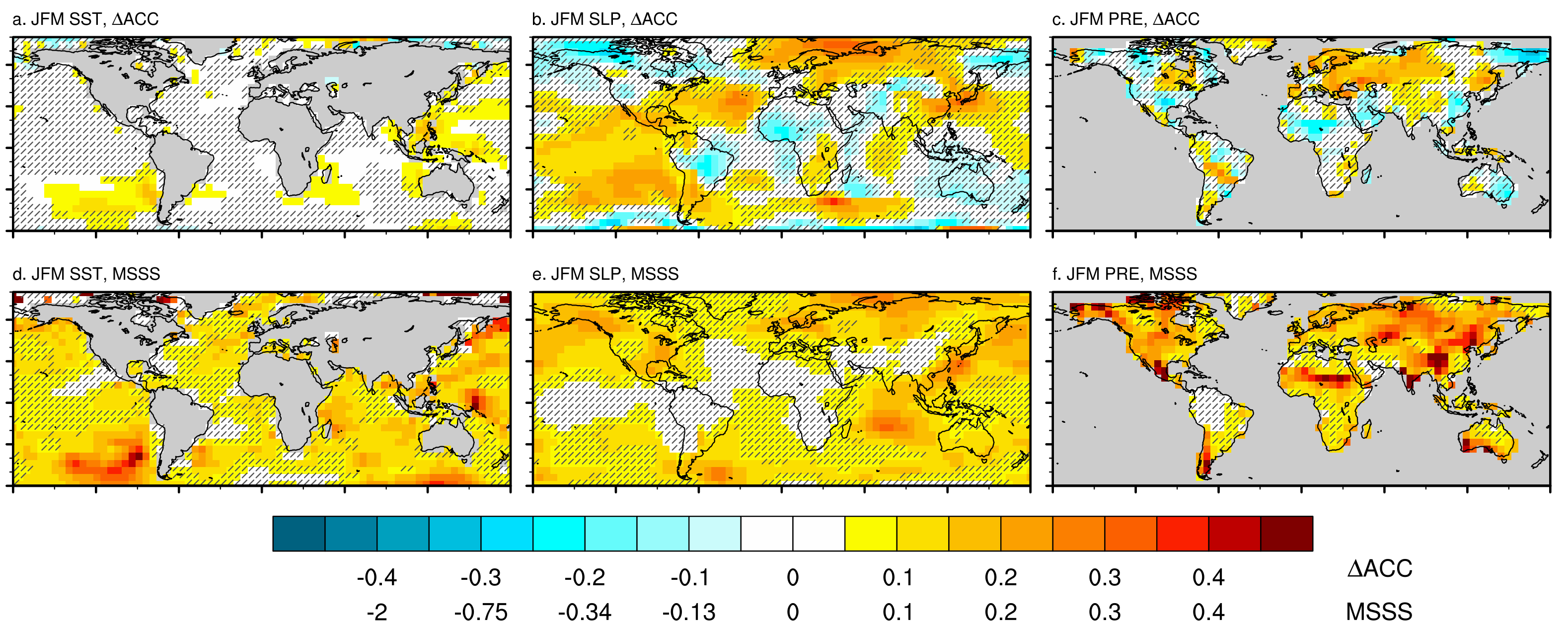
DPLE LY3-7 skill: ENS=40 vs ENS=5

SST SLP PREC

JAS ➔



JFM ➔



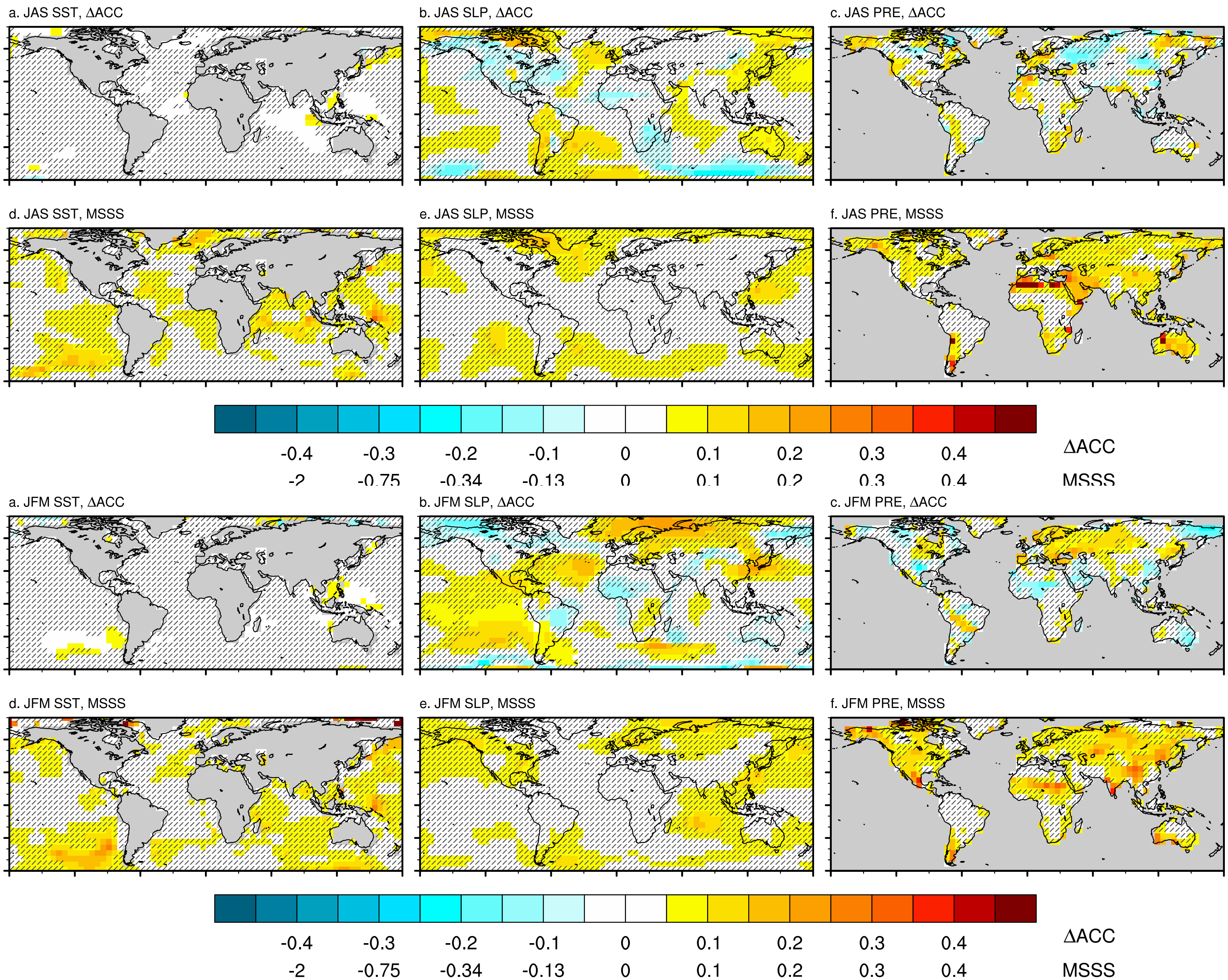
Sensitivity to ensemble size

DPLE LY3-7 skill: ENS=40 vs ENS=10

SST SLP PREC

JAS ➔

JFM ➔

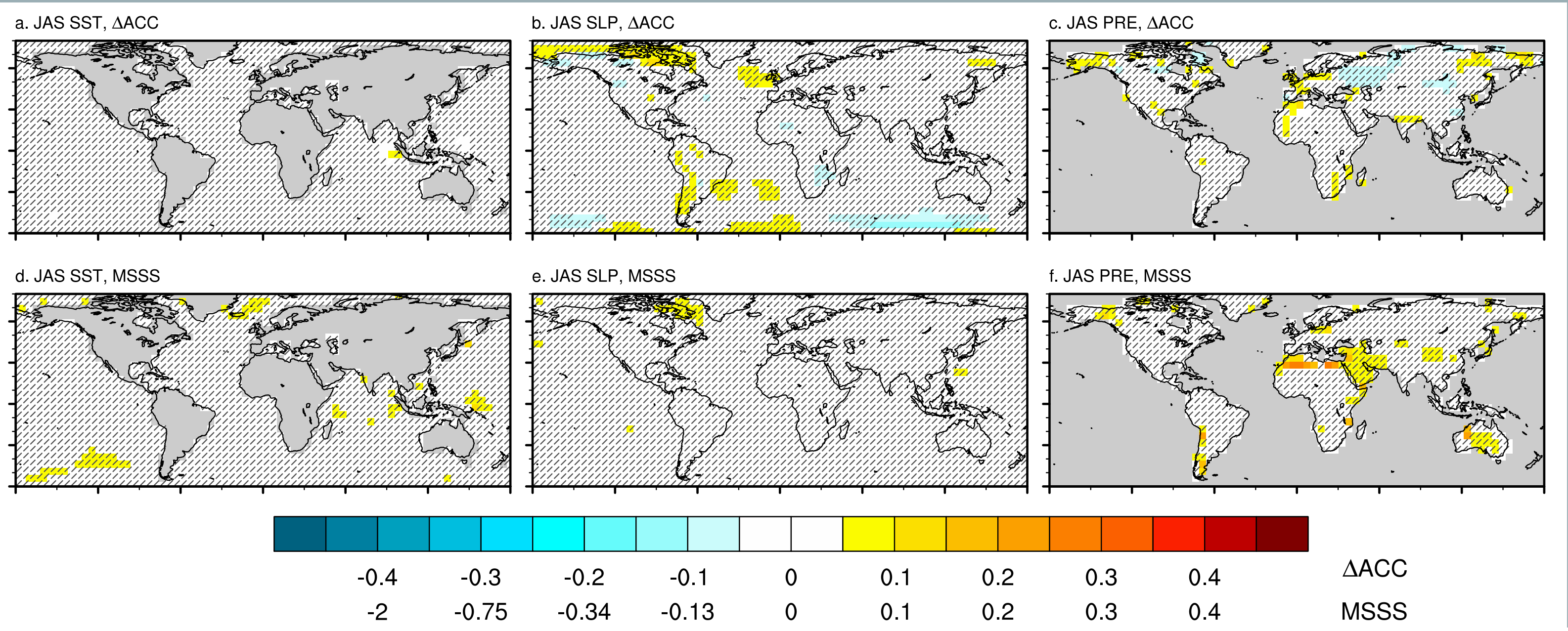


Sensitivity to ensemble size

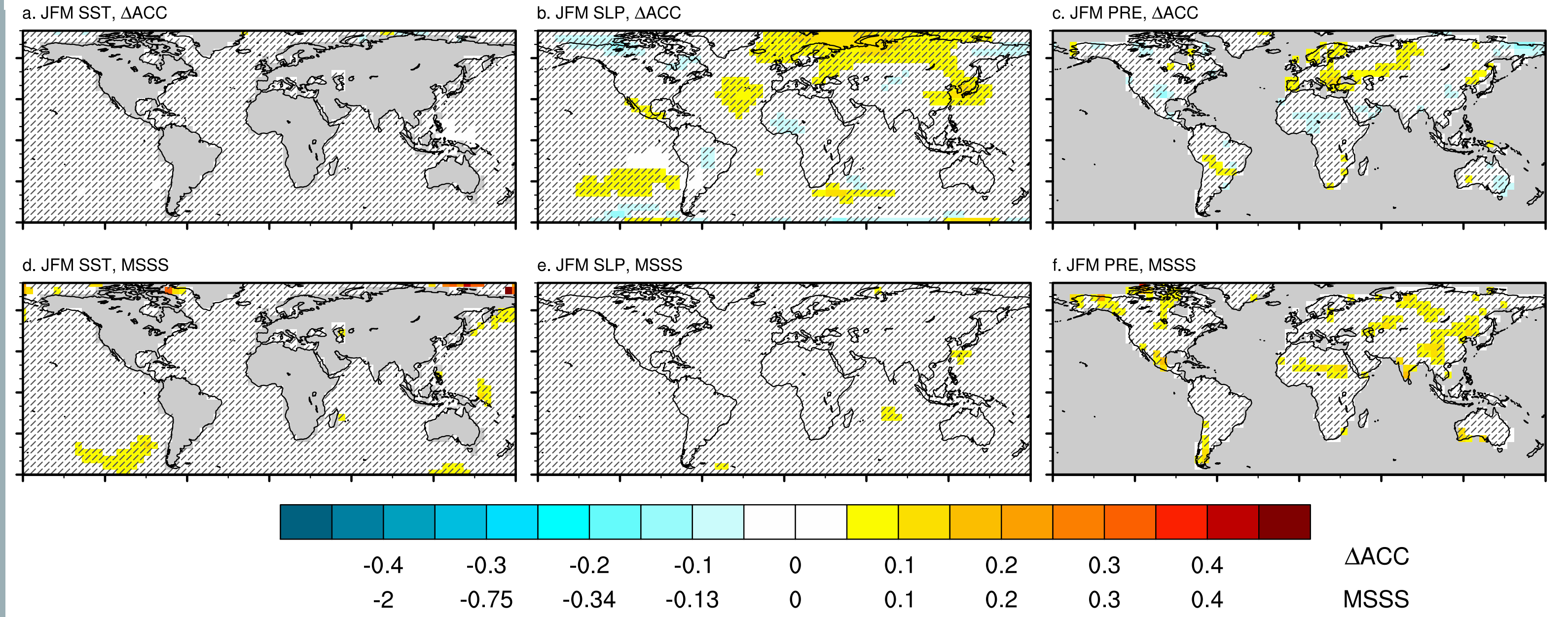
DPLE LY3-7 skill: ENS=40 vs ENS=20

SST SLP PREC

JAS ➔

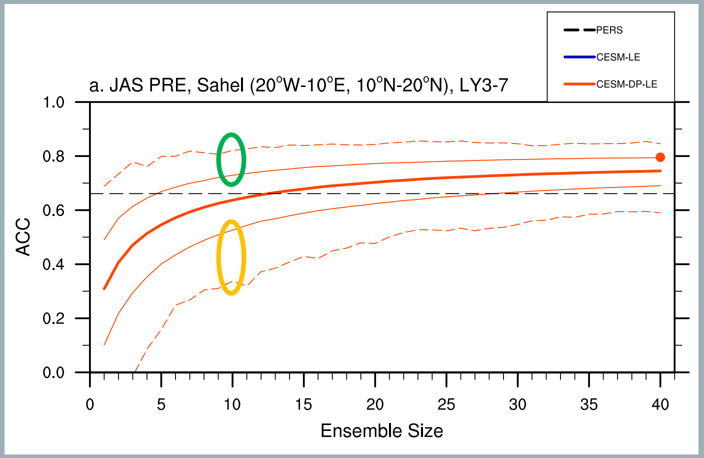


JFM ➔

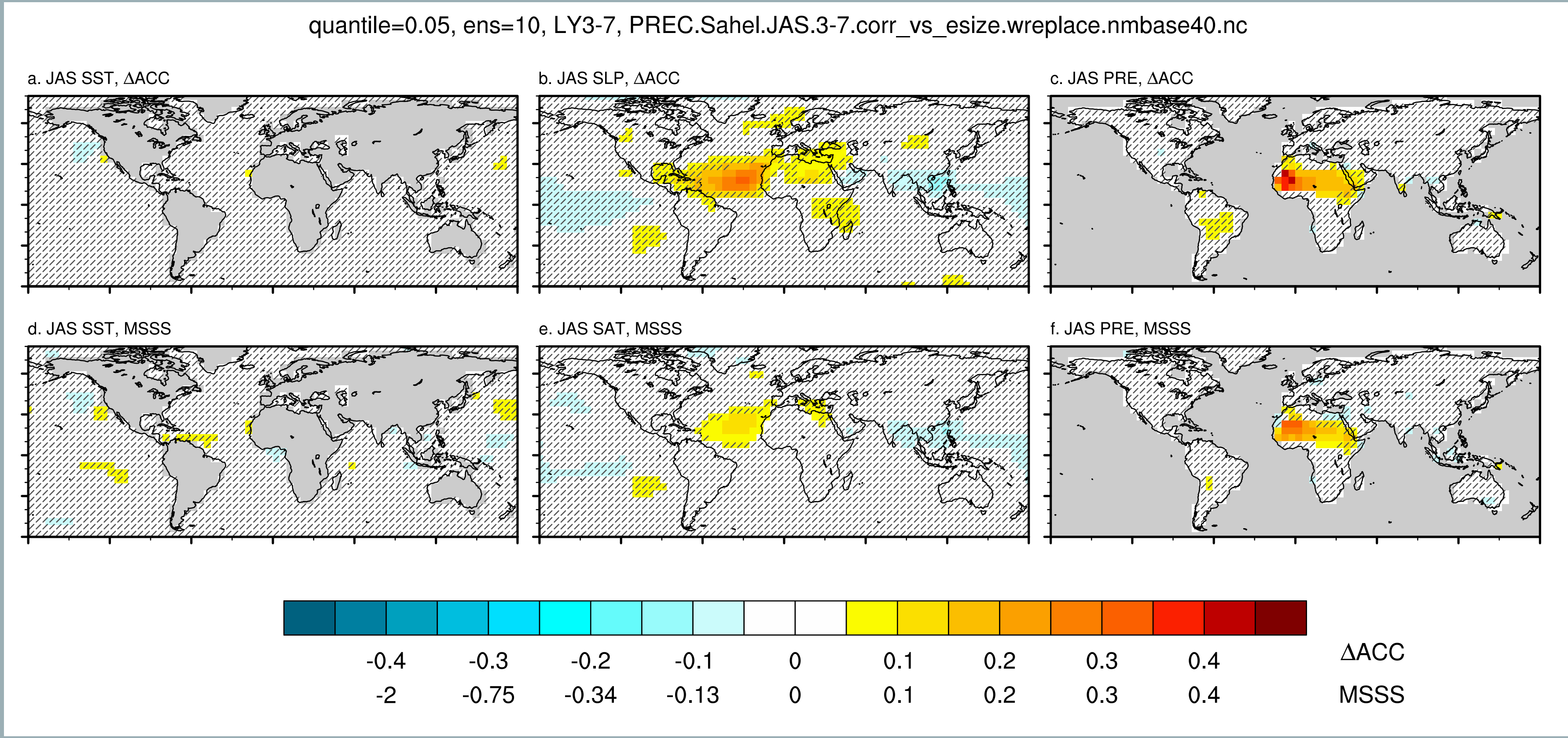


What explains skill uncertainty?

DPLE LY3-7 JAS Sahel PRE skill

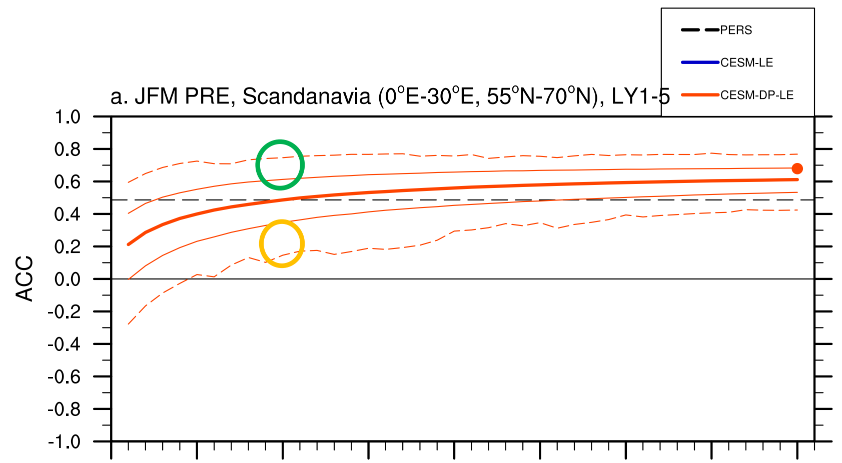


- Spread in skill entirely attributable to spread in atmospheric evolution (no clear SST driver of spread) – related to signal-to-noise paradox?



What explains skill uncertainty?

DPLE LY1-5 JFM Scandinavia PRE skill



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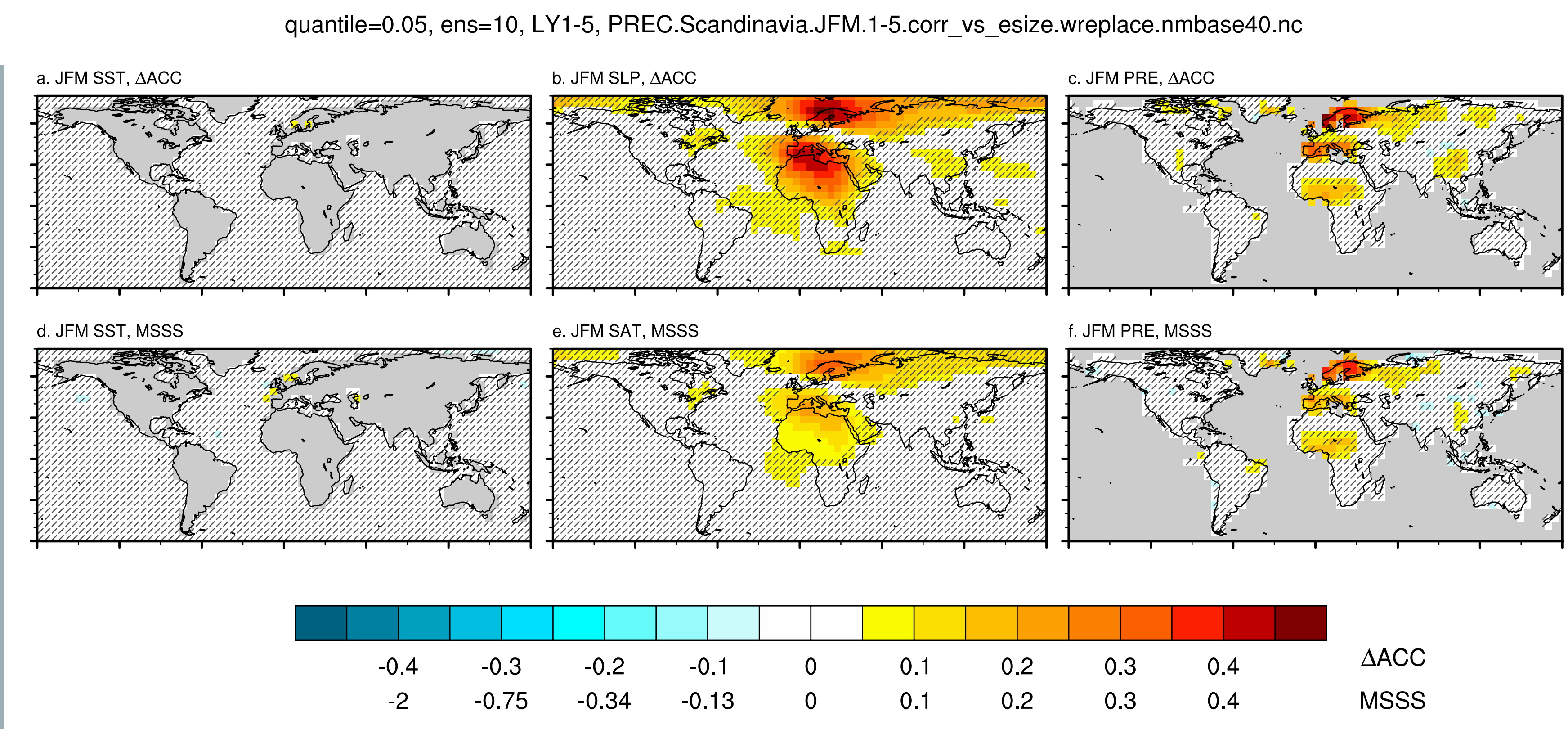


Some of the lessons learned (so far) from CESM-DPLE:

- Decadal skill for (land) precipitation is complex and varies considerably with: region, season, lead time, ensemble size, inclusion (or not) of trend, degree of spatial filtering, etc. BUT, there are grounds for optimism and indications that max skill has not yet been achieved.

- High, robust skill for: JAS: **Sahel**, Europe JFM: N Europe, Eurasia
- Promising results for: Africa, S Asia, N and S America, Australia.

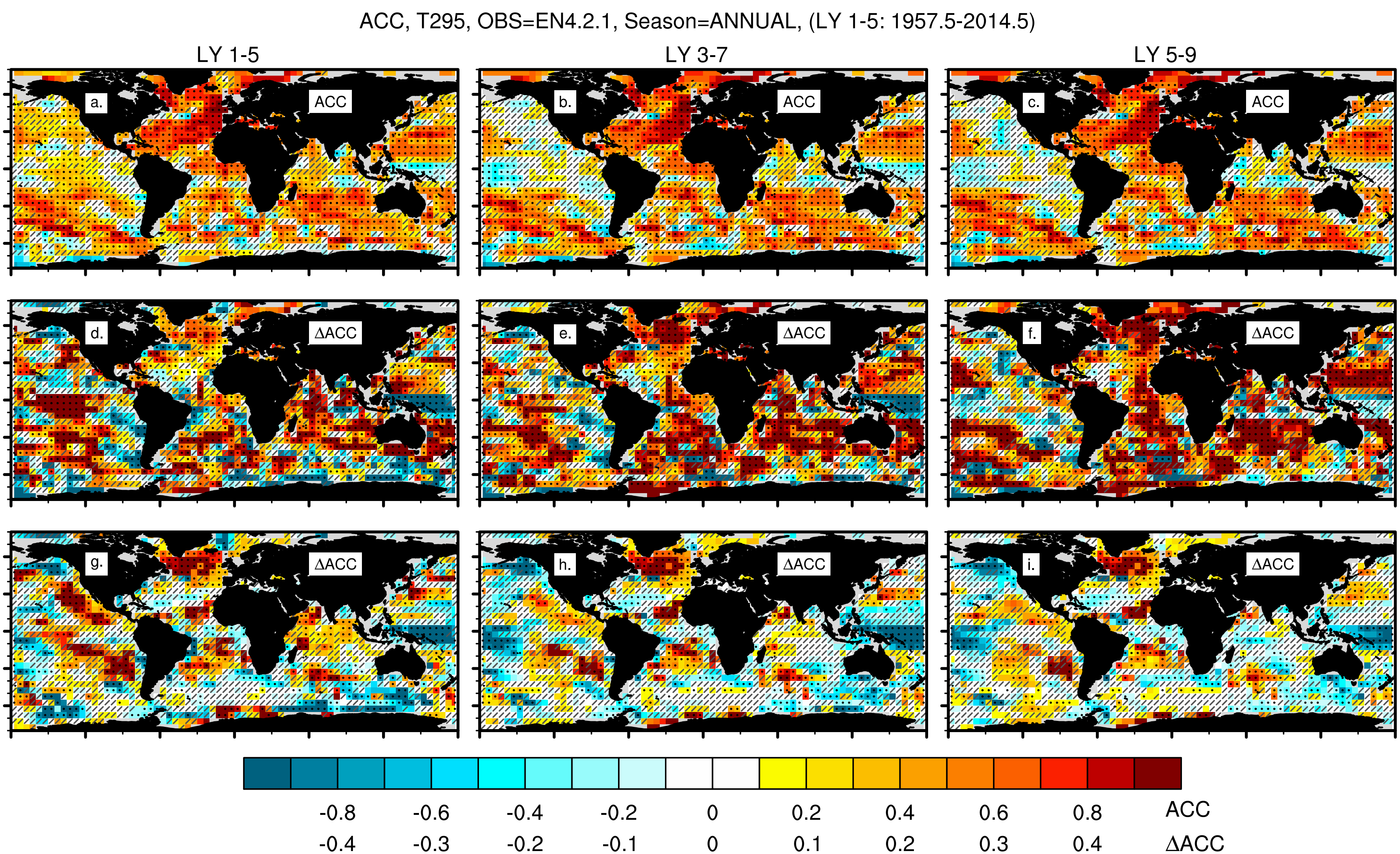
- Initialization shock can result in SST forcing that improves with lead time in some key regions ➔ potential PRECIP skill is likely not being fully realized. Suggests the need to run beyond LY 5 as skill is not necessarily maximized at short leads.

- Low model signal-to-noise can be overcome (to some extent) with larger ensembles, but points to the need for model development to realize higher real world predictability. Diminishing returns for ENS>20 for decadal predictions of seasonal precipitation. Large uncertainties in externally-forced signal call into question the validity of skill improvement assessments using small UI ensembles.

- Precipitation skill uncertainty is almost entirely attributable to uncertainty in atmospheric response, not SST driving.

- Data publically available at http://www.cesm.ucar.edu/projects/community-projects/DPLE/

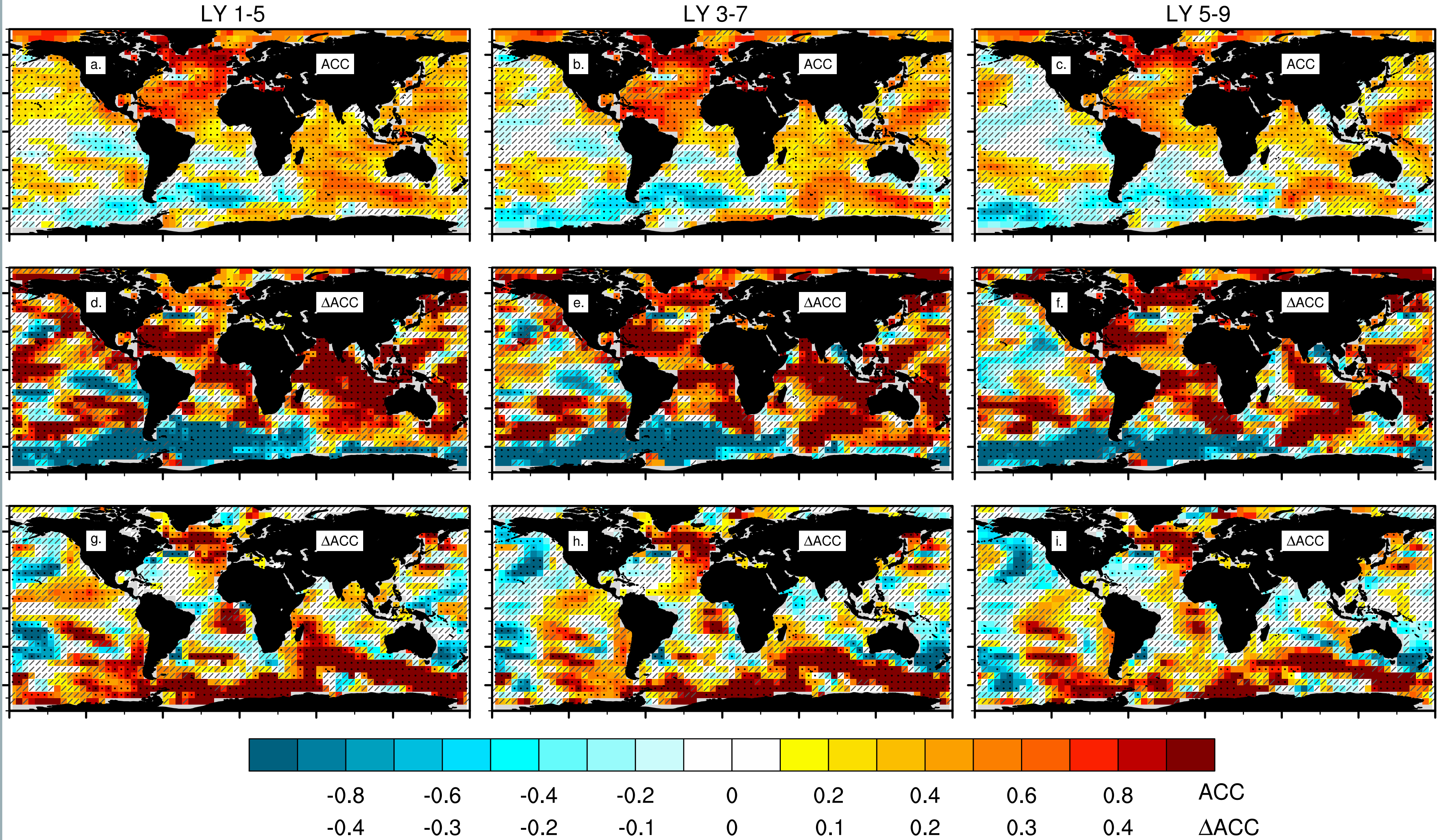
CESM-DPLE: 0-295m Ocean Temperature



Yeager et al. (2018)

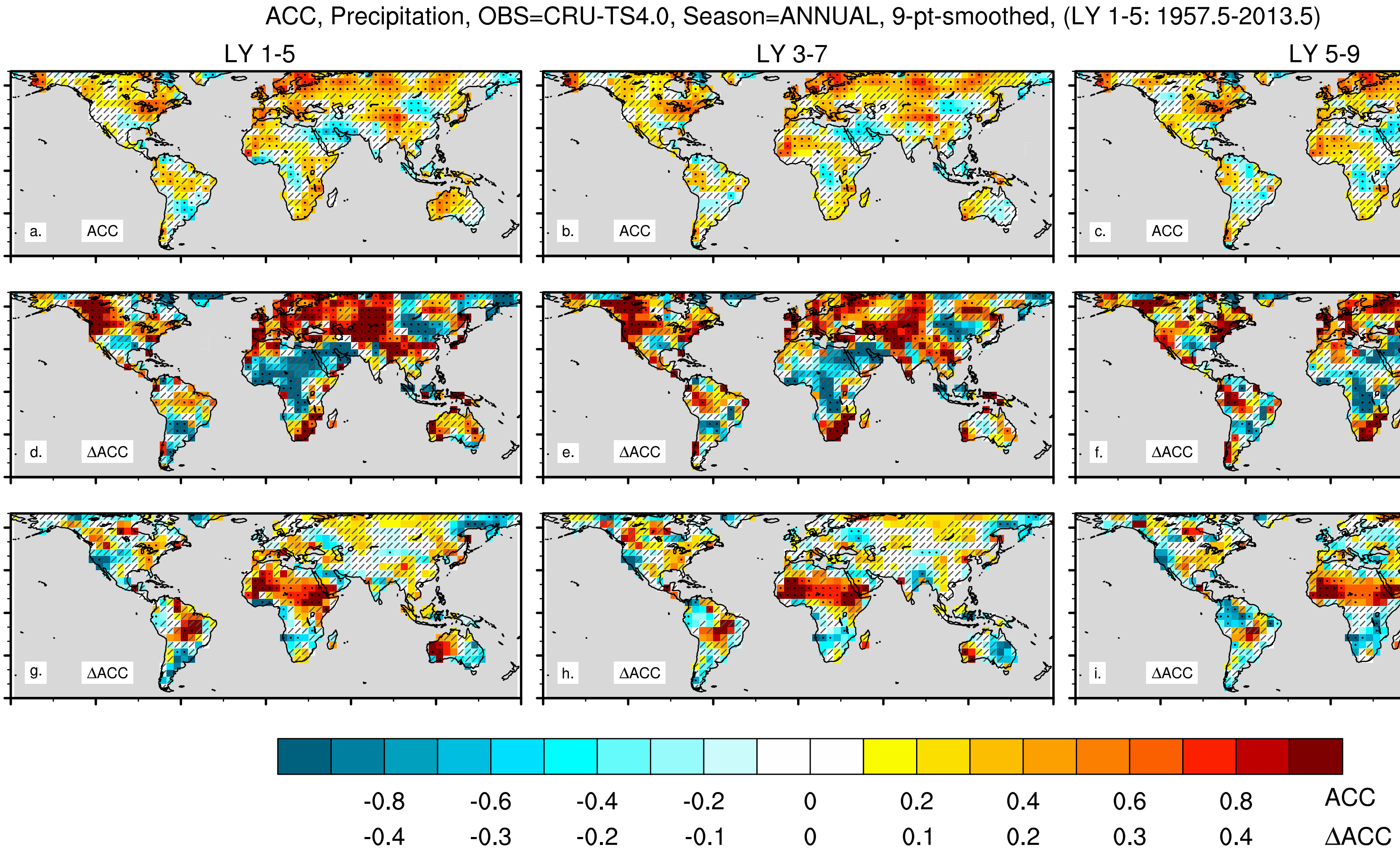
Understanding the Origins of Precipitation Skill

DPLE : Sea Surface Temperature (detrended)



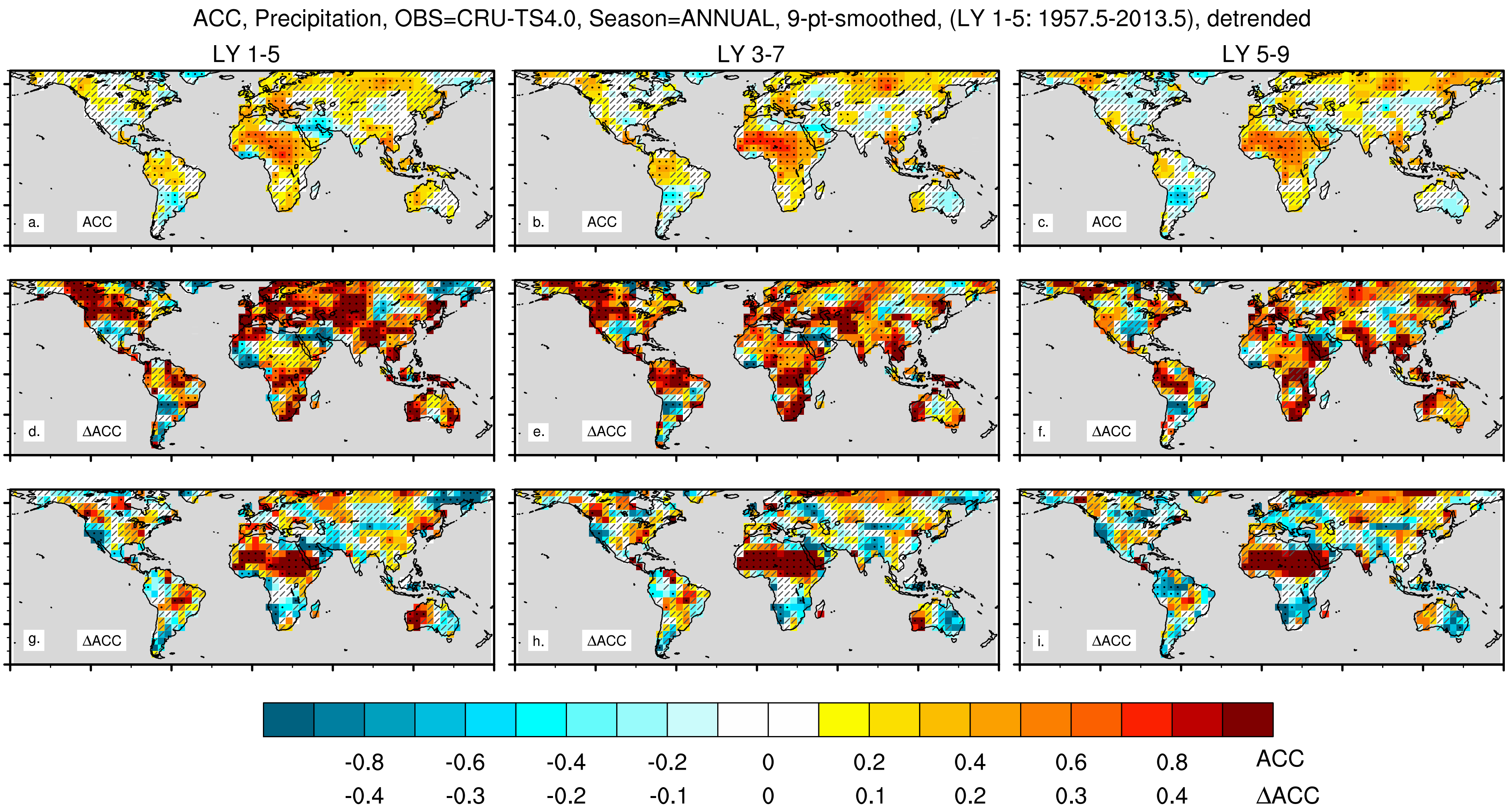
Yeager et al. (2018)

CESM-DPLE: Annual Precip



Yeager et al. (2018)

CESM-DPLE: Annual Precip (detrended)



Yeager et al. (2018)