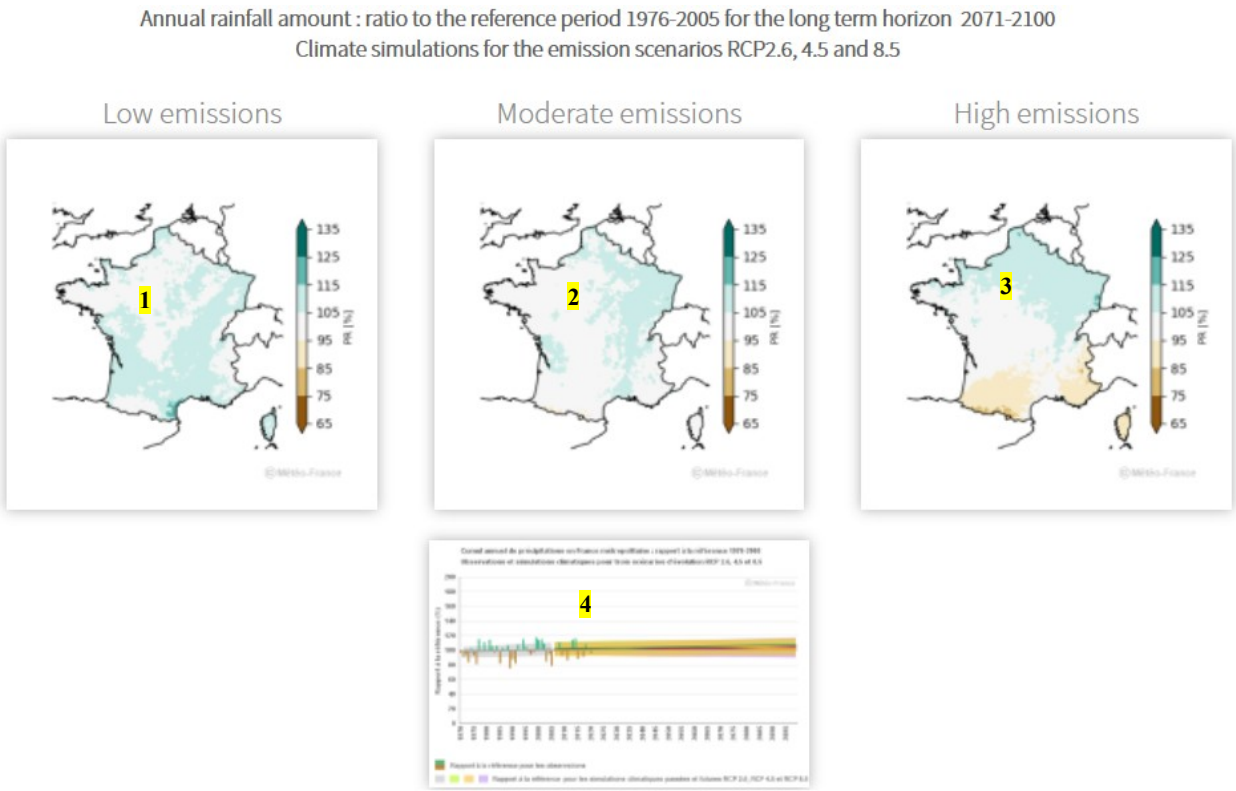
Evolution of annual and seasonal precipitations
Past and future climate – metropolitan France

1. Graph reading aid



3 maps and one graph are presented on this page:

Map 1:
Ratio (%) between the annual or seasonal rainfall amount simulated by a set of models (DRIAS 2020) for the low emissions scenario RCP 2.6 over the period 2071-2100 and the reference (average across the period 1976-2005).

Map 2:
Ratio (%) between the annual or seasonal rainfall amount simulated by a set of models (DRIAS 2020) for the moderate emissions scenario RCP 4.5 over the period 2071-2100 and the reference (average across the period 1976-2005).

Map 3:
Ratio (%) between the annual or seasonal rainfall amount simulated by a set of models (DRIAS 2020) for the high emissions scenario RCP 8.5 over the period 2071-2100 and the reference (average across the period 1976-2005).

Graph 4:
Ratio (%) between the annual or seasonal rainfall amount simulated by a set of models (DRIAS 2020) over the period 2006-2100 and the reference (average across the period 1976-2005): over the period 1970-2005 (grey streak), and over the period 2006-2100 for 3 scenarios: low emissions (green streak), moderate emissions (orange streak) and high emissions (purple streak).
On this graph, the histogram in green and ocher shows the ratio between the observed annual or seasonal rainfall amount and the reference (average 1976-2005), in ocher the values lower than the average value established over the period 1976-2005, in green the higher ones.

Each map and graph can be enlarged by clicking on the corresponding thumbnail.

2. Definitions

Meteorological seasons:
- Winter of the year A : December of the year A-1 to February of the year A
- Spring : March to May
- Summer: June to August
- Autumn : September to November

Deviation from the reference period (1976-2005) of annual or seasonal rainfall amount: difference between the annual or seasonal amount (RRs) and the reference average (Ref RRs)
- Annual or seasonal rainfall amount (RRs) : amount across the year or the season of daily precipitations
- Daily rainfall : quantity of water collected between J at 06:00 UTC and J+1 at 06:00 UTC
- Reference average across the period 1976-2005 (Ref RRs) : average of 30 values of RRs

3. Data and methods

Climatic modelling:
Climate simulations are created from general circulation models, which take into account different reference scenarios of the evolution of radiative forcing known as RCP (Representative Concentration Pathway). With respect to forecasting models, one essential feature of climatic models is that they are not drawn towards observations. The simulated climatic system evolves unhindered; it receives energy from sun rays and loses it in the form of infra red radiation emitted towards space. The simulated climate (temperature, precipitations, etc.) is the result of this adjustment between received energy and lost energy.
Energy conservation and more generally energy exchanges are therefore fundamental for a climatic model, and their modelling is a climatologist's prime concern.
These models allow the elaboration of climatic projections representative of various possible scenarios of climate evolution.

The RCP scenarios:
3 RCP scenarios are considered:
RCP 8.5, corresponding to a scenario with high greenhouse gas (GHG) emissions.
RCP 4.5, corresponding to a scenario with moderate greenhouse gas (GHG) emissions.
RCP 2.6, corresponding to a scenario with low greenhouse gas (GHG) emissions.
The number which follows the acronym RCP is the radiative forcing for the year 2100 in Watts per square metre.

The climatic projections used:
1. The DRIAS 2020 set, consisting of a multi-model ensemble (12 GCM/RCM pairs) derived from Euro-Cordex modelling, then corrected by the Adamont method (Météo-France) :
The main deliverable of the project Euro-Cordex is the availability across Europe of a set of climate simulations based on different models using statistical and dynamical down-scaling methods, forced by global methods used in the last report of the IPCC.

From this dataset a selection was made in order to determine a subset, allowing the best coverage of the range of future changes in temperature and precipitation over the territory of metropolitan France. This dataset was then reprocessed for the French territory by applying a correction method (Adamont) using the Safran reanalysis (this 1959-2013 reanalysis constitutes the reference for the observed climate). The resulting multi-model set is composed of 12 models for climate projections associated with RCP8.5, 10 models for RCP4.5, 8 models for RCP2.6 and 12 models for past climate simulations.

2. The statistical products elaborated from the multi-model set DRIAS 2020: the percentiles
The multi-model approach allows the representation of the dispersion of models, that is to say the set of values that can take a given parameter, and therefore take into account the uncertainty linked to the modelling. The percentile is each of the 99 values which divides the given data into 100 equal parts, so that each part represents 1/100 of the sample of the population.
For example, the median, which corresponds to the percentile 50%, is the threshold value for which 50% of the distribution values are higher.
These percentiles can be represented in the form of streaks for the time sequences, or of maps representing the values of percentiles in each grid point of the modelled surface.
In the DRIAS 2020 dataset, several percentiles and extreme values are available; the temperature evolutions presented here are based on the 17 and 83% quantiles which constitute the plume envelopes associated with each scenario.

4. Références

Drias, climate futures
www.drias-climat.fr

Observatoire National sur les Effets du Réchauffement Climatique (National observatory for the effects of global warming) : French climate reports in the 21st century
http://www.developpement-durable.gouv.fr/Volume-4-Scenarios-regionalises.html

Euro-Cordex
http://www.euro-cordex.net