Hydrologic benchmarking of meteorological drought indices at interannual to climate change timescales: A case study over the Amazon and Mississippi river basins

Supplementary Material

Based on CNRM-CM5.1 simulations, we showed that projections are highly index definition dependent (Fig.3 and Fig.4). Taking into account the strong uncertainties among CGMs, we repeat this analysis using a subset of 13 CMIP5 models (summarized in Table1) under the same RCP8.5 concentration scenario. The ensemble mean projections as well as the corresponding uncertainties are plotted in Fig. R1 over both the Amazon and the Mississippi river basin for two drought indices: SPI12 and SPEI12_hg. Note that we could not compute the SPEI_hg from the IPSL model as the Tmin and Tmax outputs are not available.

The projections of the areal fraction in drought are qualitatively consistent with those derived from CNRM.CM5 (cf. Fig 3 in the manuscript). Therefore, CNRM-CM5 is not an outlier among the CMIP5 models. Moreover, the difference among the different drought indices is not negligible compared to the inter-model spread shown for a given index (especially over the Mississippi) so that the index definition is as important as the choice of the model as a source of uncertainty for drought projections.

Table S1 List of CMIP5 models used for the figure S1

Short Name	Originating Group(s)	Model version CMIP5	Atmospheric Resolution CMIP5
CCCMA	CCCMA (Victoria,Canada)	canesm2	128 x 64, L35
CNRM	CNRM & CERFACS (Toulouse, France)	cnrm-cm5	256 x 128, L31
CSIRO	CSIRO & QCCCE (Australia)	csiro-mk3-6-0	192 x 96, L18
GFDL	NOAA-GFDL (Princeton, USA)	gfdl-esm2m	144 x 90, L24
GISS	NASA-GISS (New York, USA)	giss-e2-r	144 x 90, L40
INM	INM (Moscow, Russia)	inmcm4	180 x 120, L21
IPSL	IPSL (Paris, France)	ipsl-sm5a-lr	96 x 96, L39
MIROC	AORI & NIES & JAMSTEC (Japan)	miroc-esm	128 x 64, L35
MOHC	MOHC (Exeter, UK)	hadgem2-es	192 x145, L38
MPI	MPIM (Hamburg, Germany)	mpi-esm-lr	192 x 96, L47
MRI	MRI (Tsukuba, Japan)	mri-cgcm3	320 x 160, L48
NCAR	NCAR (Boulder, USA)	ccsm4	288 x 192, L26
NCC	NCC (Oslo, Norway)	noresm1-m	144 x 96, L26

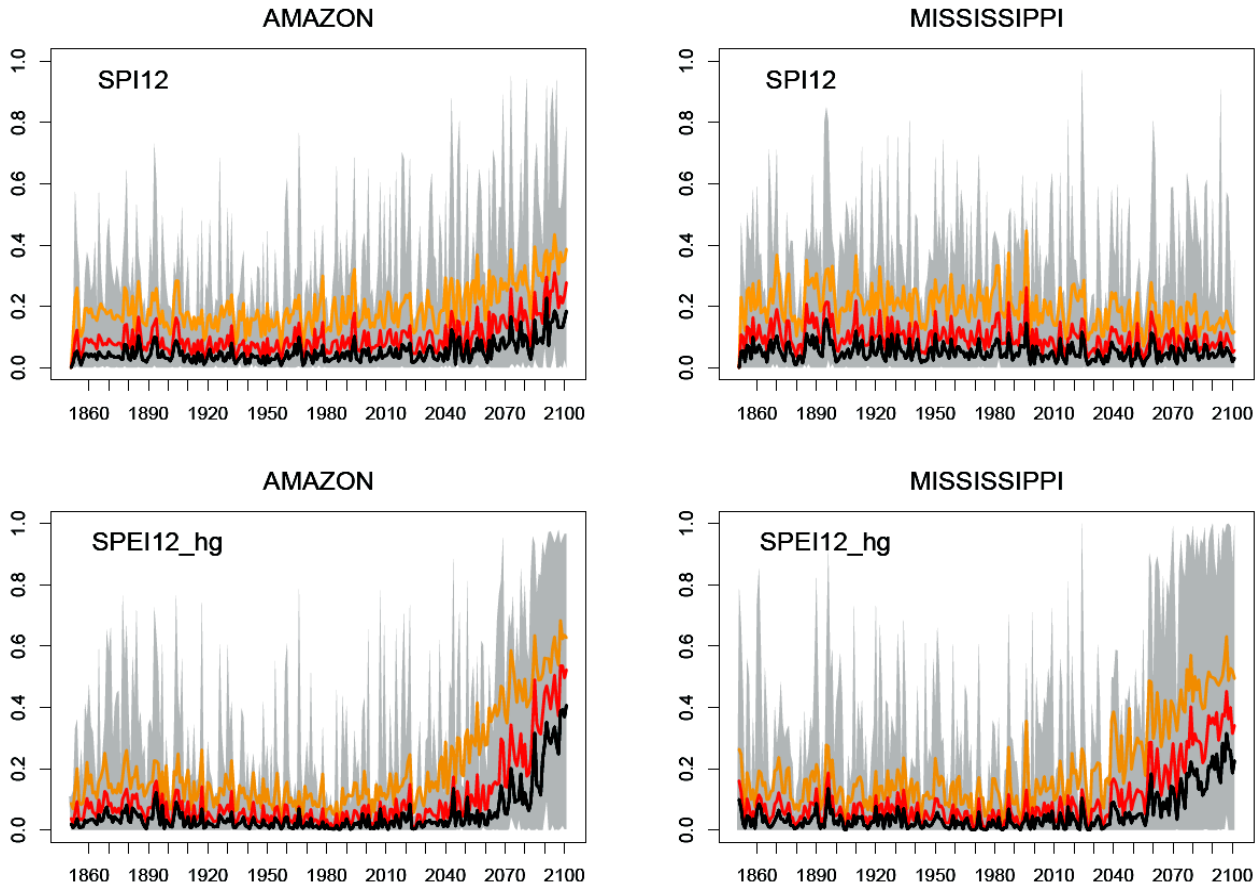

Fig S1: Time series from 1850 to 2100 of the ensemble mean value of the areal fraction in drought condition in the Amazon and Mississippi basins for a subset of 13 CMIP5 models. Moderate, severe and extreme droughts are defined locally as below the 20th (orange), the 10 th (red) and the 5th (black) percentile. The grey envelop around the red line is defined by the minimum and maximum values of severe droughts among the models. Note that, as we used only one member for each model, the interannual variability is here much more stronger than in Fig3 of the manuscript where we used 5 members for the CNRM-CM5.