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3.6 better constrain evaporation at the scale of Climate model
4.11 Land-surface interaction related biases in AMIP

F. Cheruy, Y.Zhao, A. Ducharne, A. Al Yaari, JL. Dufresne

IPSL, France

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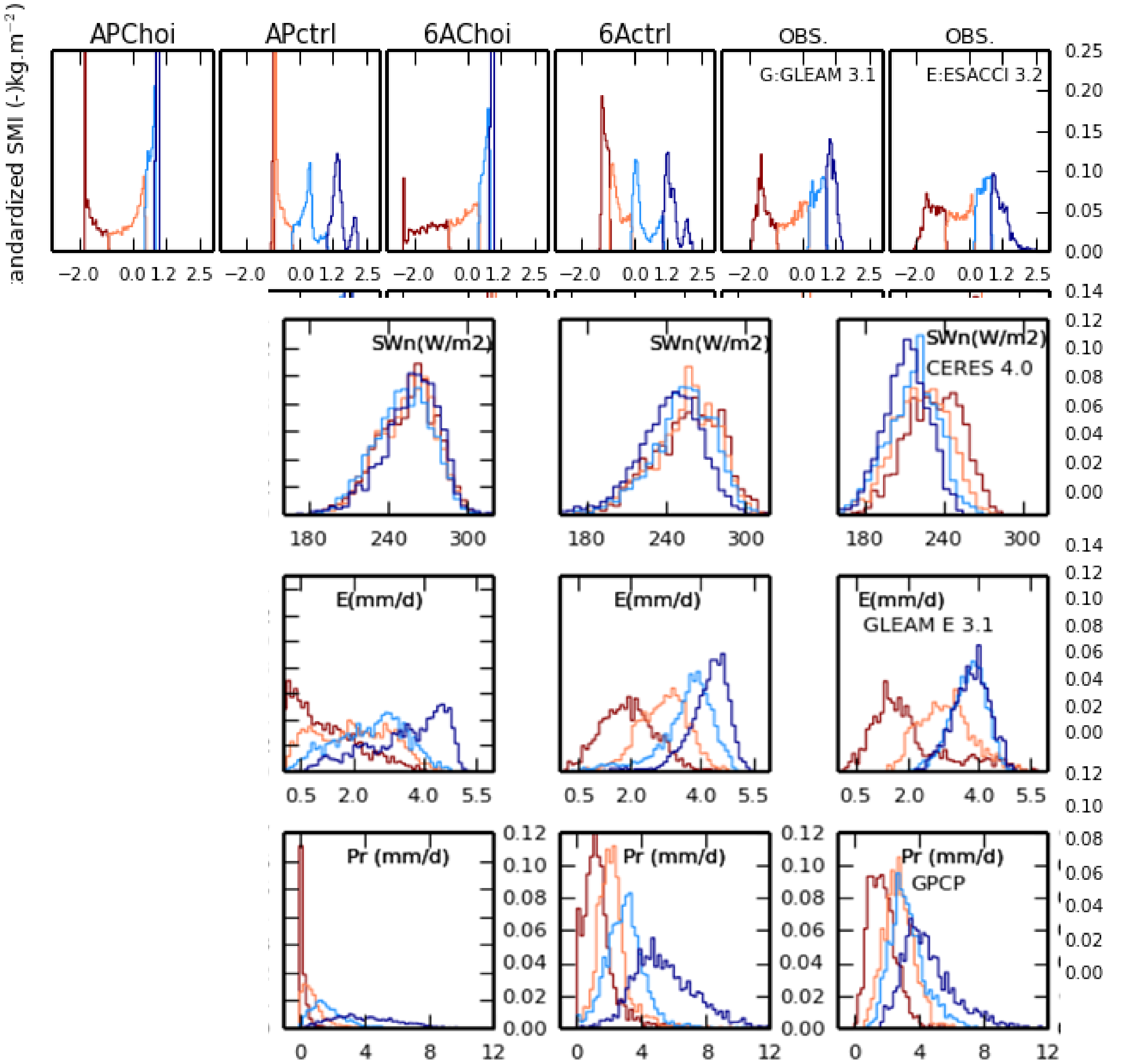
Regional histograms from monthly values of the individual grid points corresponding to the Sahel box (-10:30E,0:20N) in JJA, 10-year long period in which all observations are available (2001-2010).



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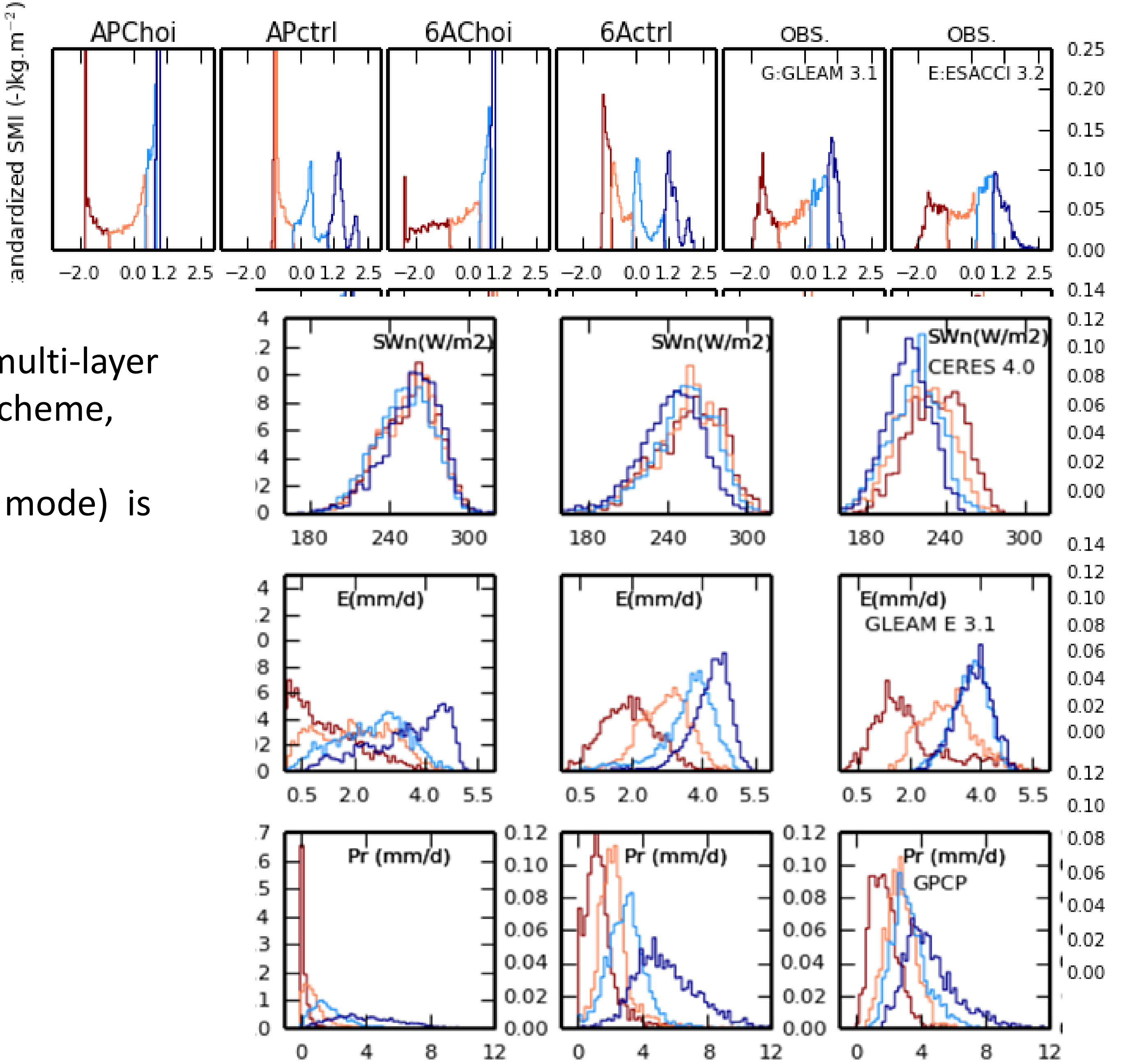


- Evapotranspiration is better constrained with a multi-layer hydrology scheme than with a Choisnel type scheme,
- However the atmospheric forcing (in coupled mode) is decisive in terms of realisms for the regional distribution of the evapotranspiration

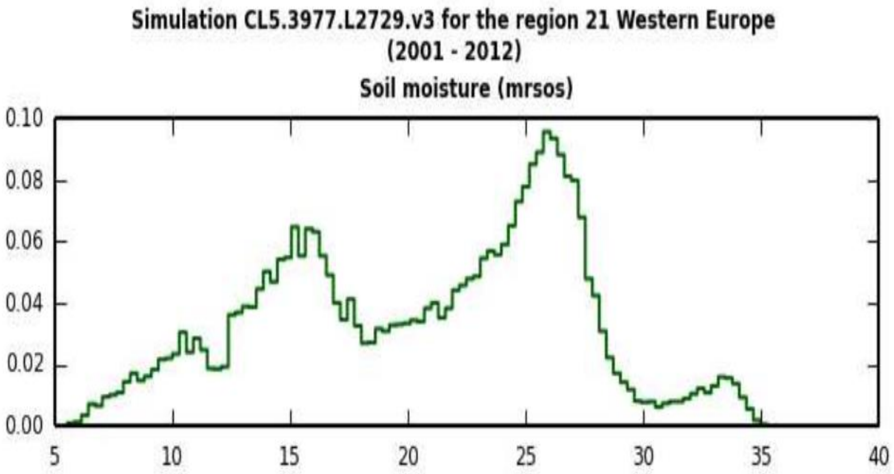
manuscript submitted to *Journal of Advances in Modeling Earth Systems* (

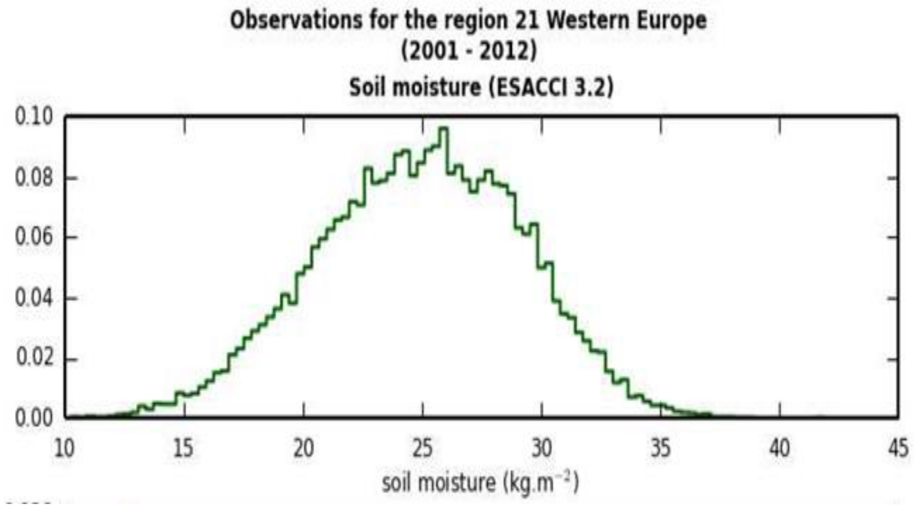
Improved near surface continental climat
IPSL-CM6A-LR by combined evolutions
atmospheric and land surface physics

Frédérique Cheruy[1], Agnès Ducharne[2], Frédéric Hourdin[1], Ione
Etienne Vignon[3], Guillaume Gastineau[4], Vladislav Bastrikov[5],
Vuichard[5], Binta Diallo[1], Jean-Louis Dufresne[1], Josefine Ghattas[6]
Grandpeix[1], Abderrahmane Idelkadi[1], Lidia Mellul[1], Fabienne I
Martin Menegoz[7], Catherine Ottlé[5], Philippe Peylin[5], Jérôme S
Fuxing Wang[1], Yanfeng Zhao[1]

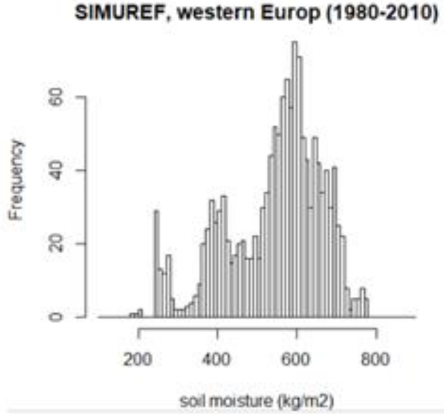
4.11 Land-surface interaction related biases in AMIP

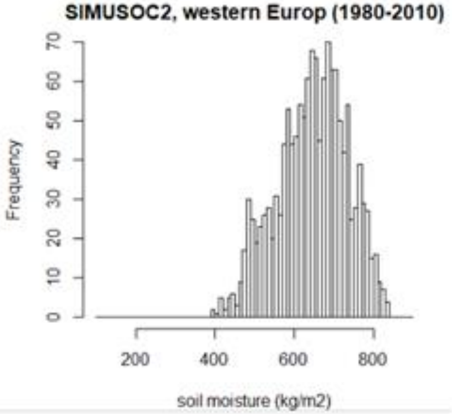
Simulated VS observed soil moisture, AMIP-like runs





Discrete VS Continuous PTFs





Tafasca et al.

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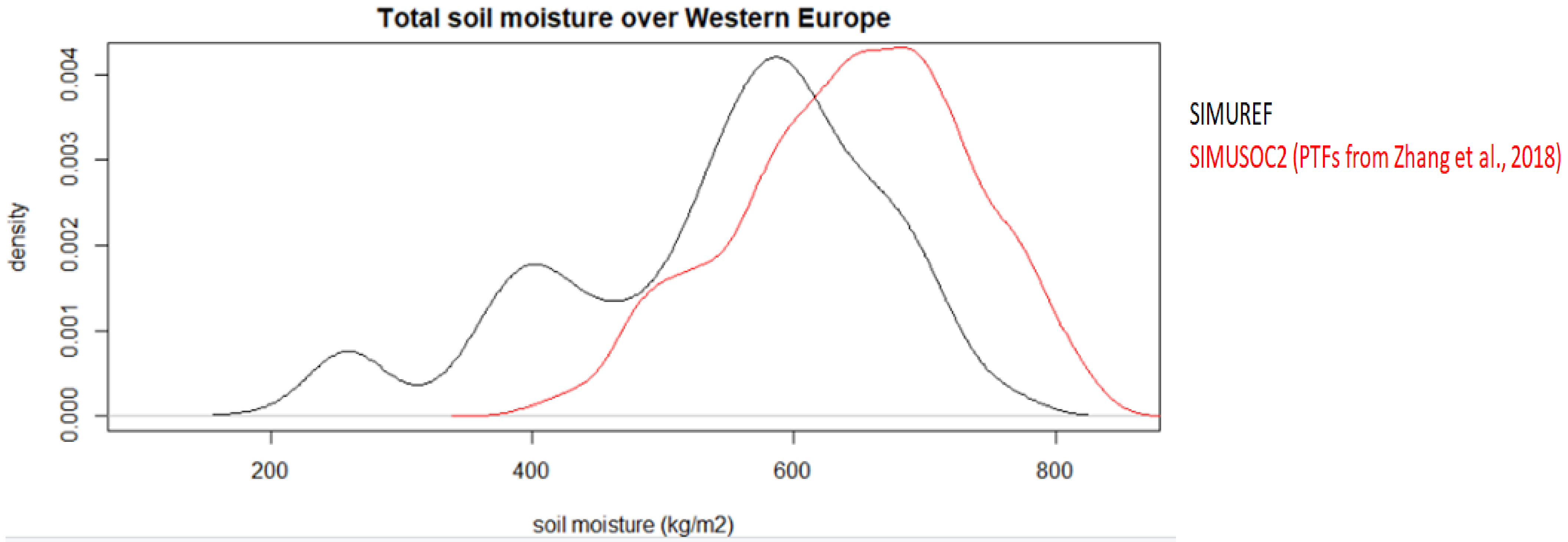

Tafasca et al.

Can we use combined LST, SM, PRECIP data to detect the contribution of soil thermal inertia which is strongly dependent on soil moisture to daily variations in nighttime minimum temperature?


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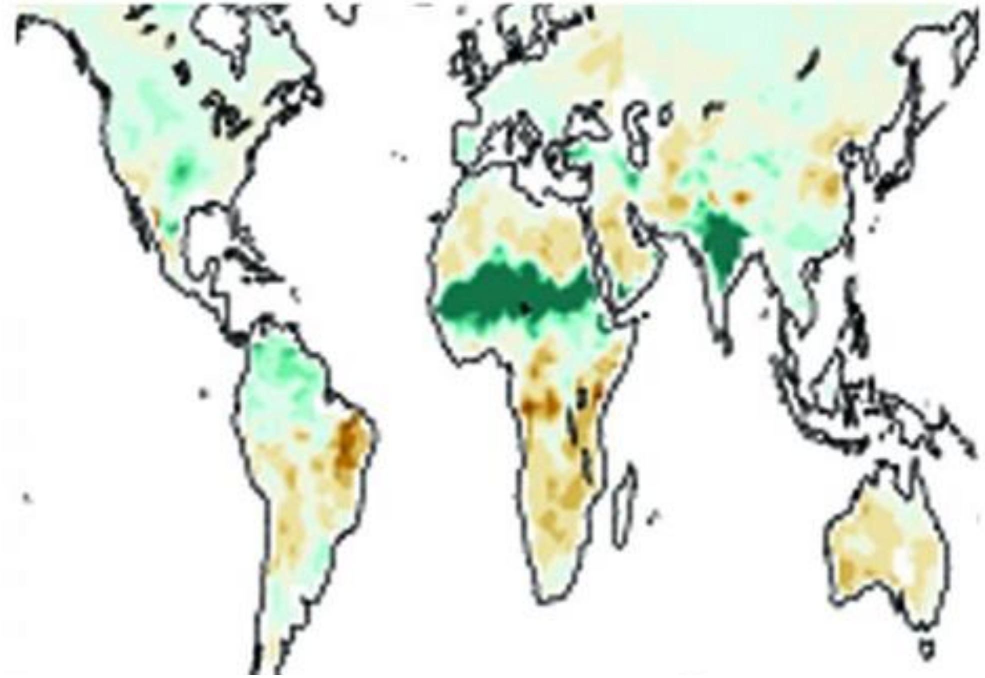
HYDROLOGY, CRYOSPHERE & EARTH SURFACE Editors' Highlights

Wet Soils Elevate Nighttime Temperatures

Soil moisture can elevate overnight temperatures, offsetting daytime cooling, especially over areas of strong land-atmosphere interactions.

SOURCE: *Journal of Advances in Modeling Earth Systems (JAMES)*



Contribution of soil thermal inertia, which is strongly dependent on soil moisture, to daily variations in nighttime minimum temperature during June-August. Dark green colors show the strongest mediation of low temperatures by moist soils. Credit: Cheruy et al., 2017, Figure 8b

By Paul A. Dirmeyer 5 January 2018

land surface temperature cci

3.5 Document SM-atmosphere feedbacks in transition regions (temperature and precipitation)

Combined instantaneous LST, superficial soil moisture and precipitation are used to identify dry spells and explore the sensitivity of the LST to the superficial soil moisture.

Y. Zhao and F. Cheruy

	Resolution	Region	Period
LST CCI SEVIRI MSG L3 data (MSG_SEVIRI_L3U)	0.05 ° spatial Hourly temporal-	81.125 ° W-E 81.125 ° N-S	2008-2010
ESA CCI Surface Soil Moisture COMBINED Product (fv04.5)	0.25 ° spatial Daily temporal	Global	1979-2018
Tropical Rainfall Measuring Mission (TRMM) V7	0.25 ° spatial 3-hourly temporal	81.125 ° W-E 50 ° N-S	2008-2010
CERES (V4a)	1 ° spatial Daily	Global	2008-2010

land surface temperature cci

Identify dry spells to isolate the effect of SM on LST

Find the dry day when the mean daily rainfall is below 0.5mm at 0.25° resolution.

At least 10 consecutive dry days for one dry spell.

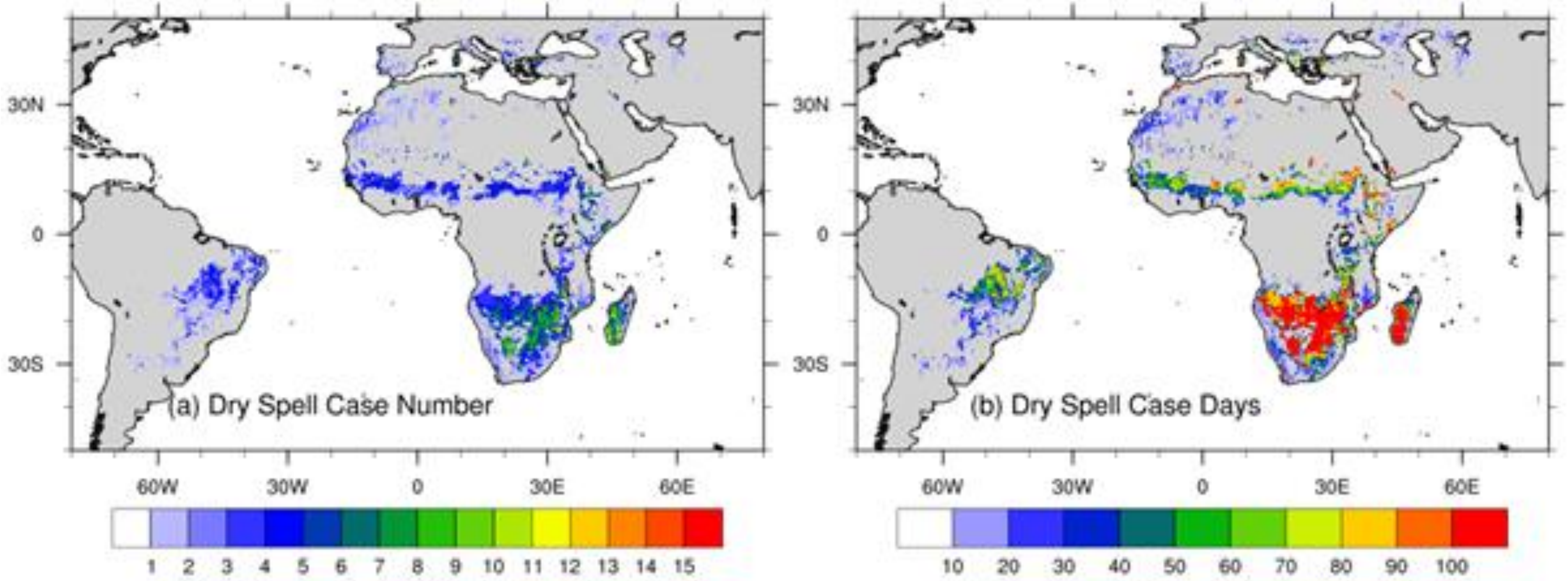
Select dry spell days to calculate the linear regression coefficient between LST (daily maximum, minimum and magnitude) and SM

The day without the missing value for 16 hours LST.

The day without the missing value for daily SM.

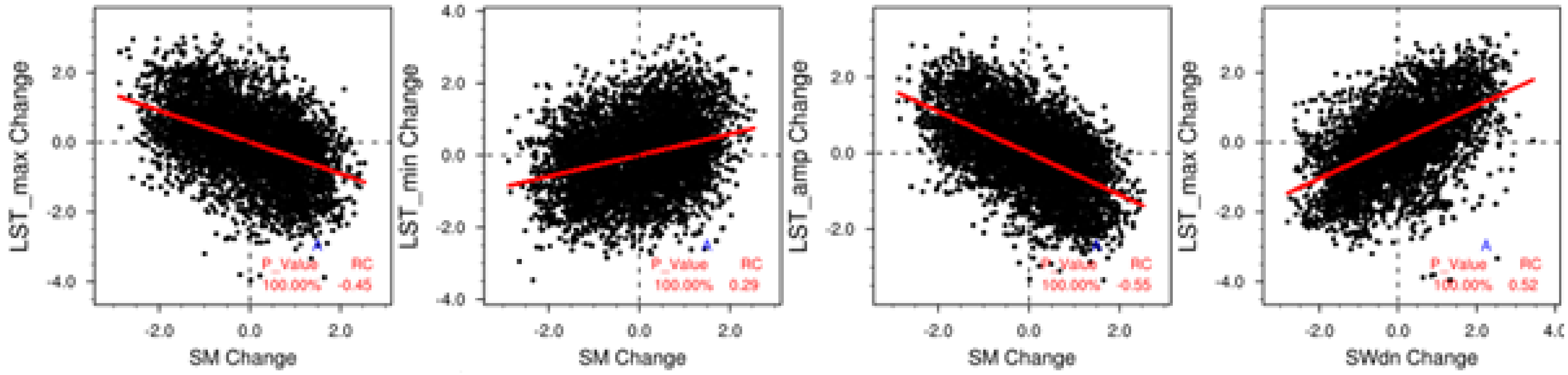
The day is in the dry spell period.

cases to be analyzed
10 dry spell days with at least 16 LST retrievals and SM measurement available)



3.5 Document SM-atmosphere feedbacks in transition regions (temperature and precipitation)

Regional climatological change in δLST_max, δLST_max LST_min, δLST_amp versus corresponding δSM (daily basis)



$$S_{i,j,d} = \frac{x_{i,j,d} - \frac{1}{N}\sum_{d=1}^{N} x_{i,j,d}}{\sqrt{\frac{1}{N-1}\sum_{d=1}^{N}\left(x_{i,j,d} - \frac{1}{N}\sum_{d=1}^{N} x_{i,j,d}\right)^2}}$$

Zhao et al.

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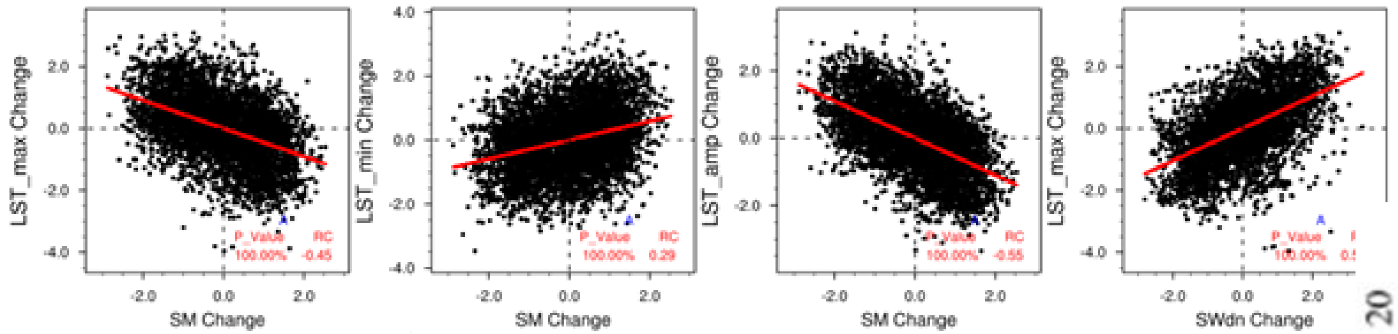
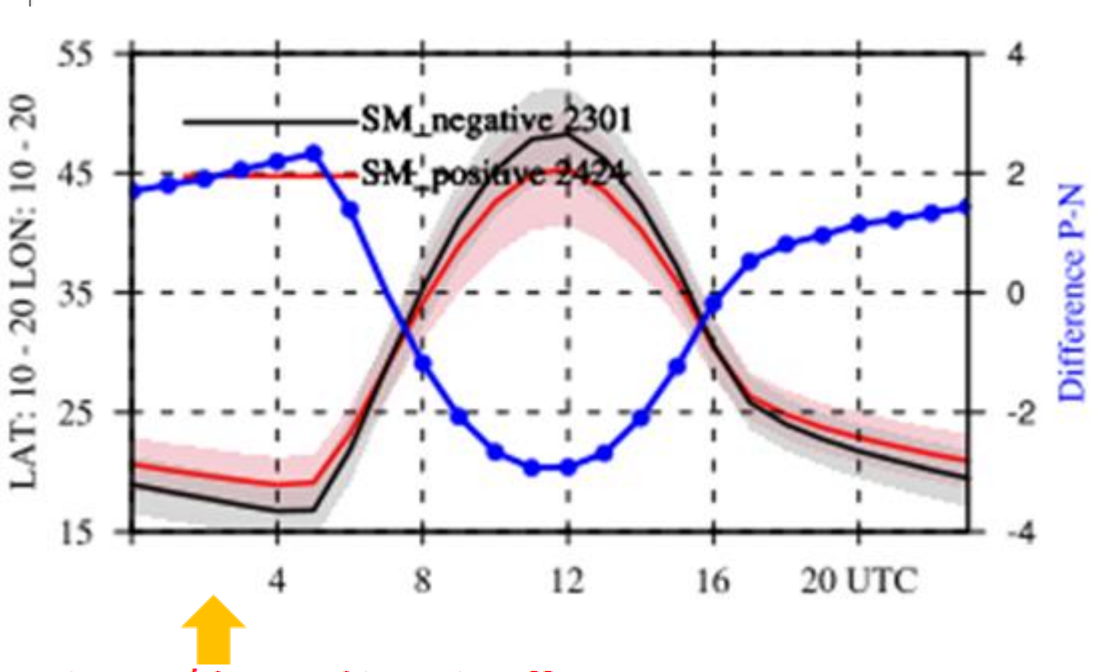


Evaporative cooling effect



Soil moisture/thermal inertia effect

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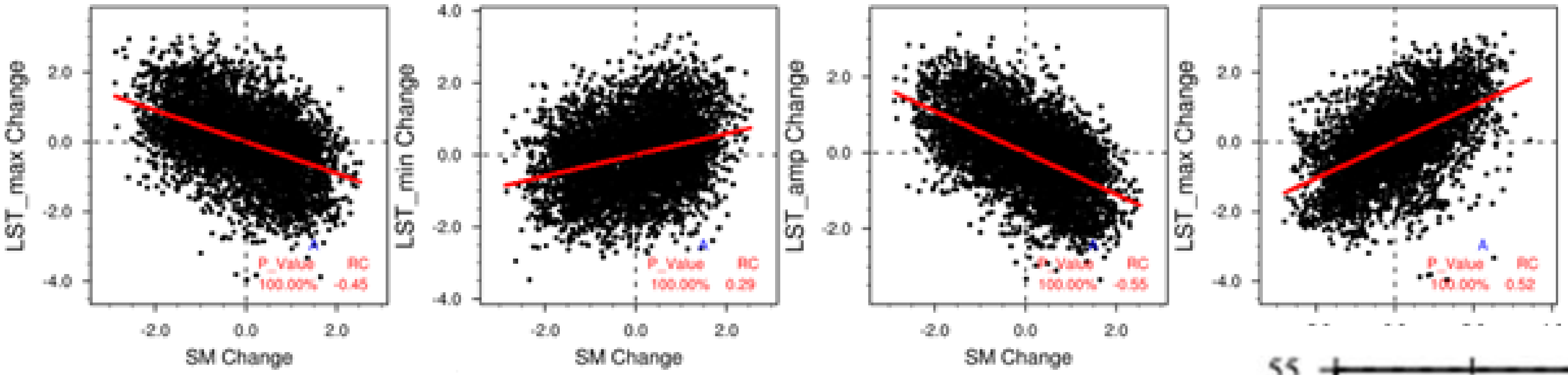

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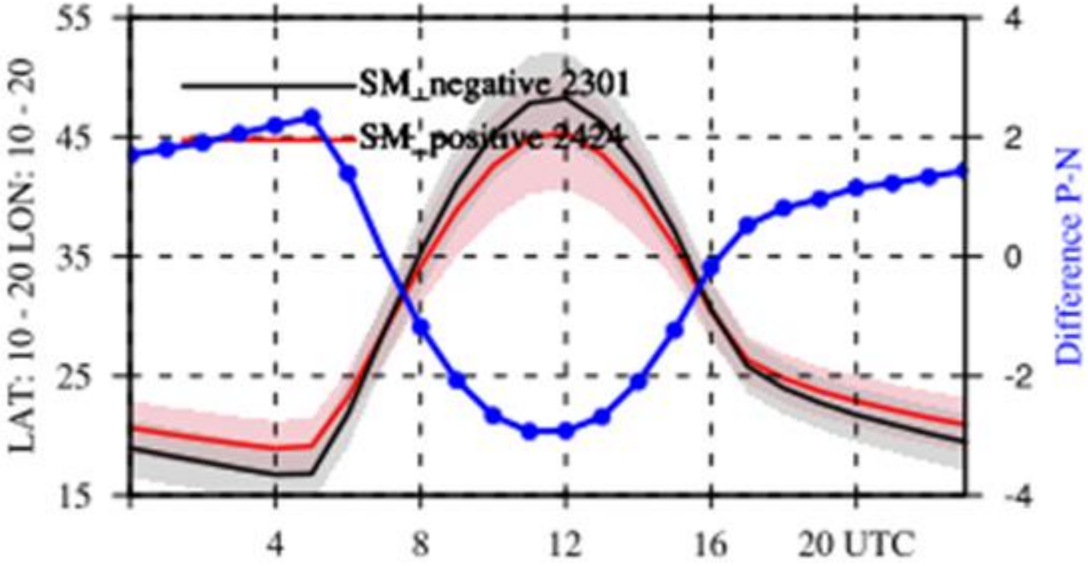
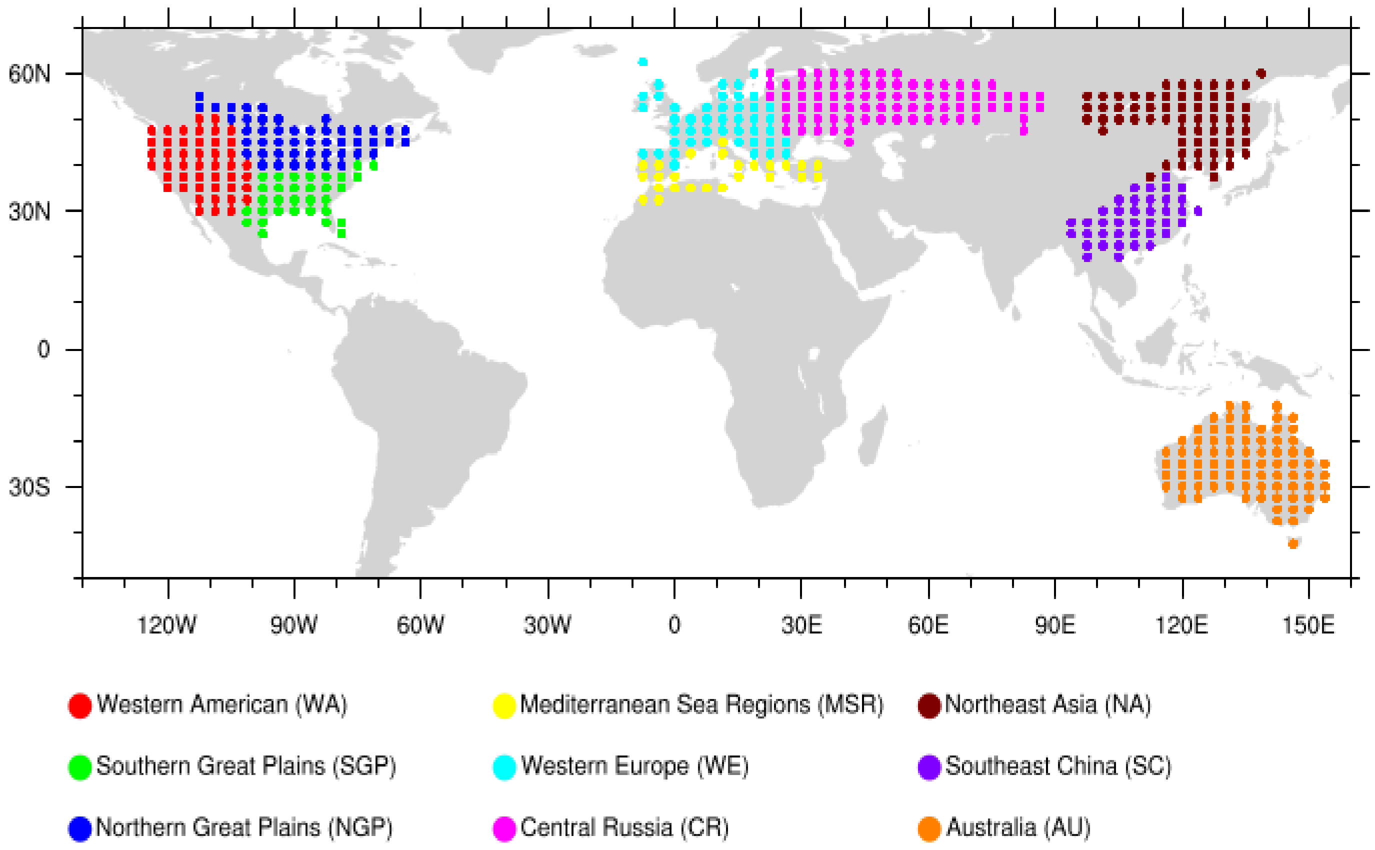
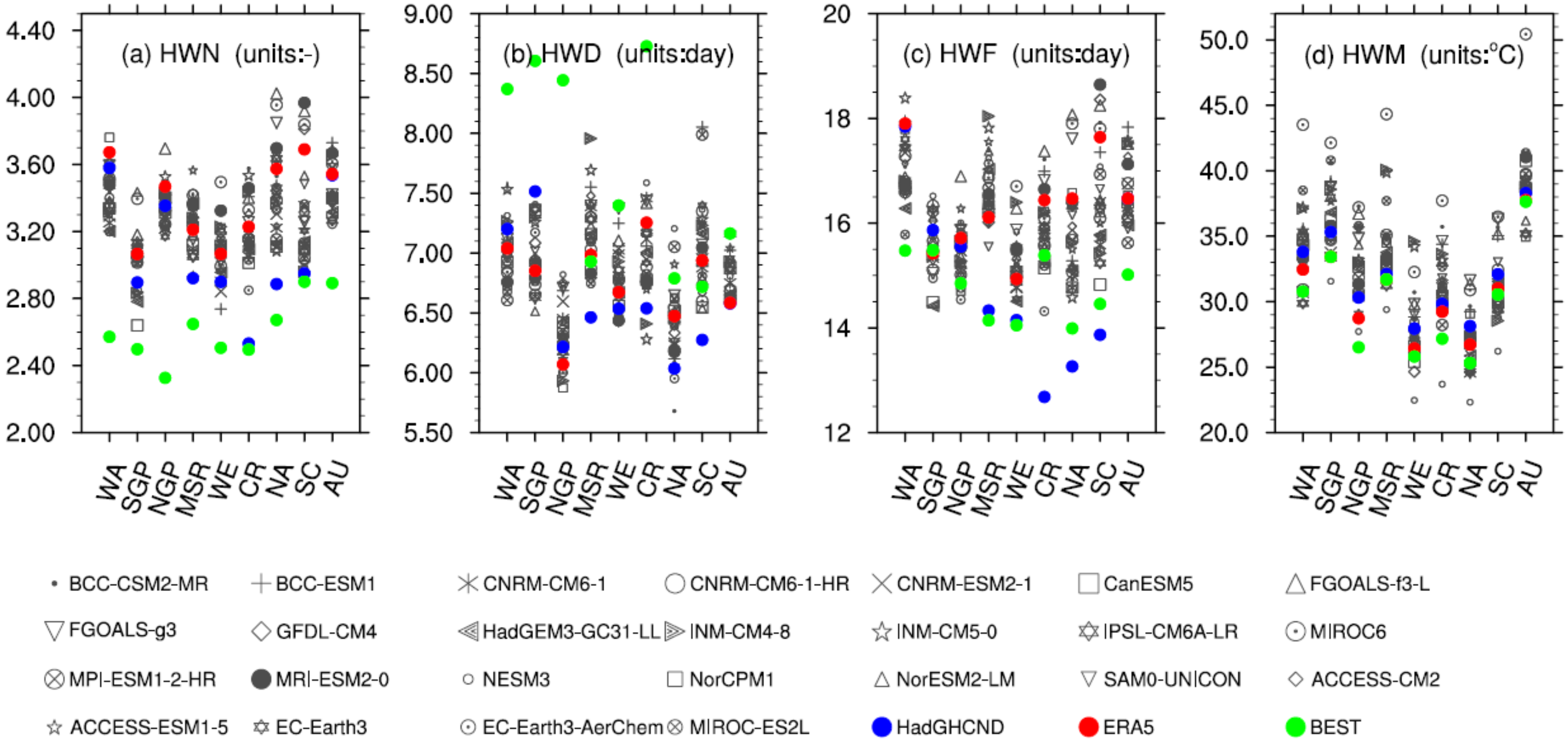
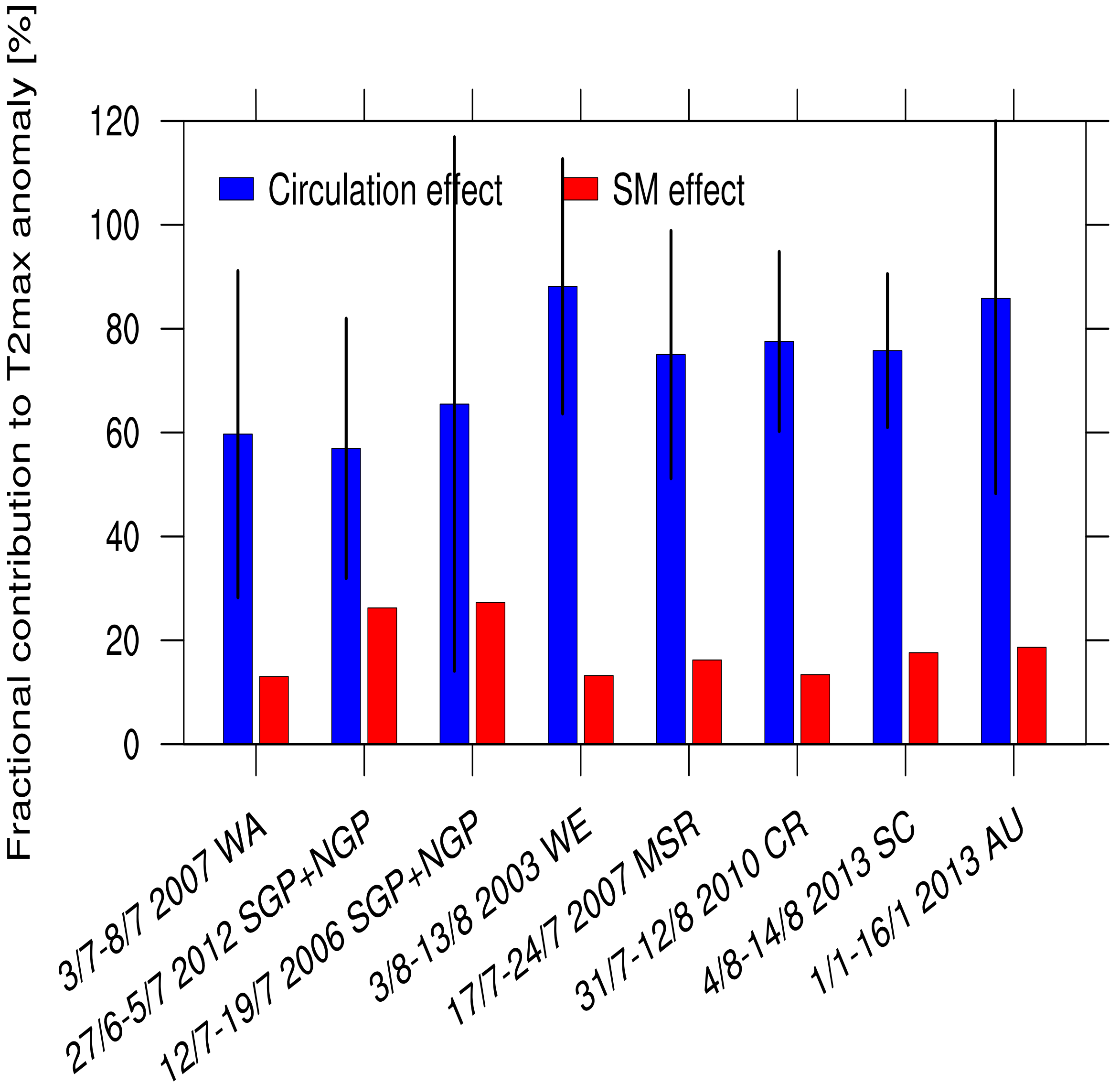


Multi-model analysis of the realism of summer HW in AMIP-CM6 database

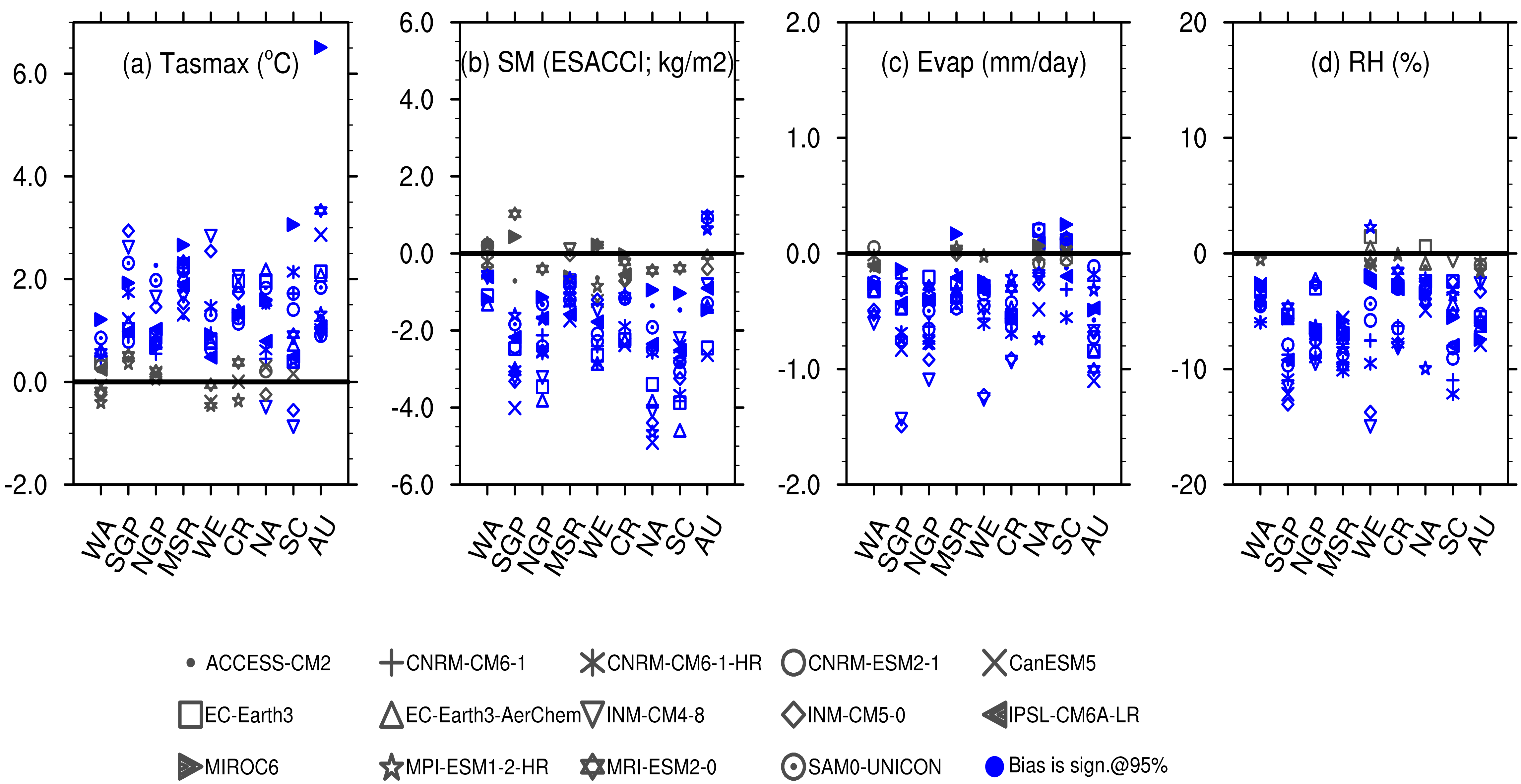


Heat waves properties in the AMIP-CM6 dataset

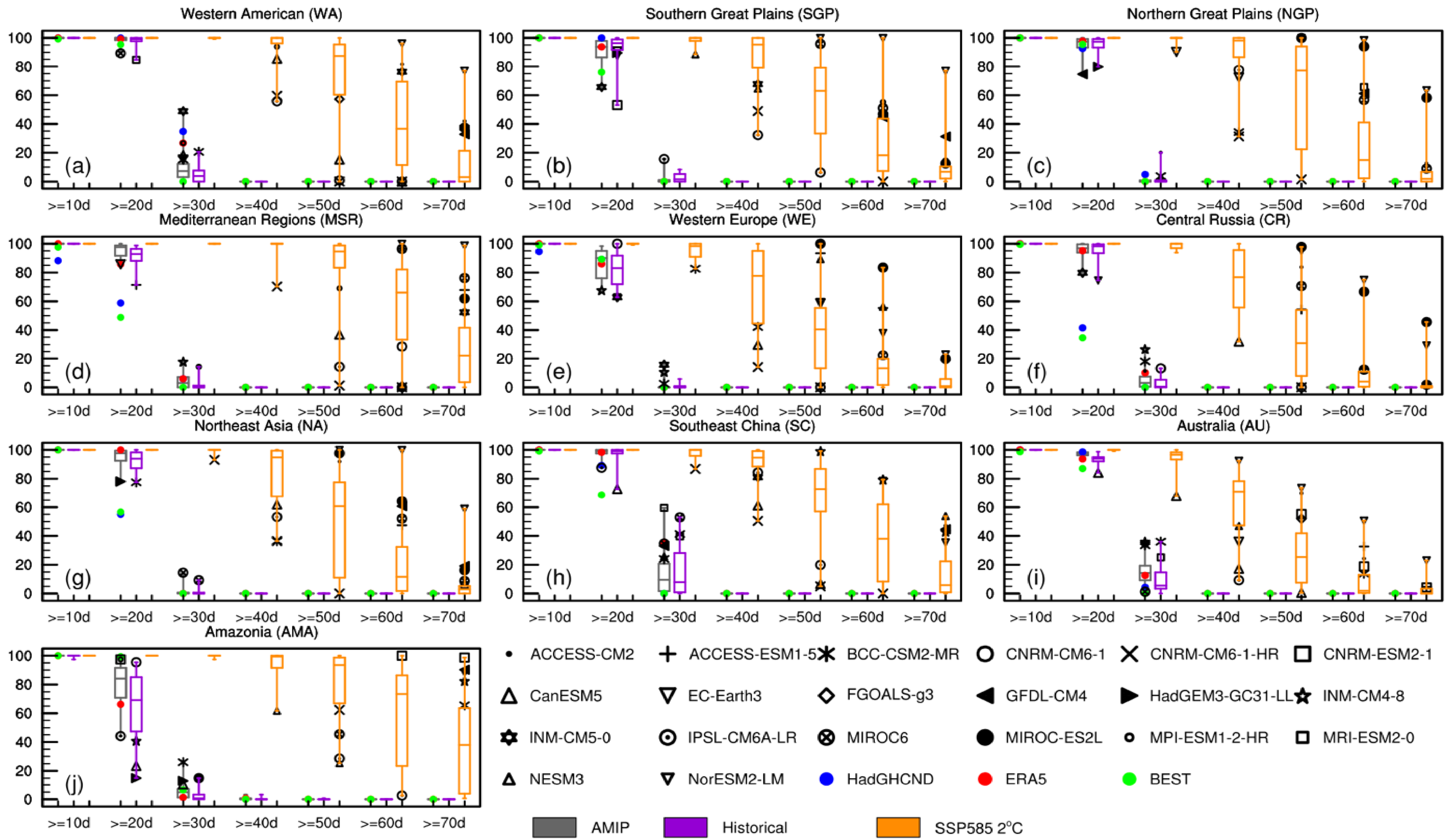




Fractional contribution to T2max anomaly [%]
120
100
80
60
40
20
0
Circulation effect
SM effect
3/7-8/7 2007 WA
27/6-5/7 2012 SGP+NGP
12/7-19/7 2006 SGP+NGP
3/8-13/8 2003 WE
17/7-24/7 2007 MSR
31/7-12/8 2010 CR
4/8-14/8 2013 SC
1/1-16/1 2013 AU



(a) Tasmax (°C)
(b) SM (ESACCI; kg/m2)
(c) Evap (mm/day)
(d) RH (%)
WA SGP NGP MSR WE CR NA SC AU
ACCESS-CM2
CNRM-CM6-1
CNRM-CM6-1-HR
CNRM-ESM2-1
CanESM5
EC-Earth3
EC-Earth3-AerChem
INM-CM4-8
INM-CM5-0
IPSL-CM6A-LR
MIROC6
MPI-ESM1-2-HR
MRI-ESM2-0
SAM0-UNICON
Bias is sign.@95%



Zhao et al. , sub Earth's Future Oct. 2022