

Caractérisation et évolution des précipitations extrêmes  
horaires en France à partir d'un modèle régional de climat à  
convection profonde résolue

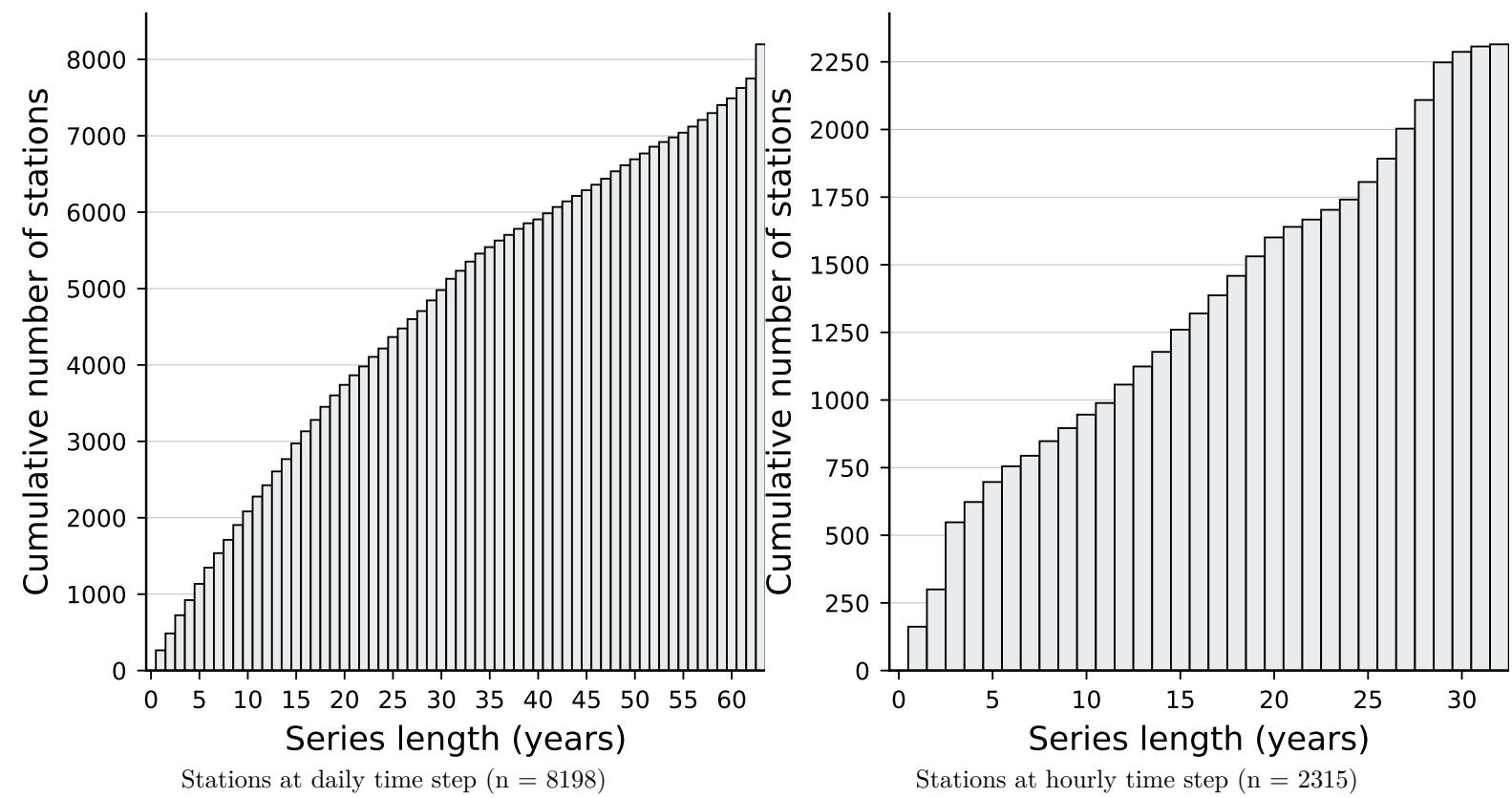


FIGURE 1 – Distribution of the number of hydrological years with at most 10% missing values for Météo-France stations at the daily (1959-2022) and hourly (1990-2022) time steps.

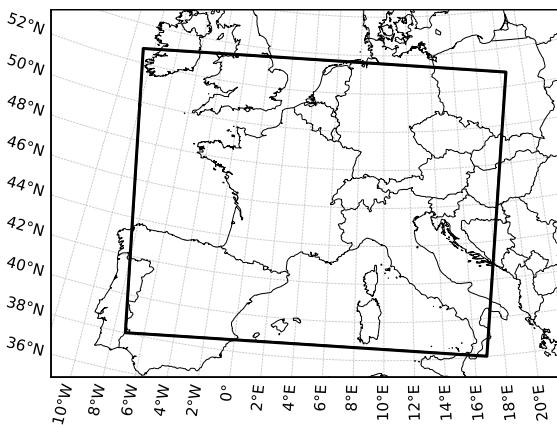


FIGURE 2 – Mapping of the computational domain of the AROME numerical model.

**Number of days per year with precipitation**  
 $r = 0.95$  (n = 1583)

**Annual precipitation total**  
 $r = 0.94$  (n = 1583)

**Mean of daily precipitation maxima**  
 $r = 0.96$  (n = 1583)

**Mean of hourly precipitation maxima**  
 $r = 0.89$  (n = 574)

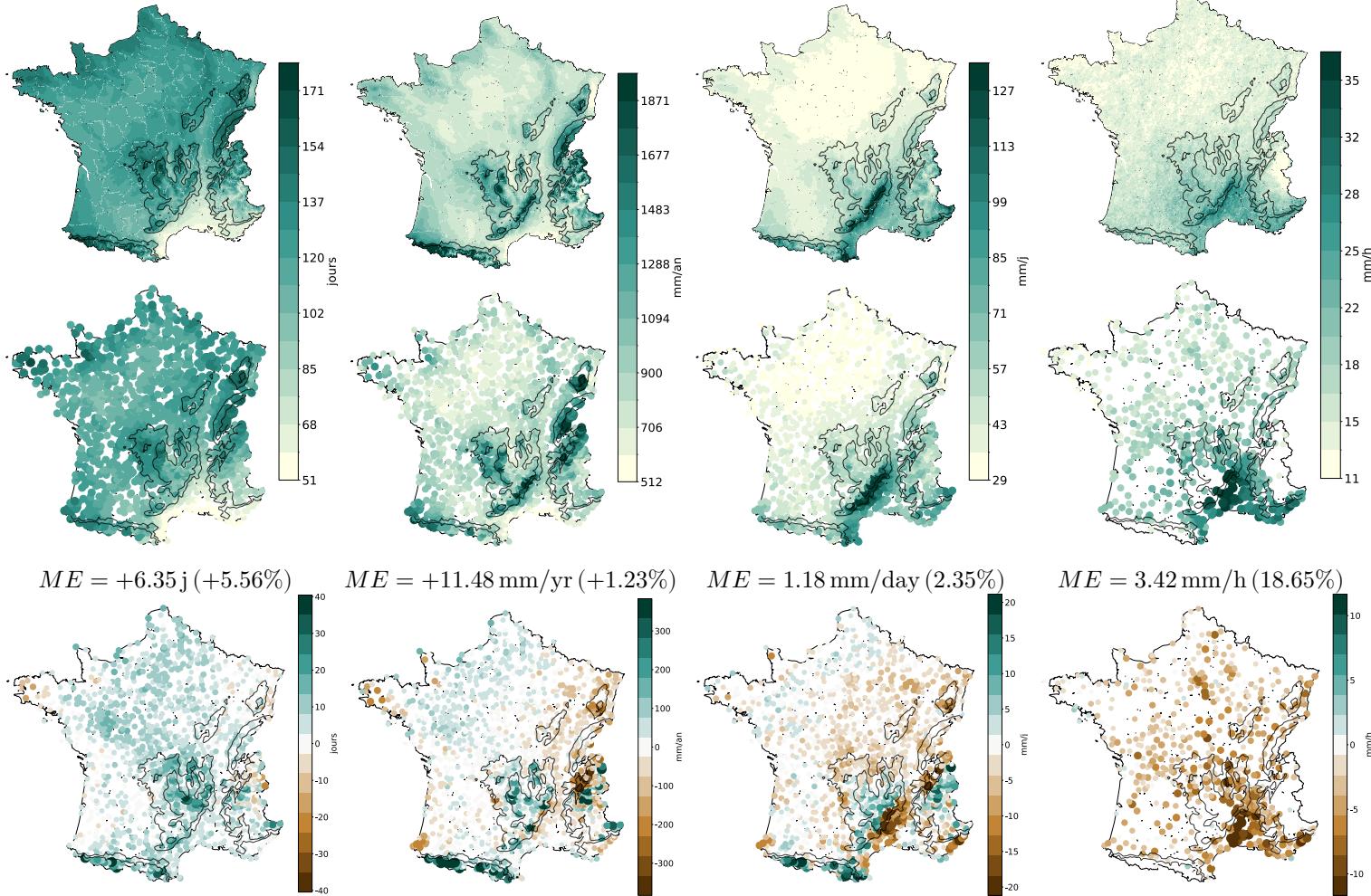


FIGURE 3 – Climatology between the AROME model (first row), Météo-France stations (second row) with the correlation ( $r$ ) and the number of stations compared (n), and the AROME–Station difference (third row) with the bias ( $ME$ ) and the associated relative deviation (%) derived from daily data from 1959 to 2022 and hourly data from 1990 to 2022 for a hydrological year.

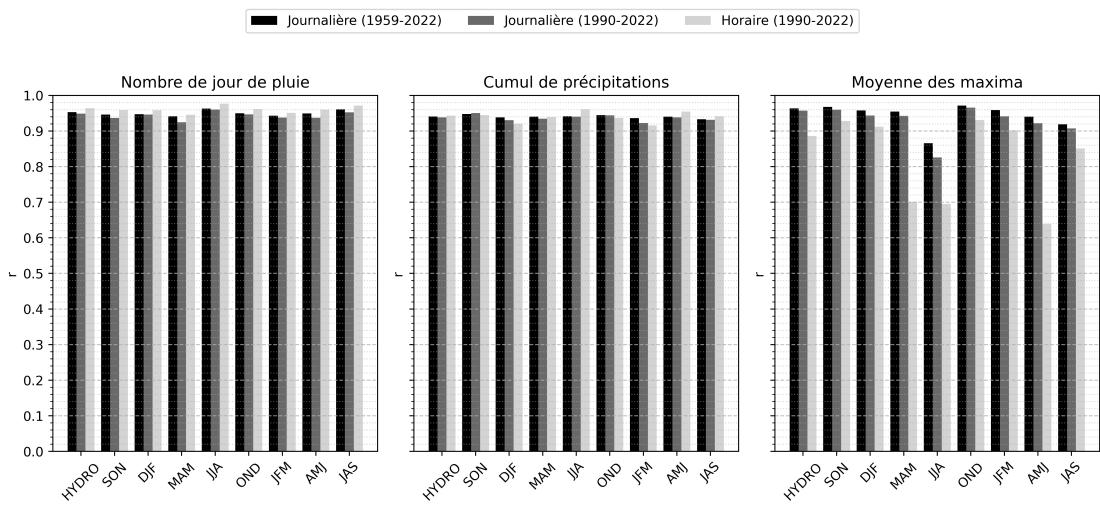
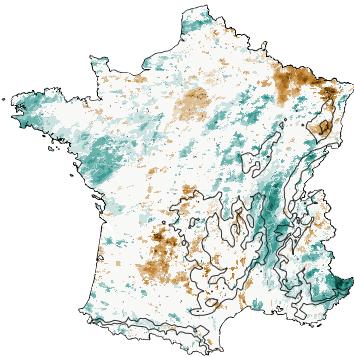
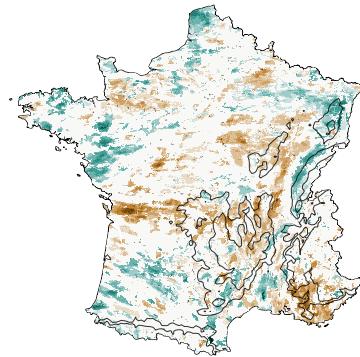


FIGURE 4 – Correlations of climatological data between the AROME model and Météo-France stations for each data source.

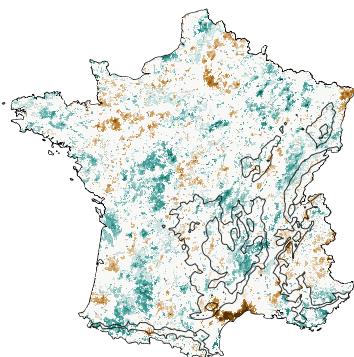
**OND**  
 $r = 0.40$  (n=809)  
 $ME = 2.41\%$



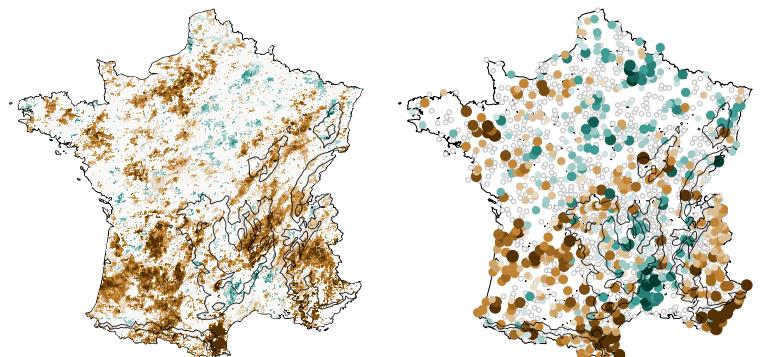
**JFM**  
 $r = 0.32$  (n=709)  
 $ME = 0.30\%$



**AMJ**  
 $r = 0.13$  (n=800)  
 $ME = 5.44\%$



**JAS**  
 $r = 0.28$  (n=696)  
 $ME = 3.02\%$



**HYDRO**  
 $r = 0.15$  (n=704)  
 $ME = 4.67\%$

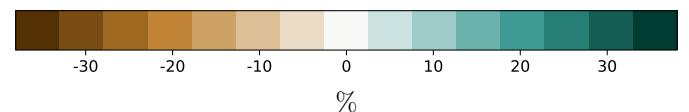
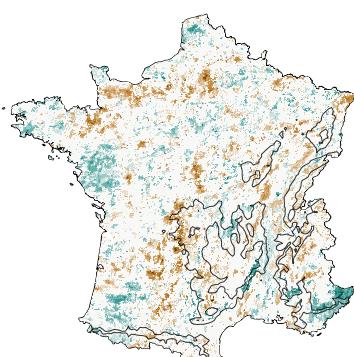
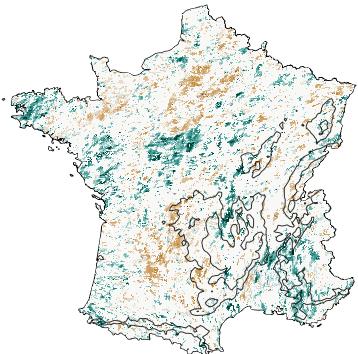
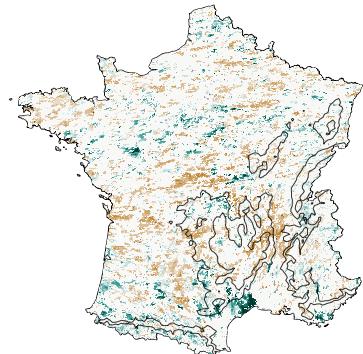


FIGURE 5 – Seasonal analysis of relative trends from 1995 to 2022 (%) in the 10-year return level between the AROME model (left) and Météo-France stations (right), with the correlation ( $r$ ), the number of stations compared (n), and the bias (ME) derived from daily precipitation maxima from 1959 to 2022.

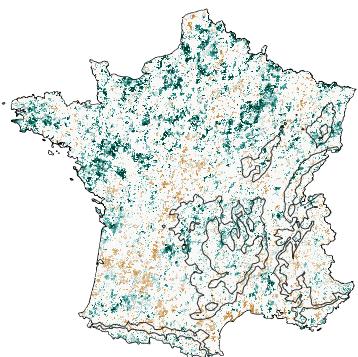
**OND**  
 $r = 0.15$  (n=225)  
 $ME = 13.64\%$



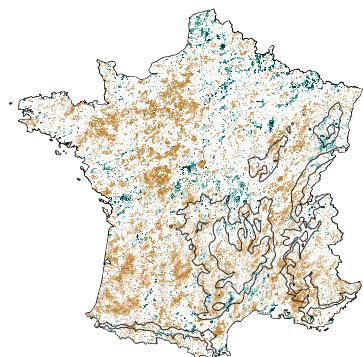
**JFM**  
 $r = 0.02$  (n=200)  
 $ME = 7.86\%$



**AMJ**  
 $r = 0.14$  (n=298)  
 $ME = 59.81\%$



**JAS**  
 $r = 0.04$  (n=246)  
 $ME = 18.91\%$



**HYDRO**  
 $r = 0.12$  (n=193)  
 $ME = 29.01\%$

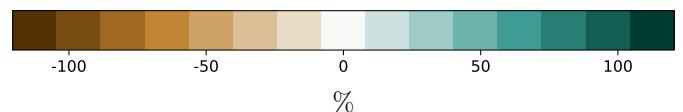
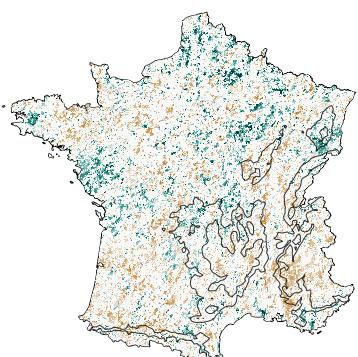


FIGURE 6 – Seasonal analysis of relative trends from 1995 to 2022 (%) in the 10-year return level between the AROME model (left) and Météo-France stations (right), with the correlation ( $r$ ), the number of stations compared (n), and the bias (ME) derived from hourly precipitation maxima from 1990 to 2022.

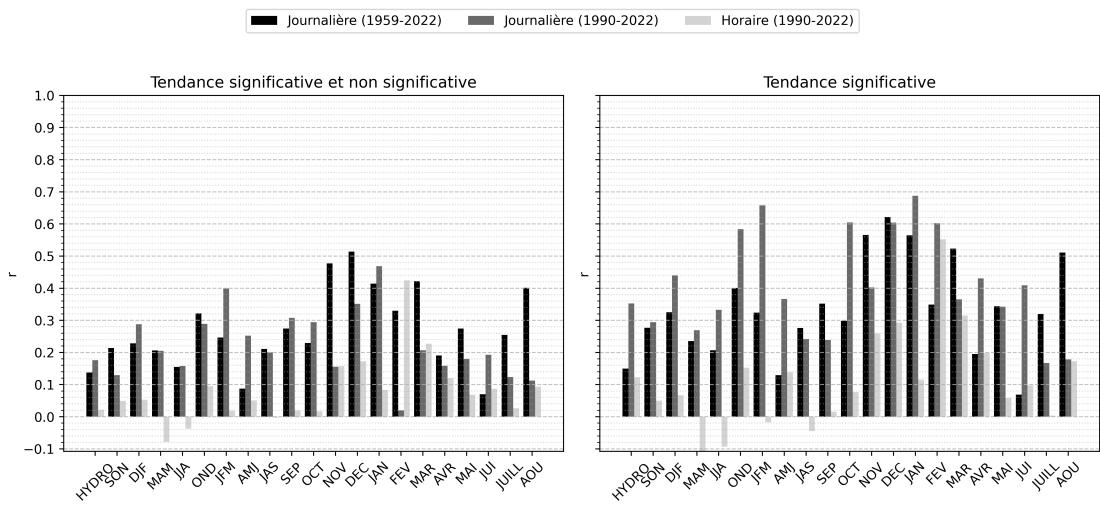


FIGURE 7 – Correlations of relative trends (all and significant) between AROME and Météo-France stations, by season and by month.