Figure S1. Mean seasonal precipitation for the gridded rainfall products (AROME, CERRA-Land, COMEPHORE, ERA5-Land, PDIR, SERVAL, SPAZM), on the period 2007–2017. An upper limit of 1000 mm has been fixed for better visibility but values can be higher. The seasons are winter (djf), spring (mam), summer (jja), and autumn (son).
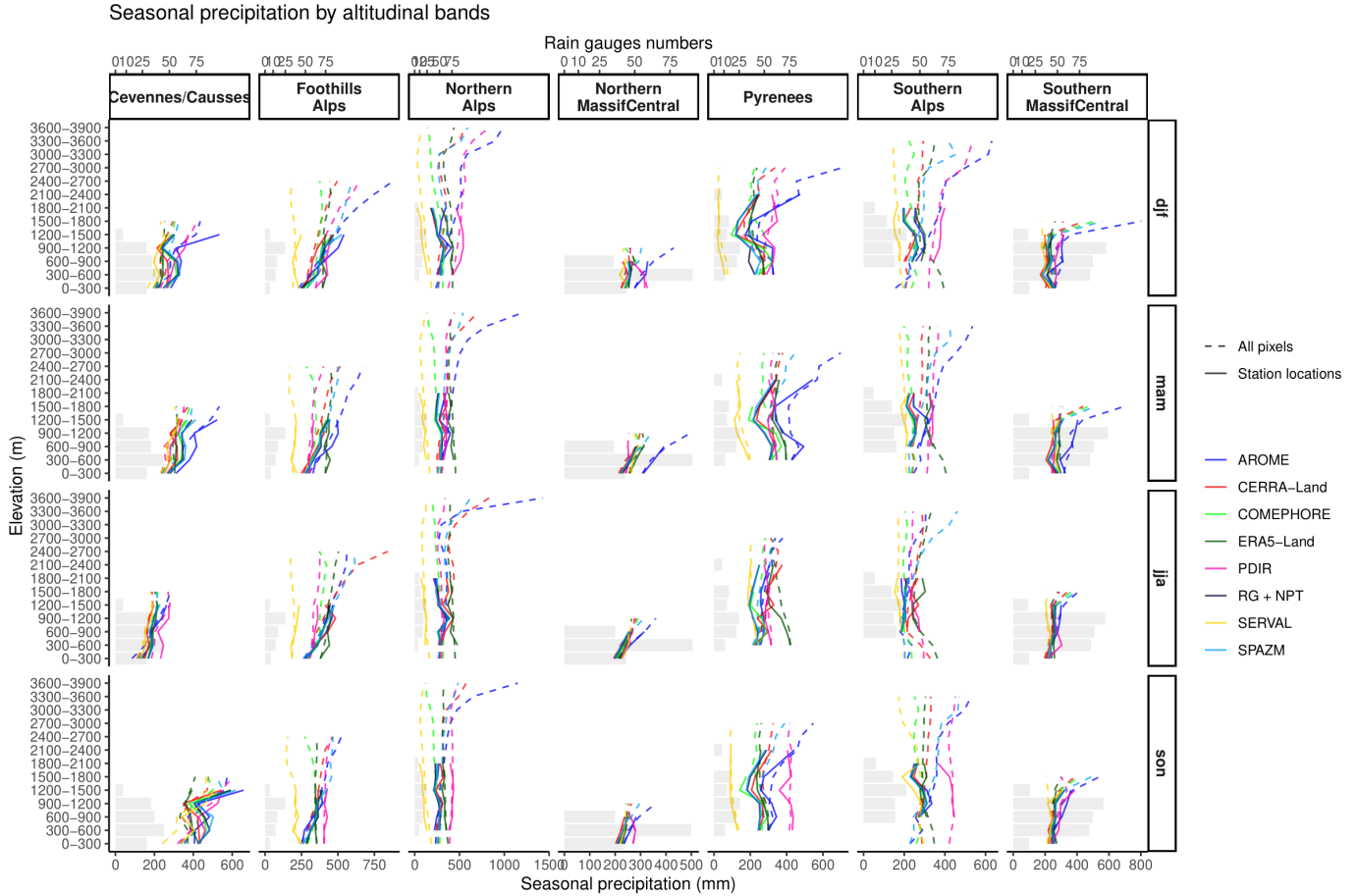
Figure S2. Comparison between the altitude dependence of seasonal precipitation from AROME, CERRA-Land, COMEPHORE, ERA5-Land, PDIR, SERVAL, SPAZM, stations (rain gauges and NPT) in seven regions. The lines show the median precipitation amount in each altitude zone and the bars denote the number of rain gauges in each area. Comparisons are done on both station locations and on all pixels from the gridded products. The season *djf* refers to the winter (December, January, February), the season *mam* to the spring (March, May, July), the season *jja* to the summer (June, July, August), the season *son* to the autumn (September, October, November).
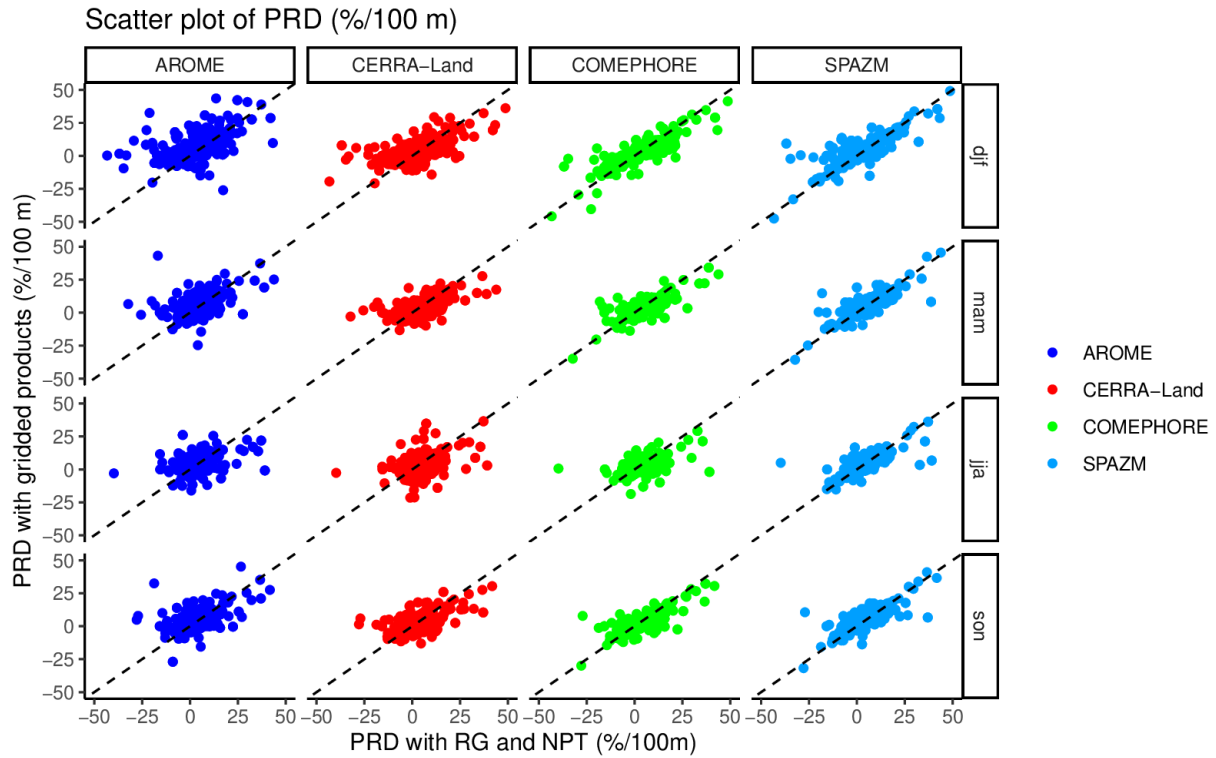
Figure S3. Comparison of precipitation relative difference (%/100m) calculated with stations and gridded rainfall products. PRDs are derived for all couples of neighboring stations. Scatter plot between observed and gridded PRD at station locations. The dotted lines indicate the 1:1 lines. The season *djf* refers to the winter (December, January, February), the season *mam* to the spring (March, May, July), the season *jja* to the summer (June, July, August), the season *son* to the autumn (September, October, November).
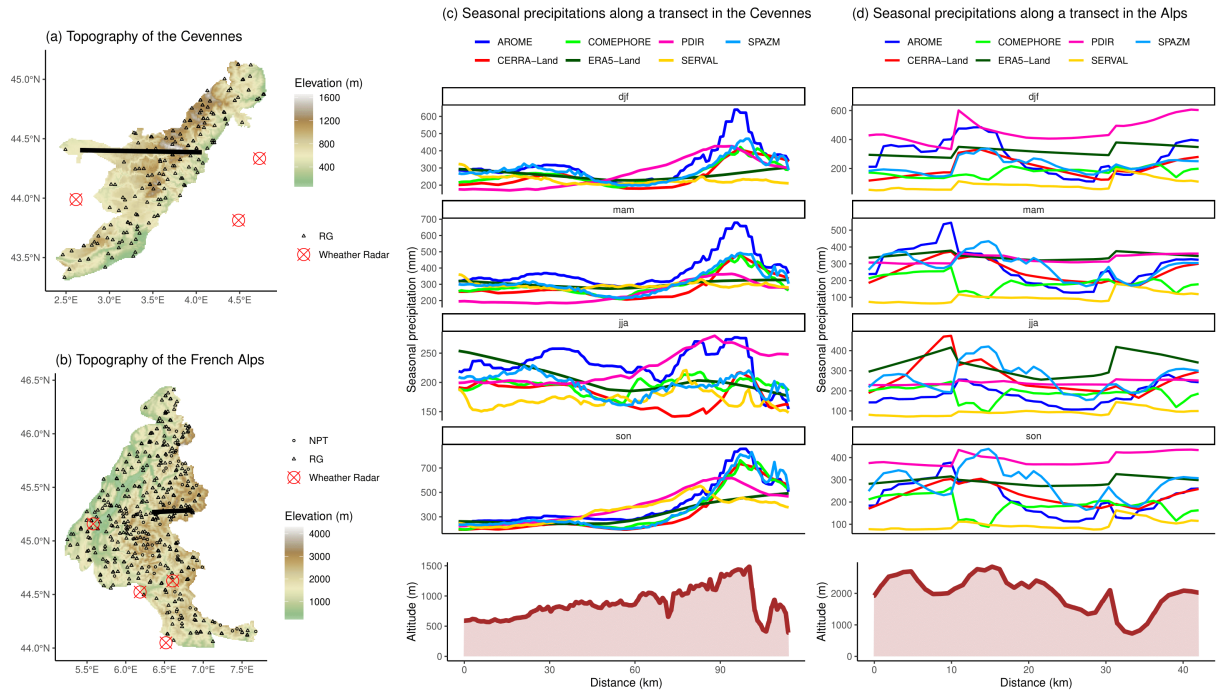
Figure S4. Transects in the Cévennes **(a)** and the Northern Alps **(b)**. Winter *djf*, spring *mam*, summer *jja*, and autumn *son* precipitations extracted across the transects are colored according to gridded products **(c), (d)**. Elevation is represented in brown as an altitude profile.
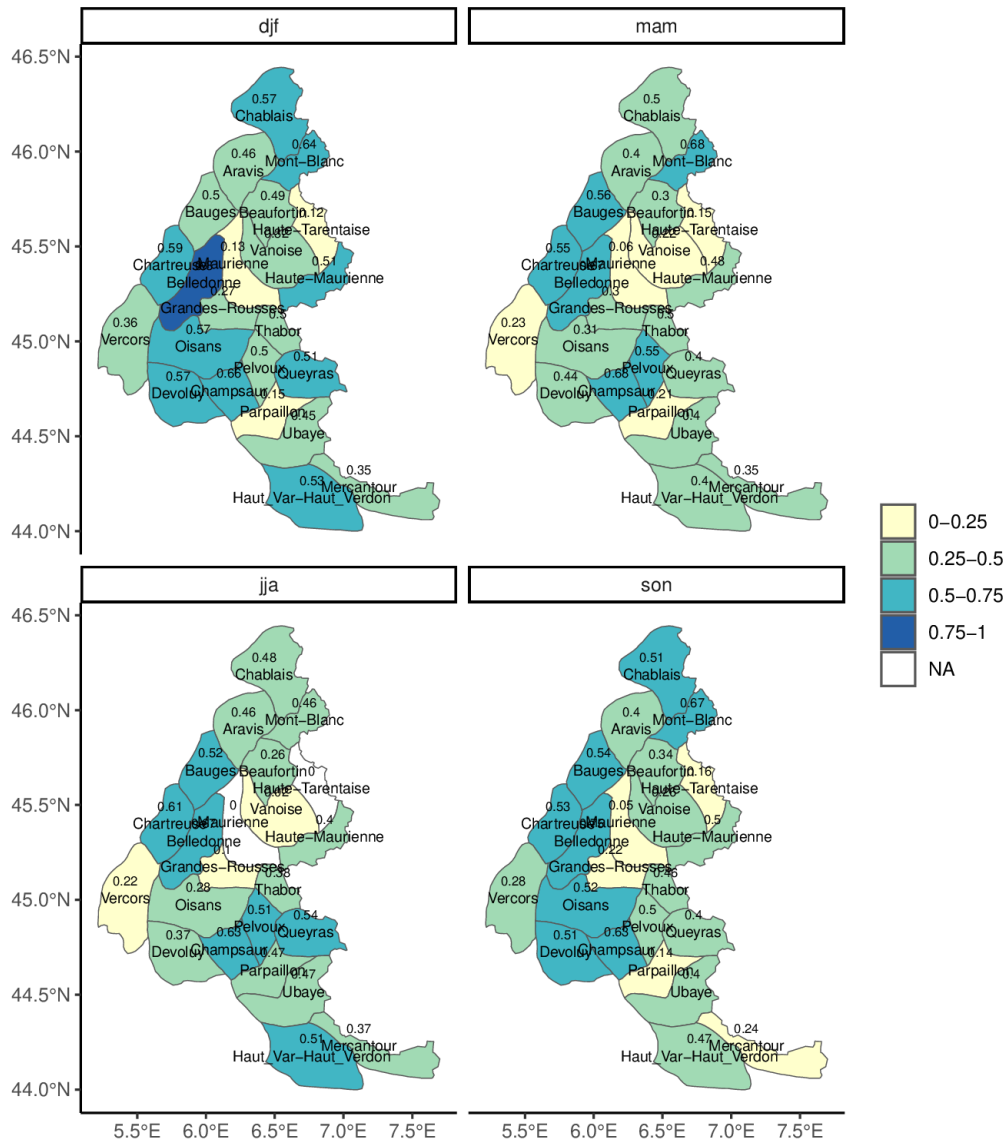
Figure S5. Spatial distribution of seasonal R^2 extracted from the precipitation-altitude regressions for all grids within each area. Categorical results are displayed in the French Alps at the sub-regional scale. The season *djf* refers to the winter (December, January, February), the season *mam* to the spring (March, May, July), the season *jja* to the summer (June, July, August), the season *son* to the autumn (September, October, November).
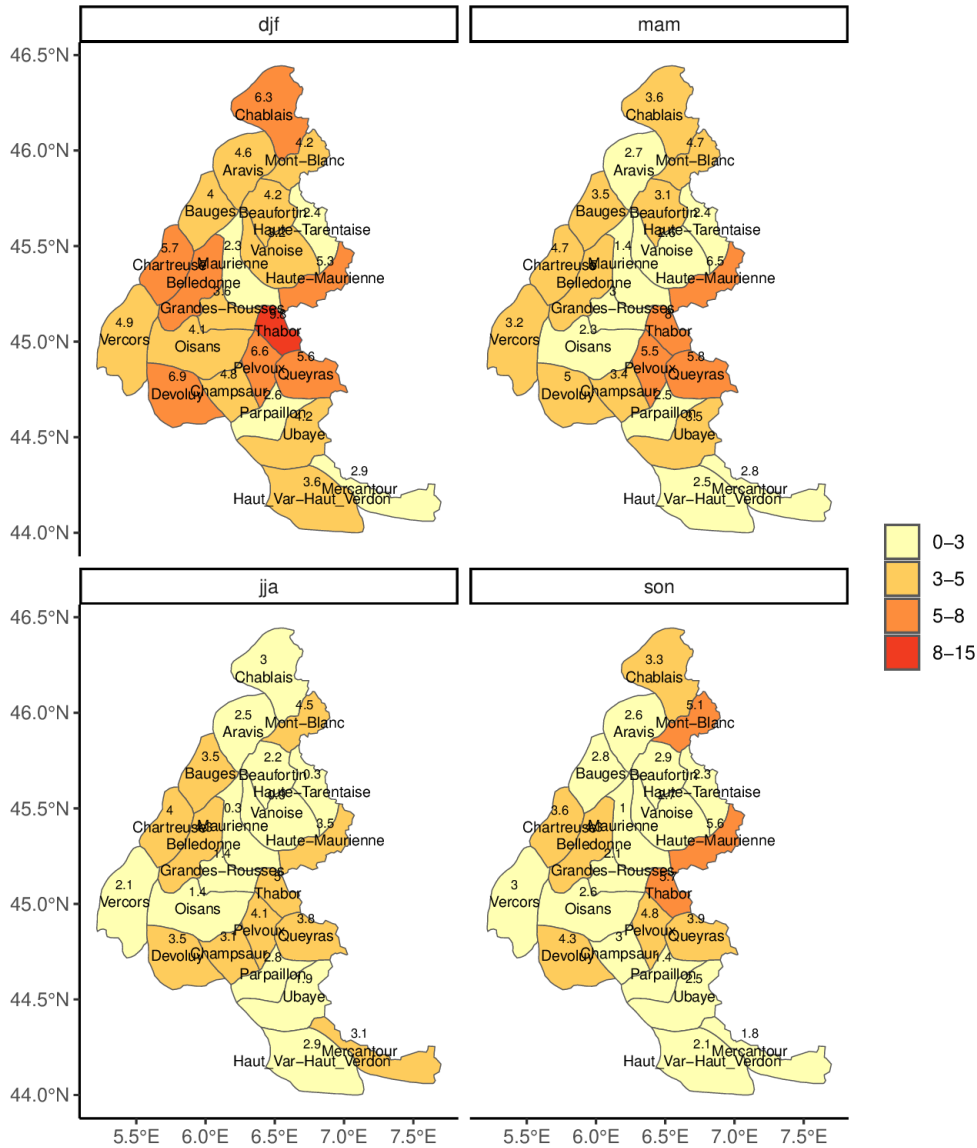
Figure S6. Spatial distribution of seasonal precipitation lapse rates (precipitation change per 100 m altitude difference divided by area-averaged precipitation) extracted from the precipitation-altitude regressions for all grids within each area. Categorical results are displayed in the French Alps at the sub-regional scale. The season *djf* refers to the winter (December, January, February), the season *mam* to the spring (March, May, July), the season *jja* to the summer (June, July, August), the season *son* to the autumn (September, October, November).
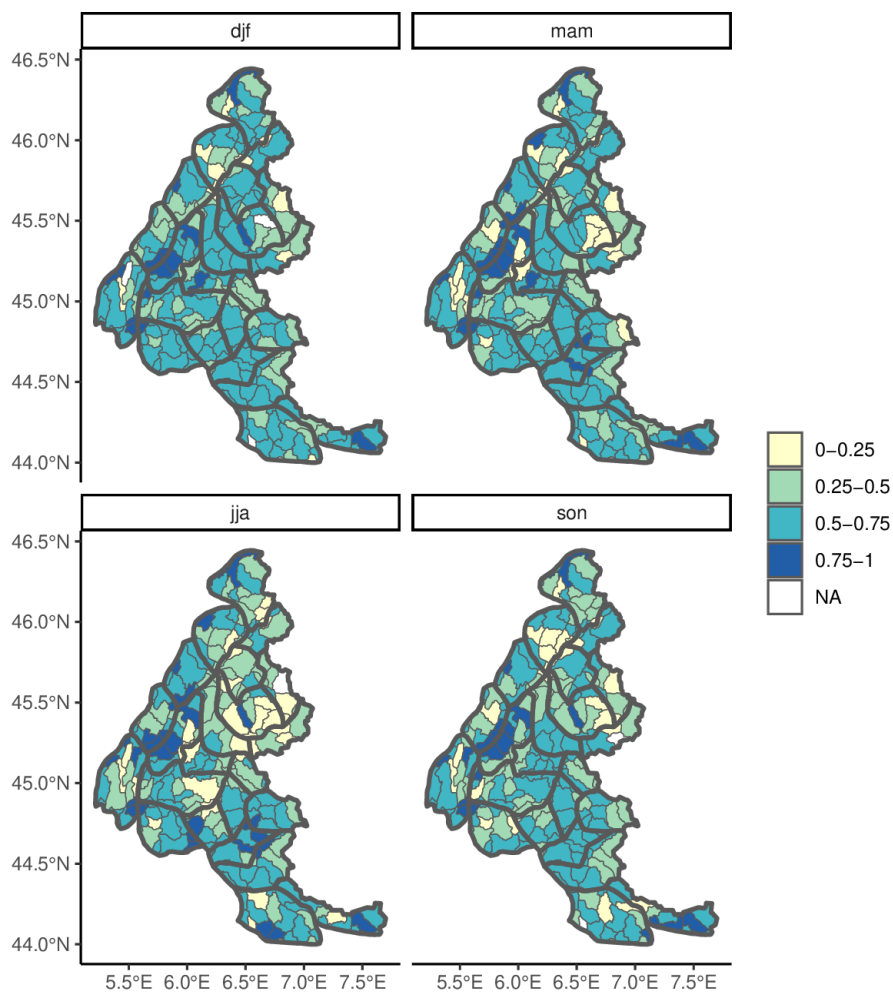
Figure S7. Spatial distribution of seasonal R^2 extracted from the precipitation-altitude regressions for all grids within each area. Categorical results are displayed in the French Alps at the catchment scale. The area indicated as "NA" and filled in white represents catchments with insufficient altitudinal variability (standard deviation of the altitude higher than 50 m). The season *djf* refers to the winter (December, January, February), the season *mam* to the spring (March, May, July), the season *jja* to the summer (June, July, August), the season *son* to the autumn (September, October, November).
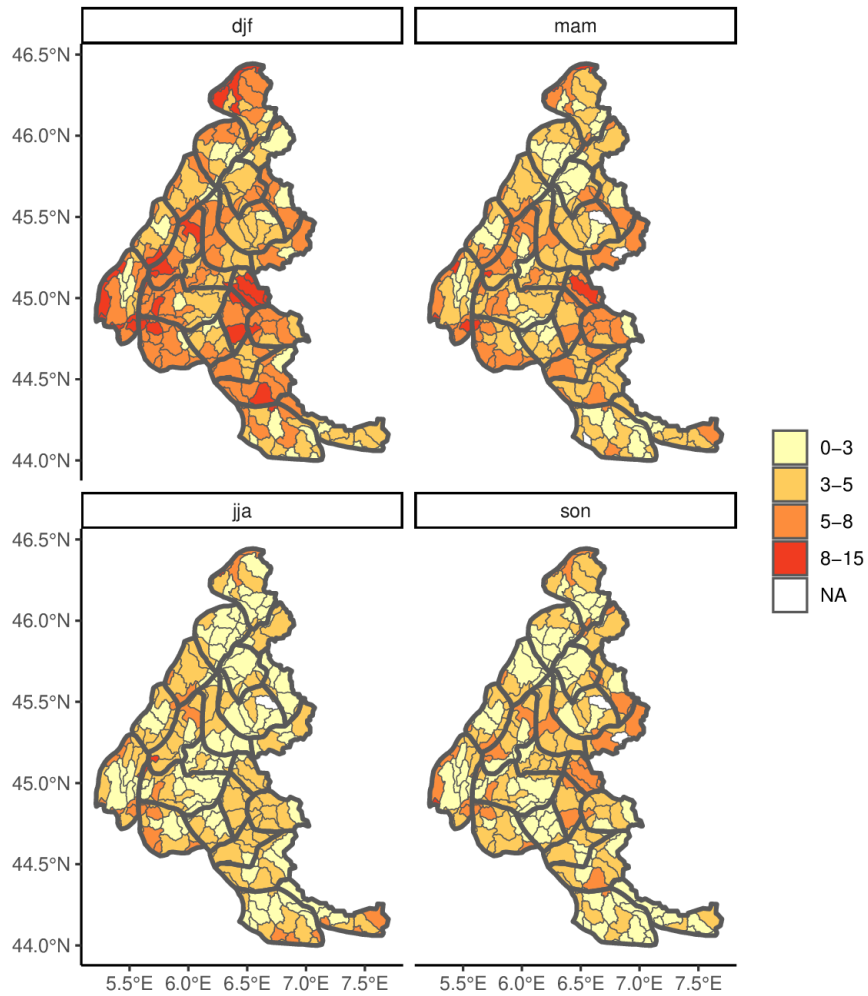
Figure S8. Spatial distribution of seasonal precipitation lapse rates (precipitation change per 100 m altitude difference divided by area-averaged precipitation) extracted from the precipitation-altitude regressions for all grids within each area. Categorical results are displayed in the French Alps at the catchment scale. The area indicated as "NA" and filled in white represents catchments with insufficient altitudinal variability (standard deviation of the altitude higher than 50 m) or R^2 inferior to 0.5. The season *djf* refers to the winter (December, January, February), the season *mam* to the spring (March, May, July), the season *jja* to the summer (June, July, August), the season *son* to the autumn (September, October, November).

Figure S9. Spatial distribution of seasonal R^2 extracted from the precipitation-altitude regressions for all grids within each area. Categorical results are displayed in the study domain at the catchment scale. The area indicated as "NA" and filled in white represents catchments with insufficient altitudinal variability (standard deviation of the altitude higher than 50 m). The season *djf* refers to the winter (December, January, February), the season *mam* to the spring (March, May, July), the season *jja* to the summer (June, July, August), the season *son* to the autumn (September, October, November).
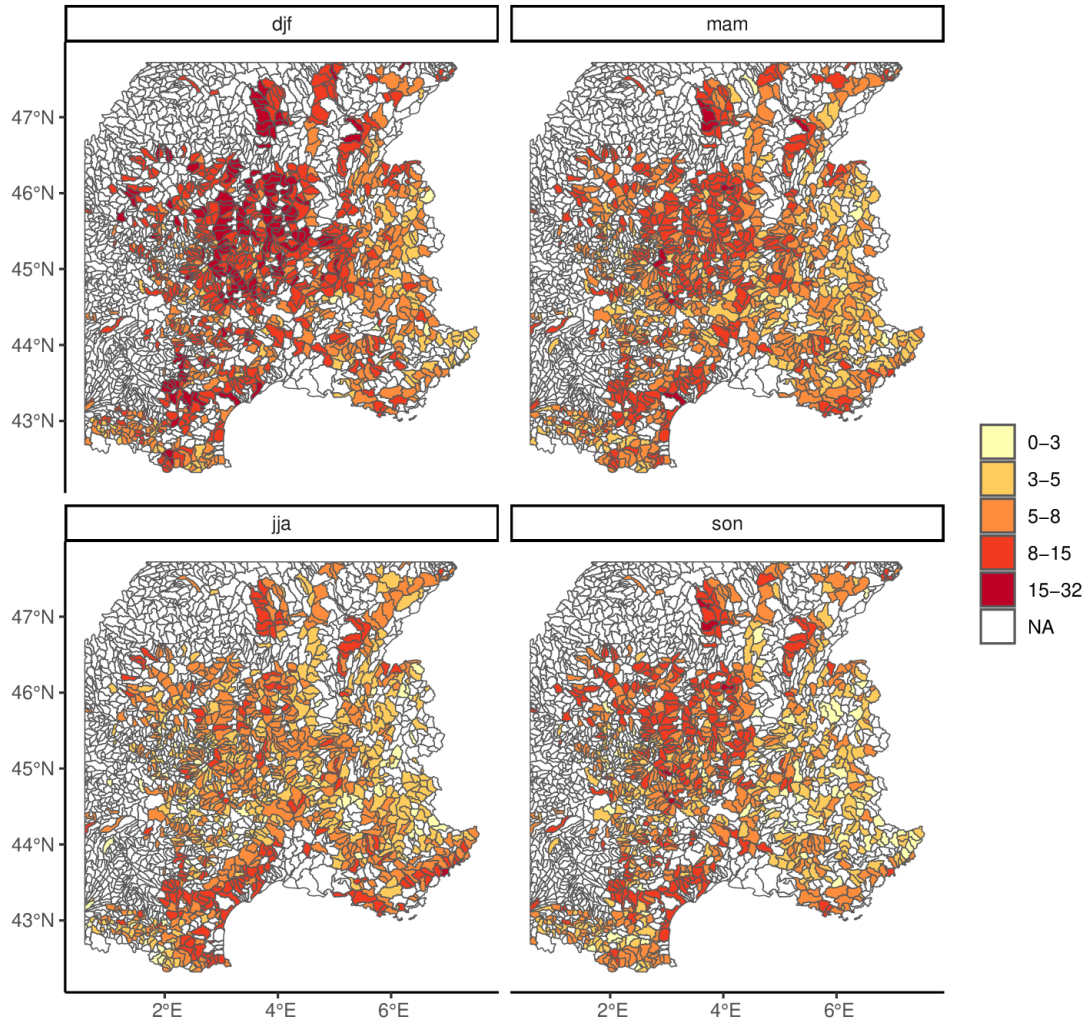
Figure S10. Spatial distribution of seasonal precipitation lapse rates (precipitation change per 100 m altitude difference divided by area-averaged precipitation) extracted from the precipitation-altitude regressions for all grids within each area. Categorical results are displayed in the study domain at the catchment scale. The area indicated as "NA" and filled in white represents catchments with insufficient altitudinal variability (standard deviation of the altitude higher than 50 m) or R^2 inferior to 0.5. The season *djf* refers to the winter (December, January, February), the season *mam* to the spring (March, May, July), the season *jja* to the summer (June, July, August), the season *son* to the autumn (September, October, November).

Figure S11. (a) Catchments located in the Vercors massif and colored according to their geographic locations. Three groups of catchments are distinguished: the Vercors plateaus, the Western Vercors, and the Southern Vercors. ID numbers are printed for each catchment. **(b)** Scatter plot of AROME seasonal precipitation and altitude for the pixels in the Vercors (gray dots). The dot colors correspond to the colors used in panel a). The season *djf* refers to the winter (December, January, February), the season *mam* to the spring (March, May, July), the season *jja* to the summer (June, July, August), the season *son* to the autumn (September, October, November).
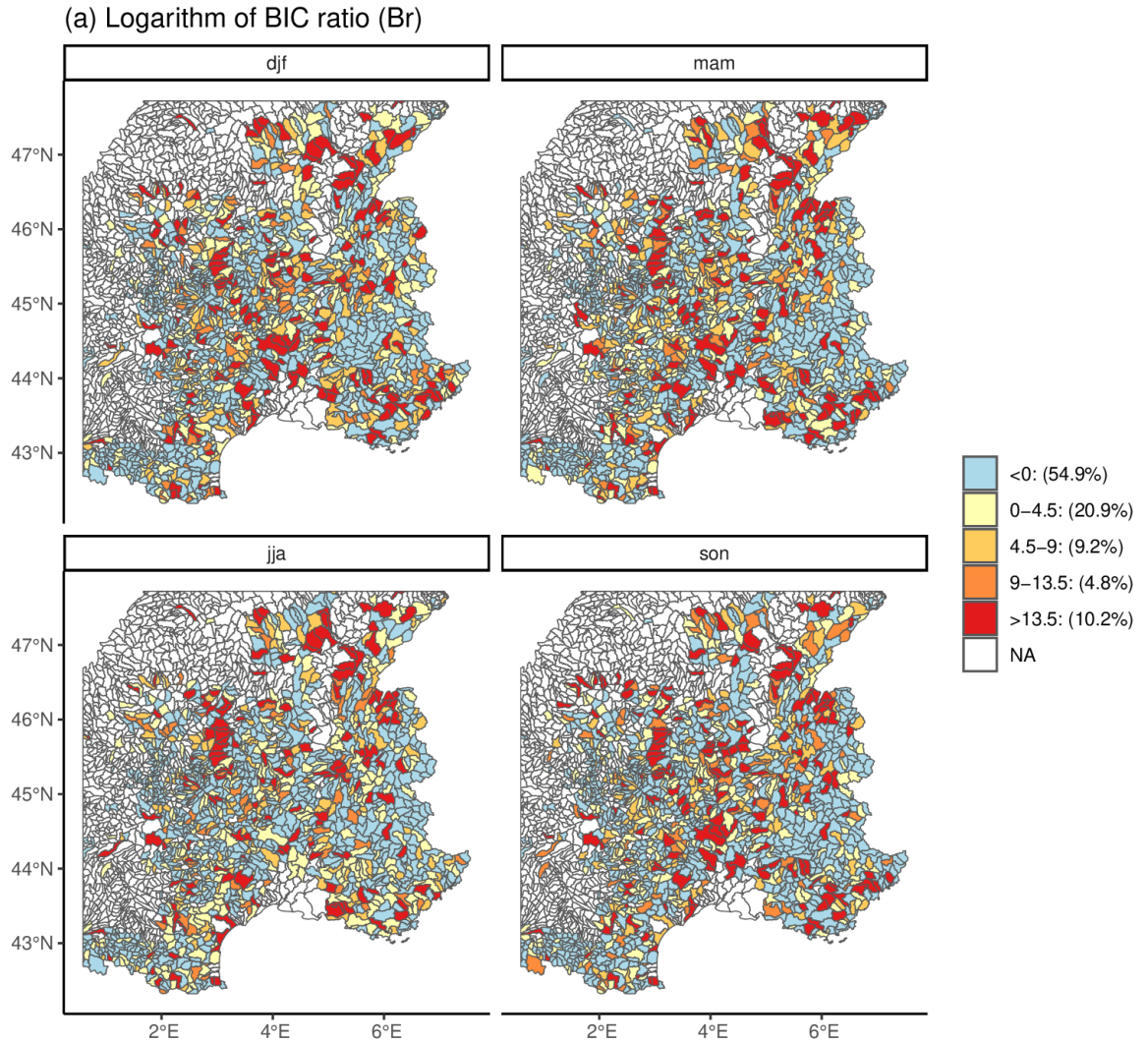
Figure S12. Spatial representation of the logarithm of the Bayes factors between linear and piecewise linear regression (seasonal precipitation ∼ altitude) models. The numbers expressed in % correspond to the percentage of catchments within the classes of Bayes factors. The season *djf* refers to the winter (December, January, February), the season *mam* to the spring (March, May, July), the season *jja* to the summer (June, July, August), the season *son* to the autumn (September, October, November).