



**HAL**  
open science

## Climate change impact on water resources: which future scenarios over France?

Guillaume Thirel

### ► To cite this version:

Guillaume Thirel. Climate change impact on water resources: which future scenarios over France?. Colloquium Adapting the agriculture sector to climate change (V4 + FR), Embassy of the Slovak Republic in Paris, May 2019, Paris, France. hal-03301872

**HAL Id: hal-03301872**

**<https://hal.inrae.fr/hal-03301872v1>**

Submitted on 27 Jul 2021

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.


L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

# Climate change impact on water resources: which future scenarios over France?

Guillaume Thirel

Irstea, Antony, [guillaume.thirel@irstea.fr](mailto:guillaume.thirel@irstea.fr)

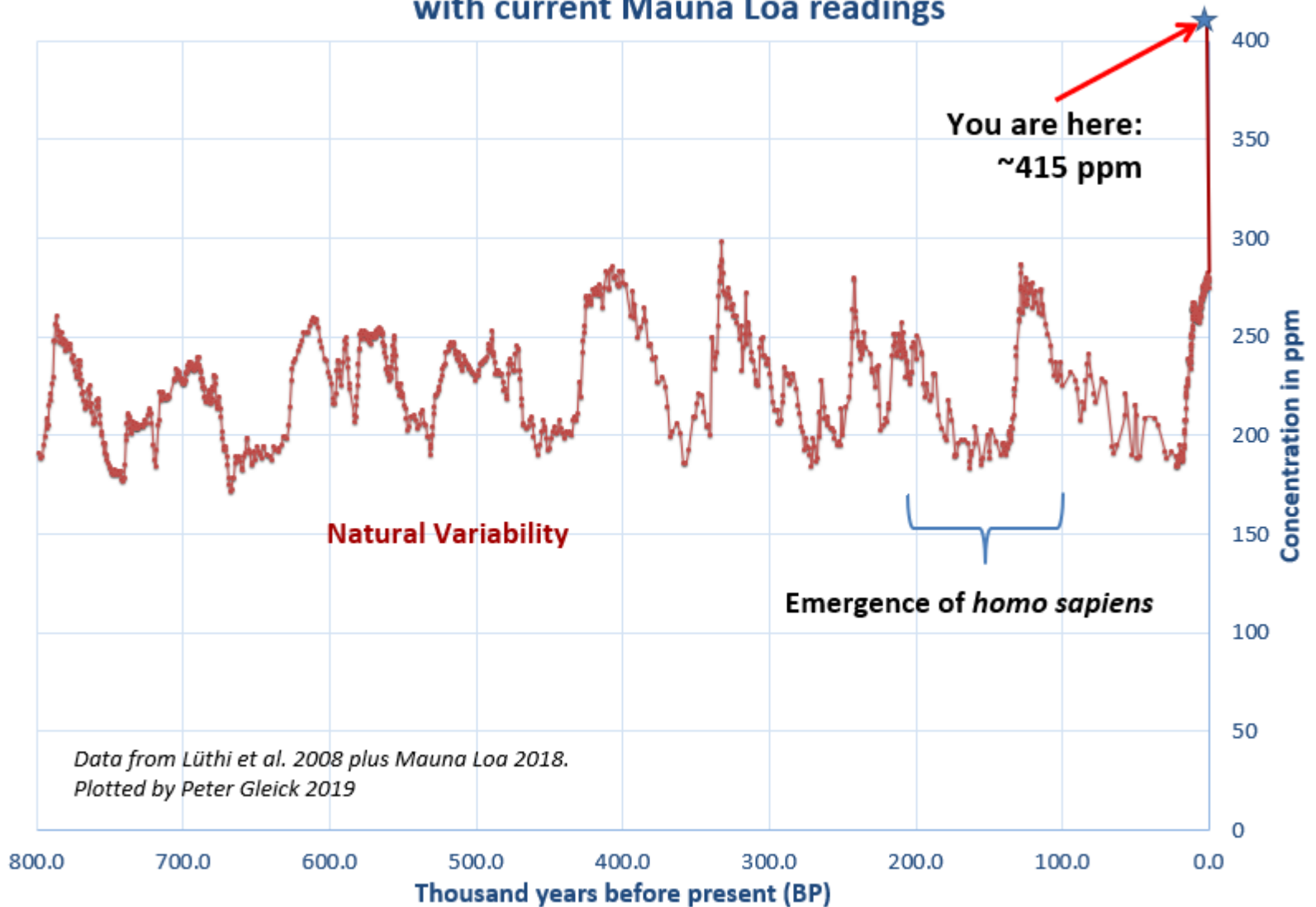
<https://webgr.irstea.fr>

 @G\_Thirel



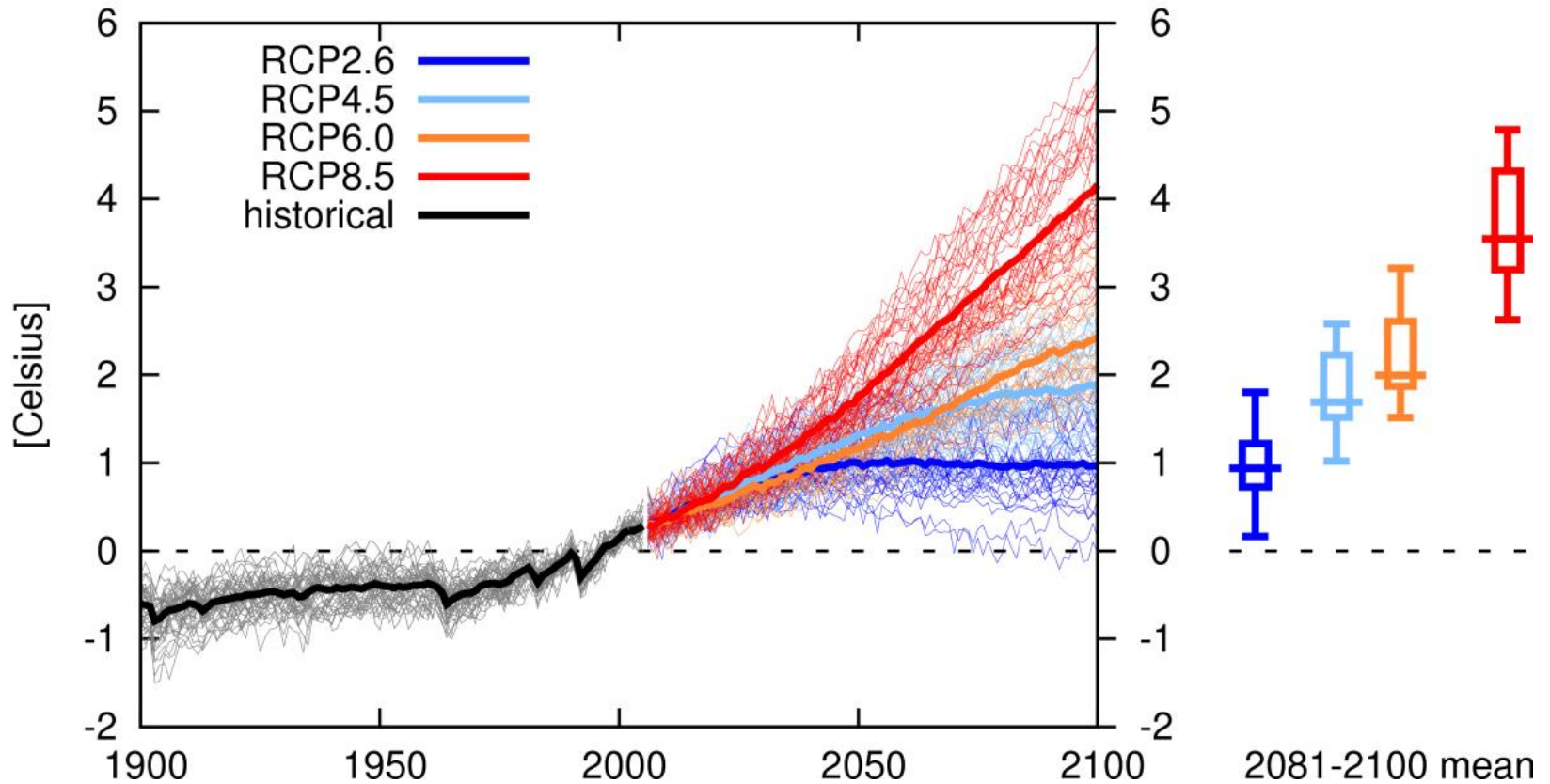
# Rising greenhouse gases concentration...

Composite Antarctic CO<sub>2</sub> record (0-800 kyr before present)  
with current Mauna Loa readings



... cause a global warming

Temperature change World Jan-Dec wrt 1986-2005 AR5 CMIP5 subset



IPCC

irstea

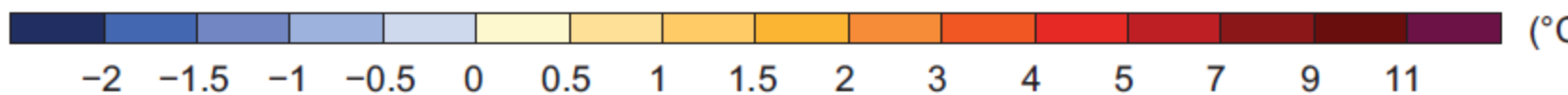
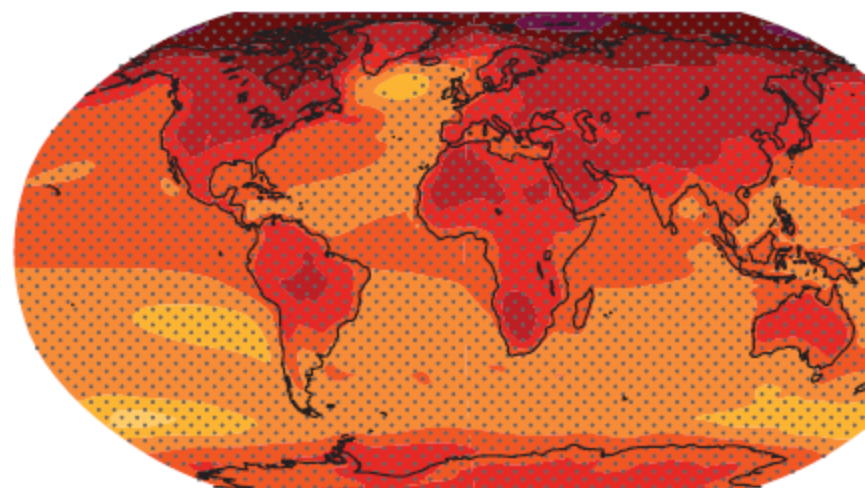
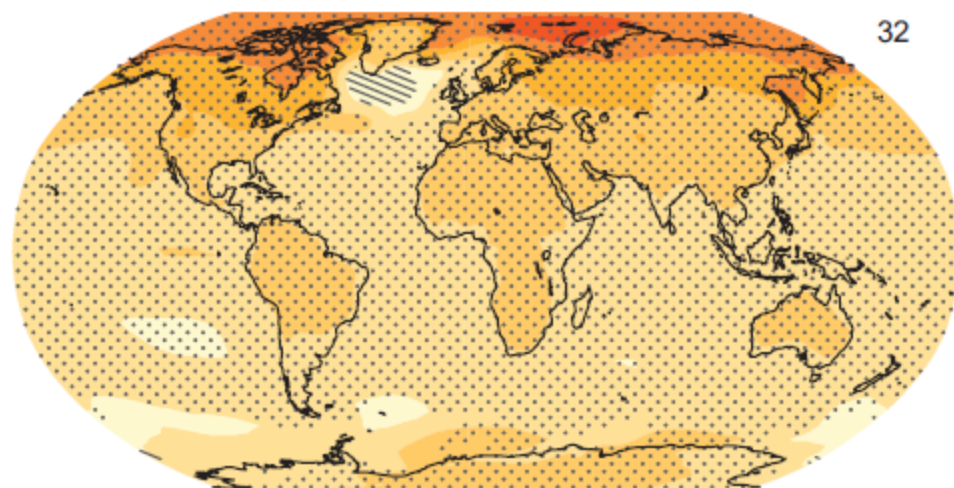
... whose future evolution will depend on present human action

RCP 2.6

RCP 8.5

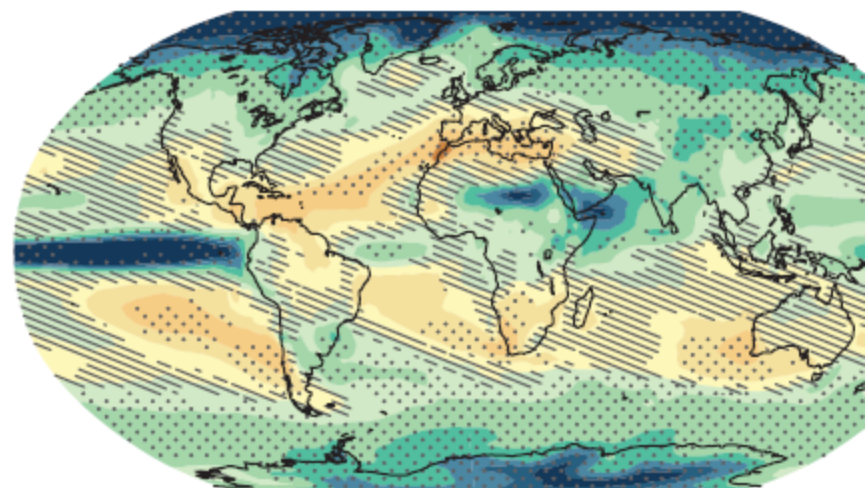
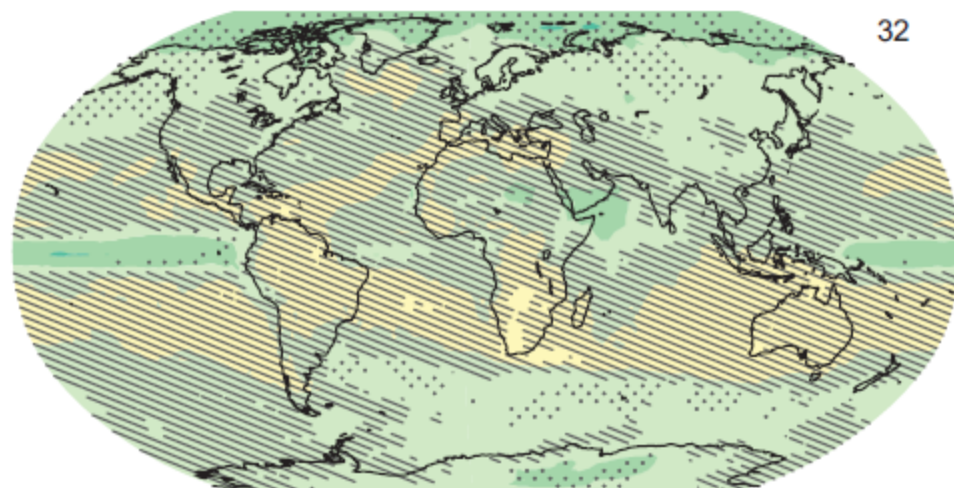
(a)

Change in average surface temperature (1986–2005 to 2081–2100)



(b)

Change in average precipitation (1986–2005 to 2081–2100)

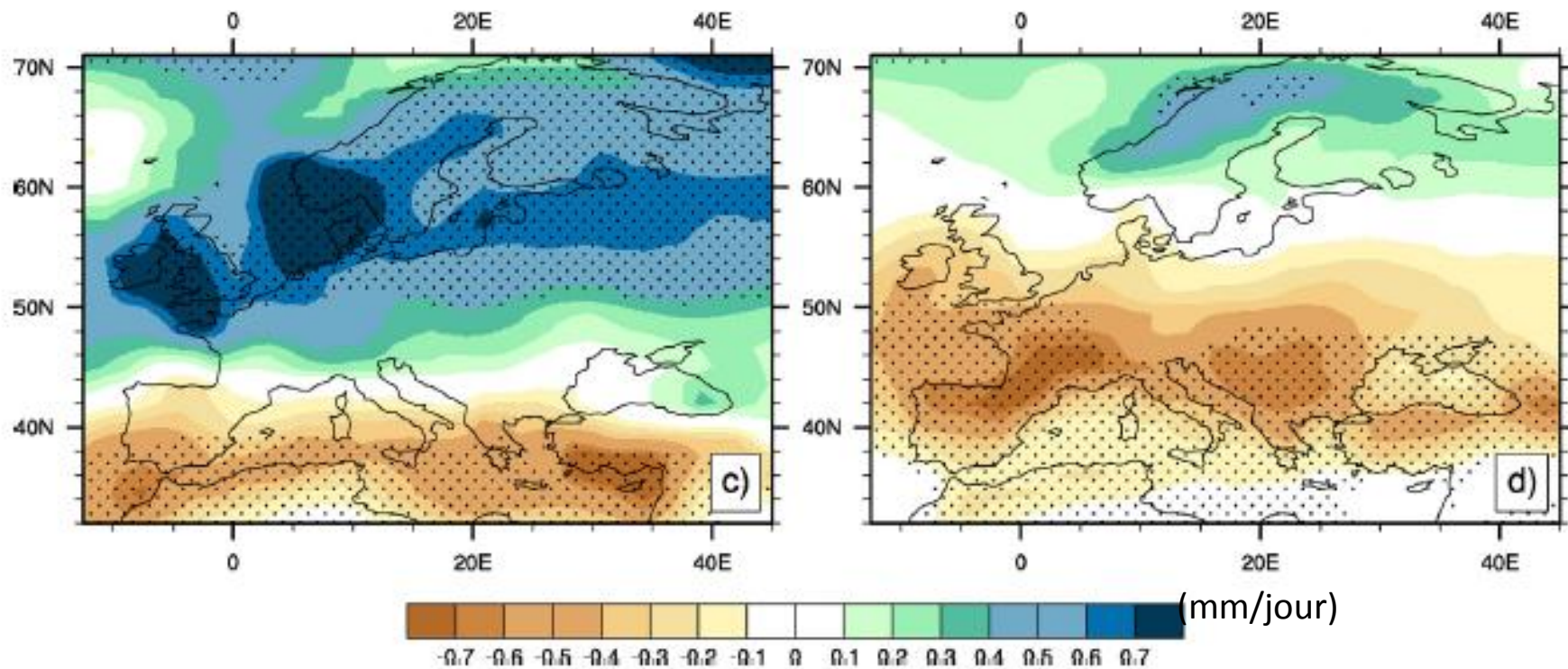




# Expected precipitation evolution in 2100

Winter

Summer



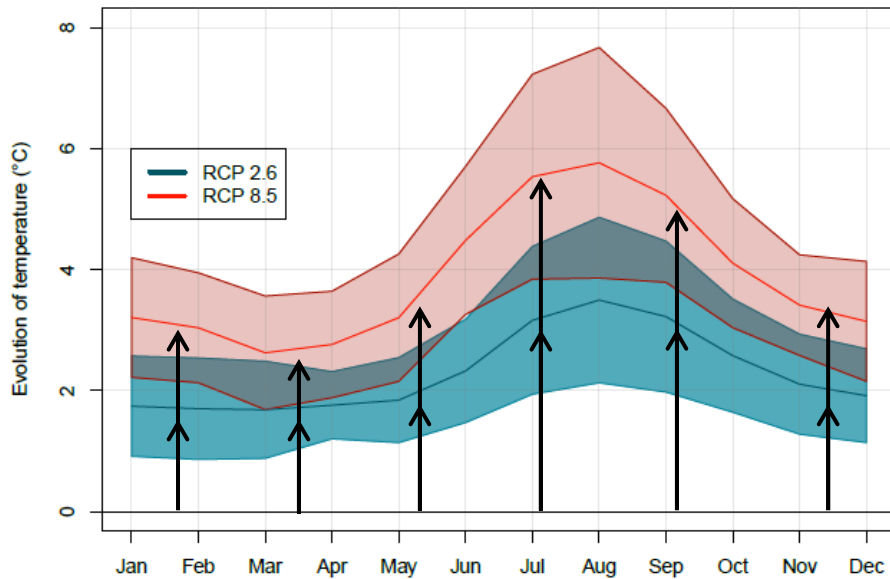
Scenario RCP8.5 (business as usual)

# Evolution of future climate over Paris

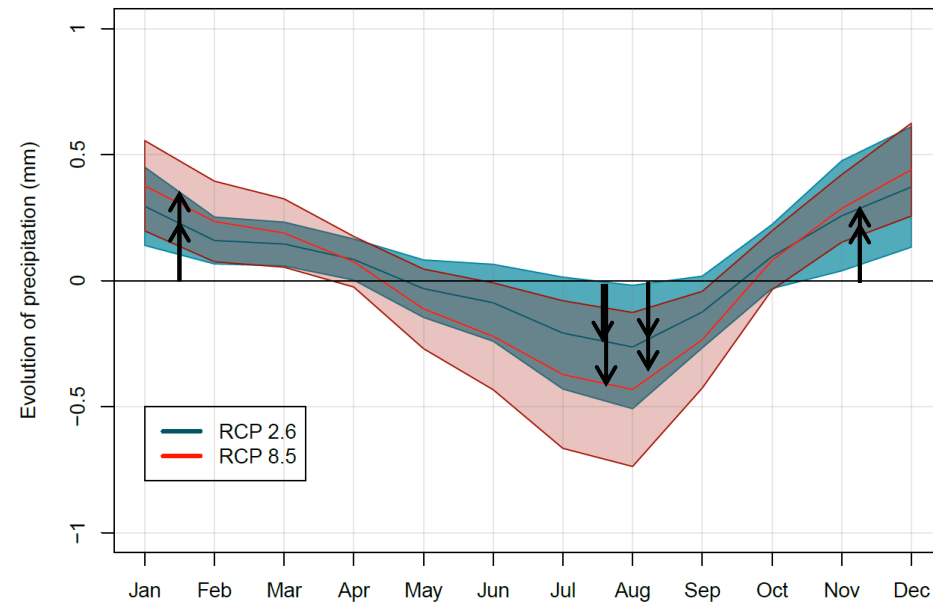
Temperature

RCP2.6: +2,3°C

RCP8.5: +3,9°C



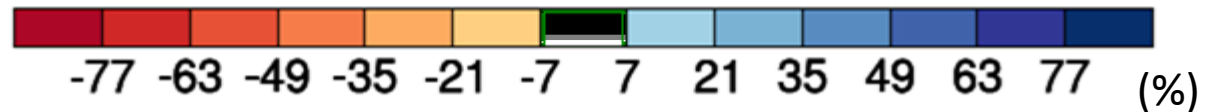
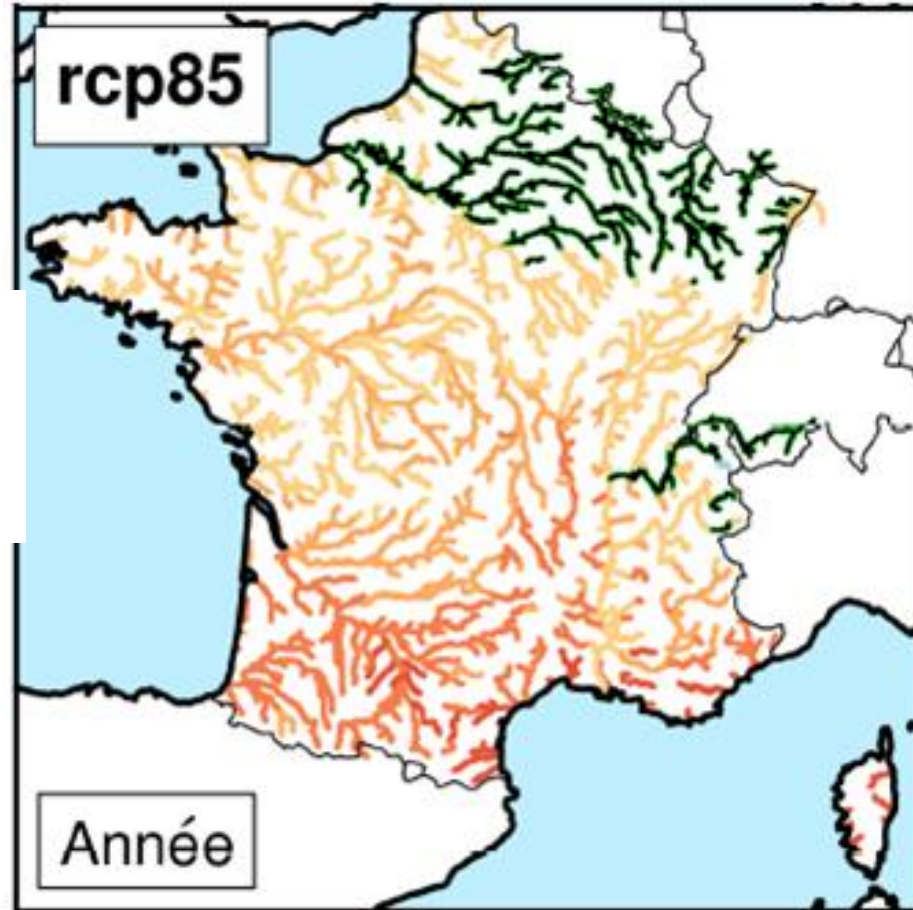
Precipitation (2.5 mm/day currently)



Strong seasonal climate evolution

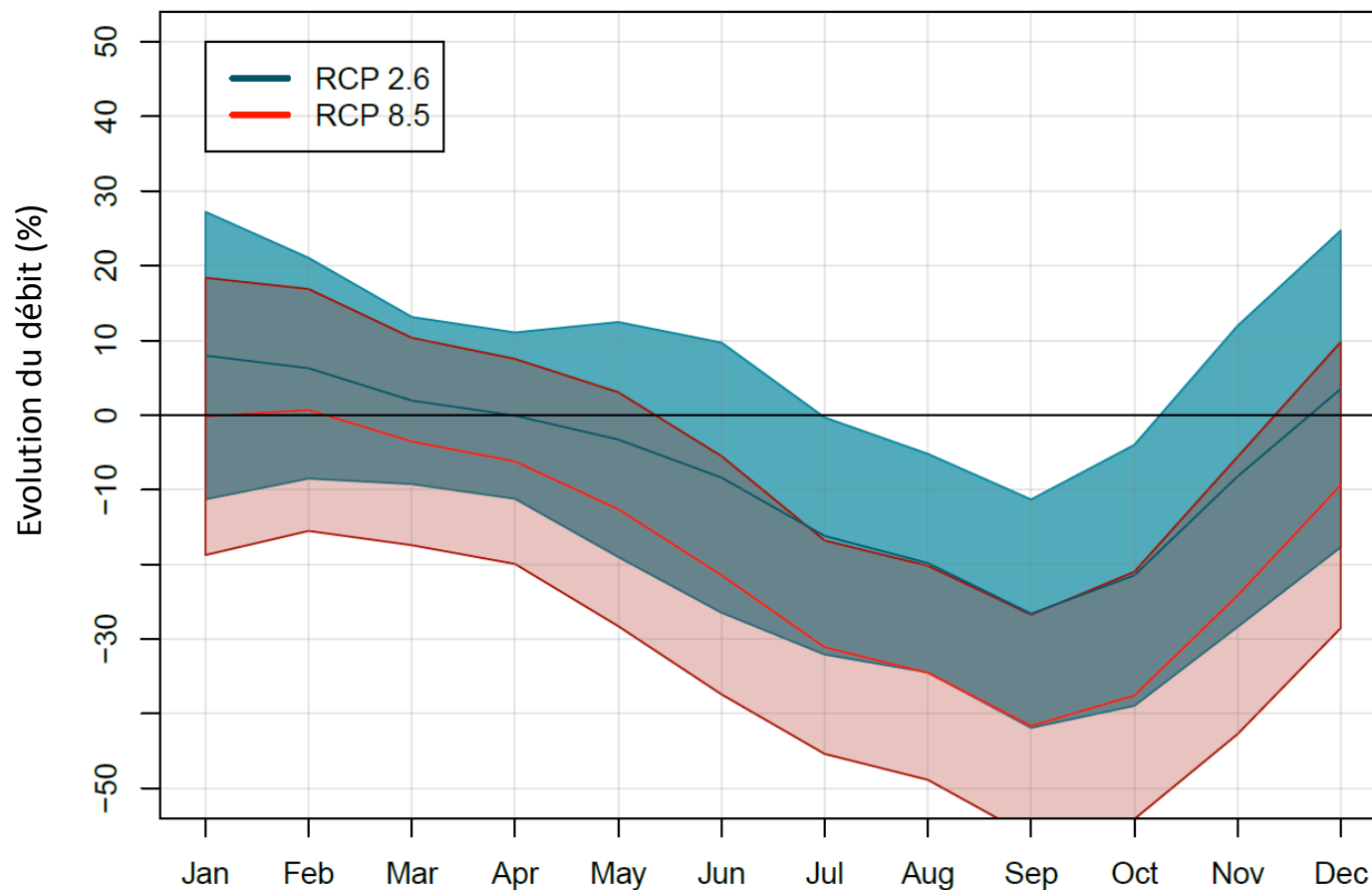
## Evolution of future mean streamflow in 2100

Towards a decrease  
of country-wide  
water resources



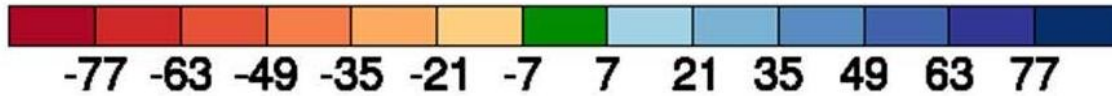
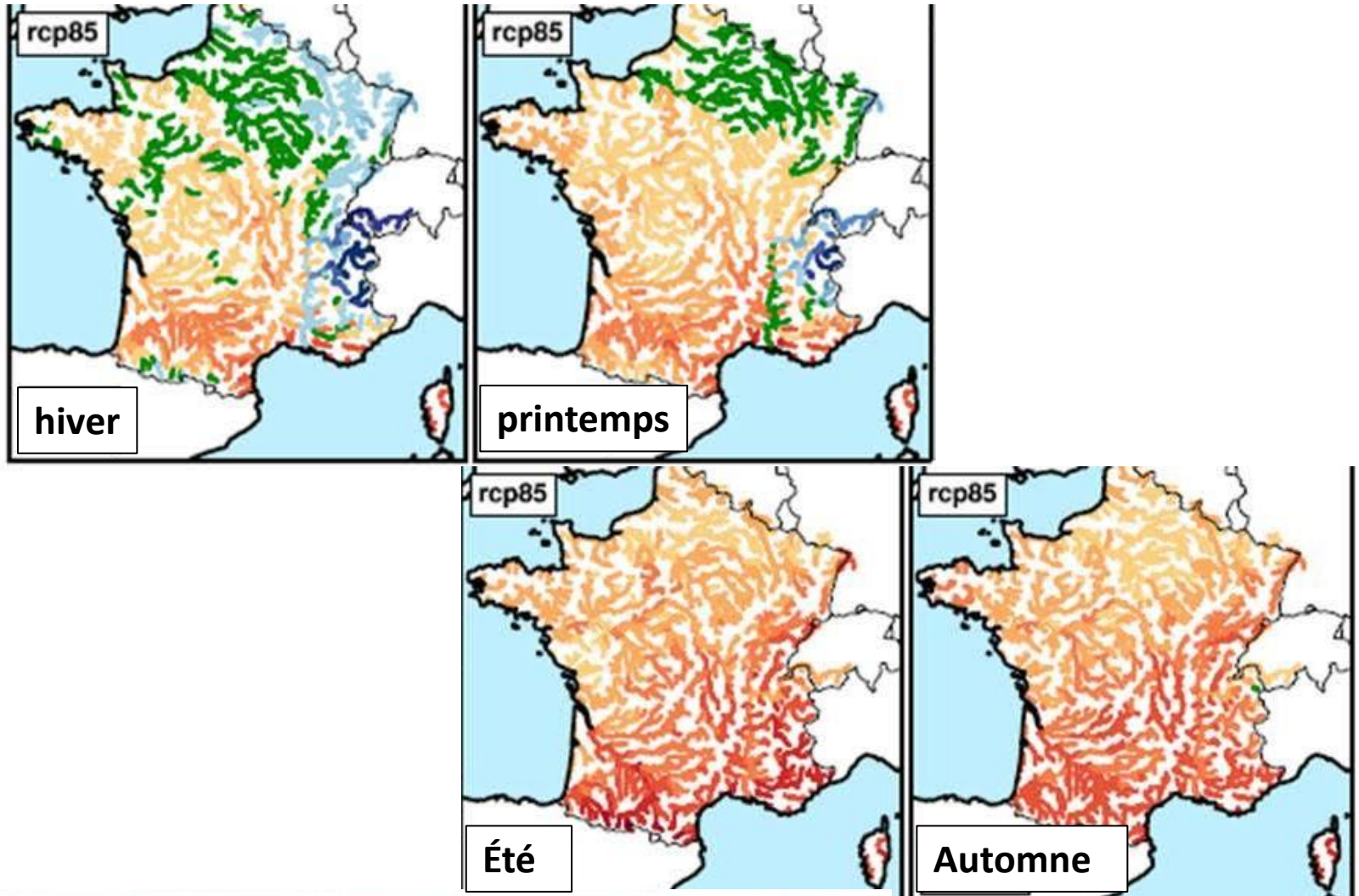


# Evolution of future streamflow for the River Seine at Paris (2100, in %)

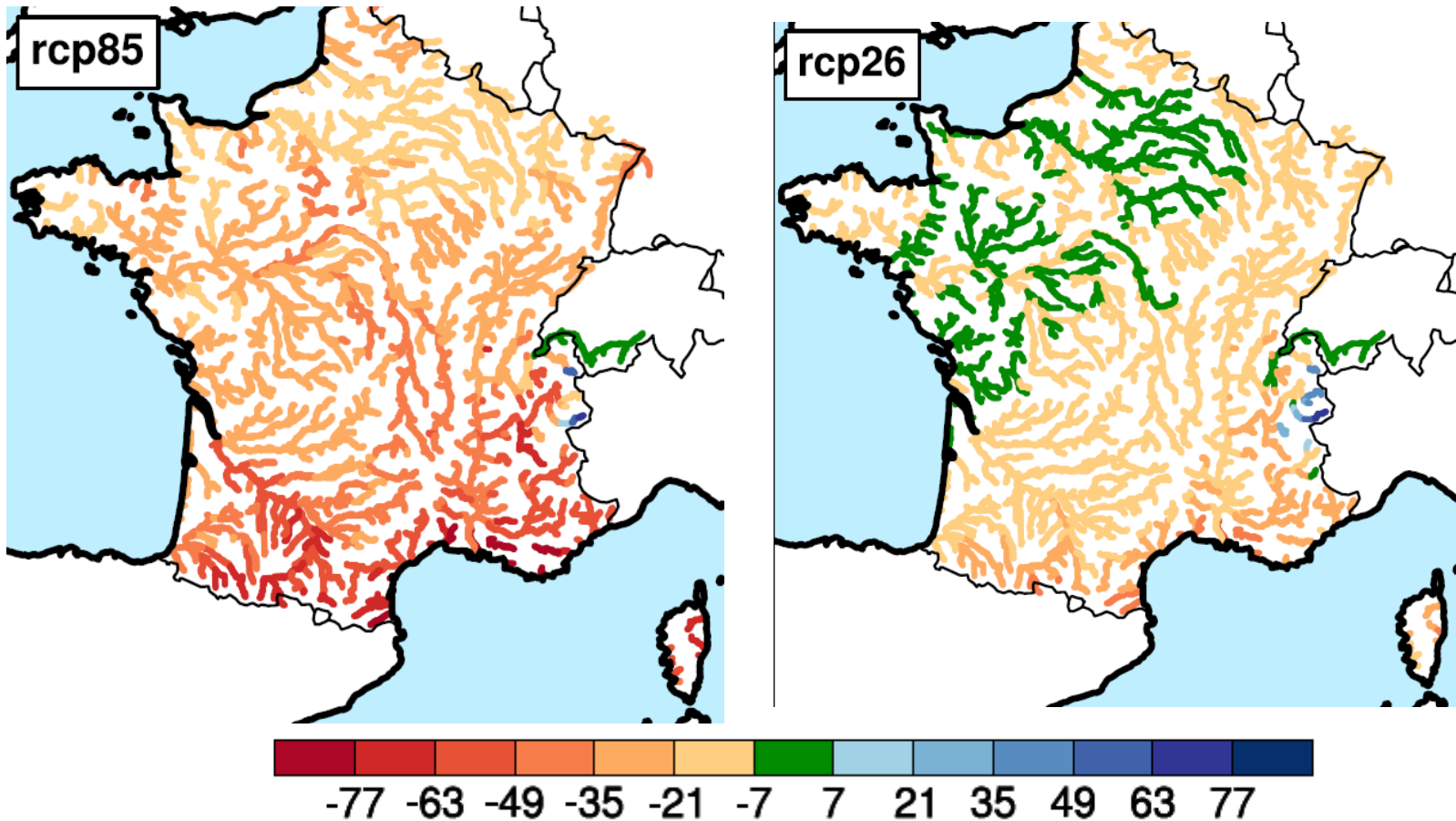


Strong seasonal impacts

# Seasonal evolution

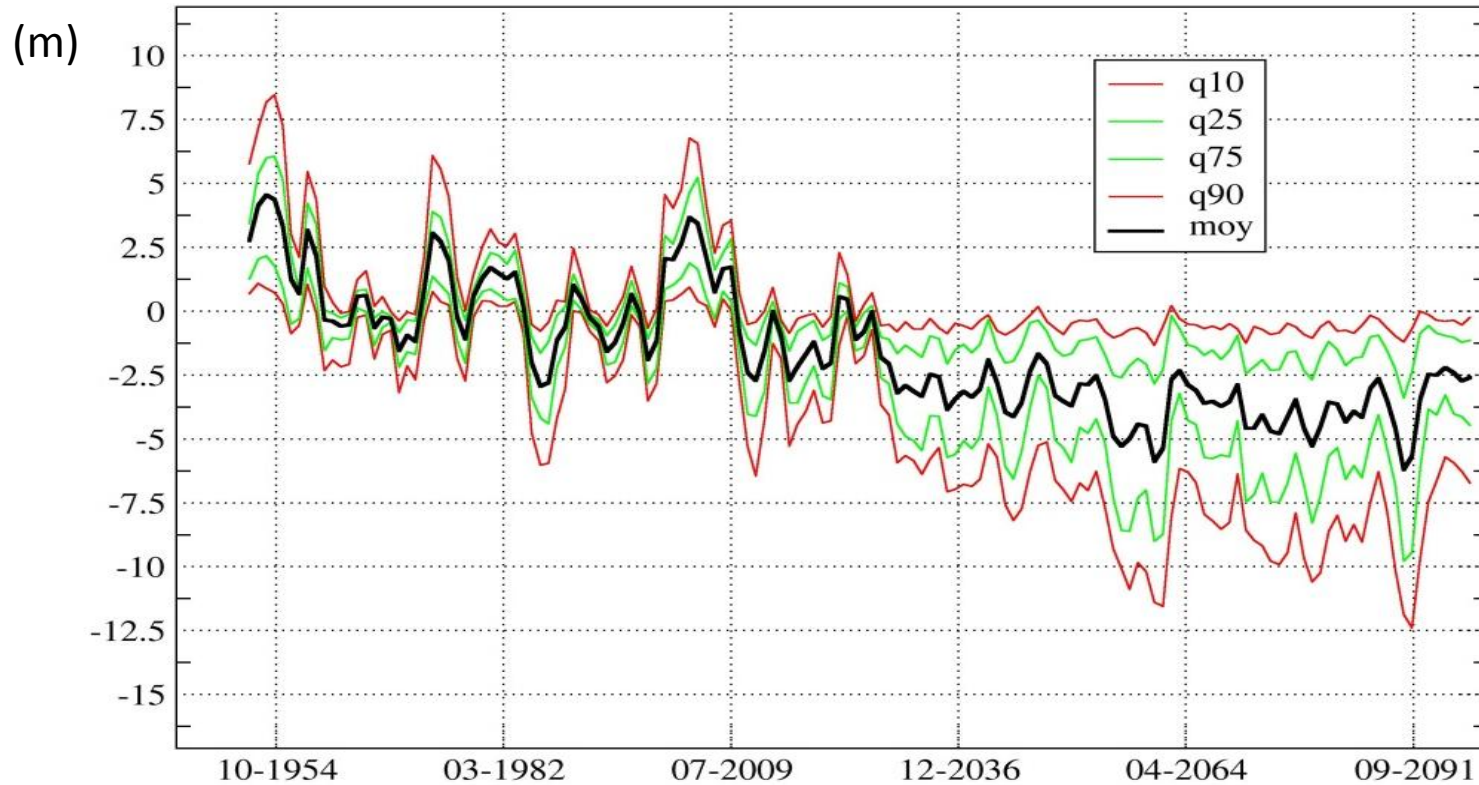


## Evolution of low flows



The reduction of greenhouse gases emission would have a strong impact

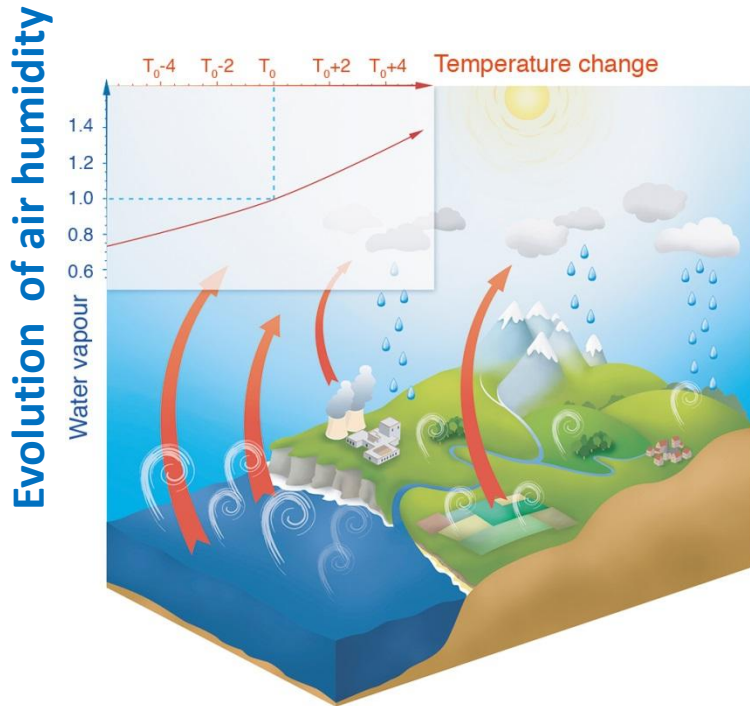
# Evolution of aquifer layer levels



[Rexhyss, Habets et al., 2013](#)

# Evolution of floods and inundations

## Evolution of air temperature



- Uncertain evolution of average floods
- Likely increase of local inundations due to intense precipitation





## Take-home messages

### **Climate change will impact the water cycle**

- Strong diminution of water resources in France, mostly during summer
- Low flows will become even lower
- Impact on floods is uncertain
- Mitigation** would allow a significant reduction of climate change impact on water resources

**Strong potential impacts on the agriculture sector can be foreseen**