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To cite this version:

Hélène Fargeon, Jean-Luc Dupuy, Nicolas Martin-StPaul, François Pimont. Climate change impact on wildfires: where do the greatest uncertainties lie?. Impact des changements climatiques en Méditerranée, Oct 2017, Montpellier, France. hal-01913028

HAL Id: hal-01913028

https://hal.science/hal-01913028v1

Submitted on 5 Jun 2020

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Climate change impact on wildfires: where do the greatest uncertainties lie ?

PhD realised at the URFM, and directed by Jean-Luc Dupuy, Nicolas Martin and François Pimont

Hélène Fargeon

16 October 2017

Introduction

Why modeling the impact of climate change on wildfires ?

- Climate change will impact wildfires in France
- Higher temperature and longer dry spells are expected

Photo : Lluis Gene

The modelling chain

Different layers of uncertainties

Scenario

↓

GCMs

↓

RCMs

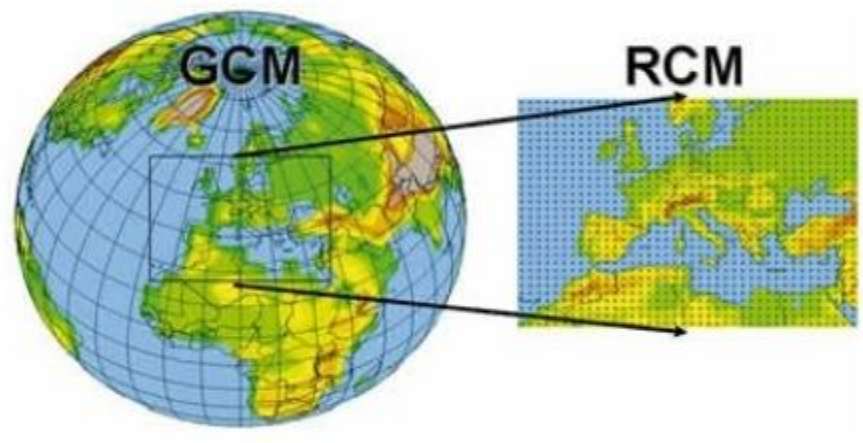
↓

Downscaling and bias correction

↓

FWI and equivalent number of fires

Adapted from Lindner et al. (2014)



Source: climate4change.eu

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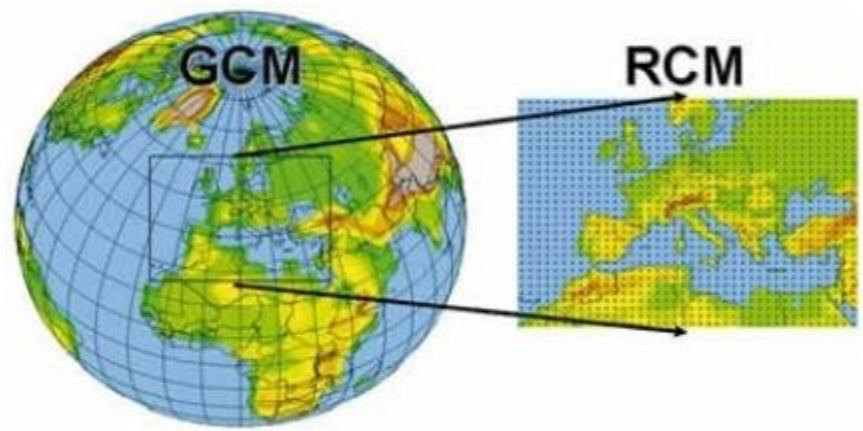

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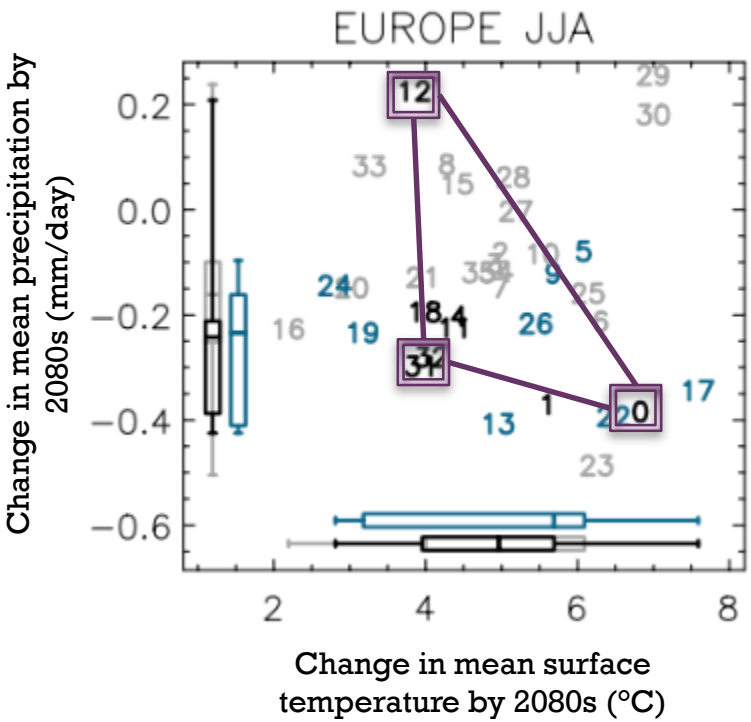
Climate model choice

Aim : have a maximal spread among the predictions

GCM choice



From McSweeney et al. (2015)

- Hypothesis: the major spread in climate simulations comes from the GCMs (*Glotter et al. 2014*)
- Necessity to make a choice :
  - Computing capacity
  - Quality of the models
  - Availability of the data

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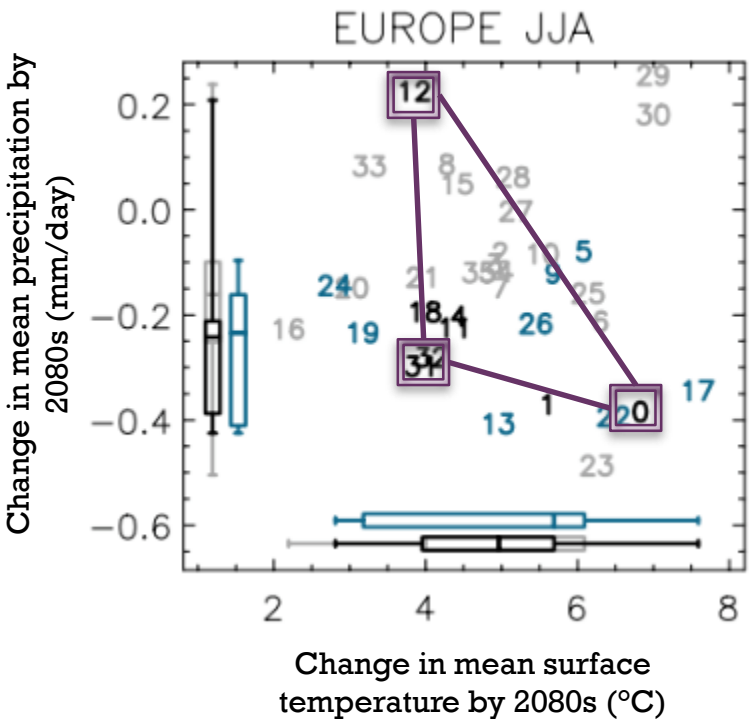

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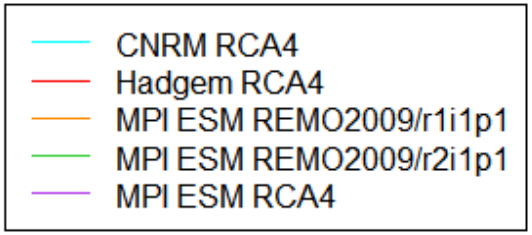
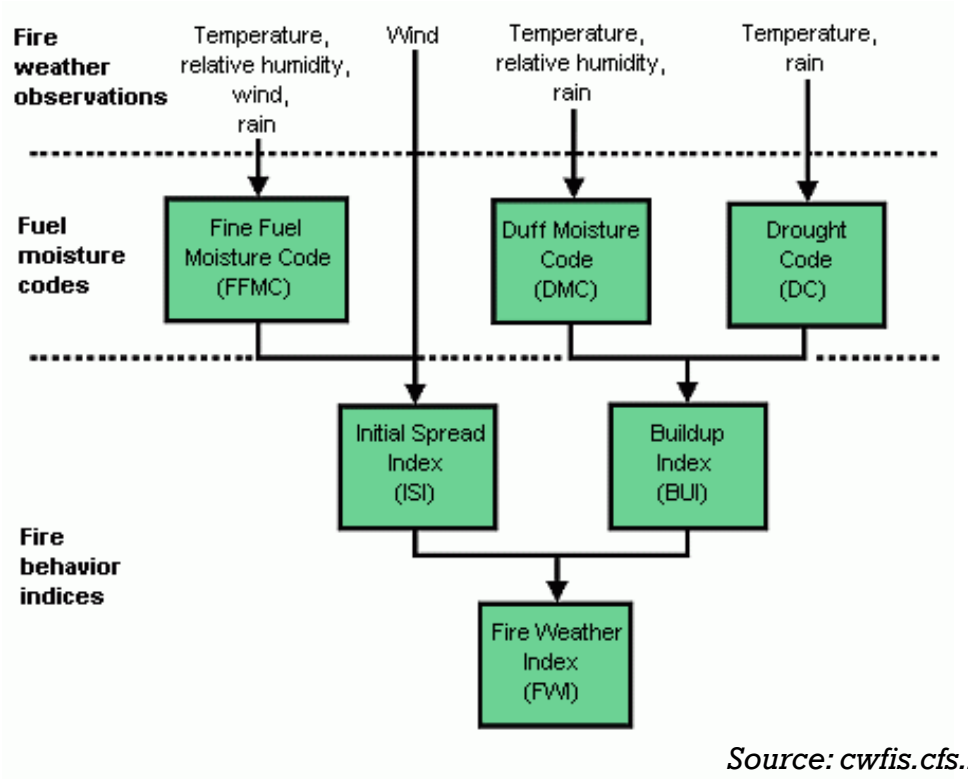


Impact on wildfire danger

Transforming climate data into fire hazard

The use of a fire danger index =
Forest fire Weather Index (FWI)



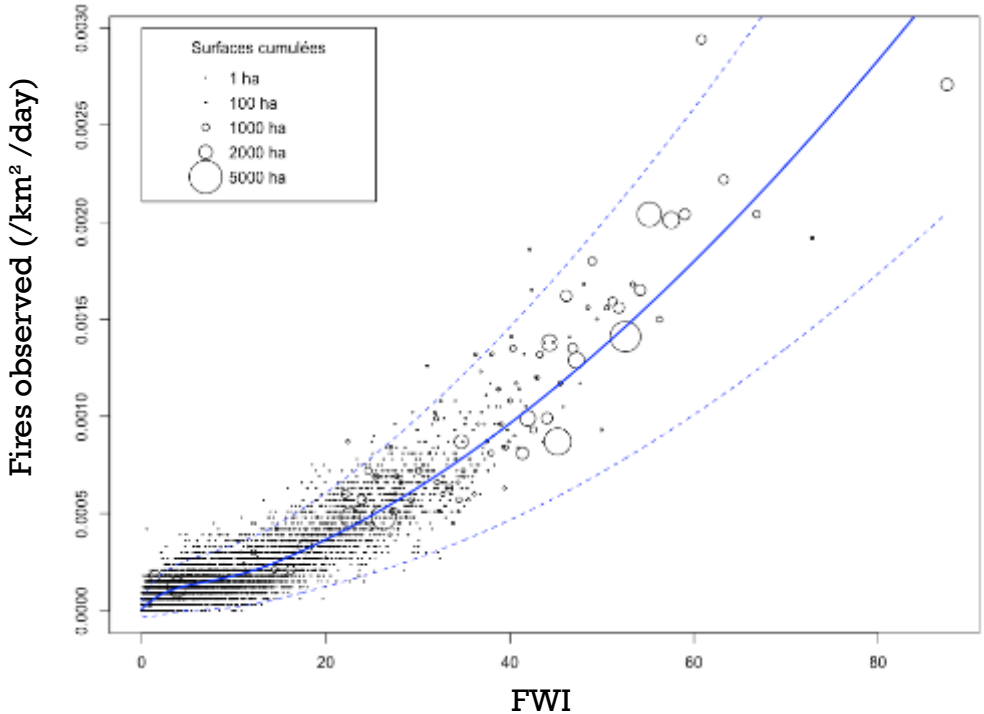
Source: cwfis.cfs.nrcan.gc.ca

Impact on wildfire danger

Transforming climate data into fire hazard

Parameterization of a FWI-fire relationship using a database of past fires on the French Mediterranean area

Relationship between FWI and observed fires



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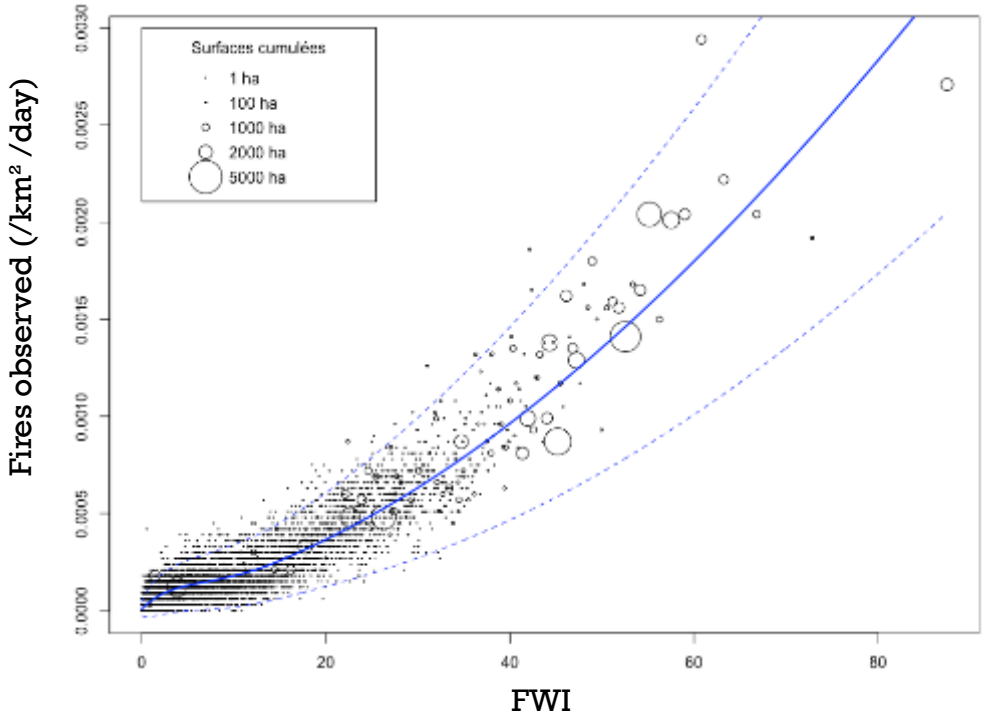

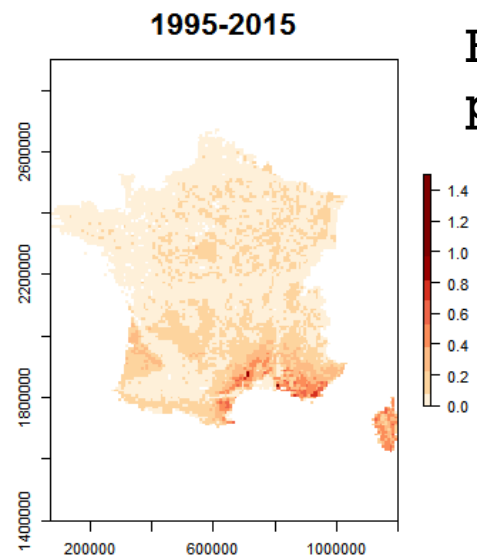

Reference period

Impact on wildfire danger

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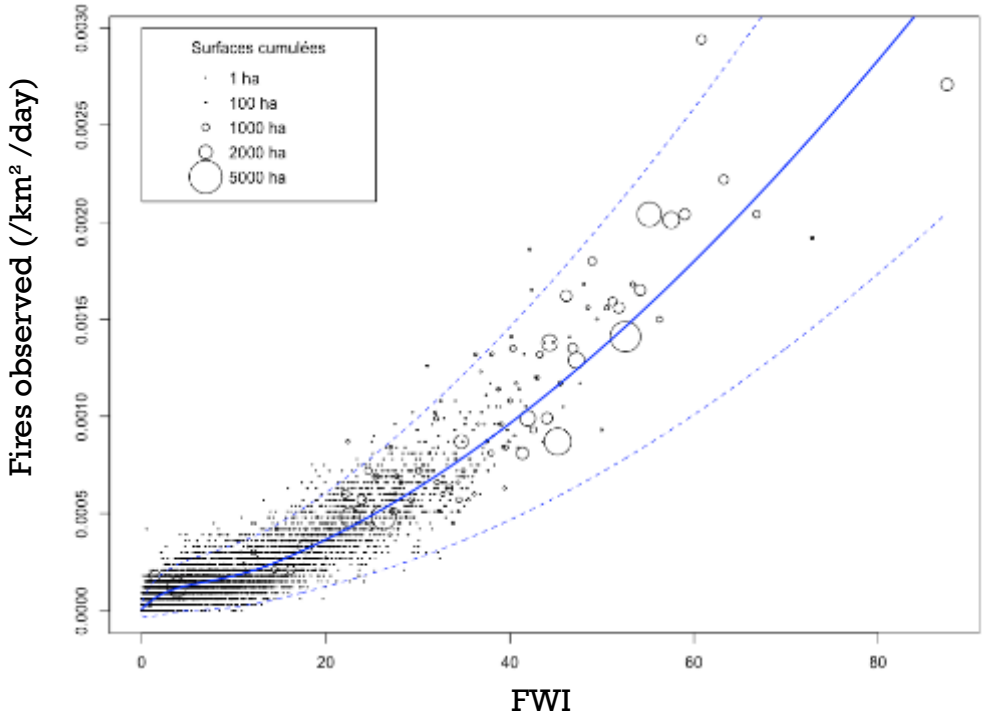
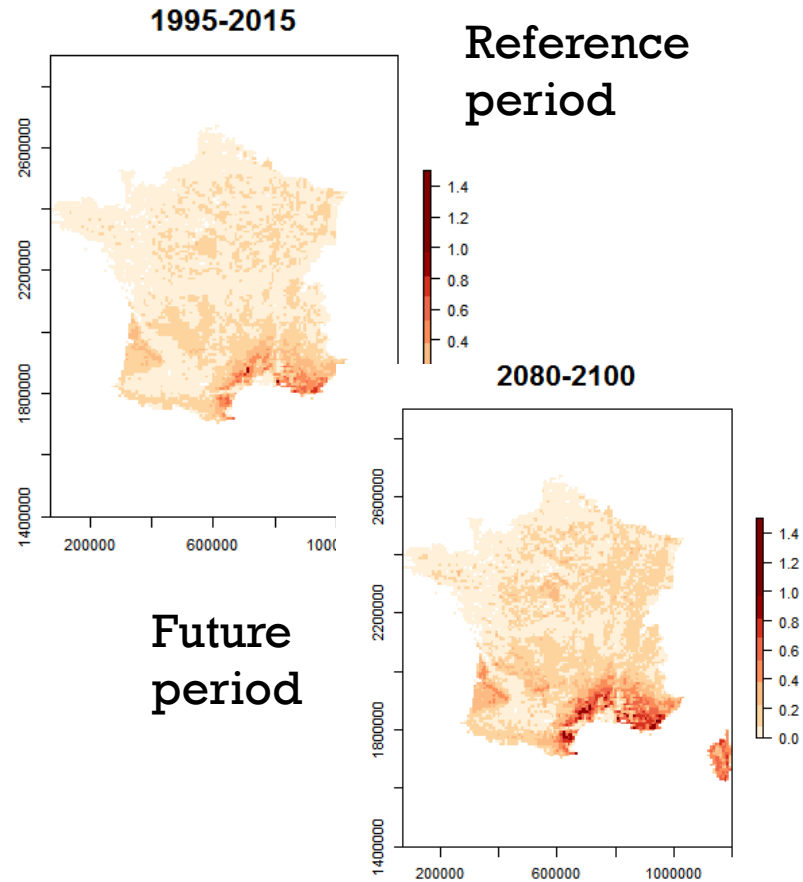
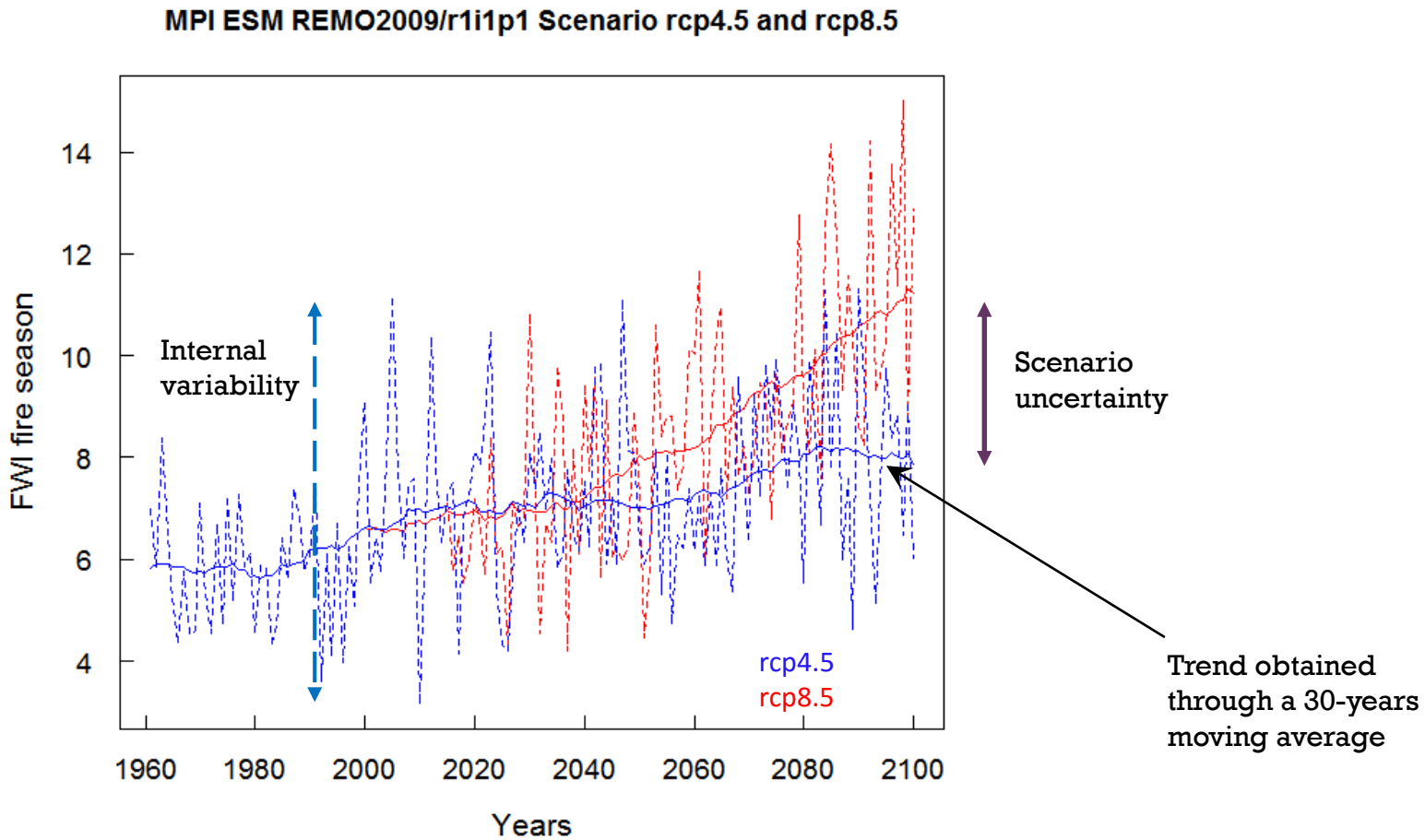
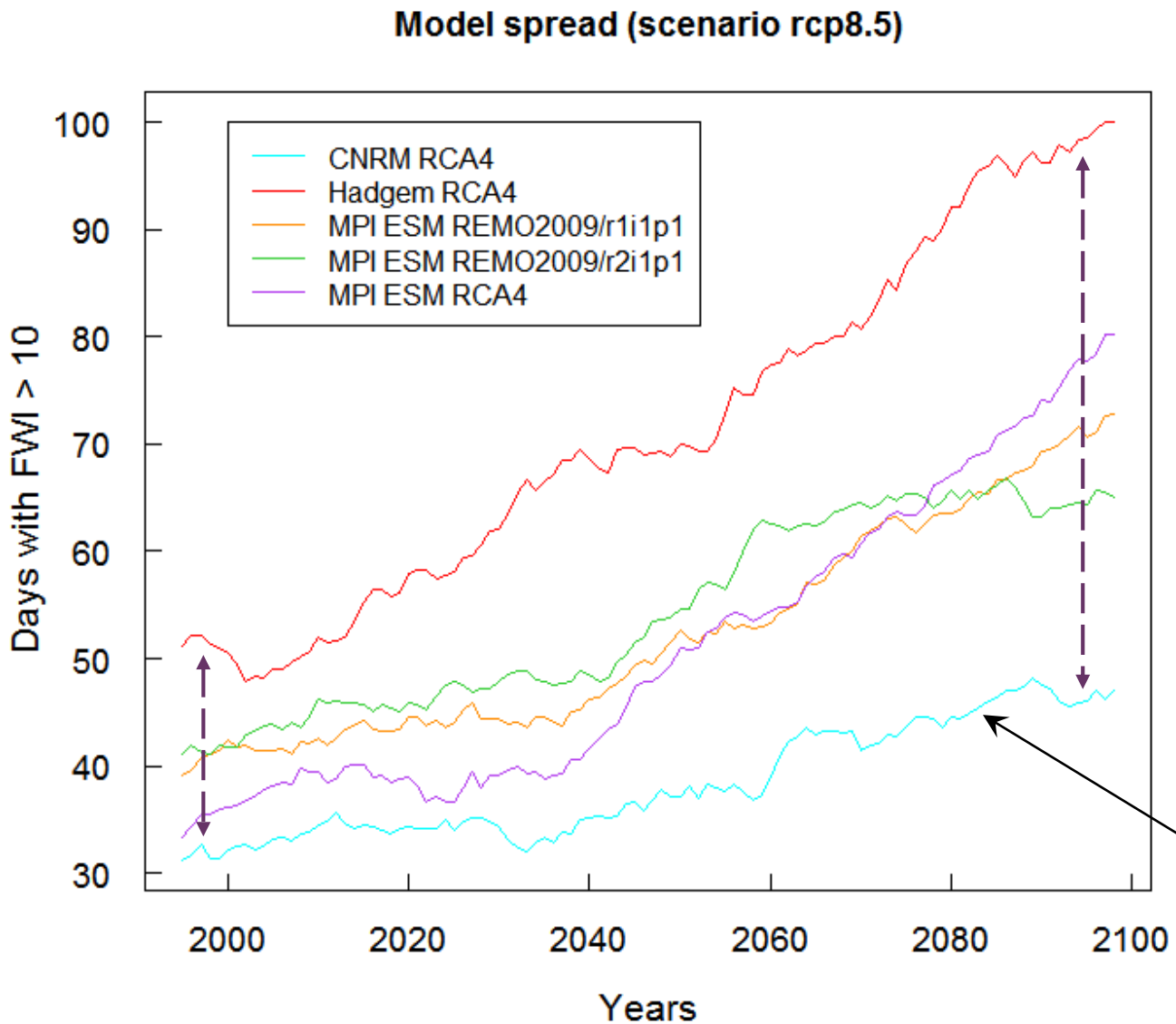




Internal variability and scenario uncertainty



Model uncertainty

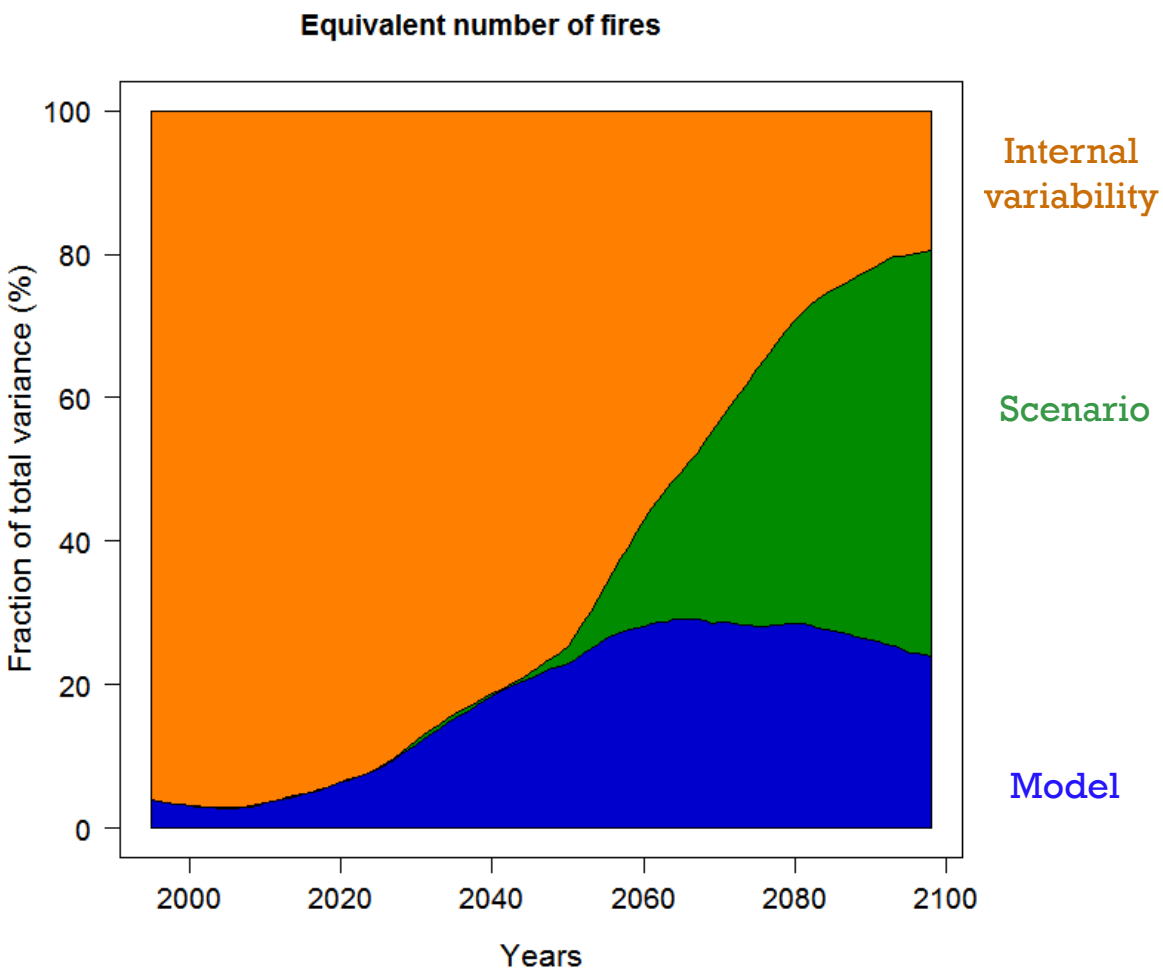


Model spread

Trend obtained through a 30-years moving average

Total variance

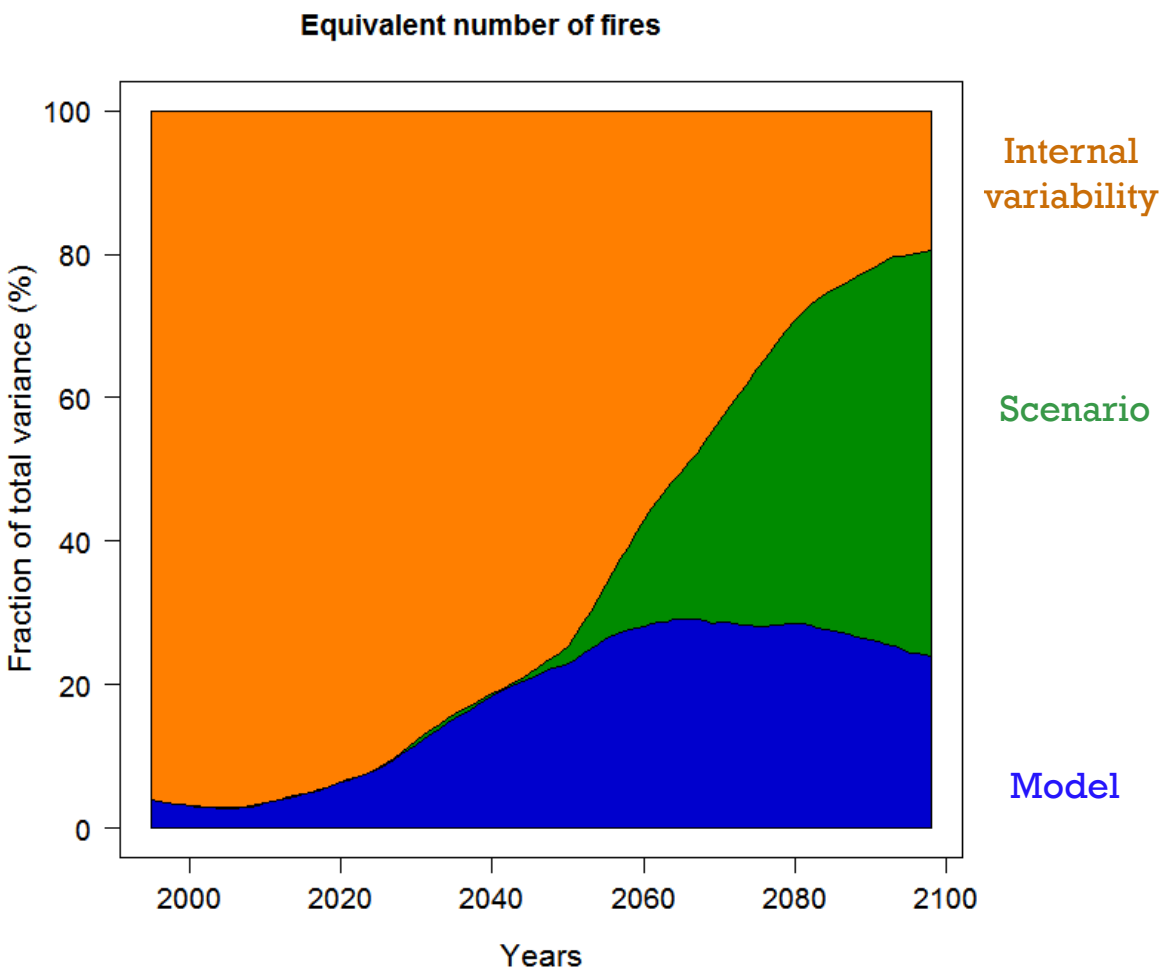
Contributions from the different uncertainty sources



Internal variability is the main source of uncertainty, and will continue to dominate the other sources of uncertainty for long…

Total variance

Contributions from the different uncertainty sources



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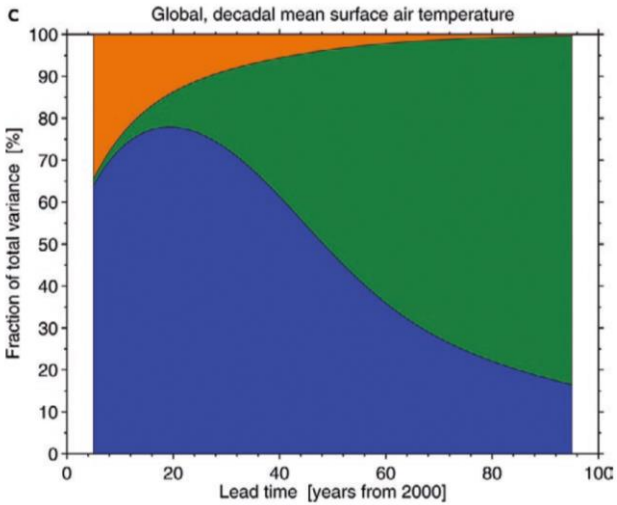
From Hawkins & Sutton (2009)



Conclusion

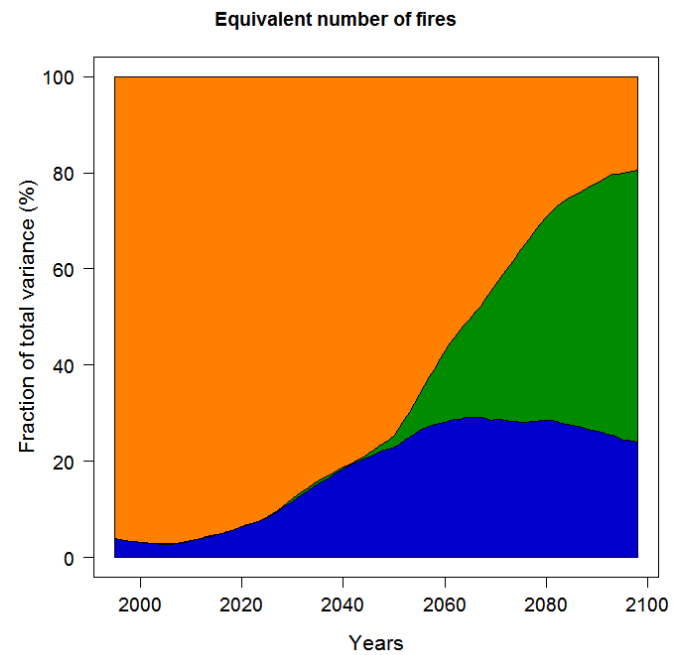
What can we do regarding all these uncertainties?

- Internal variability will dominate for long…
- … But in 2100, scenario choice explains the major part of the variance in my fire predictions

Internal variability

Scenario

Model

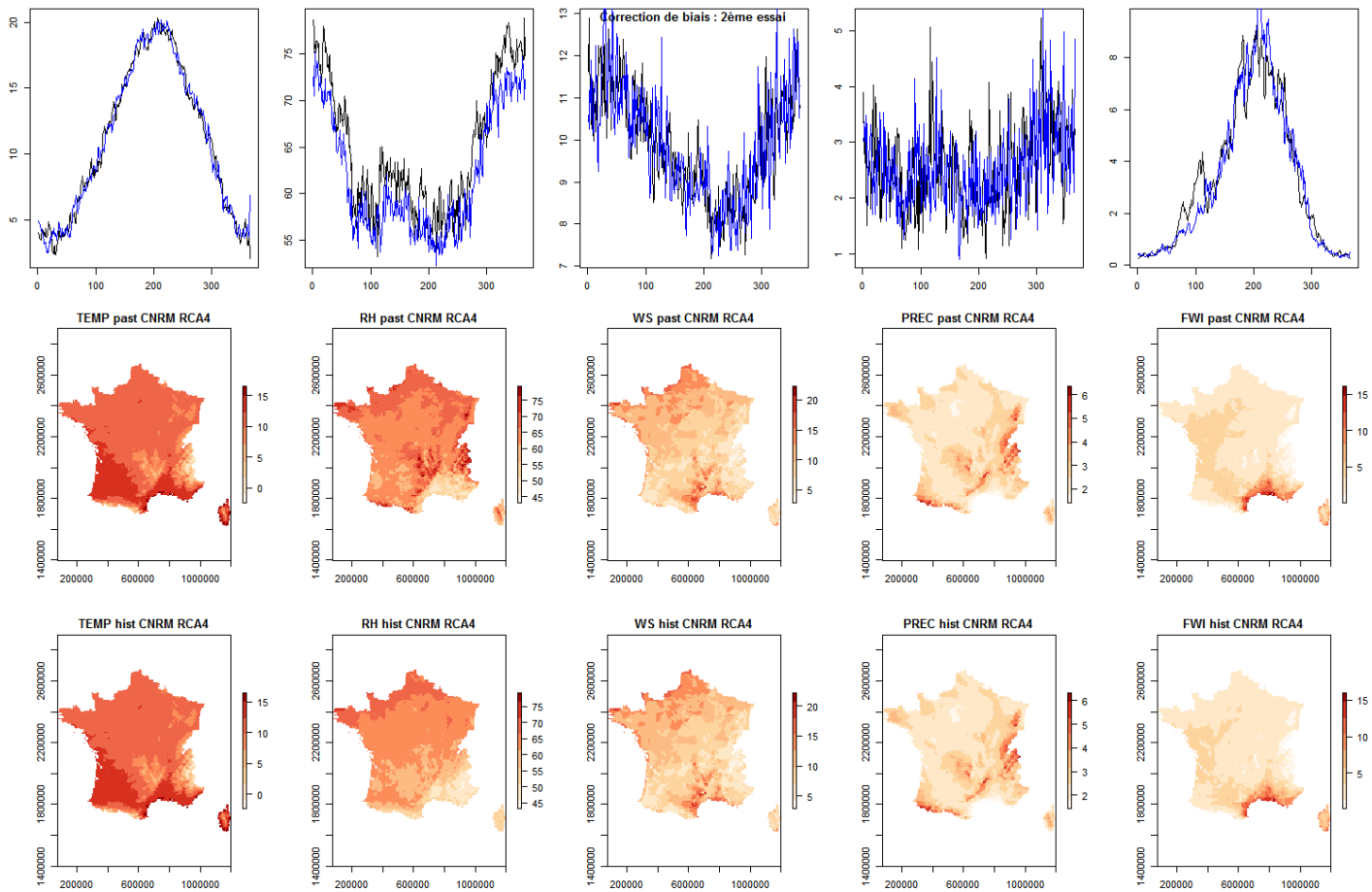


Thank you for your attention !

Source: URFM

Validation of the bias correction

Check on the different climatic variables used in the FWI



Intra annual dynamic

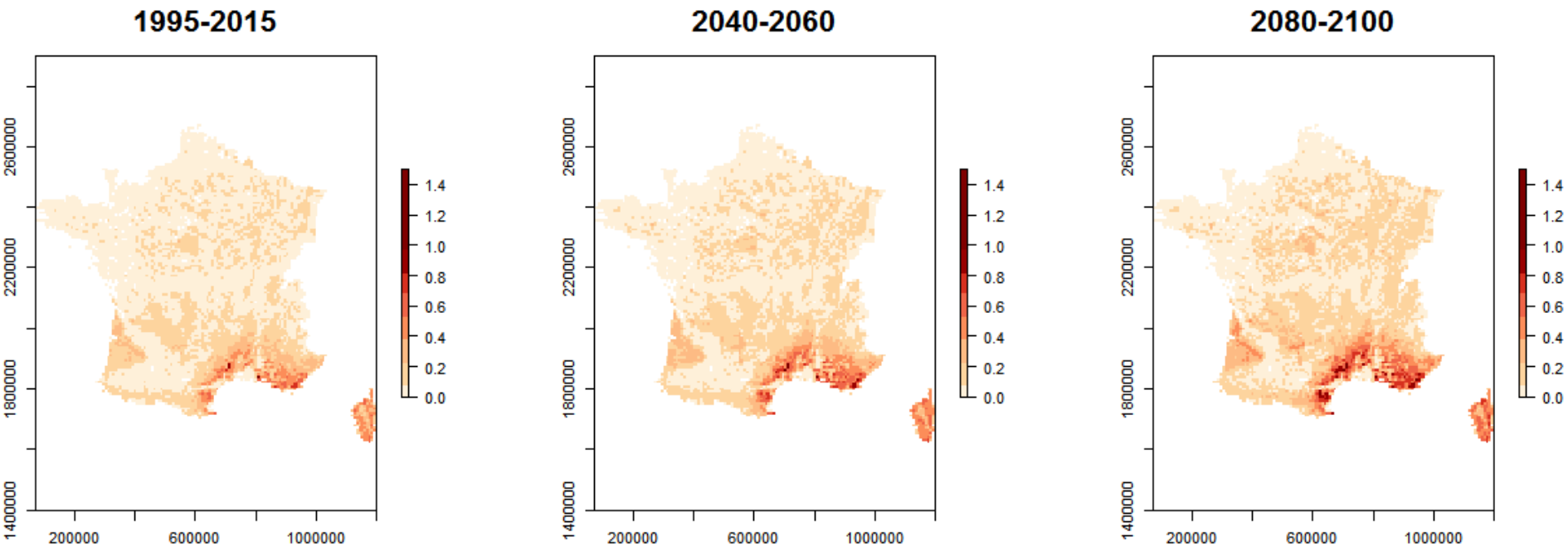
Spatial pattern

And in a spatial way ?

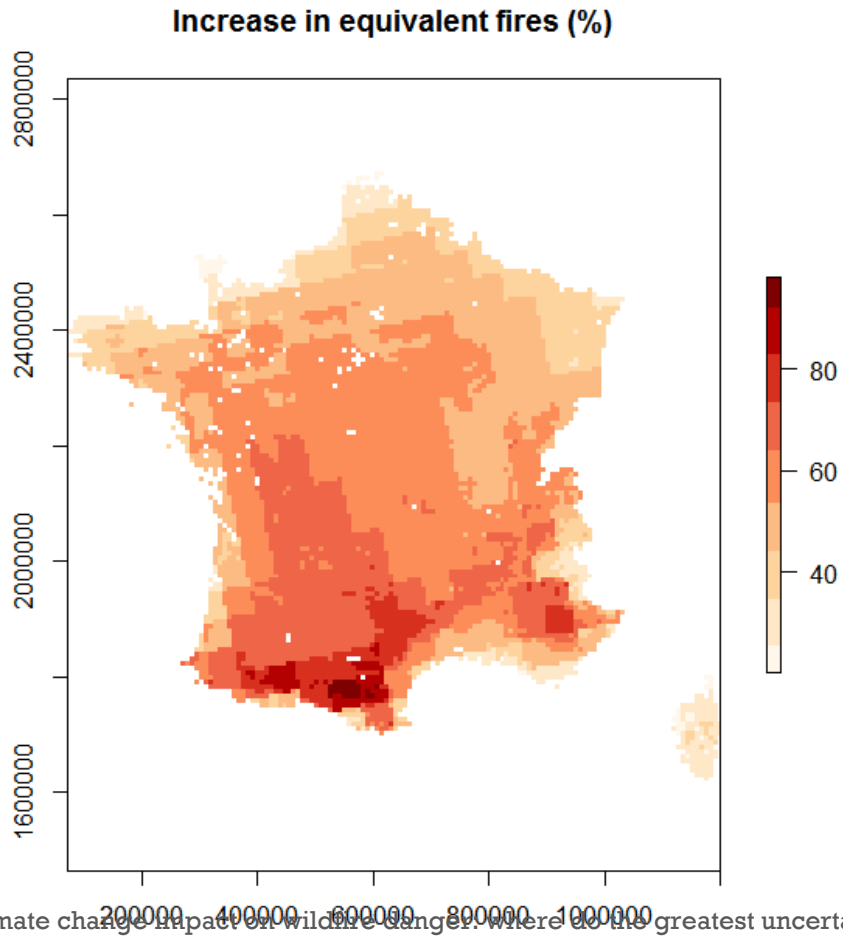
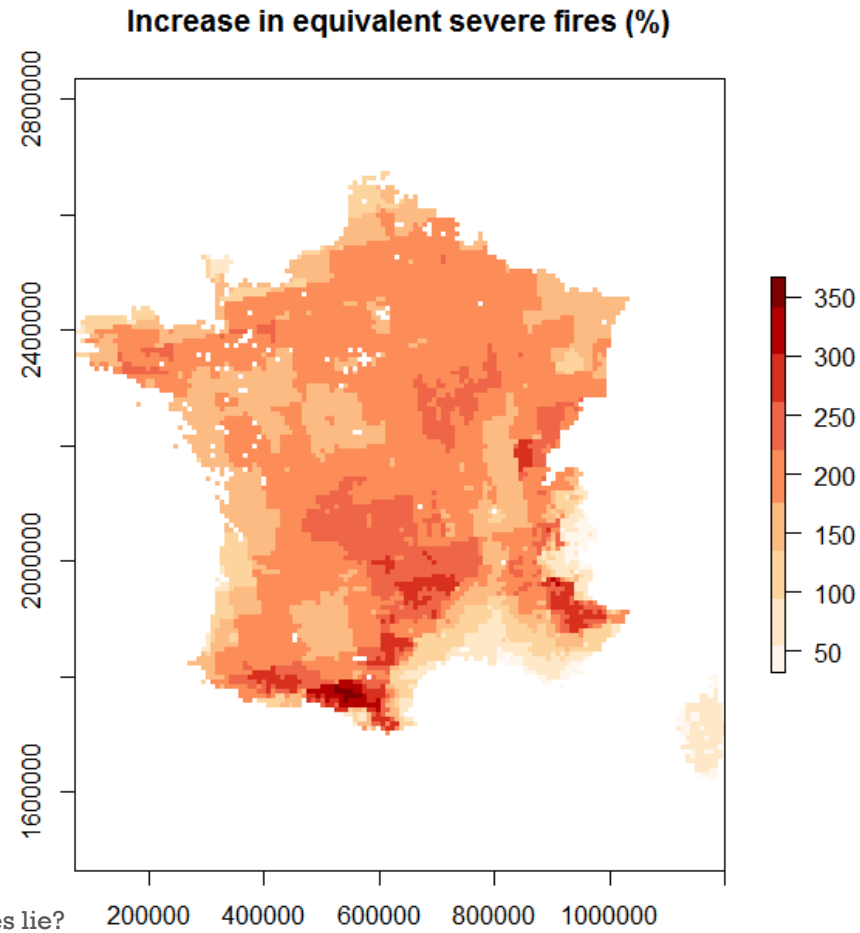
Extension of the hazard area

- Multimodel and multiscenario mean to show a general trend = more fires expected
- Especially in the Mediterranean area…

Mean number of fires (> 1 ha)



And in a spatial way ?

Non linearities in our metrics

2090 vs reference = 2000
(multimodel, multiscenario mean)