

Supporting Information for

“Historic and projected changes in coupling between soil moisture and evapotranspiration (ET) in CMIP5 models confounded by the role of different ET components”

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Models	HIST					RCP8.5				
	Surf. SM (37)	ET, Pr (48)	Tran, Esoil, Ecan (32)	LAI (30)	Column SM (34)	Surf. SM (33)	ET, Pr (40)	Tran, Esoil, Ecan (24)	LAI (27)	P/PET (27)
ACCESS1-0	✓	✓	✗	✓	✓	✓	✓	✗	✓	✓
ACCESS1-3	✓	✓	✗	✓	✓	✓	✓	✗	✓	✓
bcc-csm1-1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
bcc-csm1-1-m	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BNU-ESM	✓	✓	✓	✗	✓	✓	✓	✓	✗	✓
CCSM4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗
CESM1-BGC	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗
CESM1-CAM5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CESM1-CAM5-1-FV2	✗	✓	✗	✗	✗	✗	✓	✗	✗	✗
CESM1-FASTCHEM	✓	✓	✓	✓	✗	✓	✗	✗	✗	✗
CESM1-WACCM	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗
CMCC-CESM	✗	✓	✗	✗	✗	✓	✓	✗	✗	✗
CMCC-CM	✗	✓	✗	✗	✓	✓	✓	✗	✗	✗
CMCC-CMS	✗	✓	✗	✗	✗	✓	✓	✗	✗	✗
CNRM-CM5	✗	✓	✓	✗	✓	✓	✓	✗	✗	✓
CNRM-CM5-2	✗	✓	✓	✗	✗	✗	✗	✗	✗	✗
CSIRO-Mk3-6-0	✓	✓	✗	✗	✓	✓	✓	✗	✗	✓
CanCM4	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗
CanESM2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
FGOALS-g2	✓	✓	✓	✗	✓	✓	✓	✗	✗	✗
FGOALS-s2	✓	✓	✓	✗	✗	✓	✗	✗	✗	✗
FIO-ESM	✗	✓	✓	✓	✗	✓	✓	✓	✓	✗
GFDL-CM3	✓	✓	✗	✓	✓	✓	✓	✗	✓	✓
GFDL-ESM2G	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
GFDL-ESM2M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
GISS-E2-H	✓	✓	✓	✗	✓	✓	✓	✓	✗	✓
GISS-E2-H-CC	✓	✓	✓	✗	✗	✓	✓	✓	✗	✓
GISS-E2-R	✓	✓	✓	✗	✓	✓	✓	✓	✗	✓
GISS-E2-R-CC	✓	✓	✓	✗	✗	✓	✓	✓	✗	✓
HadCM3	✓	✓	✗	✗	✓	✓	✗	✗	✗	✗
HadGEM2-AO	✗	✓	✗	✗	✗	✓	✗	✗	✗	✗
HadGEM2-CC	✓	✓	✗	✓	✓	✓	✓	✗	✓	✓
HadGEM2-ES	✓	✓	✗	✓	✓	✓	✓	✗	✓	✓
inmcm4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IPSL-CM5A-LR	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IPSL-CM5A-MR	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
IPSL-CM5B-LR	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MIROC-ESM	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MIROC-ESM-CHEM	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MIROC4h	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗
MIROC5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MPI-ESM-LR	✗	✓	✗	✓	✓	✓	✓	✗	✓	✗
MPI-ESM-MR	✗	✓	✗	✓	✗	✓	✓	✗	✓	✗
MPI-ESM-P	✗	✓	✗	✓	✗	✓	✗	✗	✗	✗
MRI-CGCM3	✓	✓	✓	✗	✓	✓	✓	✓	✗	✓
MRI-ESM1	✓	✓	✓	✓	✗	✓	✓	✗	✓	✓
NorESM1-M	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗
NorESM1-ME	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗

Table S1: Models used in this study for each variable. See main text for variable definition; numbers in parentheses indicate the number of models available for that variable/scenario. HIST: historical scenario; RCP8.5 scenario RCP8.5.

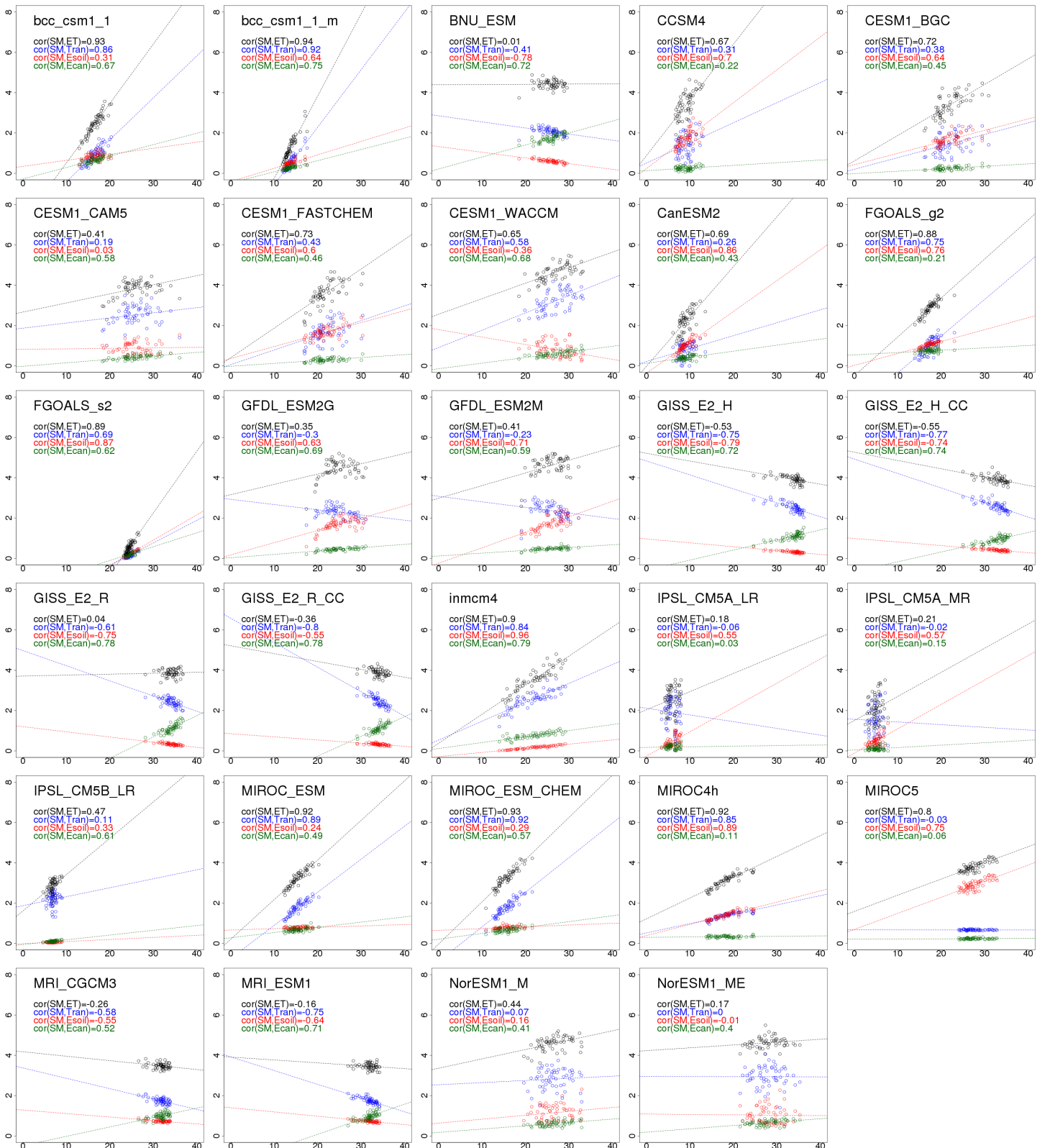


Figure S1: Relationship between summertime-mean surface soil moisture (x-axis, kg/m²) and evapotranspiration and its components (y-axis, mm/d) over 1950-2005 in 29 CMIP5 models over one pixel in the Central Great Plains of North America (260E:40N). Dotted lines are regression

lines. In each panel, numbers indicate the correlation coefficients of soil moisture with each ET component (Tran: Transpiration; E_{soil} : soil evaporation; E_{can} : canopy interception).

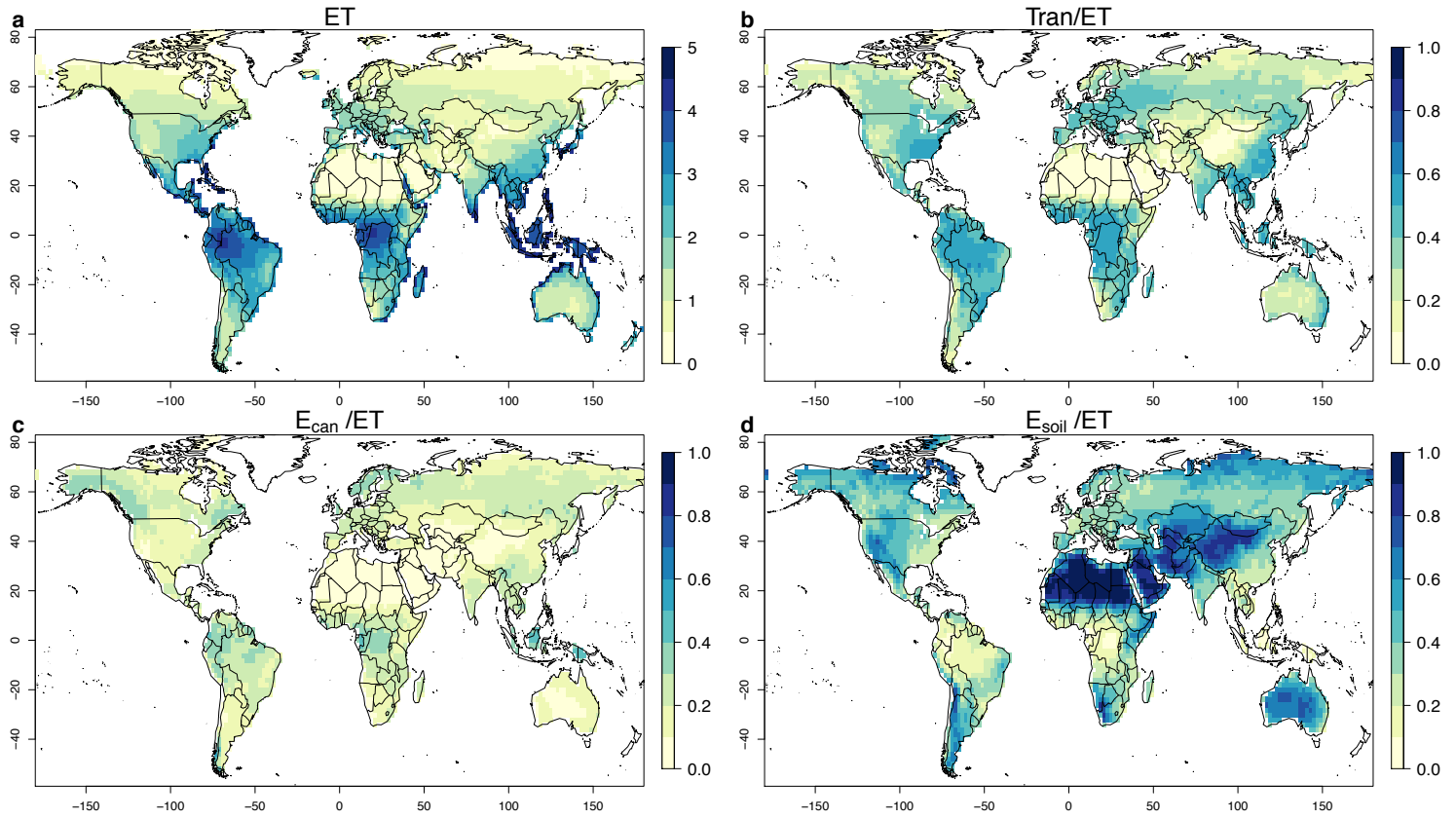


Figure S2: As in Figure 1, but for the multi-model mean annual-mean values over 1950-2005 of (a) ET (mm/d) (b-d) fractions of transpiration, canopy interception and soil evaporation, respectively, in total ET. 32 models with full ET partitioning are used.

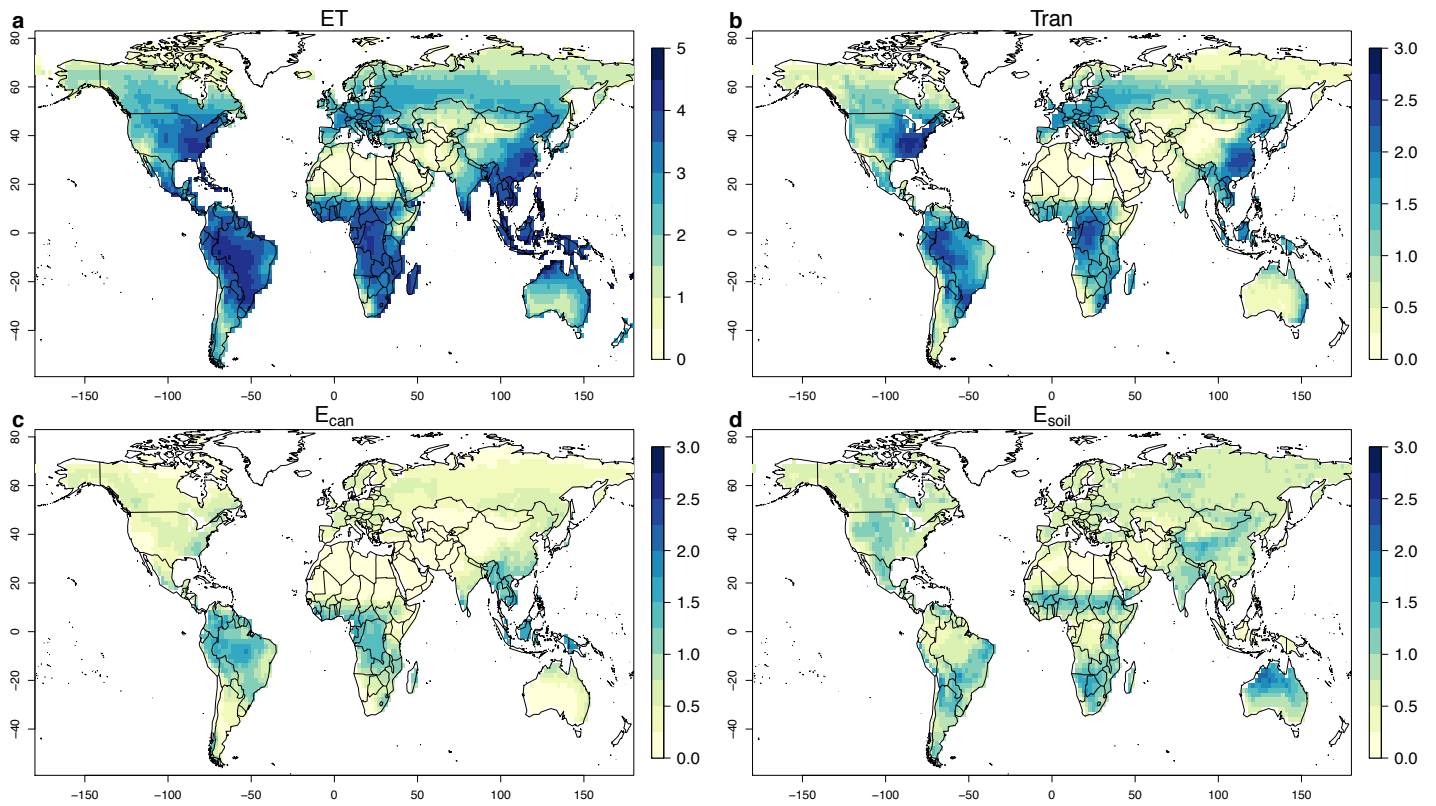


Figure S3: Multi-model mean summertime-mean values over 1950-2005 of (a) ET (mm/d) (b) transpiration, (c) canopy interception and (d) soil evaporation, respectively, in mm/d. 32 models with full ET partitioning are used. Note the different color scales between (a) and (b-d).

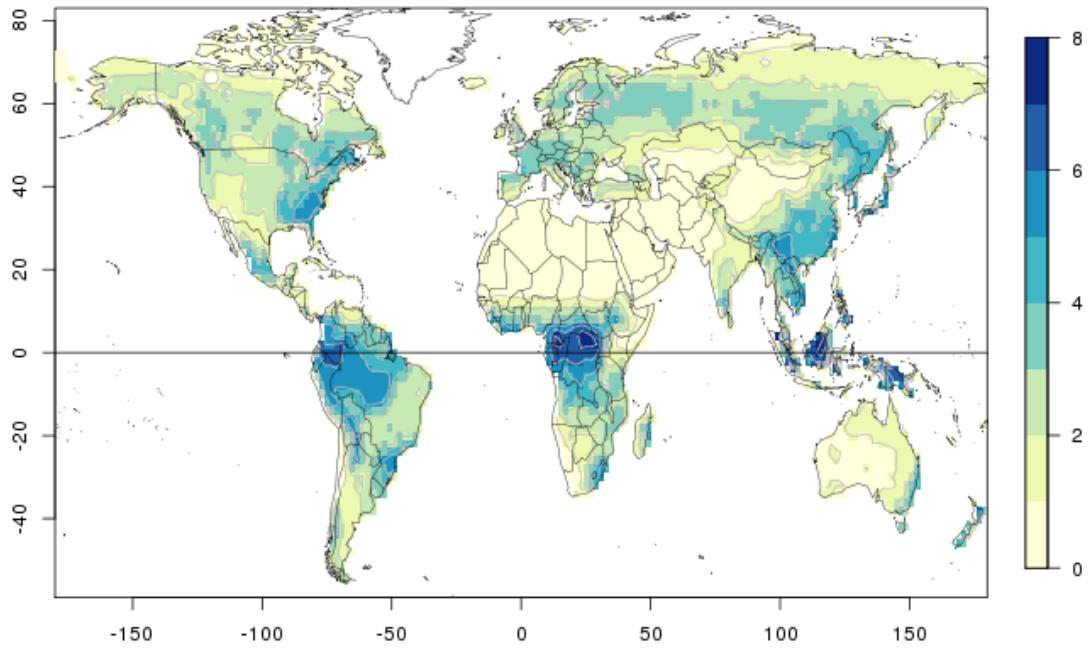


Figure S4: Multi-model mean summertime-mean Leaf Area Index (LAI) over 1950-2005. Multi-model mean is calculated for the 22 common models for which both full ET partitioning and LAI were available.

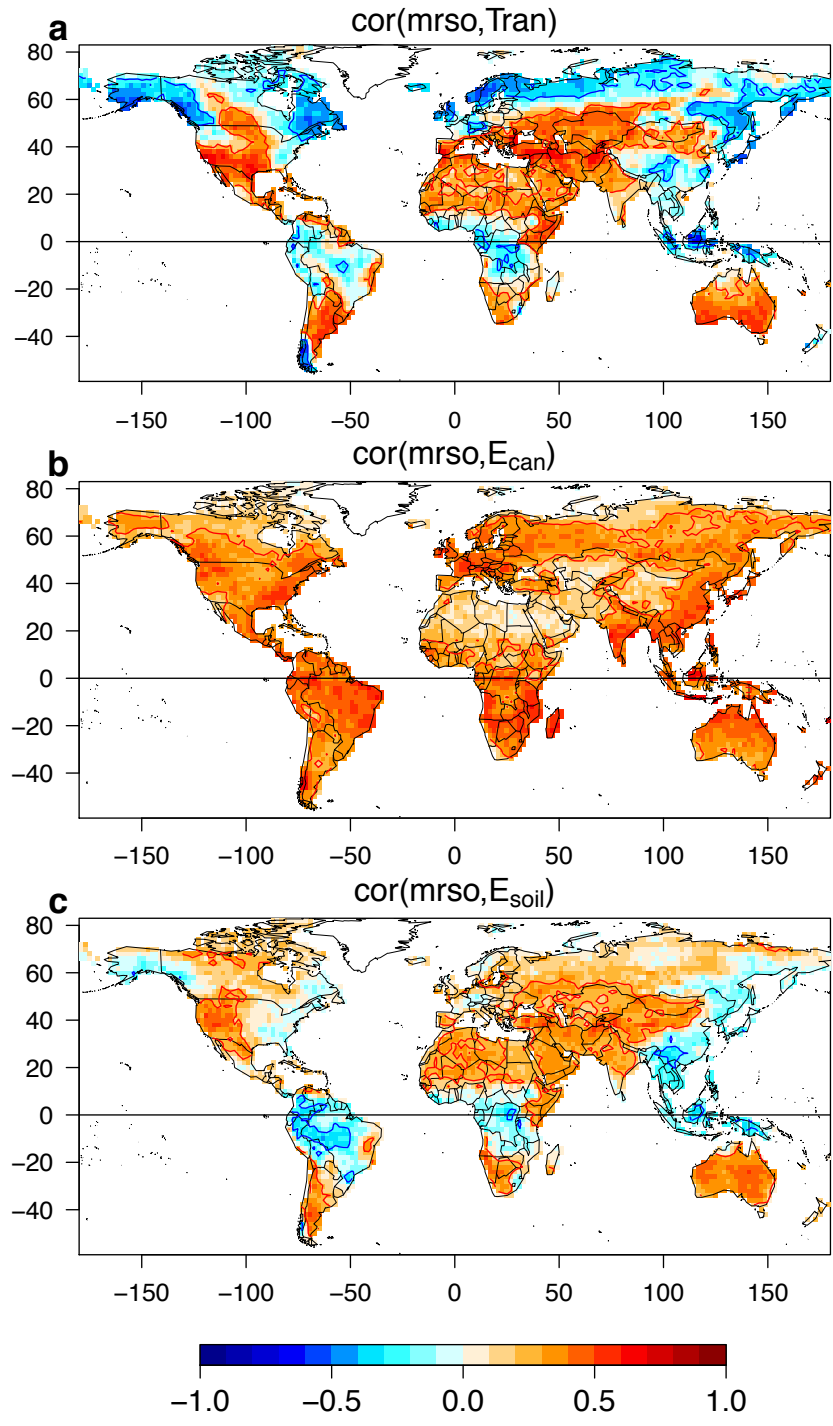


Figure S5: As in Figure 2, but for the multi-model mean correlation between summertime-mean total column soil moisture (mrso) and (a) transpiration (b) soil evaporation and (c) canopy interception, over 1950-2005. Red and blue contour lines indicate positive and negative correlations significant at the 5% level. 25 models with full ET partitioning and total soil moisture available are used.

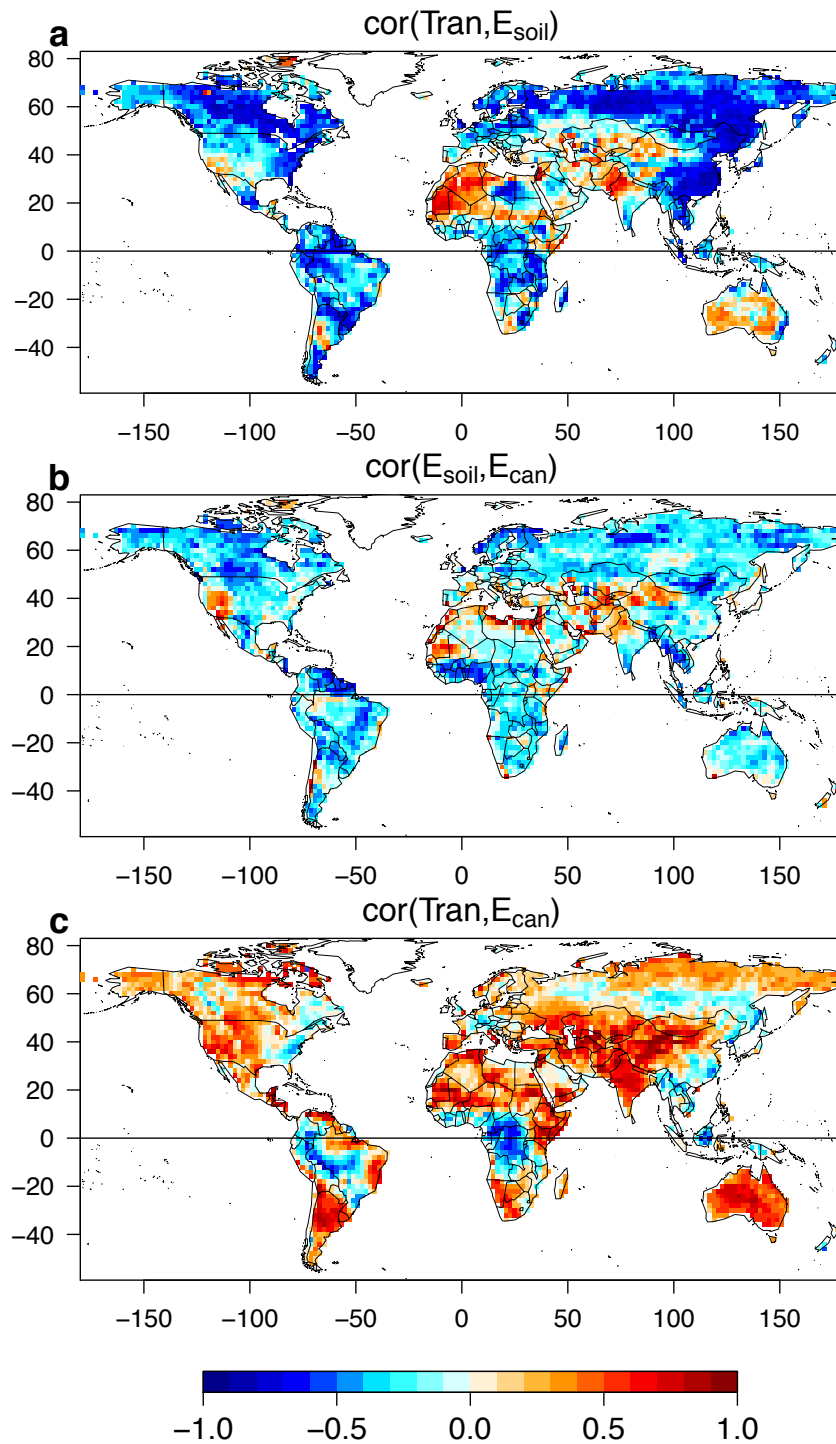


Figure S6: Multi-model mean correlation over 1950-2005 between summertime-mean values of (a) transpiration and soil evaporation (b) transpiration and canopy interception, and (c) soil evaporation and canopy interception. 32 models with full ET partitioning are used.

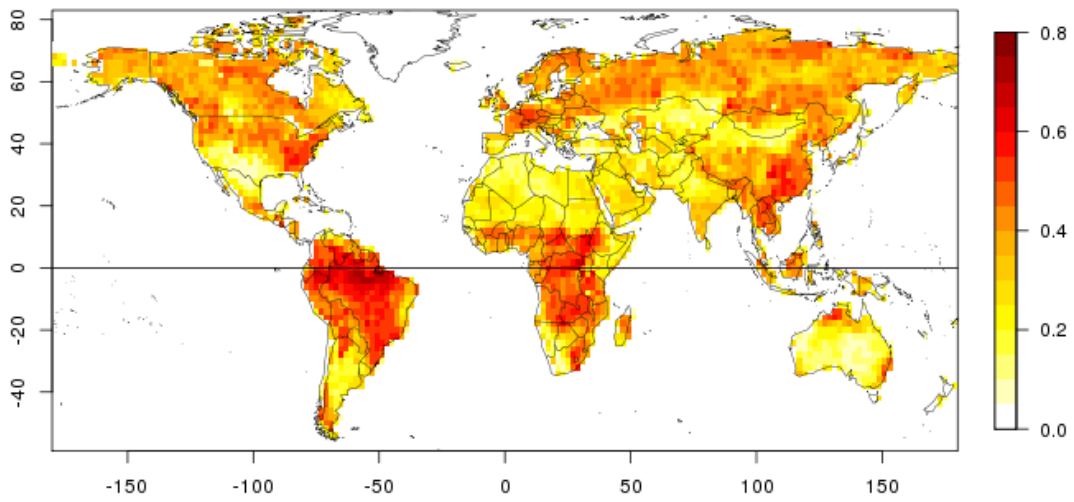


Figure S7: Standard deviation across CMIP5 models of the correlation between summertime-mean surface SM and ET over 1950–2005. 29 models with full ET partitioning and surface soil moisture available are used.