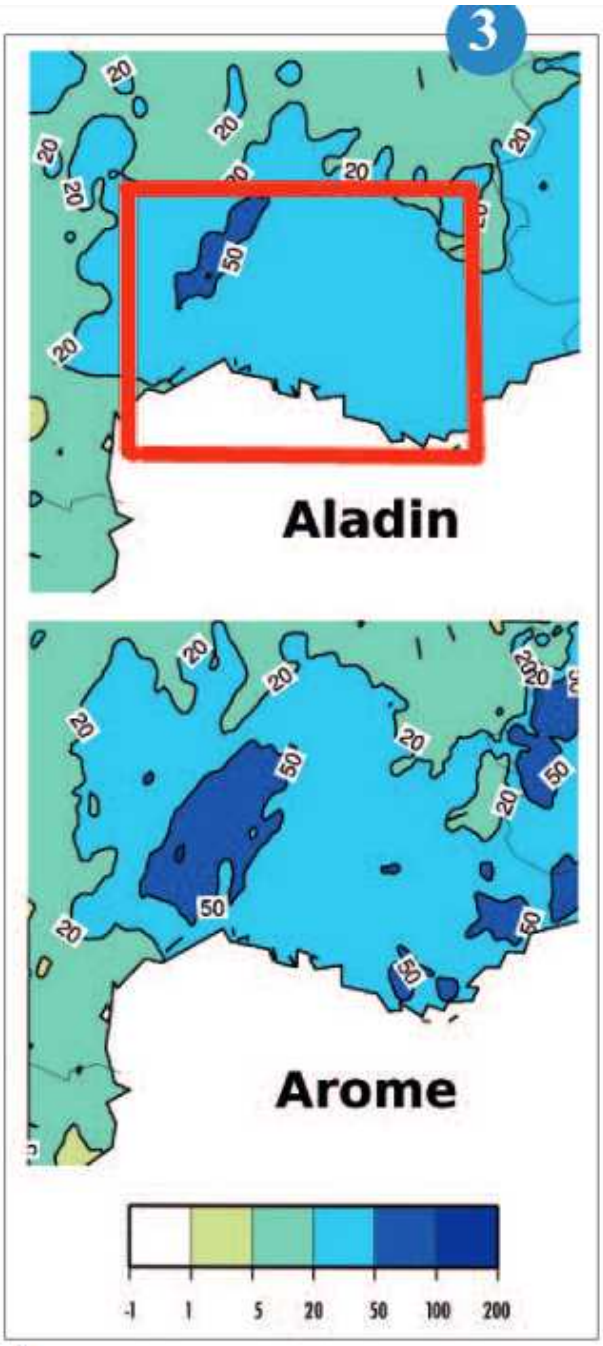
First attempt to simulate climate with AROME

Evaluating climate impacts of anthropogenic warming requires a spatial resolution finer than that of today IPCC models. With ARPEGE variable resolution model and then ALADIN model, Météo-France has tried to satisfy this demand since the mid-1990s. We have progressively reduced our grid size to 50 km, 25 km and 12 km, according to the increasing capacity of computers. We have described with some success regional characteristics of the French or European climates, and their possible evolution due to global change. However, these models represent the phenomenon of convection, which produces intense rainfall, through various empirical relations of increasing complexity named physical parameterizations. The so-called "Cevenol episodes" are coarsely represented (lift of moist air over the mountains under the thrust of large-scale circulation).

The AROME model, used since a few years at Météo-France for short-range prediction has, with its 2.5 km horizontal resolution and its non-hydrostatic equations the capacity to represent quantitatively the convection phenomenon. This is illustrated by the figure with a continuous simulation (not a sequence of short predictions) of July to December 1994. ALADIN, driven by the observed large scale over the Mediterranean basin, drives in turn AROME on South-East France. We have sorted the most intense rain days. Among the 10 selected with ALADIN, 9 are strong rain days for both models. One can see that if ALADIN captures coarsely high precipitation areas, AROME produces locally heavier precipitation. The perspective is to validate the model over the last 20 years and to downscale an IPCC scenario.



Mean precipitation of the rainiest 10 days of July-December 1994. The selection criterion is mean precipitation inside the red rectangle: ALADIN model (left panel) and AROME model (right panel)