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

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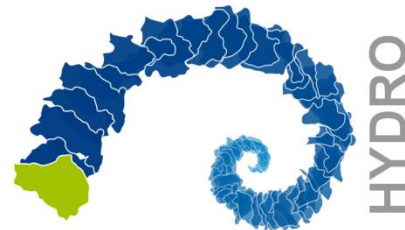
Climate change impact on water resources: which future scenarios over France?

Guillaume Thirel

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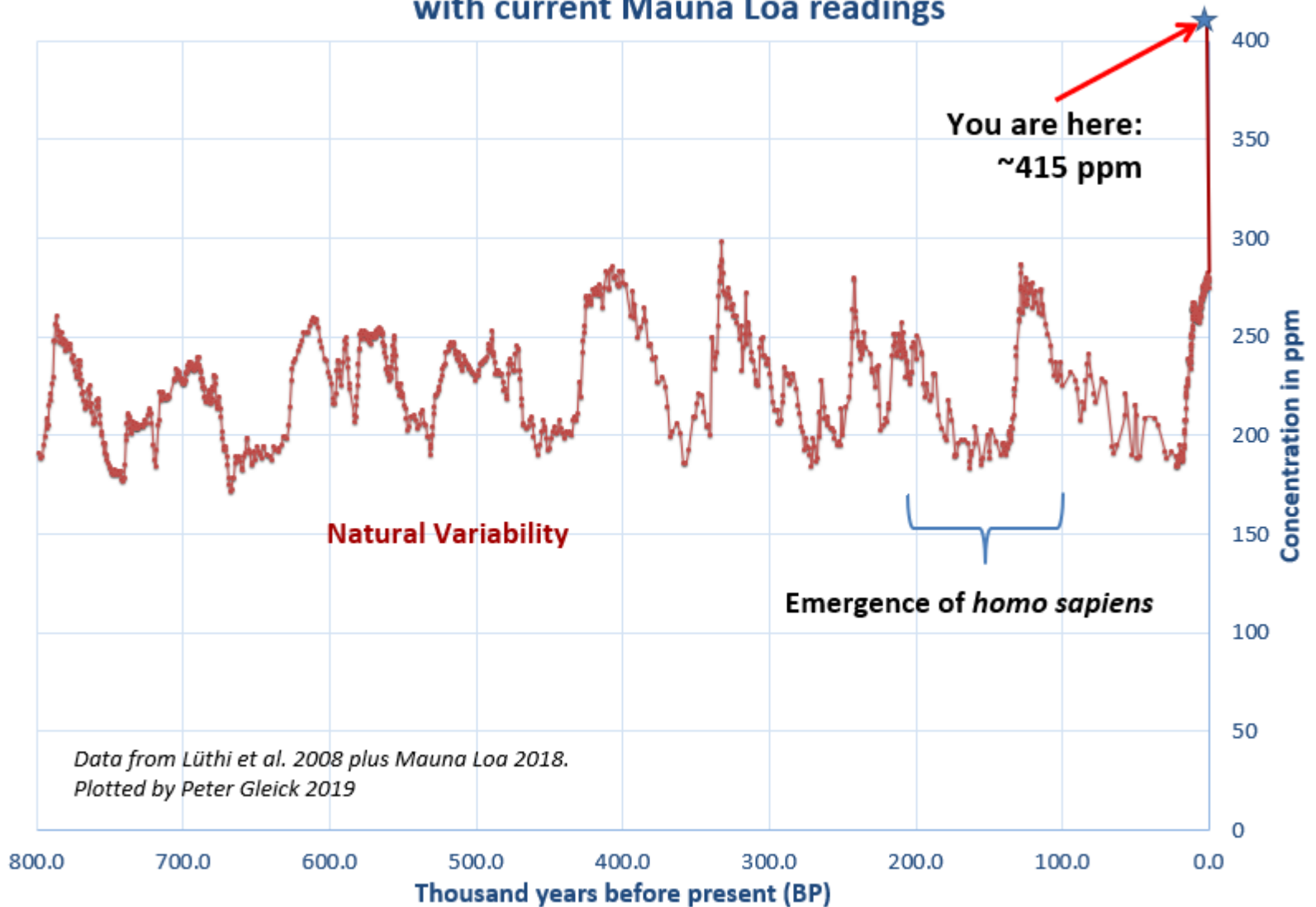
<https://webgr.irstea.fr>

 @G_Thirel



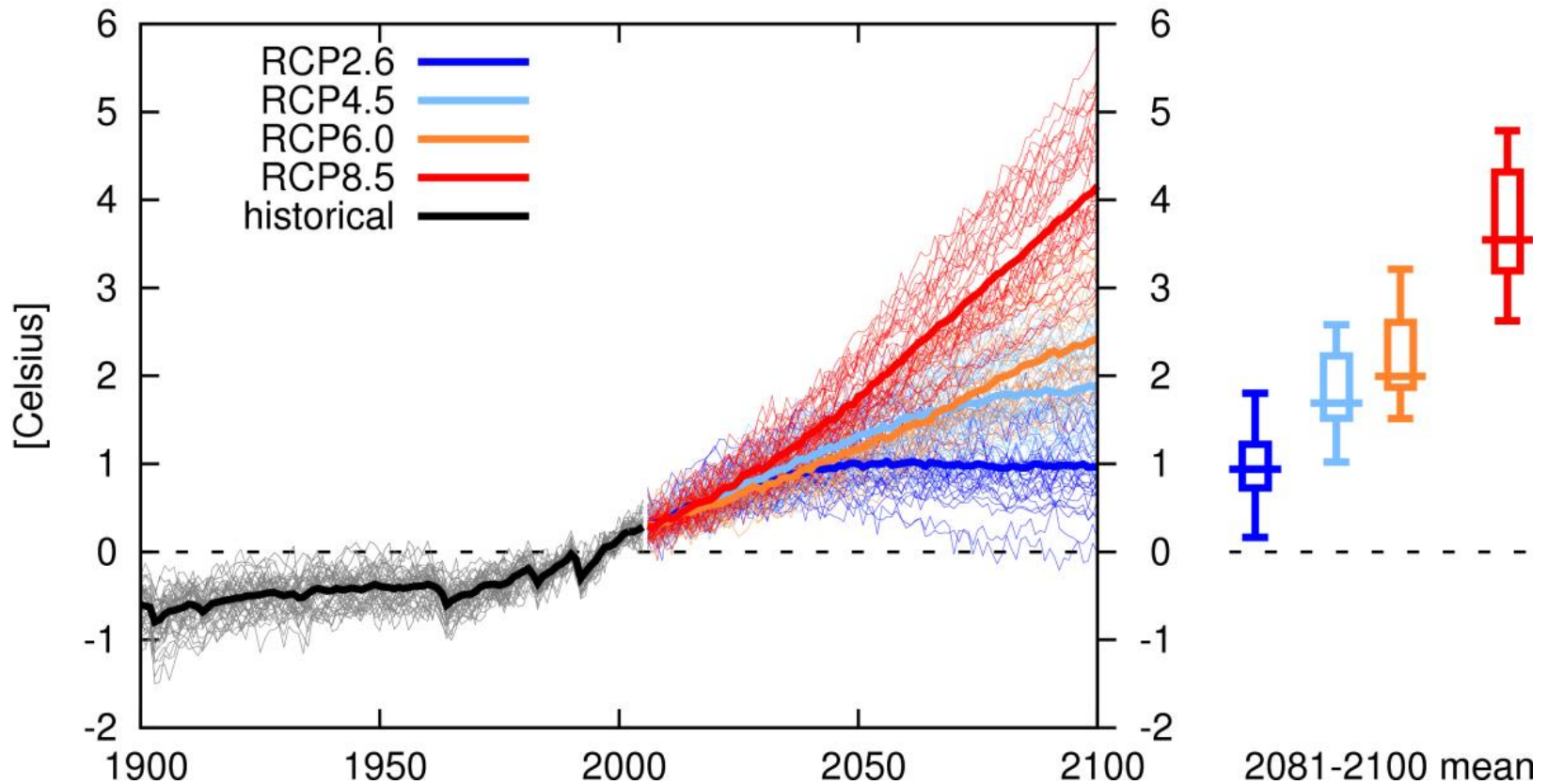
Rising greenhouse gases concentration...

Composite Antarctic CO₂ 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

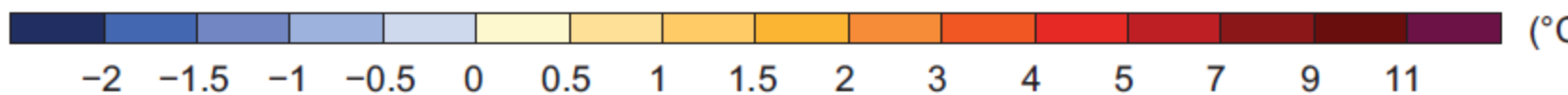
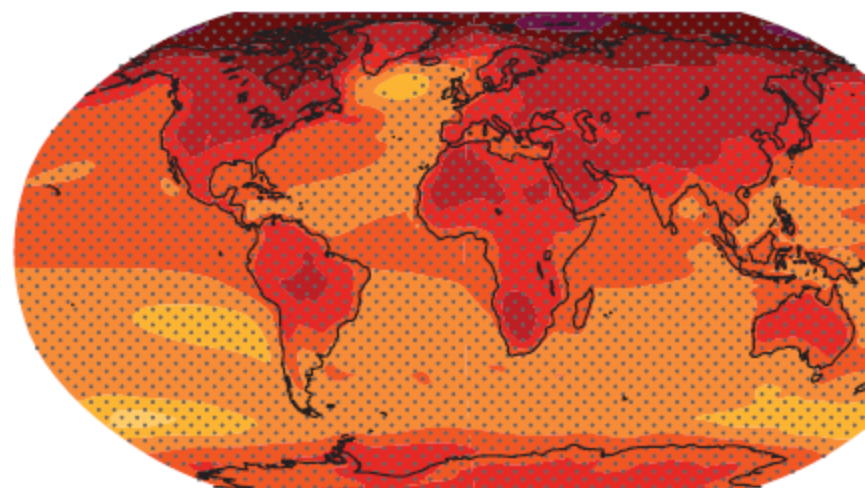
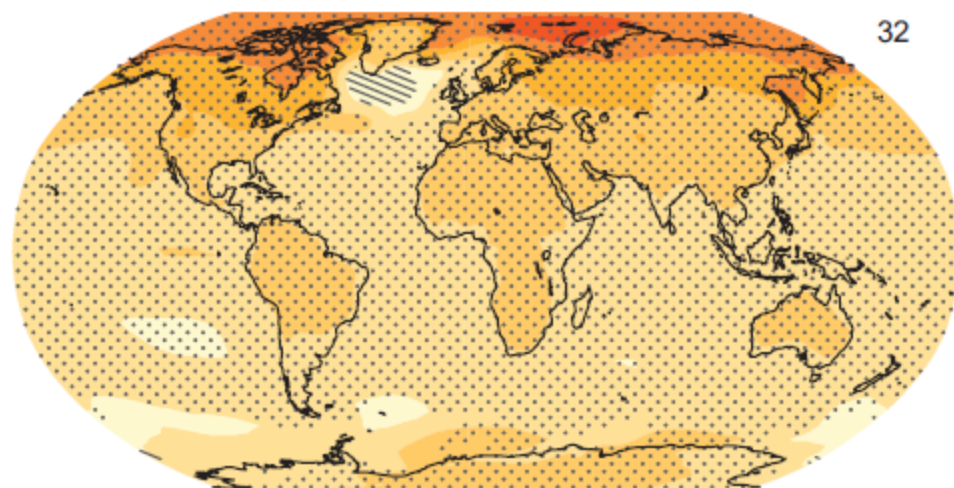
... whose future evolution will depend on present human action

RCP 2.6

RCP 8.5

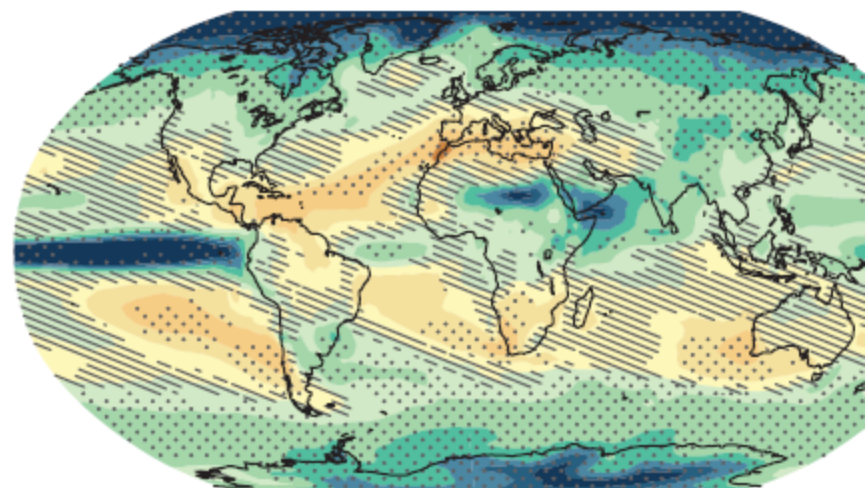
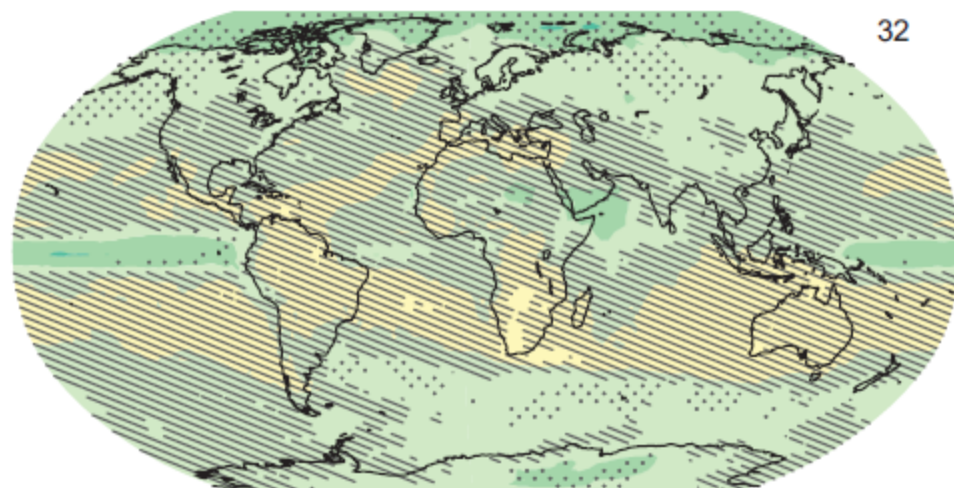
(a)

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



(b)

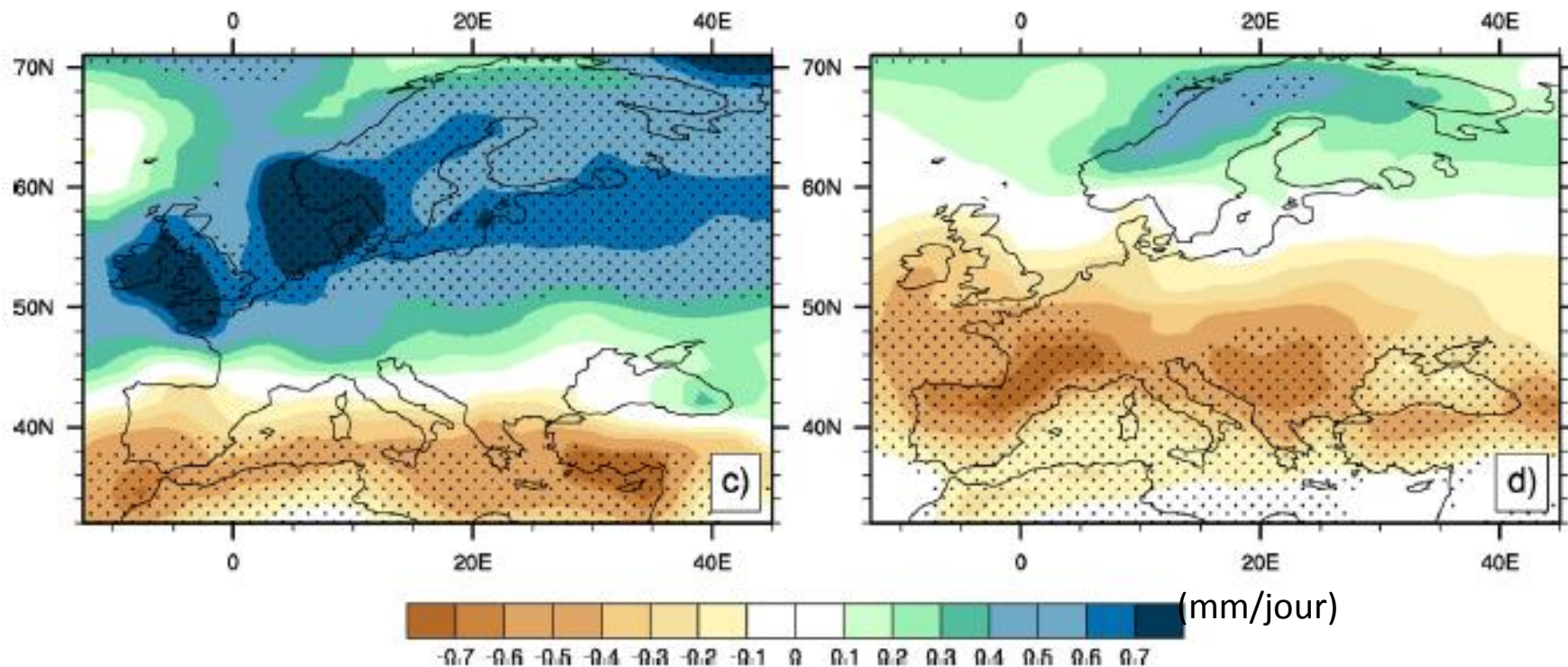
Change in average precipitation (1986–2005 to 2081–2100)



Expected precipitation evolution in 2100

Winter

Summer



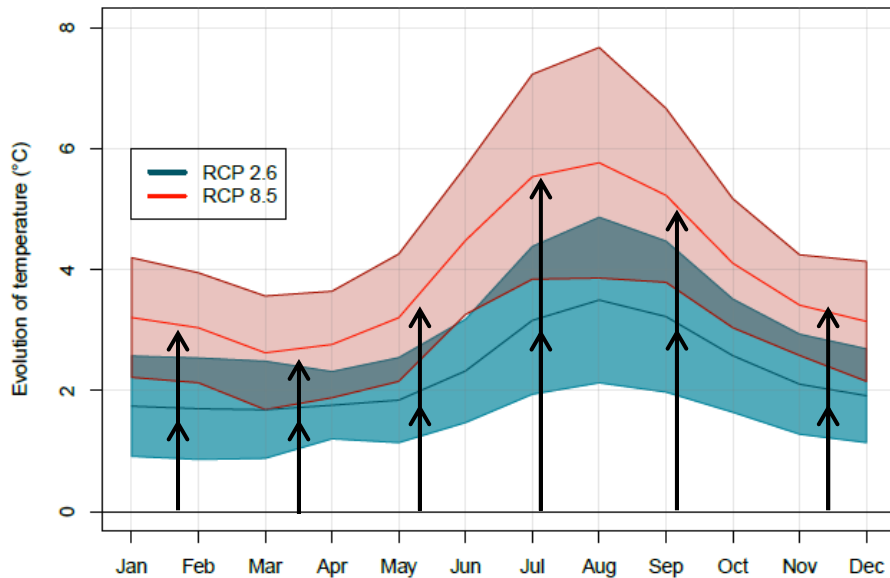
Scenario RCP8.5 (business as usual)

Evolution of future climate over Paris

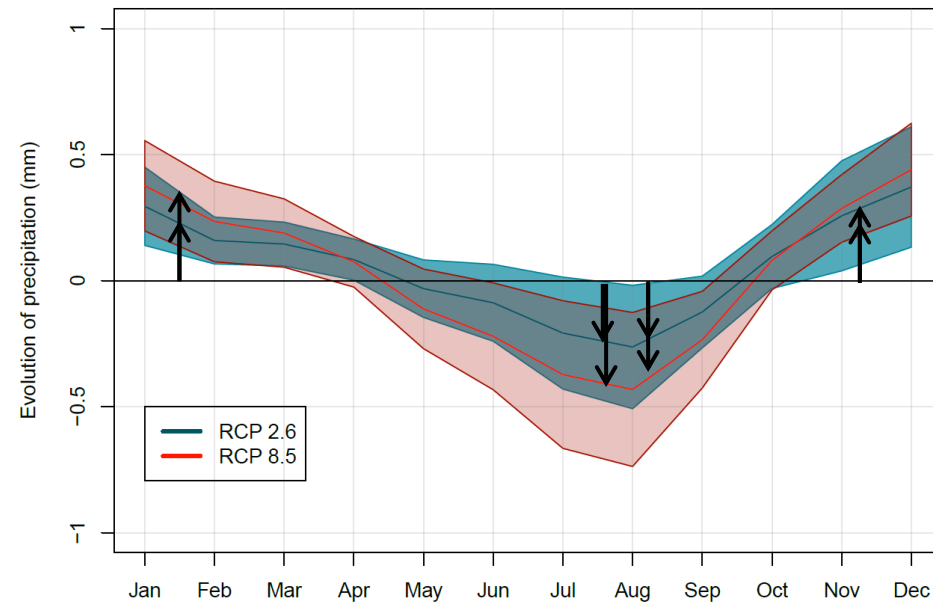
Temperature

RCP2.6: +2,3°C

RCP8.5: +3,9°C



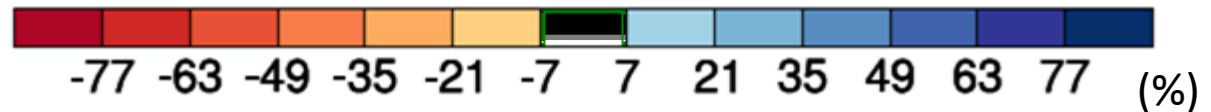
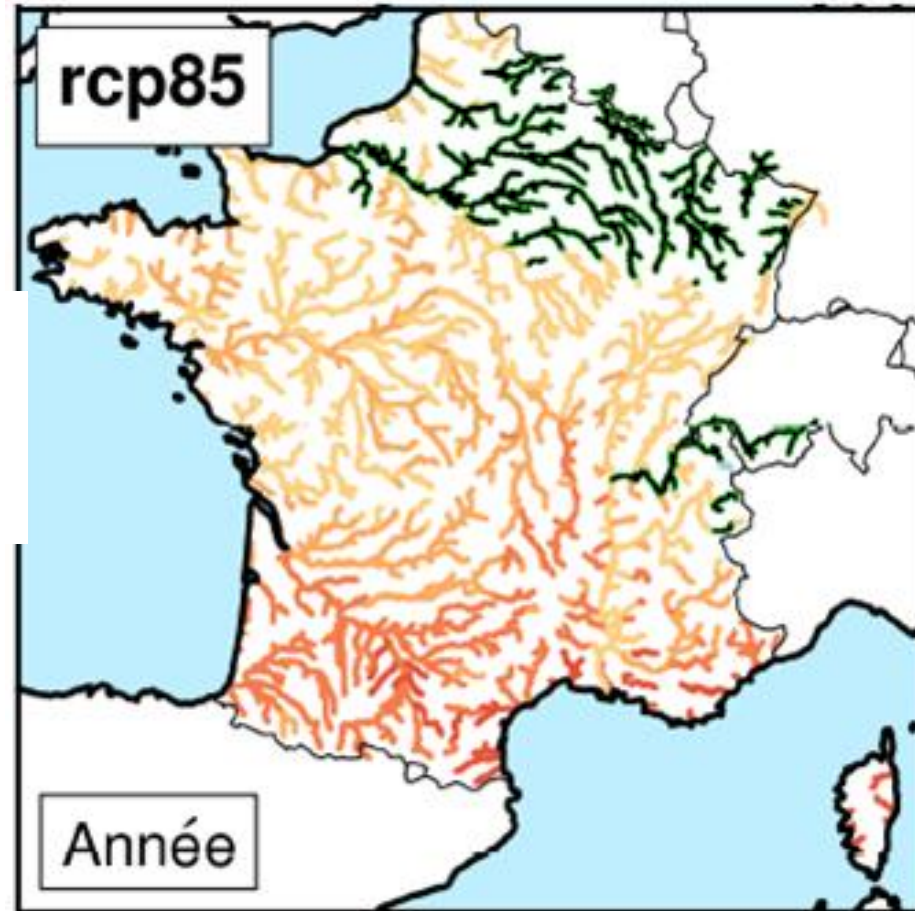
Precipitation (2.5 mm/day currently)



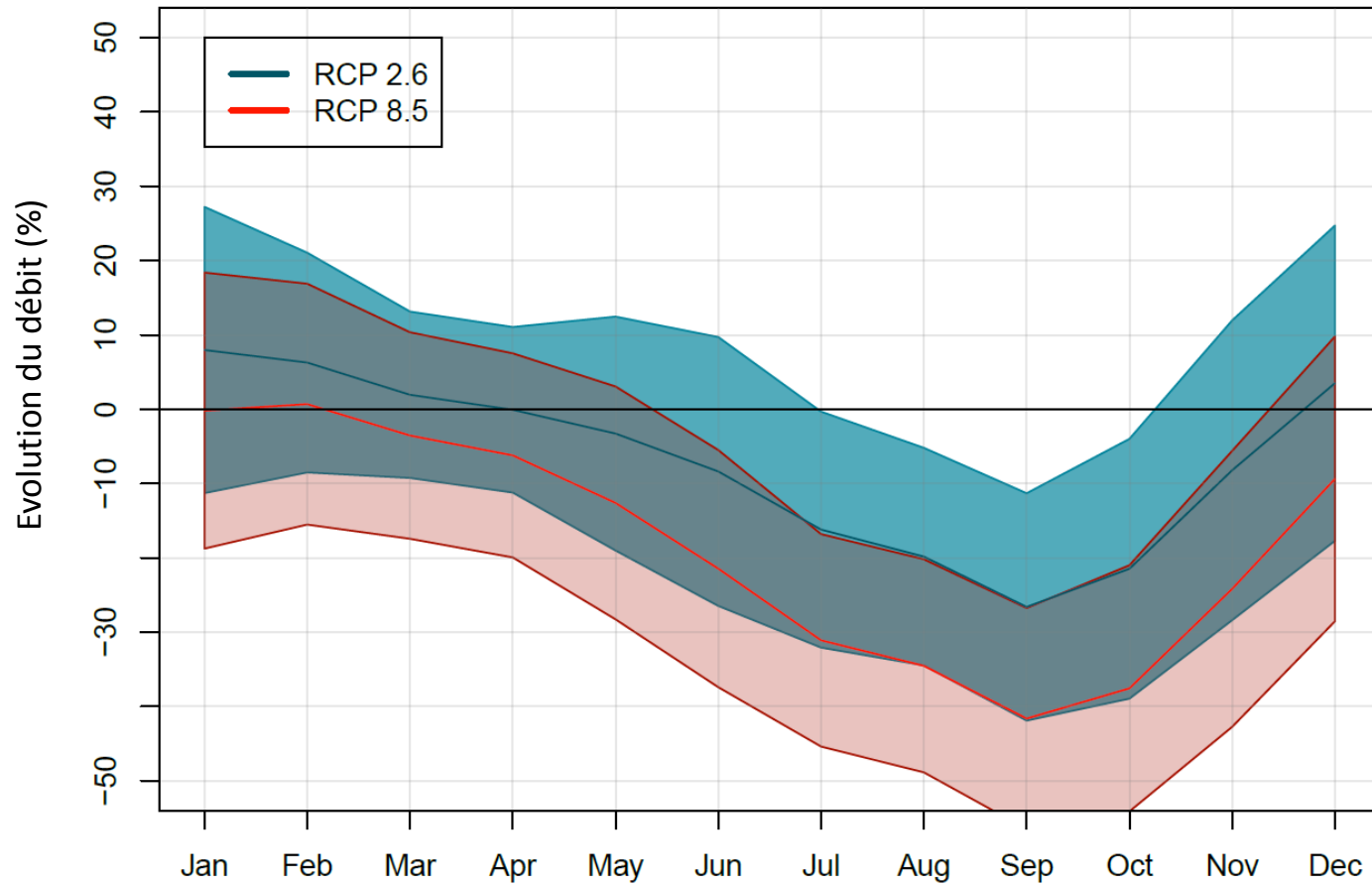
Strong seasonal climate evolution

Evolution of future mean streamflow in 2100

Towards a decrease
of country-wide
water resources

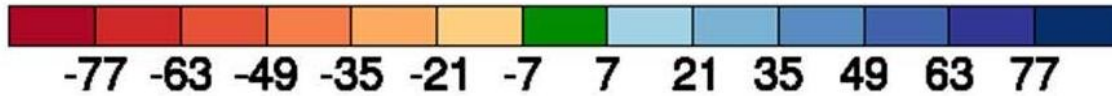
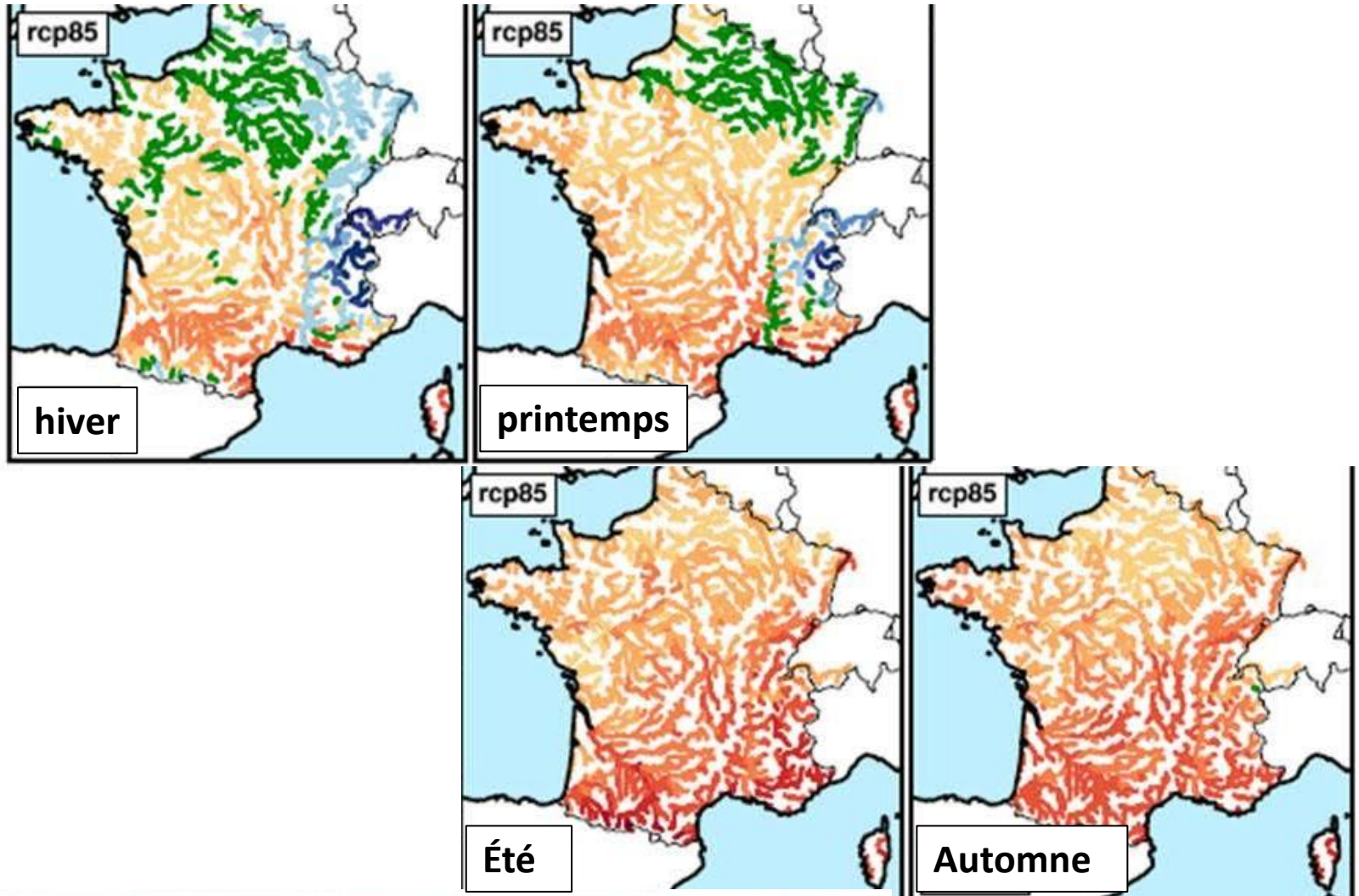


Evolution of future streamflow for the River Seine at Paris (2100, in %)

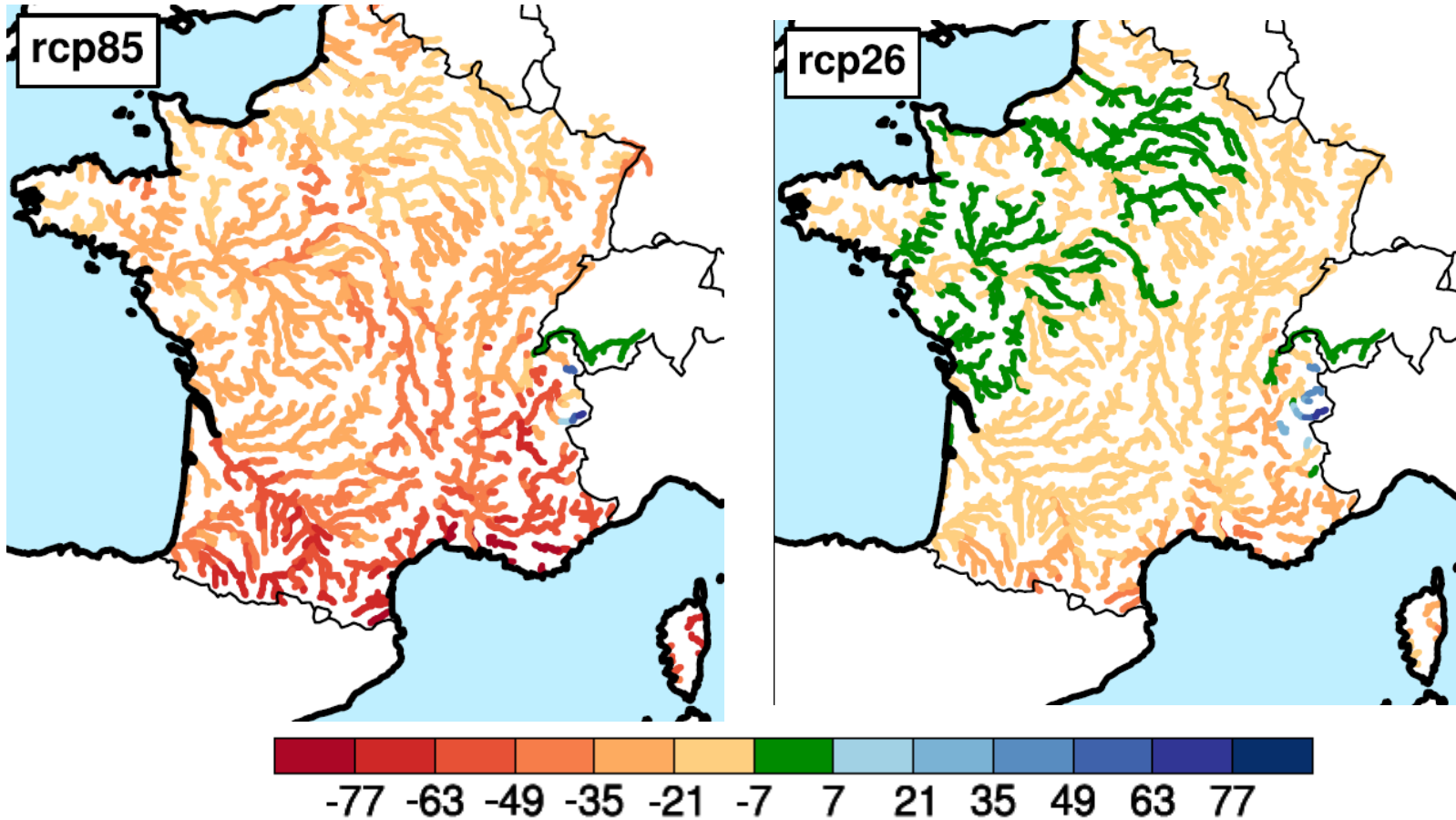


Strong seasonal impacts

Seasonal evolution

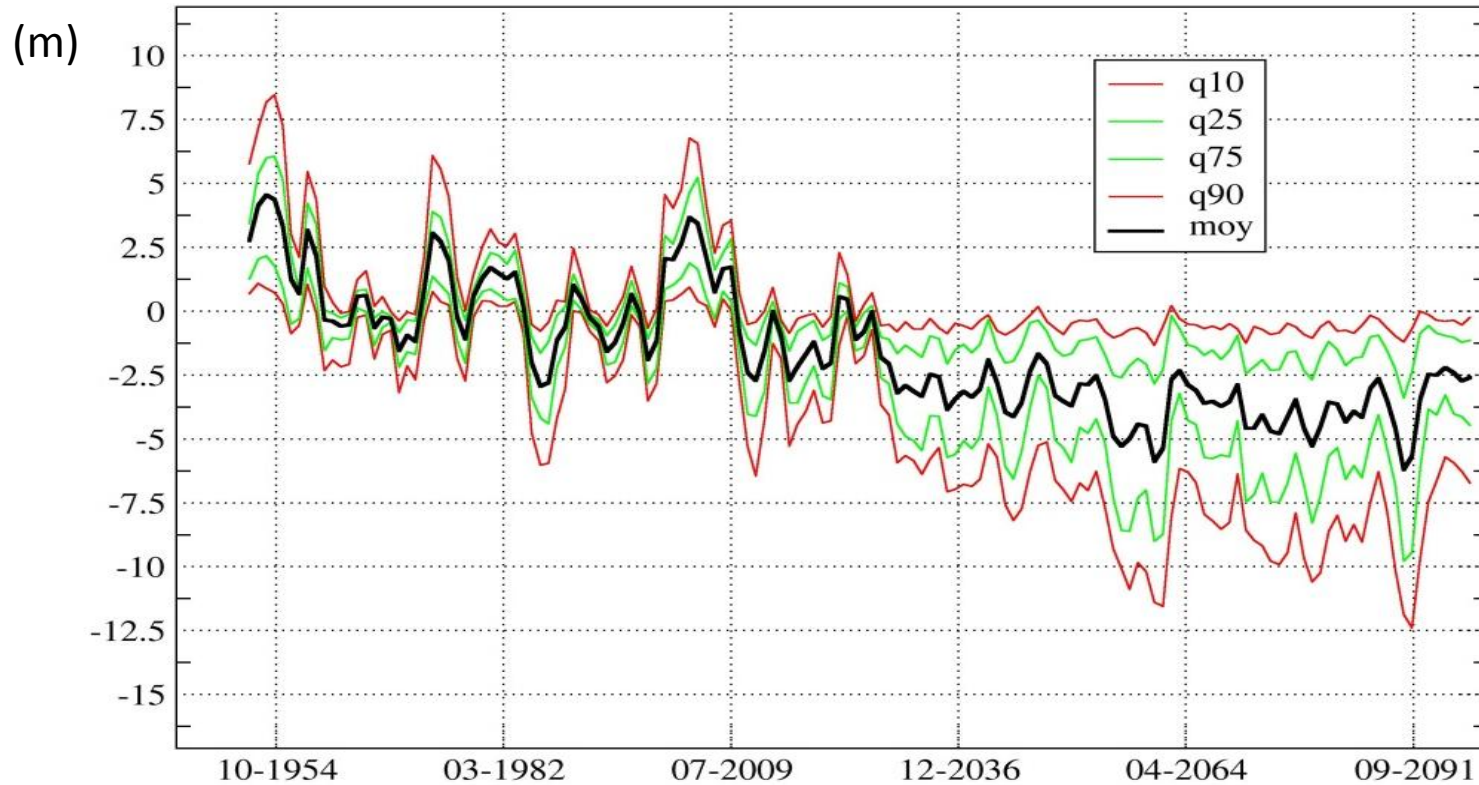


Evolution of low flows



The reduction of greenhouse gases emission would have a strong impact

Evolution of aquifer layer levels

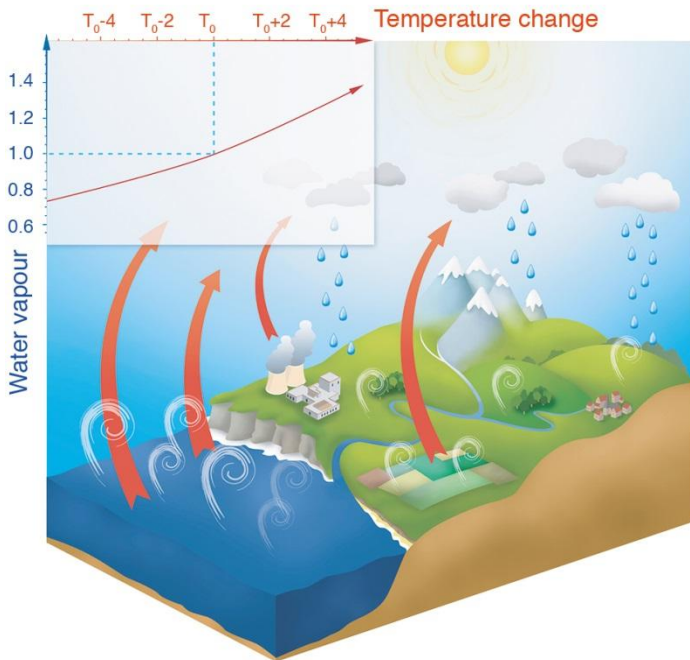


[Rexhyss, Habets et al., 2013](#)

Evolution of floods and inundations

Evolution of air temperature

Evolution of air humidity



- 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