SUPPLEMENTAL MATERIAL FOR:

Concurrent extreme events of atmospheric moisture transport and continental precipitation: the role of landfalling atmospheric rivers

Luis Gimeno-Sotelo [a,*] , Luis Gimeno [a]

[a] *Centro de Investigación Mariña, Universidade de Vigo, Environmental Physics Laboratory (EPhysLab), Ourense, Spain*
[*] *Corresponding author (luis.gimeno-sotelo@uvigo.es)*

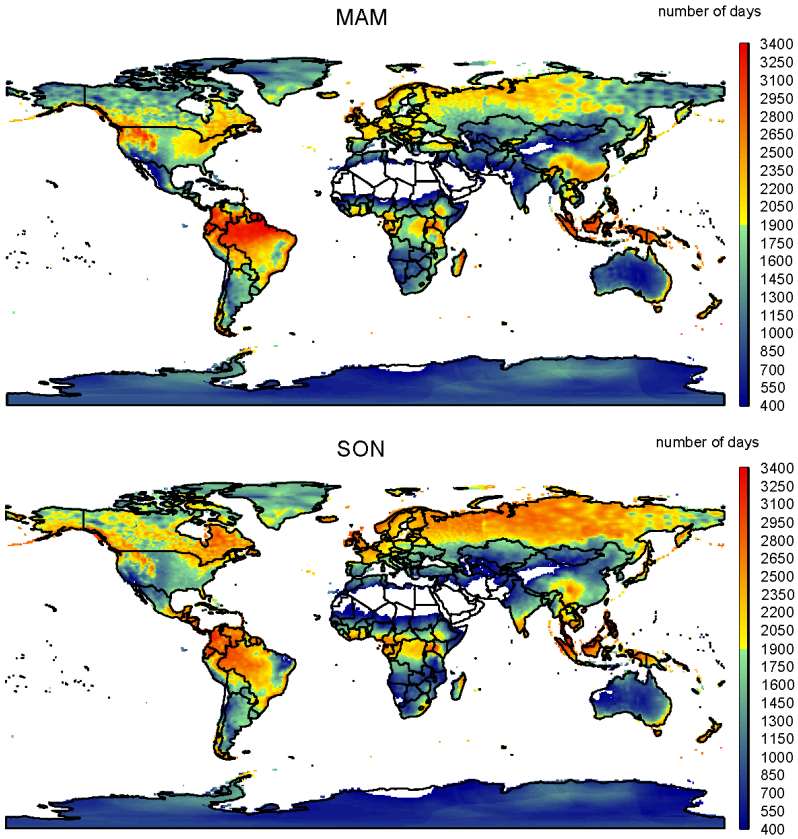


Figure S1: Total number of days for the period 1981-2017 with nonzero precipitation at each grid point for March-April-May (top) and September-October-November (bottom).

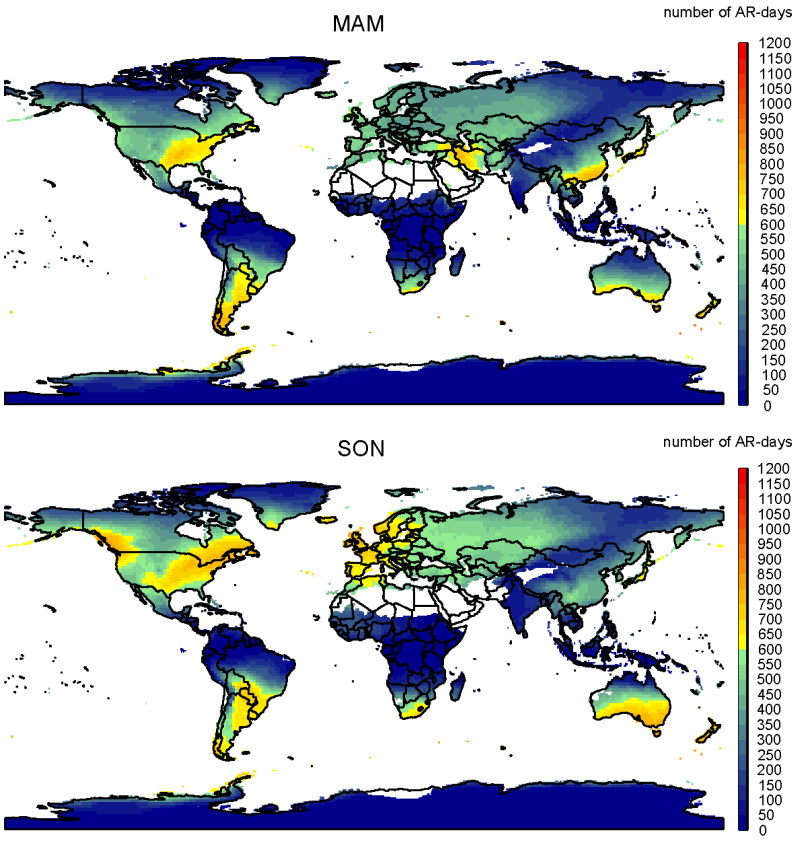


Figure S2: Number of days of occurrence of landfalling ARs for the period 1981-2017 at each grid point, for March-April-May (top) and September-October-November (bottom).

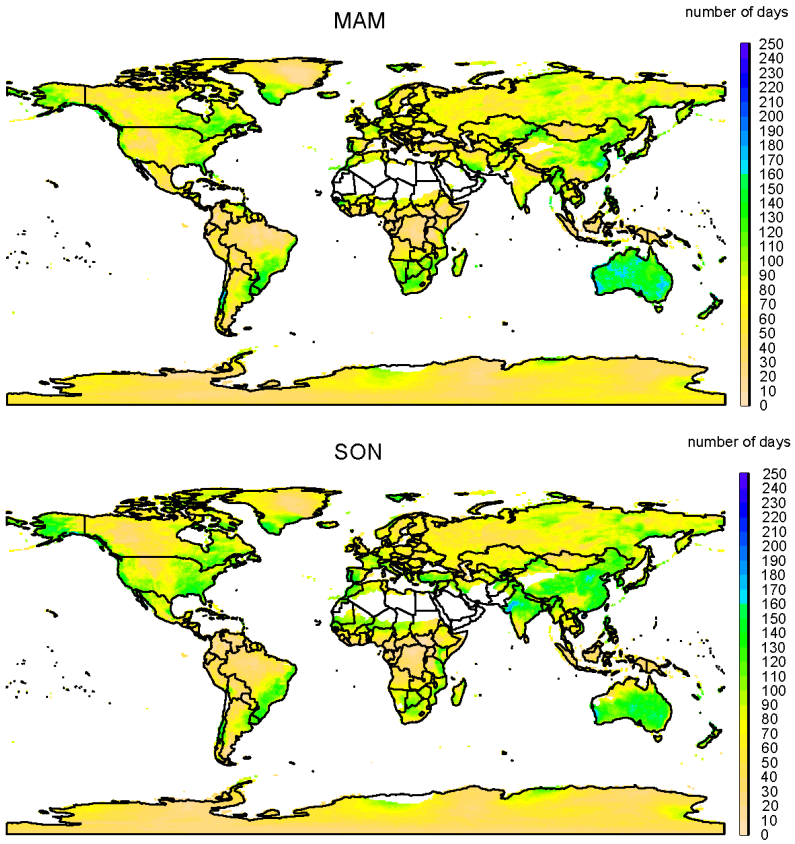


Figure S3: Number of days exceeding the bivariate threshold ($q90_{IVT}$, $q90_{prec}$) for March-April-May (top) and September-October-November (bottom) for the period 1981-2017. The quantiles were calculated including the days of zero precipitation.

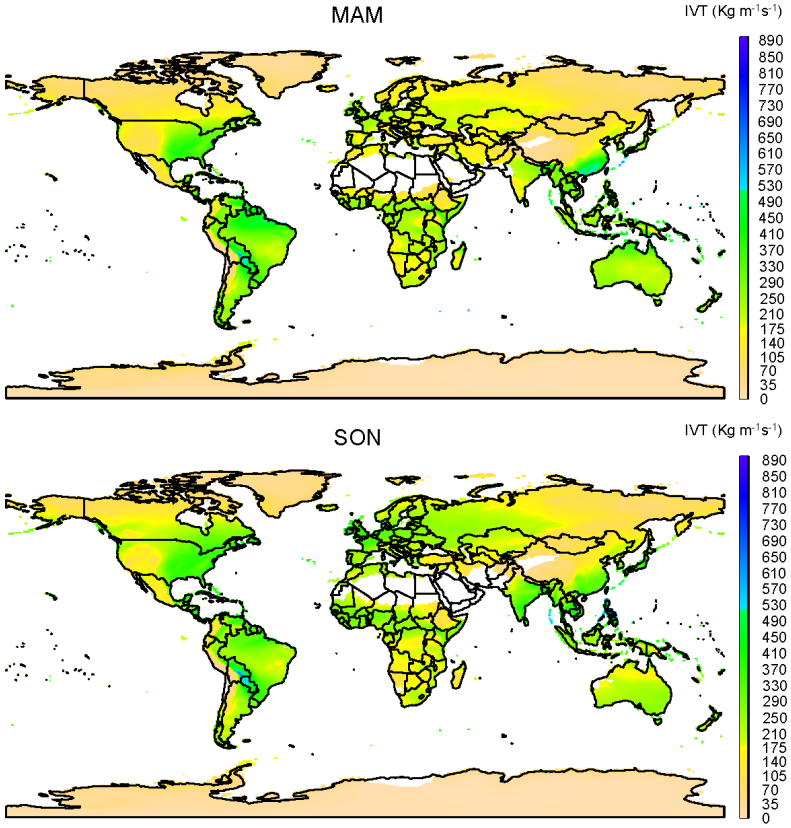


Figure S4: 90th percentile of IVT for March-April-May (top) and September-October-November (bottom) for the period 1981-2017. It was calculated including the days of zero precipitation.

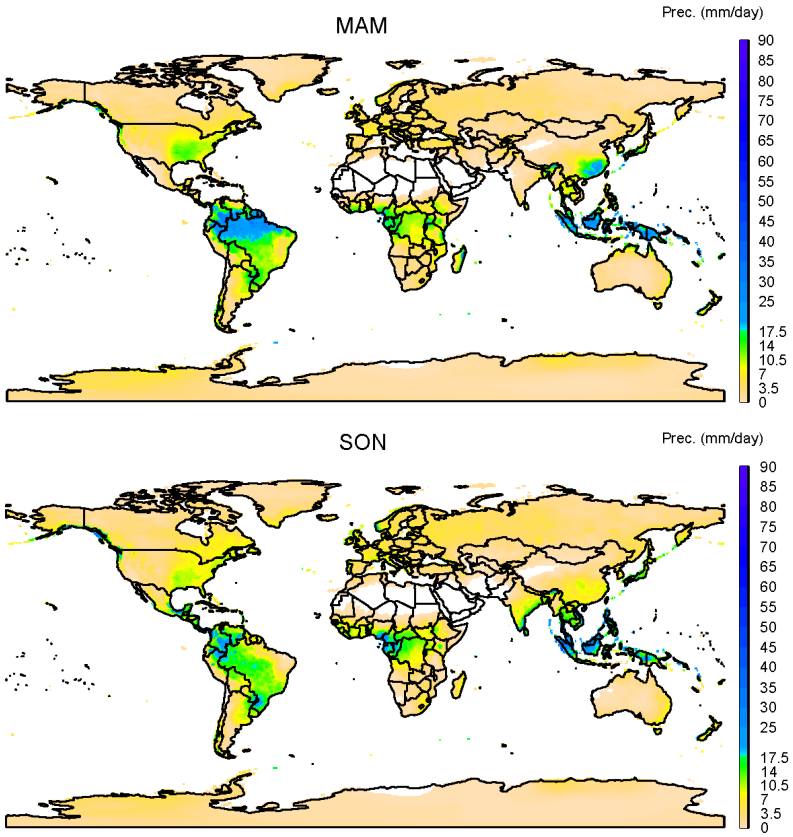


Figure S5: 90th percentile of continental precipitation for March-April-May (top) and September-October-November (bottom) for the period 1981-2017. It was calculated including the days of zero precipitation.

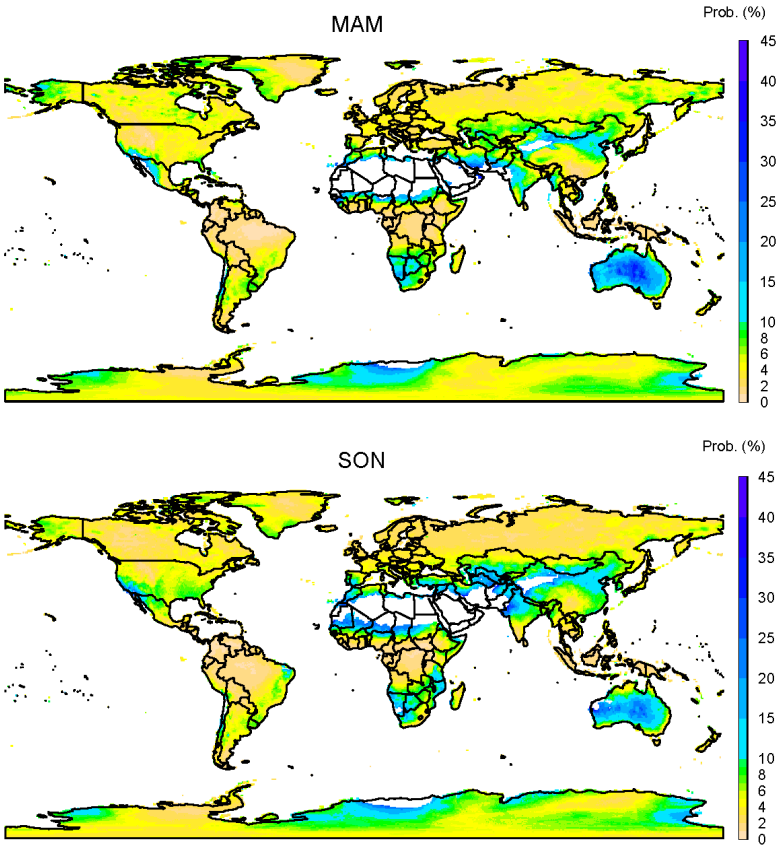


Figure S6: Estimated probability of achieving a concurrent extreme of IVT and continental precipitation (percent), for March-April-May and September-October-November for the period 1981-2017. It is computed using the copula model with the lowest AIC value for each grid point. The quantile-based thresholds were calculated including the days of zero precipitation.

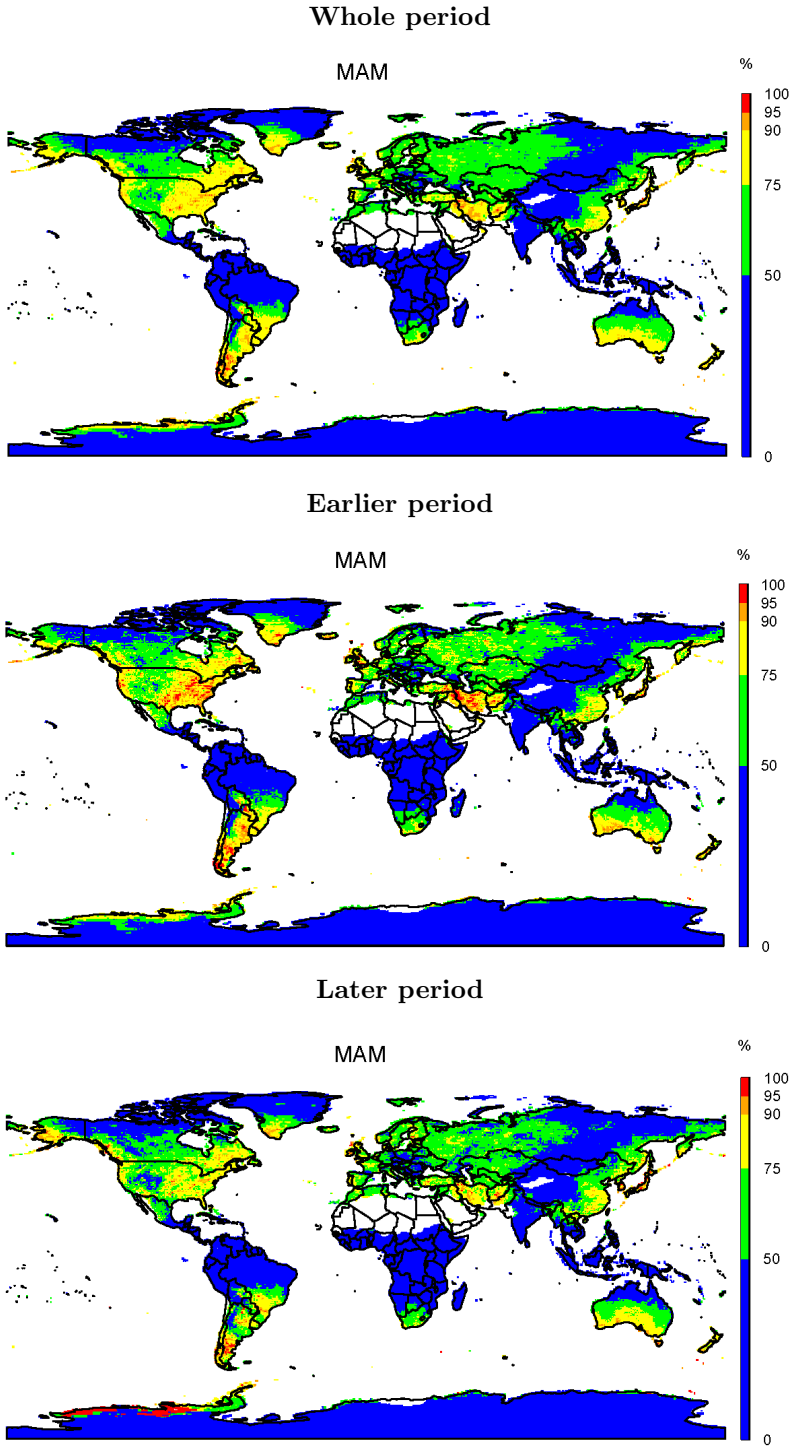
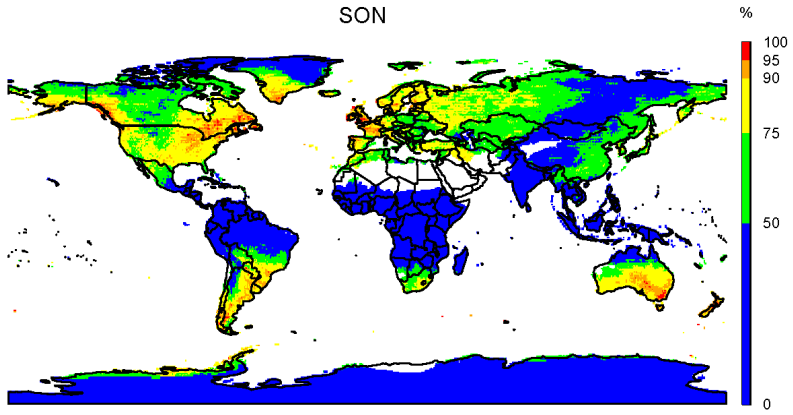
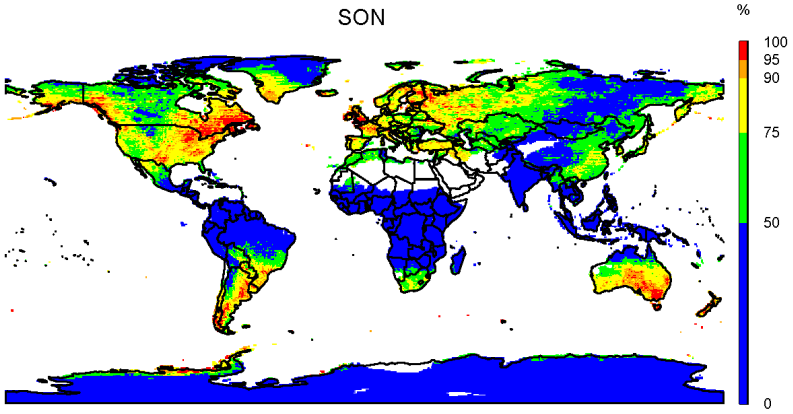


Figure S7: Percentage of concurrent extreme days of IVT and continental precipitation that coincide with the occurrence of landfalling ARs, for **March-April-May**, for the whole period 1981-2017, and the earlier and later studied periods.

Whole period



Earlier period



Later period

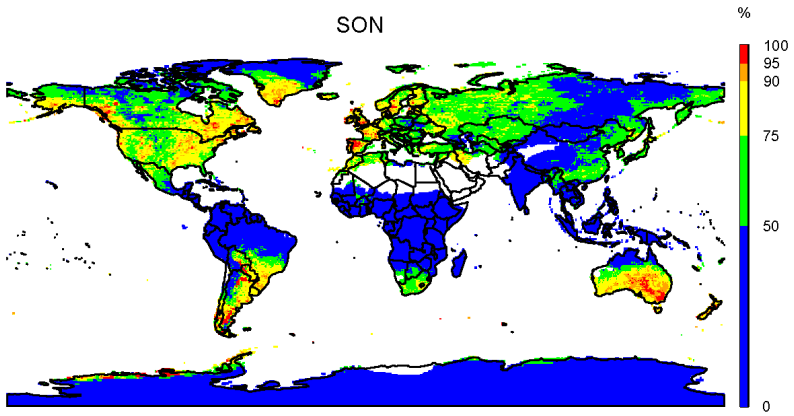


Figure S8: Percentage of concurrent extreme days of IVT and continental precipitation that coincide with the occurrence of landfalling ARs, for **September-October-November**, for the whole period 1981-2017, and the earlier and later studied periods.

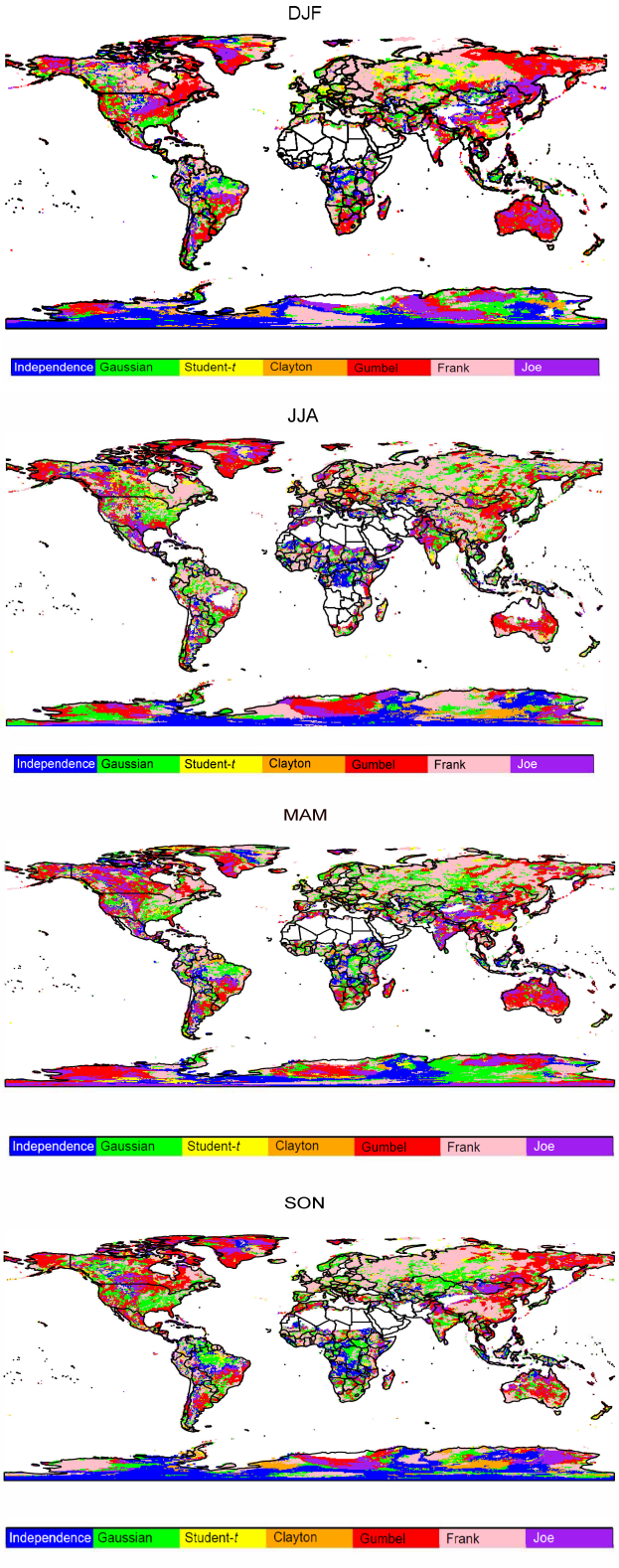


Figure S9: Fitted copula type with the lowest AIC value for each season for the period 1981-2017.

Table S1: Fitted copula type with the lowest AIC value for the IVT and continental precipitation averaged over the main AR landfalling regions, for the whole period 1981-2017 and the earlier and later studied periods.

REG.	**SEASON**	whole period	earlier period	later period
1	DJF	Student-t	Gaussian	Gaussian
2	DJF	Gaussian	Frank	Gumbel
3	DJF	Gaussian	Gumbel	Gaussian
4	DJF	Gumbel	Gumbel	Gumbel
	JJA	Student-t	Gaussian	Student-t
5	JJA	Student-t	Student-t	Student-t
6	DJF	Gaussian	Gaussian	Gaussian
	JJA	Gumbel	Student-t	Gumbel
7	DJF	Gumbel	Gumbel	Gaussian
8	DJF	Gumbel	Frank	Gumbel
9	DJF	Gumbel	Gumbel	Gumbel
10	DJF	Gaussian	Gaussian	Gaussian
11	DJF	Gaussian	Gaussian	Gaussian
12	DJF	Gaussian	Gaussian	Frank
13	DJF	Frank	Student-t	Frank
14	JJA	Frank	Frank	Gumbel
15	DJF	Gumbel	NA	NA
	JJA	Gumbel	Gaussian	Gumbel
16	DJF	Gumbel	Gaussian	Gumbel
	JJA	Gaussian	Gaussian	Gaussian
17	DJF	Gumbel	Gumbel	Gumbel
18	DJF	Gaussian	Gaussian	Gaussian
19	JJA	Frank	Frank	Frank
20	JJA	Frank	Frank	Frank
21	JJA	Student-t	Gaussian	Student-t
22	JJA	Frank	Gaussian	Frank
23	JJA	Joe	Frank	Independence
24	JJA	Gumbel	Gumbel	Gumbel

NA (Not Available): The number of days of nonzero precipitation in the corresponding period is lower or equal to 400.