IS CLIMATE CHANGE DRIVING AN INCREASE IN GLOBAL FIRES?

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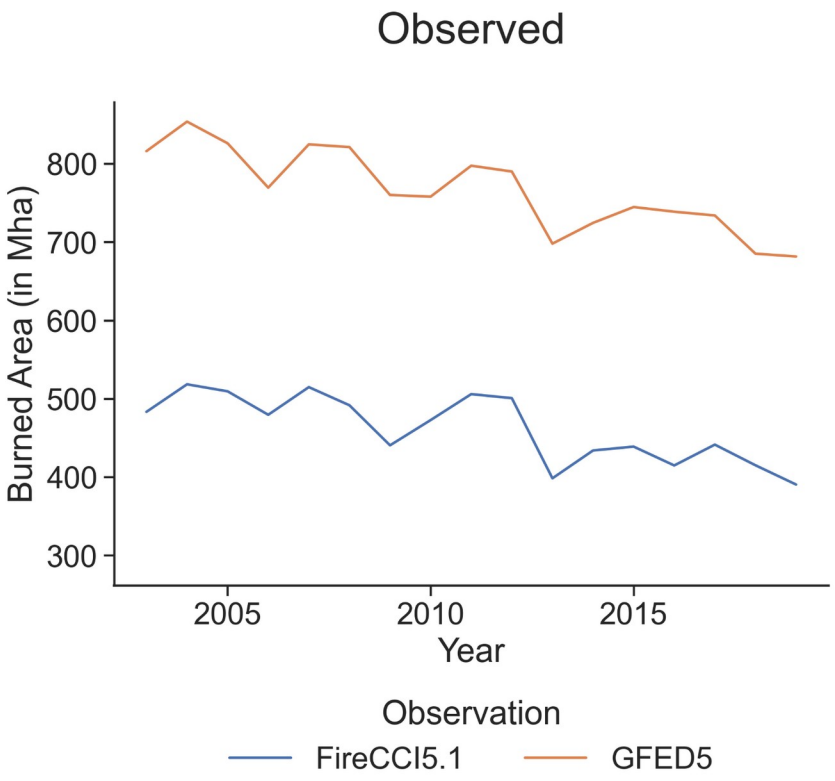
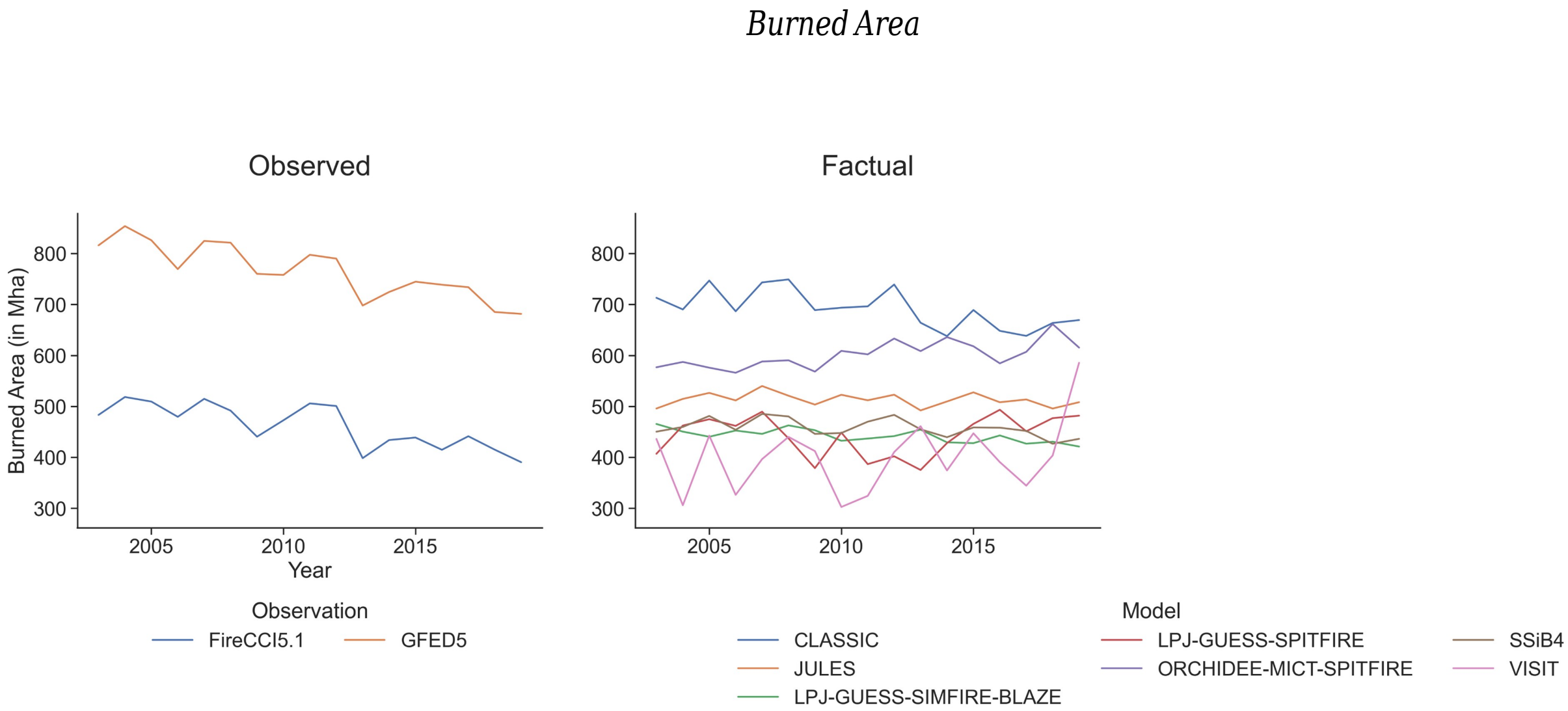
Burned Area

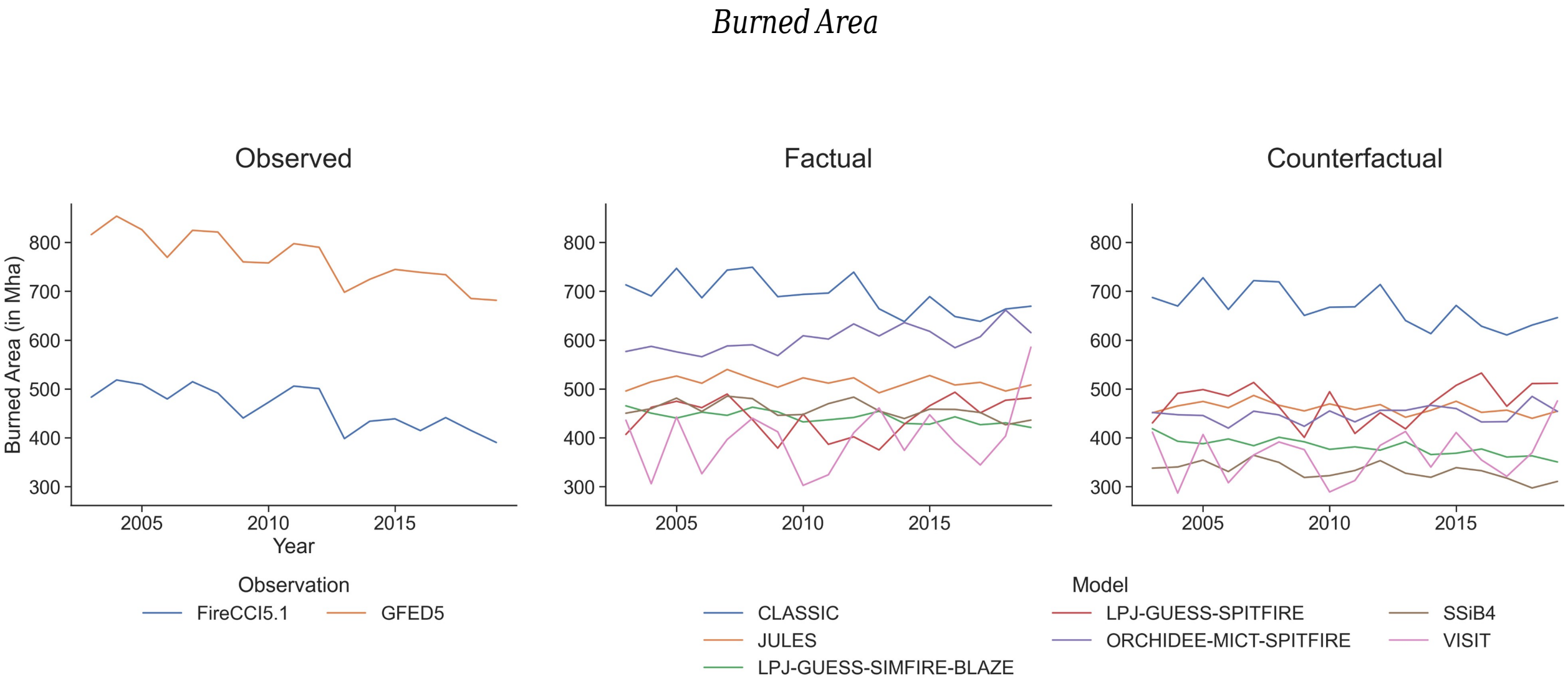
Burned Area



Burned Area

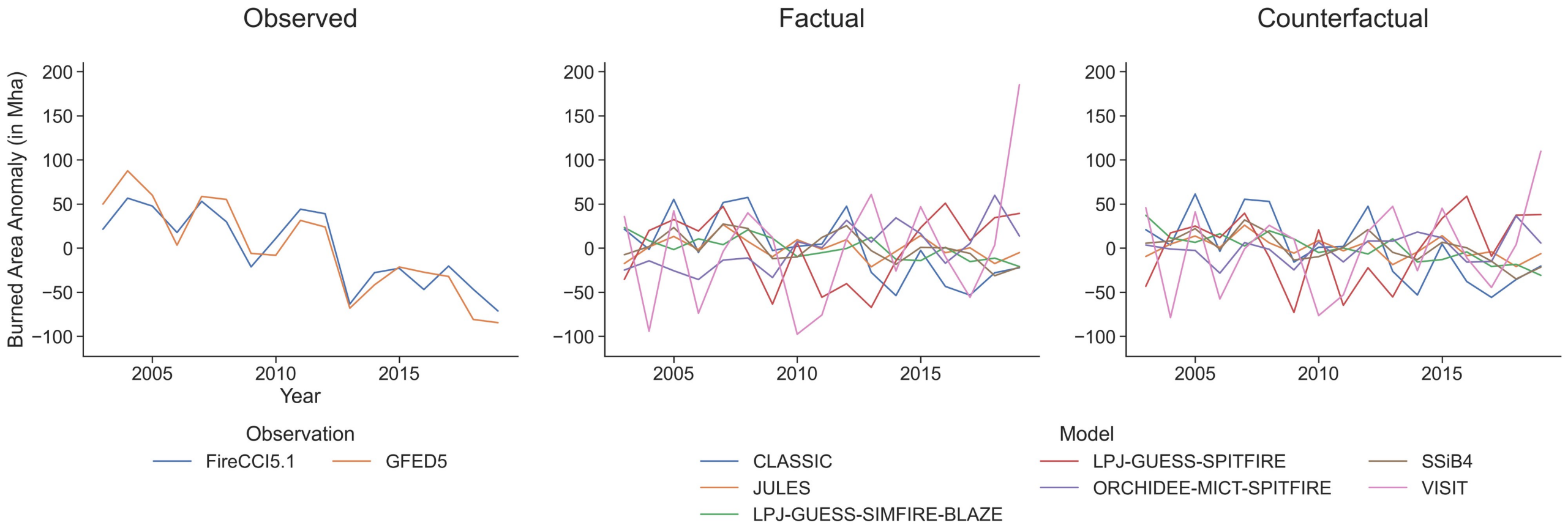

Burned Area
Observed
Factual
Burned Area (in Mha)
800
700
600
500
400
300
2005
2010
2015
Year
Observation
FireCCI5.1
GFED5
Model
CLASSIC
JULES
LPJ-GUESS-SIMFIRE-BLAZE
LPJ-GUESS-SPITFIRE
ORCHIDEE-MICT-SPITFIRE
SSiB4
VISIT

Burned Area

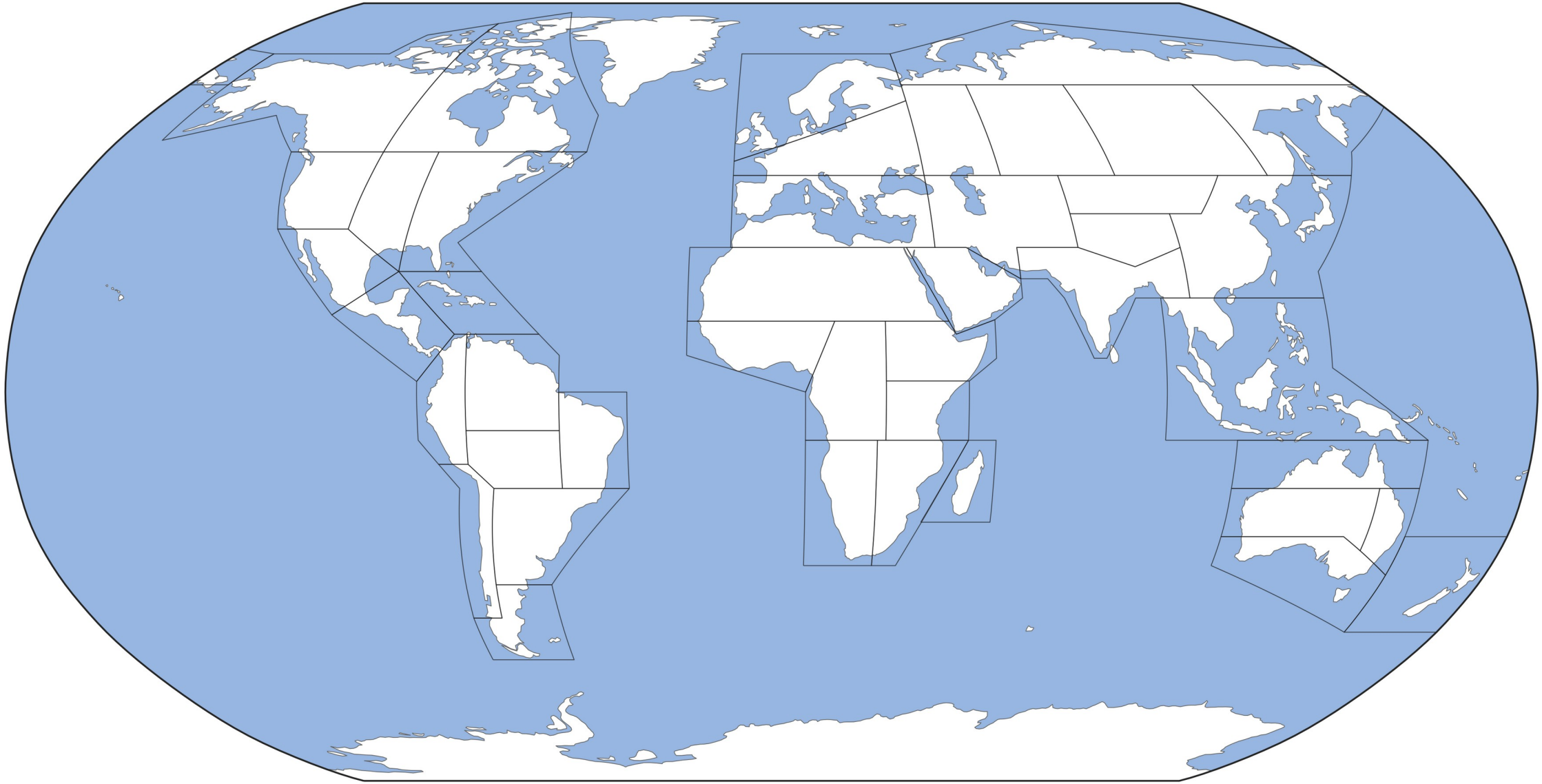

Burned Area
Observed
Factual
Counterfactual
Burned Area (in Mha)
800
700
600
500
400
300
2005
2010
2015
Year
Observation
FireCCI5.1
GFED5
Model
CLASSIC
JULES
LPJ-GUESS-SIMFIRE-BLAZE
LPJ-GUESS-SPITFIRE
ORCHIDEE-MICT-SPITFIRE
SSiB4
VISIT

Burned Area Anomaly

$$Burned\ Area - \overline{Burned\ Area}$$

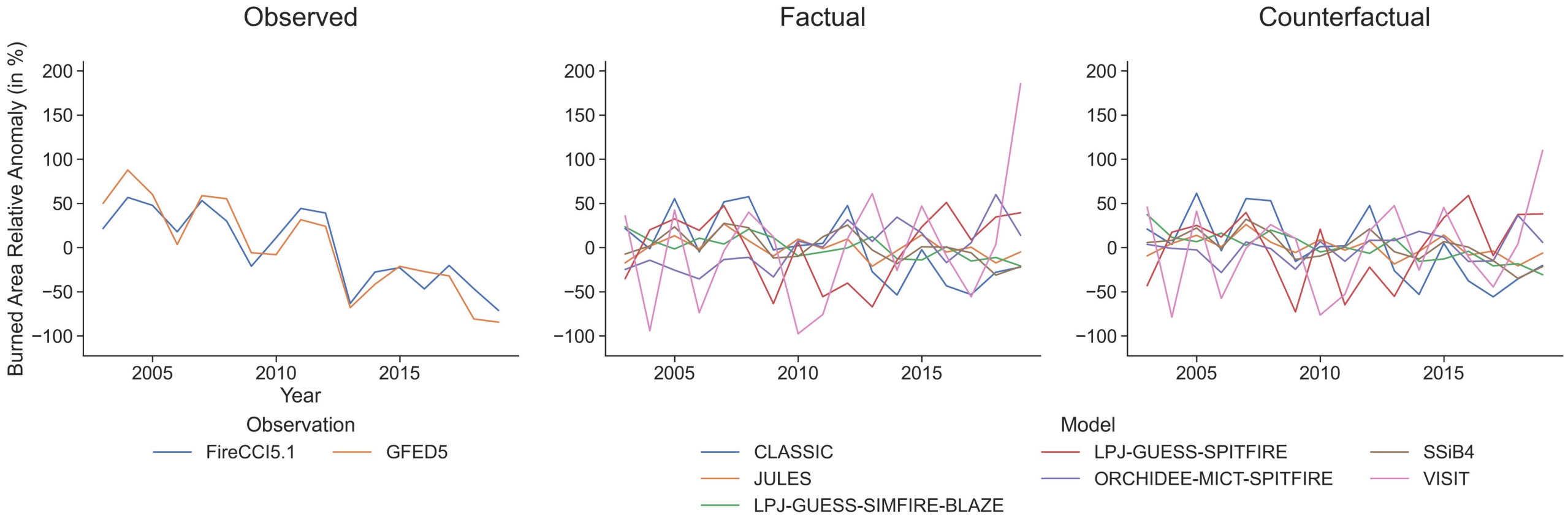


AR6 IPCC Regions



Burned Area Relative Anomaly

$$\frac{Burned\ Area - \overline{Burned\ Area}}{\overline{Burned\ Area}}$$



What?

1. What has already changed because of CC?

2. How fast are things changing currently?

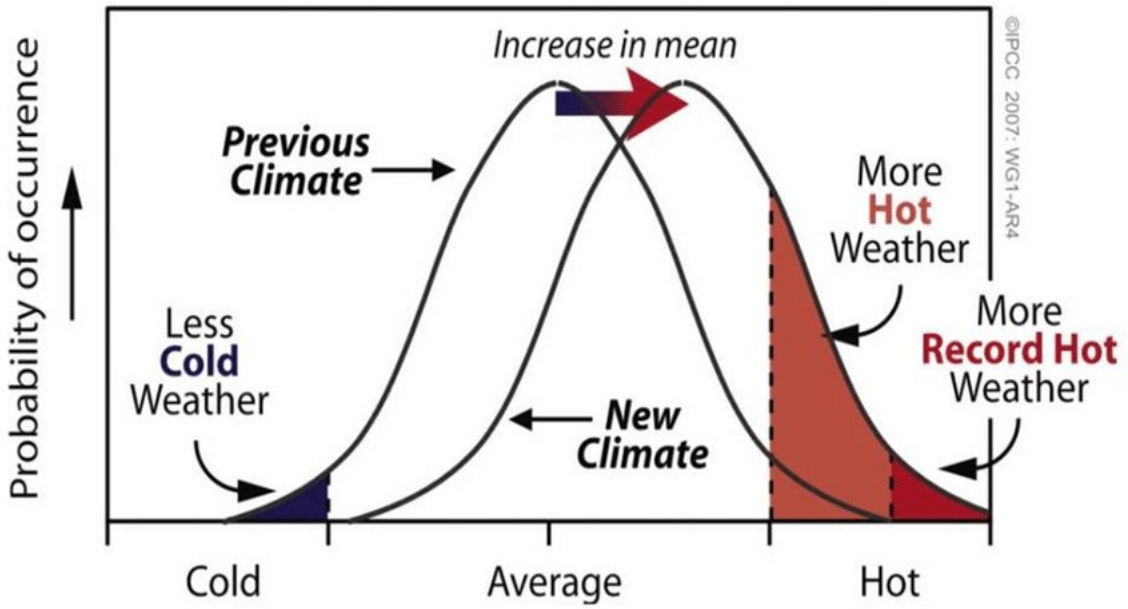
How?

1. What has already changed because of CC?
   Change in BA distribution

2. How are these changes (currently) evolving?
   Recent trends in relative anomaly difference

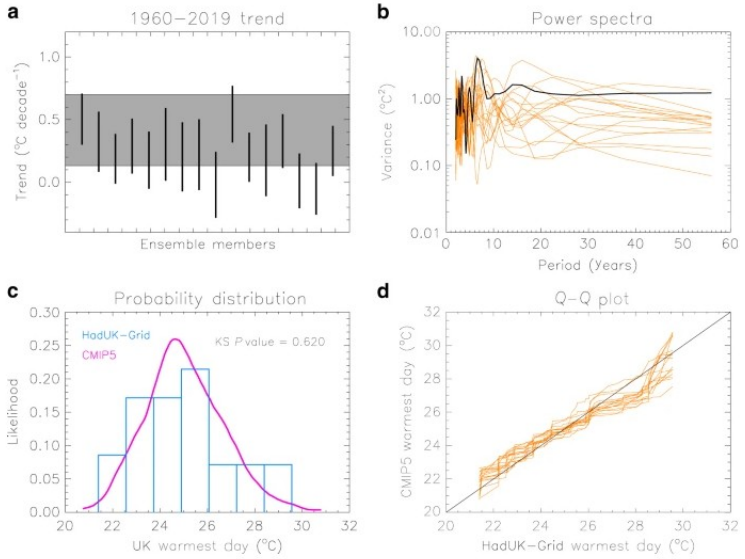
Steps

1. Regional evaluation of fire models
2. Regionally weighted ensemble
3. Analysis

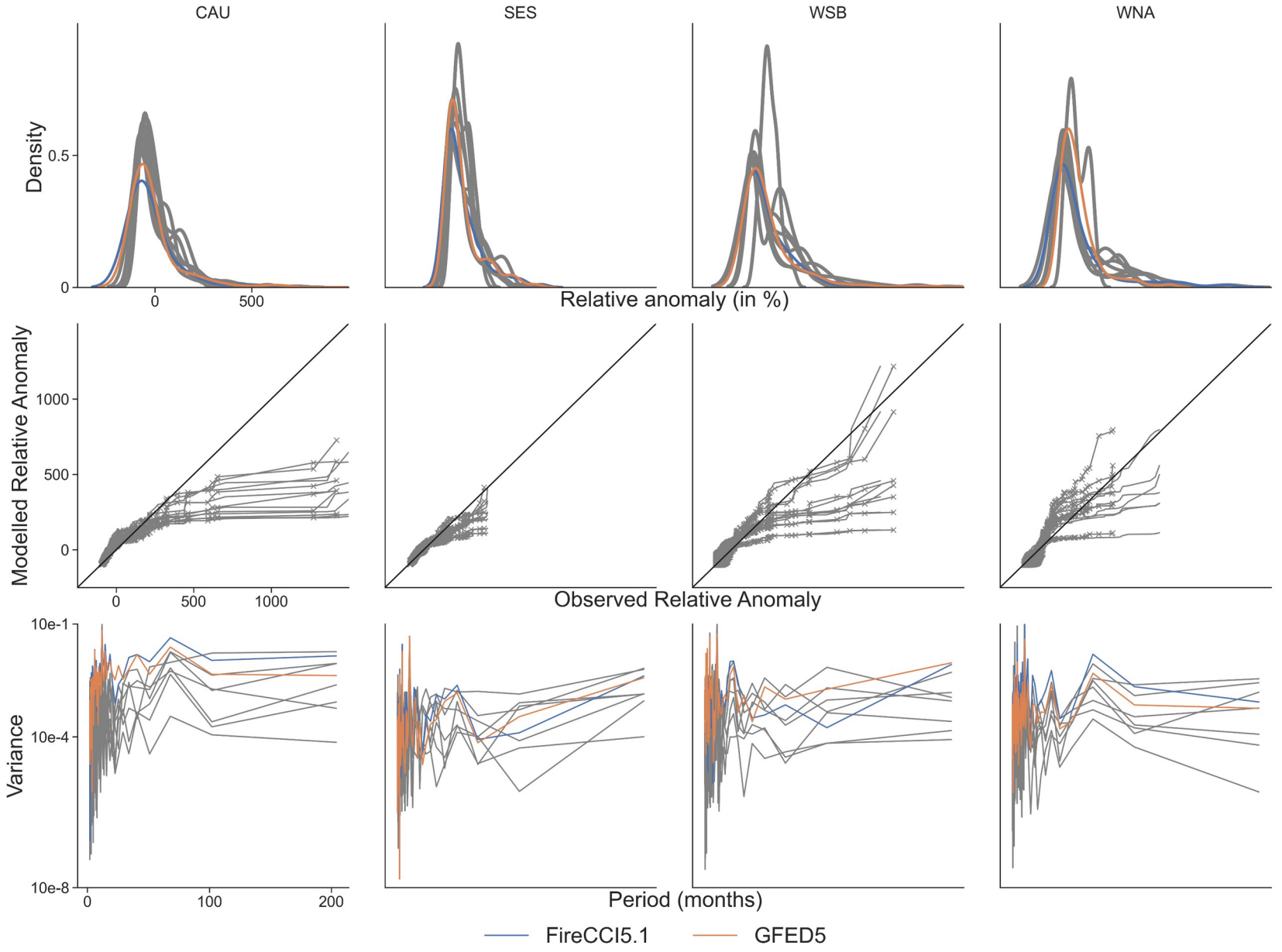


Evaluation

Fig. 3: Model evaluation.



Christidis et al. 2020



Evaluation

NME part of FireMIP default benchmarking

$$\mathrm{NME} = \frac{\sum A_i |\mathrm{obs}_i - \mathrm{sim}_i|}{\sum A_i \left|\mathrm{obs}_i - \overline{\mathrm{obs}}\right|},$$

Kelley et al., 2013; Hantson et al., 2020

Monthly ranked NME for distribution
Annual unranked NME for trend

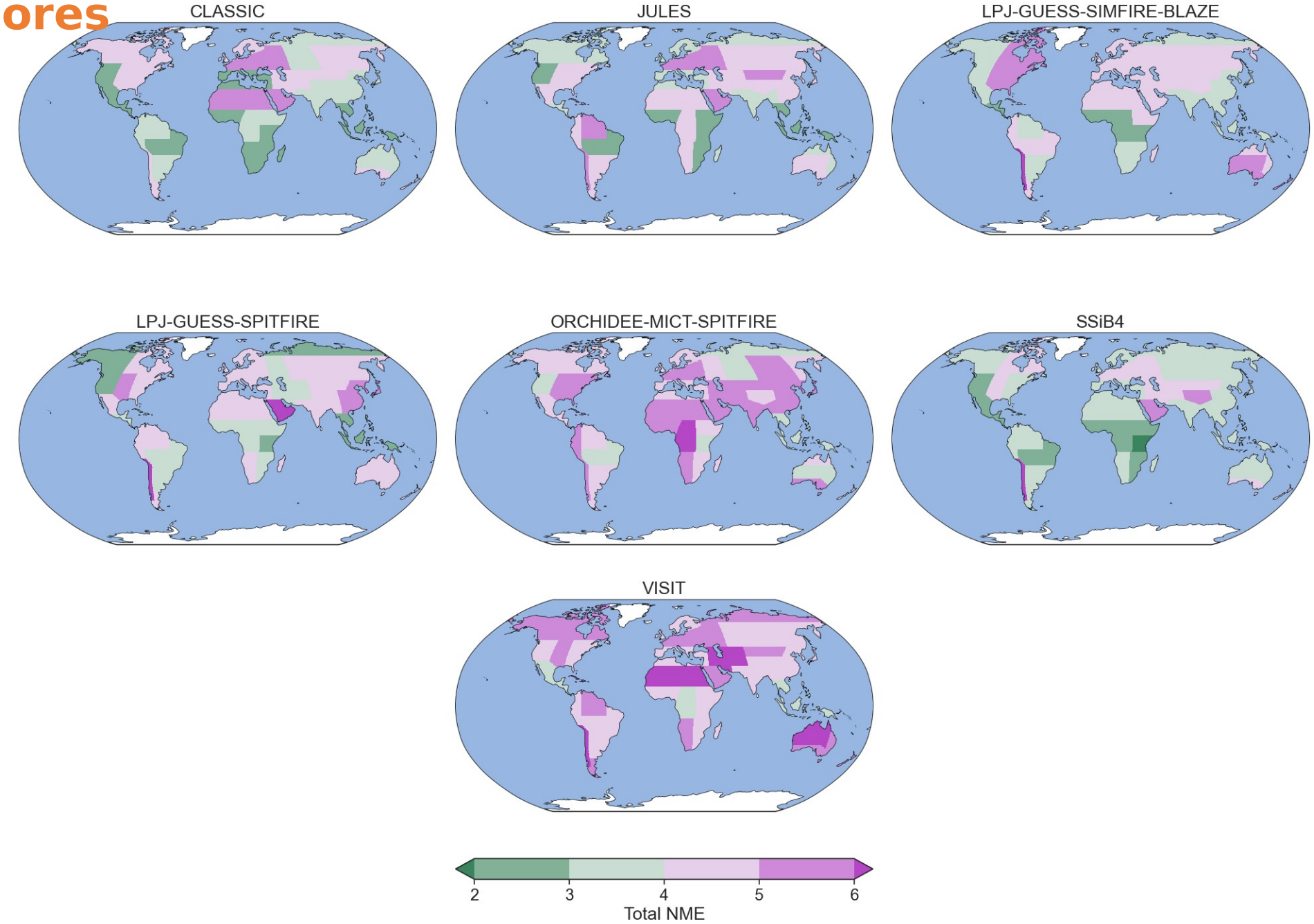
Turn NMEs into one weight per model per region

$$w_i = \frac{e^{-\frac{D_i}{\sigma D}}}{1 + \sum_{j \neq i}^{M} e^{-\frac{S_{ij}}{\sigma S}}},$$

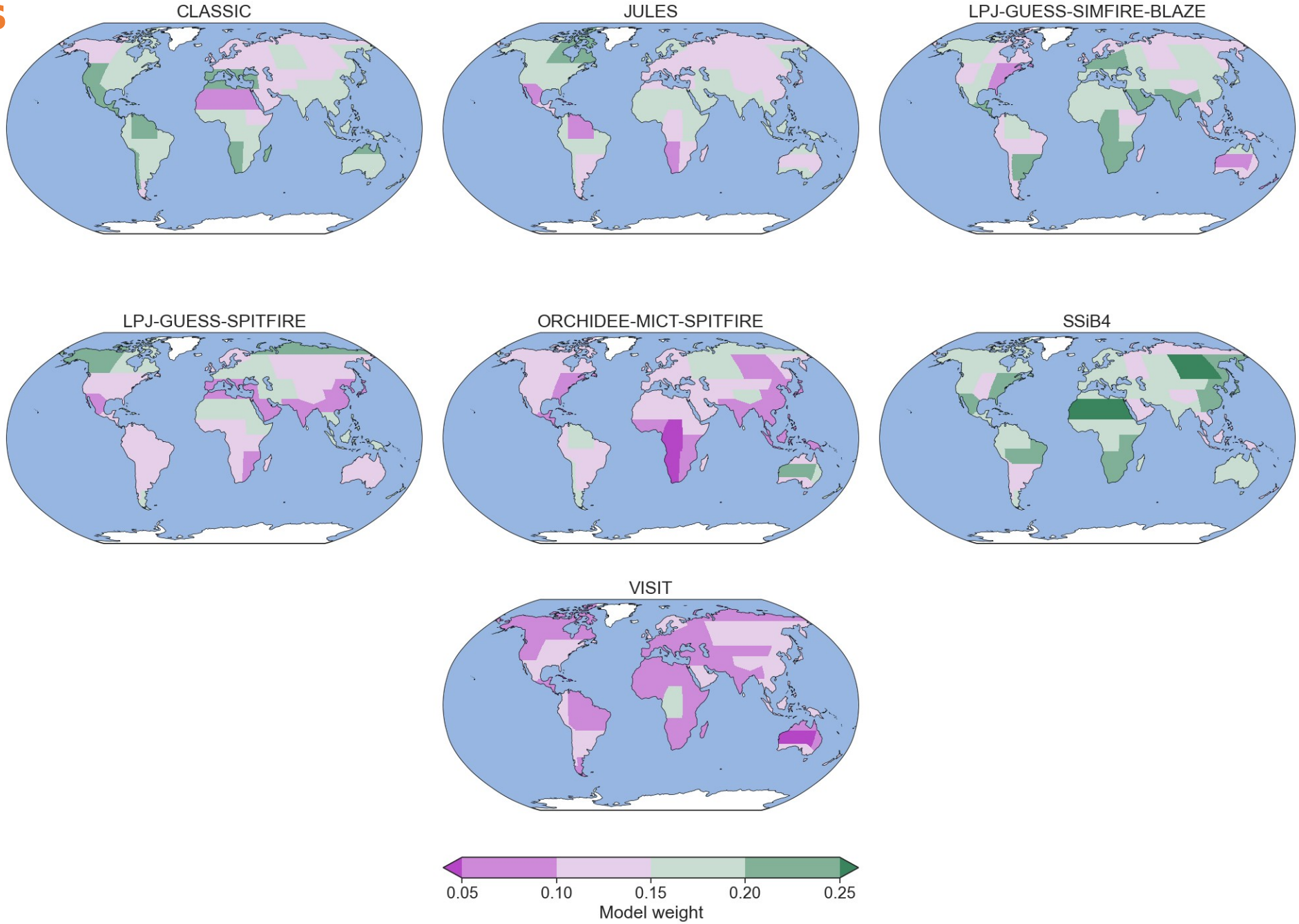
Brunner et al., 2019

Region								NWN
Model		CLASSIC	JULES	LPJ-GUESS-SIMFIRE-BLAZE	LPJ-GUESS-SPITFIRE	ORCHIDEE-MICT-SPITFIRE	SSiB4	VISIT
weights		0.121909	0.164952	0.16245	0.216085	0.113882	0.166913	0.053809
GFED5	NME3_ranked	0.75842	0.609744	0.617835	0.509879	0.779205	0.730218	1.455793
	NME3_annual	1.646342	1.279412	1.31332	0.981308	1.772612	0.925459	1.368974

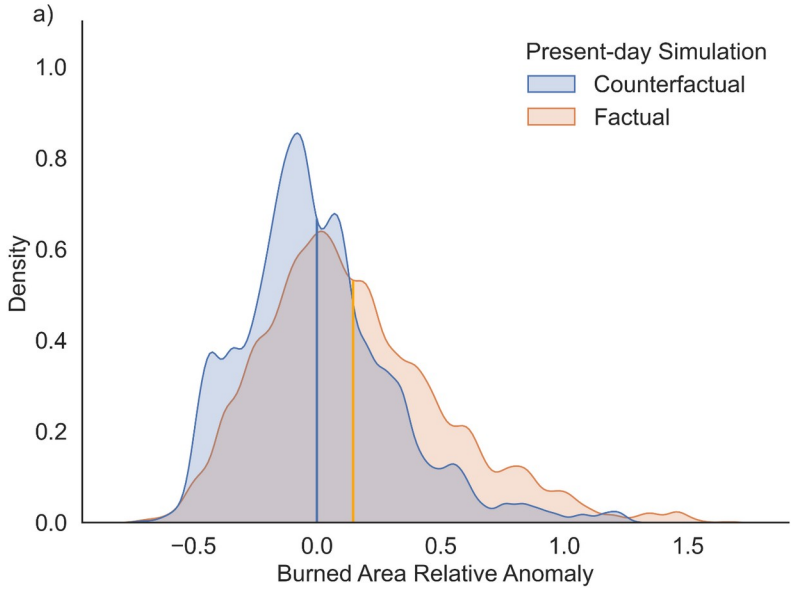
NME Scores

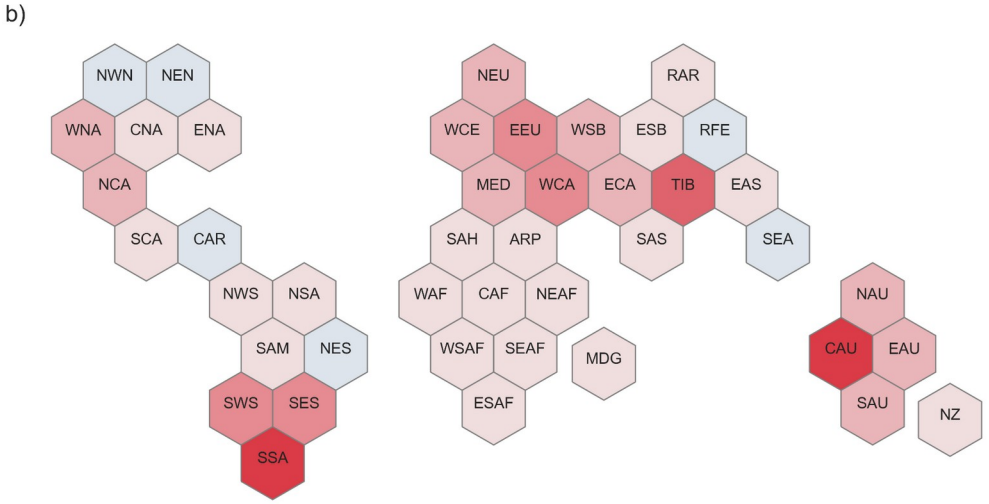

CLASSIC
JULES
LPJ-GUESS-SIMFIRE-BLAZE
LPJ-GUESS-SPITFIRE
ORCHIDEE-MICT-SPITFIRE
SSiB4
VISIT
2
3
4
5
6
Total NME

Weights


CLASSIC
JULES
LPJ-GUESS-SIMFIRE-BLAZE
LPJ-GUESS-SPITFIRE
ORCHIDEE-MICT-SPITFIRE
SSiB4
VISIT
0.05
0.10
0.15
0.20
0.25
Model weight

Results

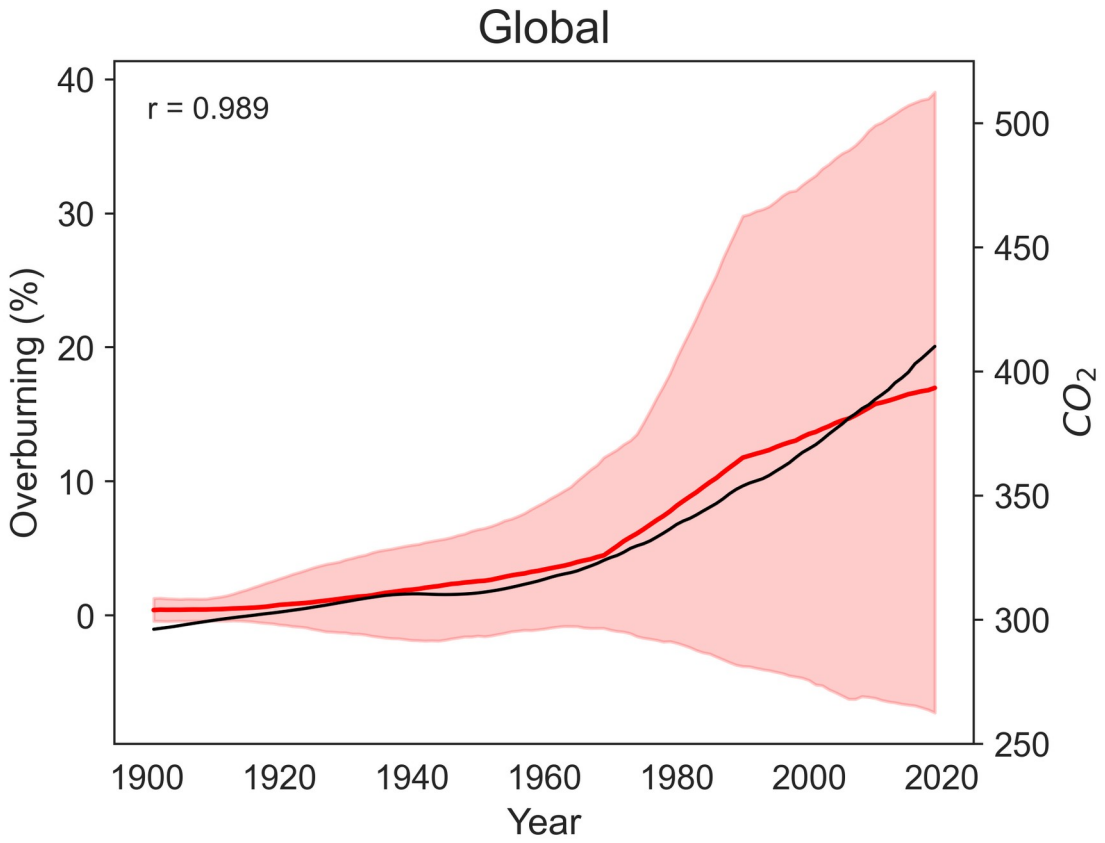

a)
Present-day Simulation
Counterfactual
Factual
Density
1.0
0.8
0.6
0.4
0.2
0.0
−0.5
0.0
0.5
1.0
1.5
Burned Area Relative Anomaly

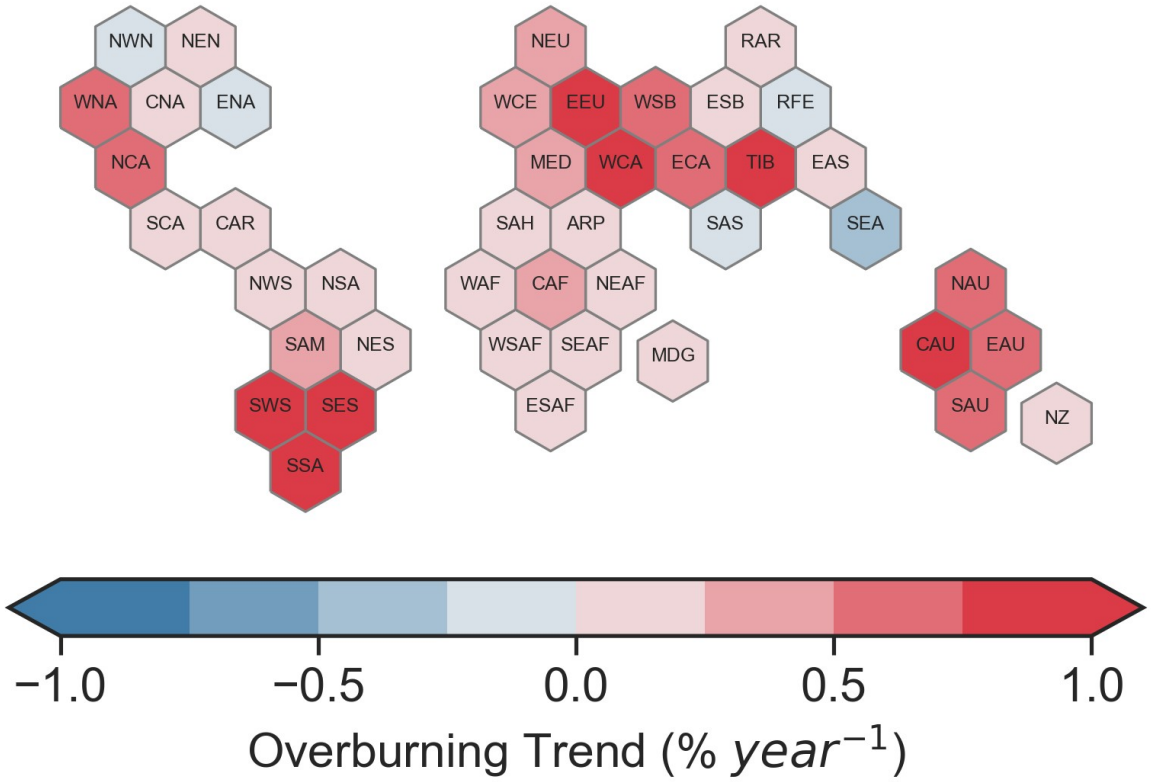

1901-1920
Climate Change
b)
NWN
NEN
WNA
CNA
ENA
NCA
SCA
CAR
NWS
NSA
SAM
NES
SWS
SES
SSA
NEU
RAR
WCE
EEU
WSB
ESB
RFE
MED
WCA
ECA
TIB
EAS
SAH
ARP
SAS
SEA
WAF
CAF
NEAF
WSAF
SEAF
MDG
ESAF
NAU
CAU
EAU
SAU
NZ


−100
−75
−50
−25
0
25
50
75
100
Burned Area Change (in %)

Results

$$\frac{\overline{Factual_{21\,year}} - \overline{Counterfactual_{21\,year}}}{\overline{Counter\,f\,actual_{21\,year}}}$$





Main conclusions

1. What has already changed because of CC?

   Global = 17.5% more burned area
   Highest Region (CAU) = 110% more burned area

2. How fast are things changing currently?

   Global Trend = 0.5% per year
   Highest Trend (CAU) = 2.5% per year


That's all Folks!