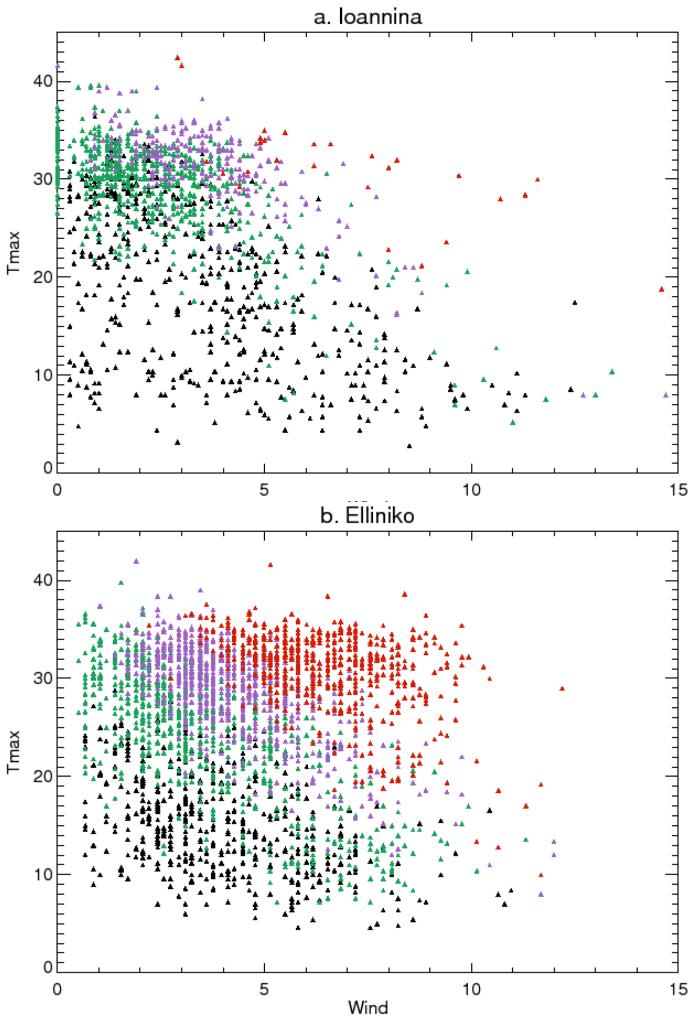
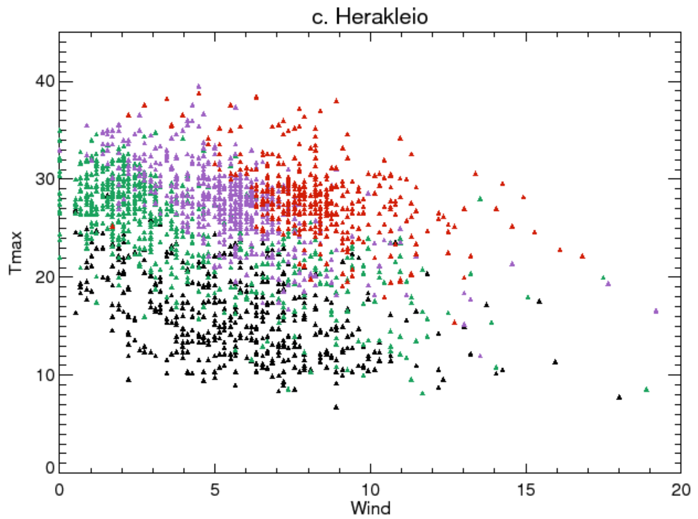
Distribution of observed FWI values



Days with r<1mm and rh<60%



FWI<15

15≤FWI<30

30≤FWI<45

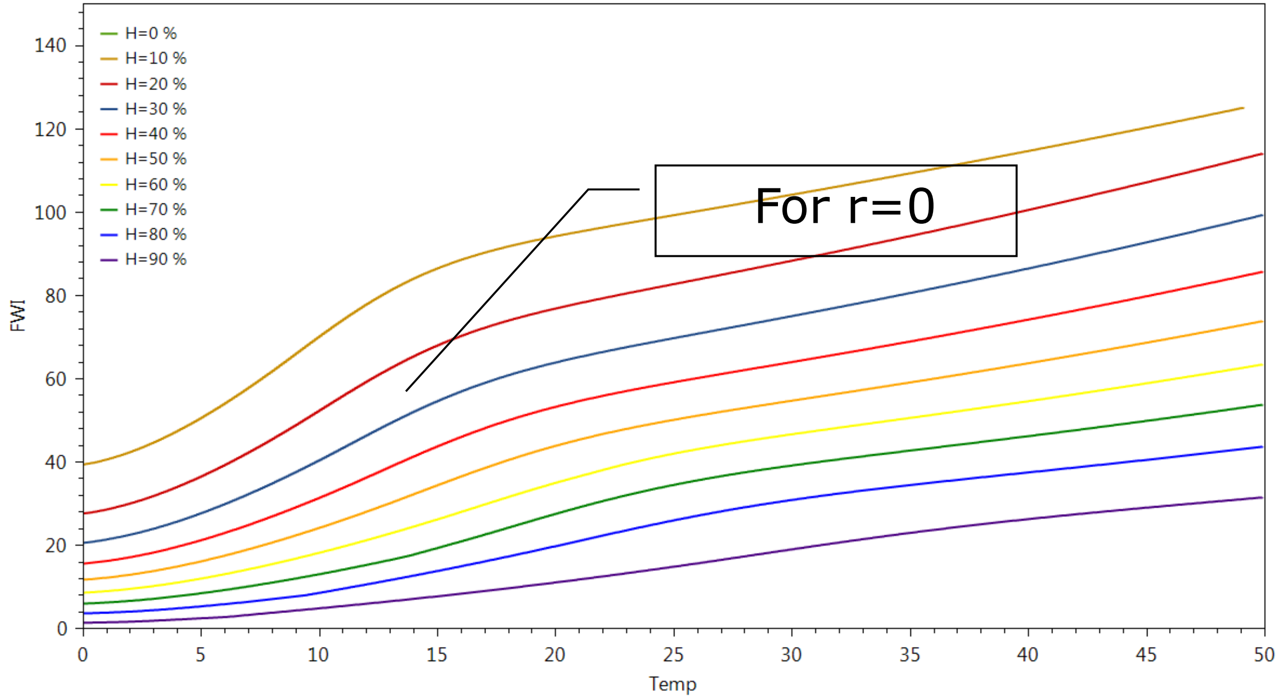
FWI≥45

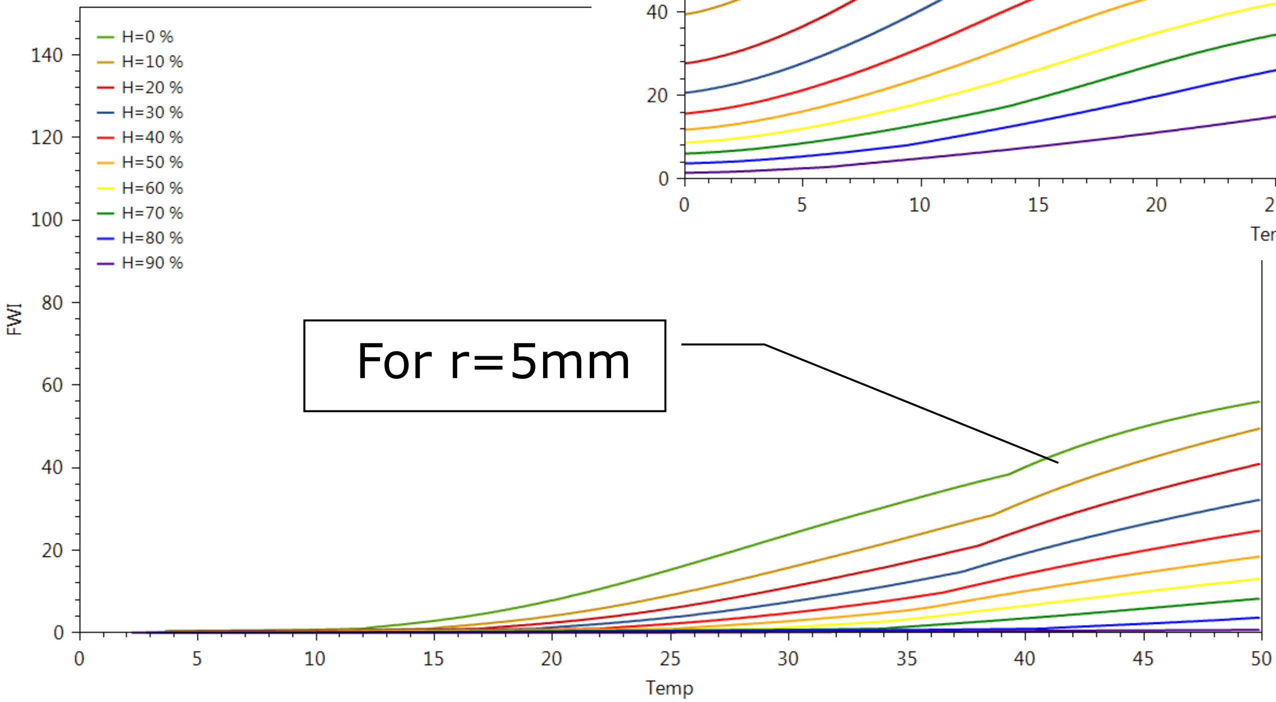
- The distribution is shifted to lower wind speed values and FWI takes substantially lower values for Ioannina (in WCG) compared to Elliniko (Athens, in ECG). In Herakleio (Crete) the wind speed receives even higher values contributing to the high index values

- Forest ecosystems to the south are more adapted and less sensitive to fire risk than the forest ecosystems further north

Sensitivity of FWI at meteo parameters

The impact of precipitation





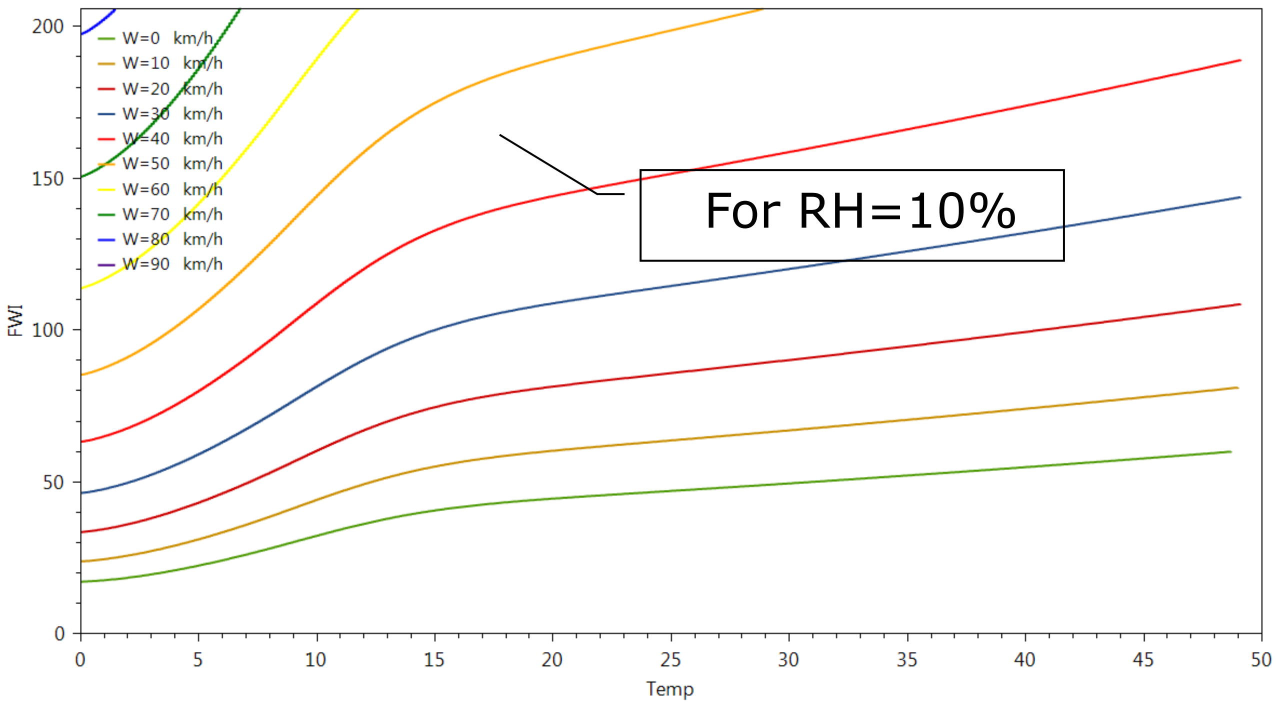
- For r = 5mm

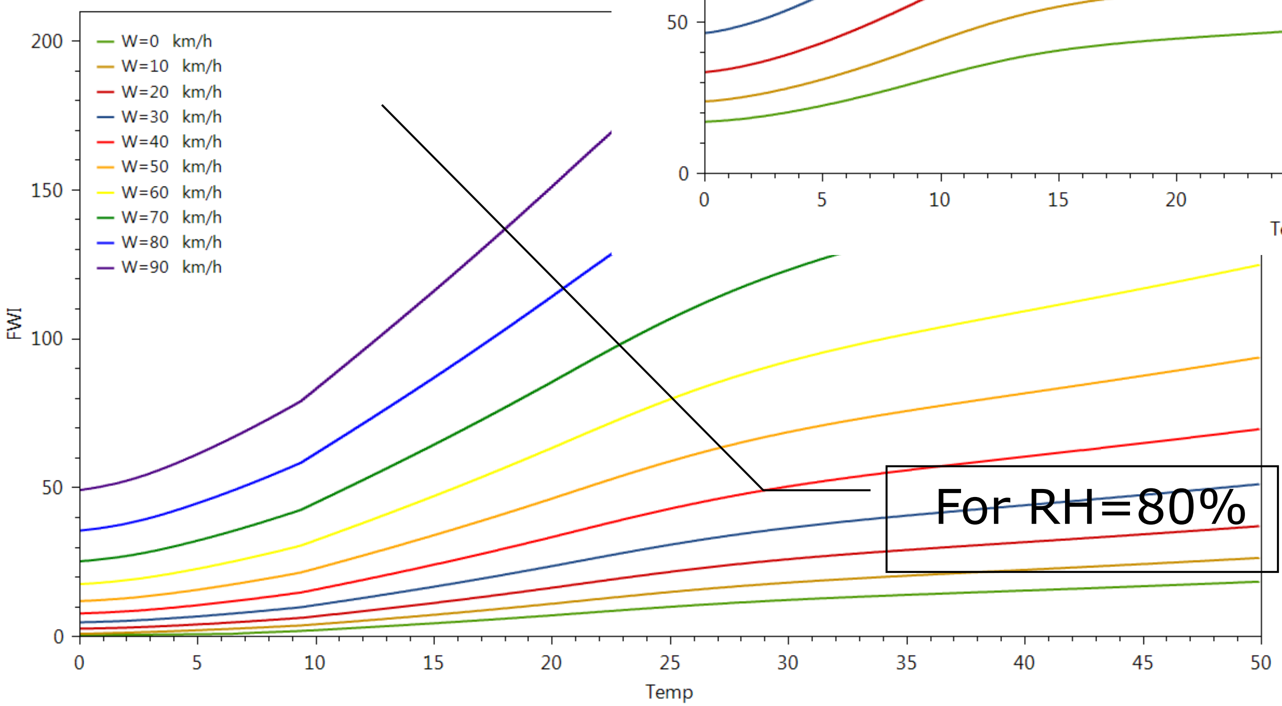
At low T, FWI ≈0

At high T, FWI ↓ 75%

Sensitivity of FWI at meteo parameters

The impact of humidity





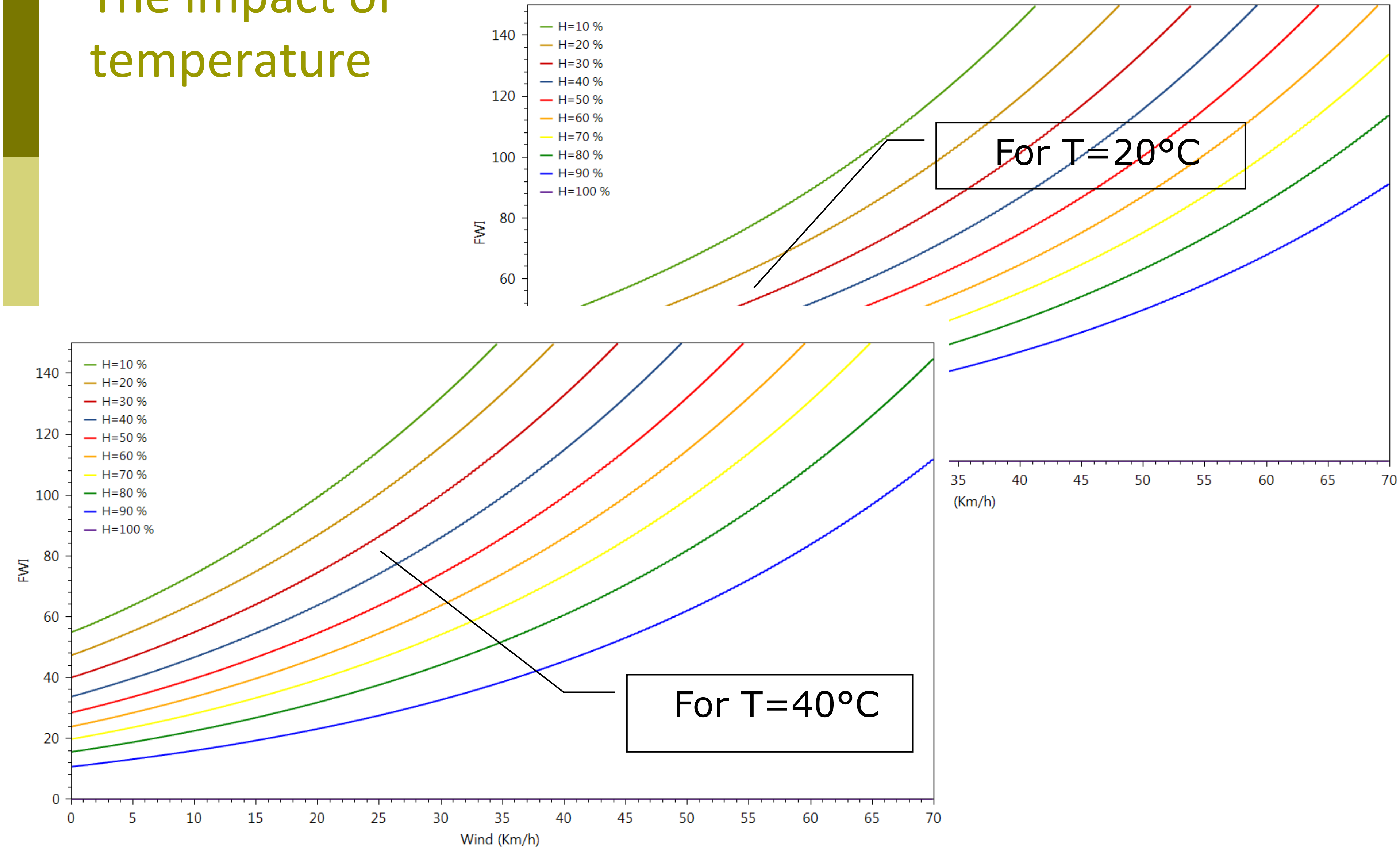
- For RH = 80%

At low T, FWI ↓ 80%

At high T, FWI ↓ 50%

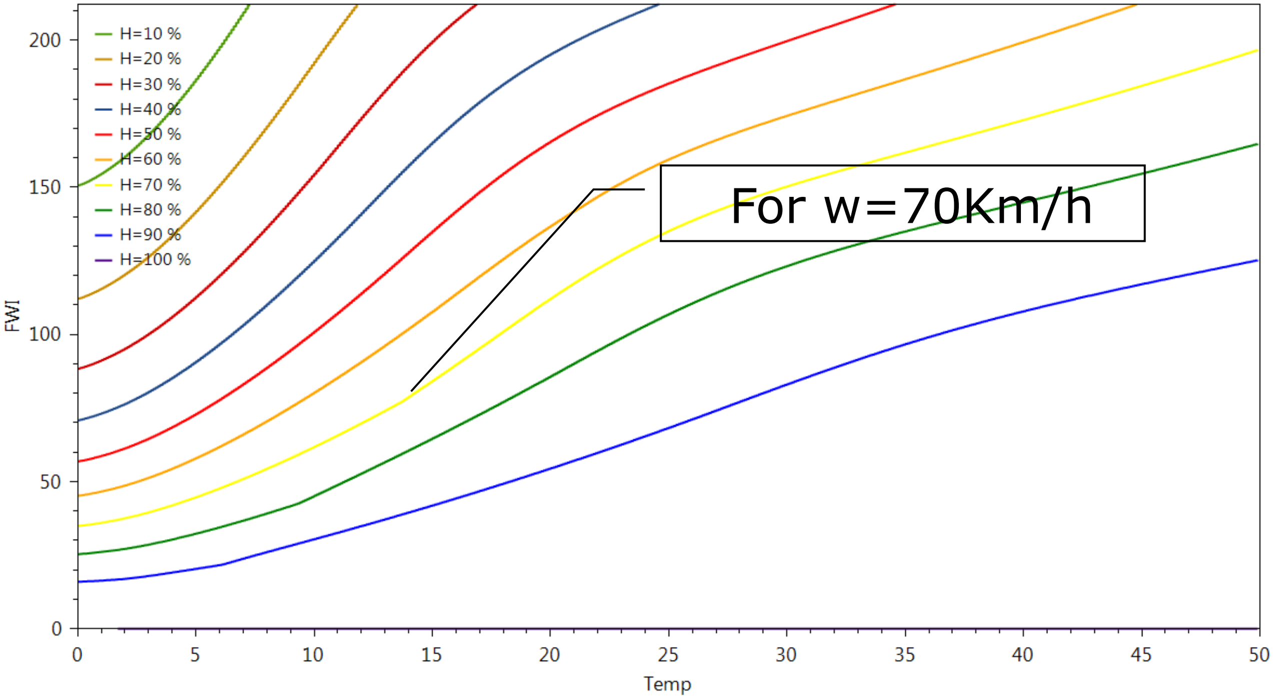
Sensitivity of FWI at meteo parameters

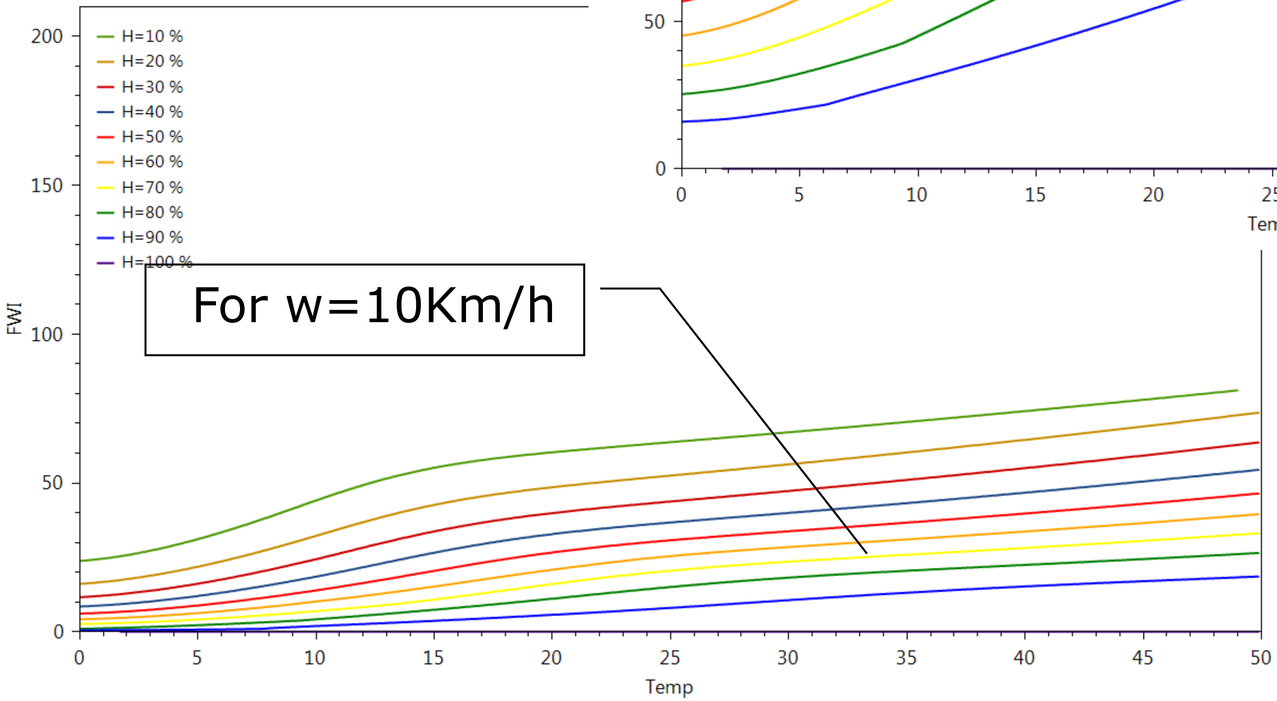
The impact of temperature



Sensitivity of FWI at meteo parameters

The impact of wind





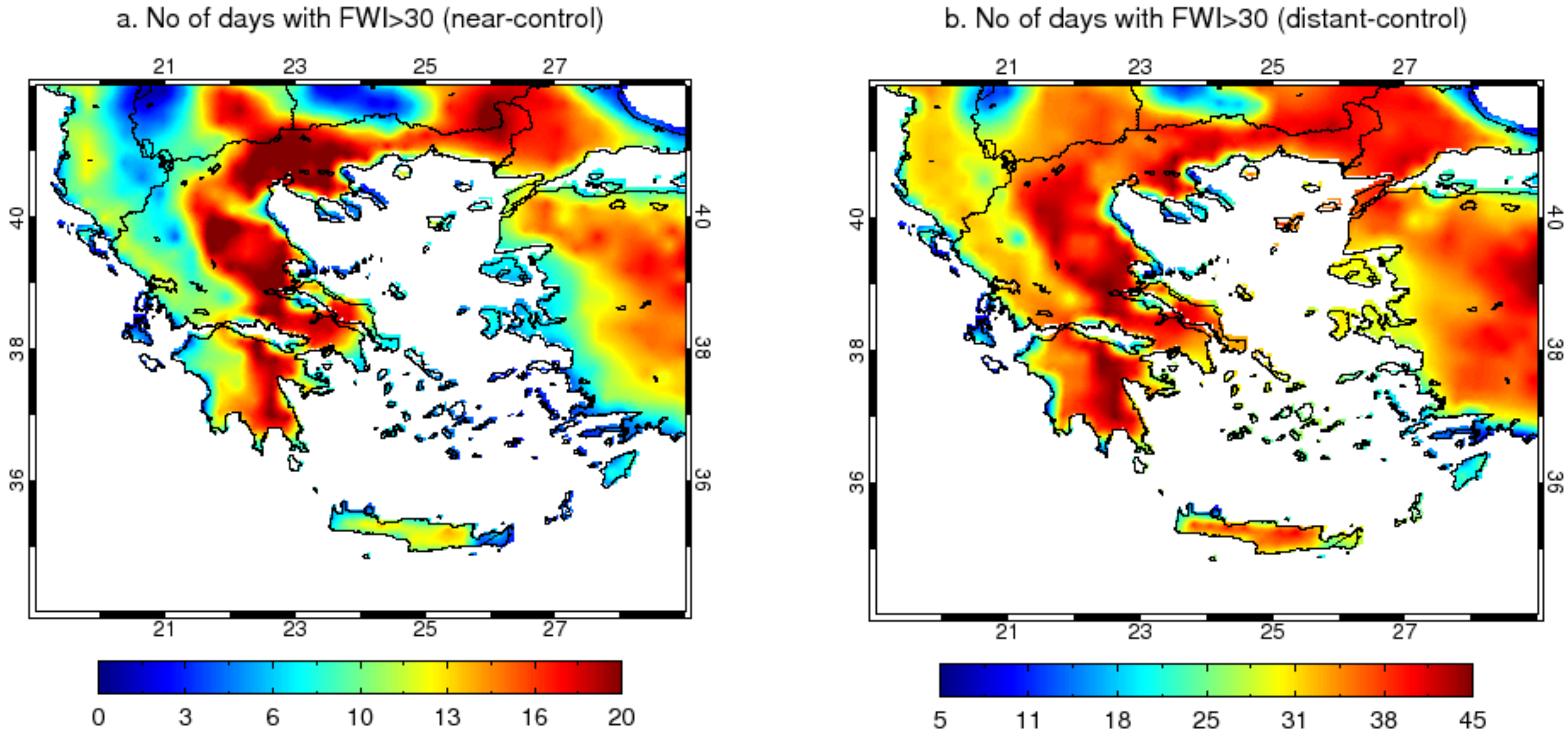
Future Projections

• Present and future model output from the **Regional Climate Model *RACMO2***. This model was developed within the framework of the EU ENSEMBLES project (www.ensembles-eu.org), by the Royal Netherlands Meteorological Institute (KNMI), at **25km horizontal resolution**

• The control run represents the base period **1961-1990** and is used as reference for comparison with future projections for the periods **2021-2050** and **2071-2100**

• The future period simulations of the model are based on the IPCC SRES **A1B scenario**, which provides a good mid-line estimate for carbon dioxide emissions and economic growth

Extreme Fire Risk Projections - ECG



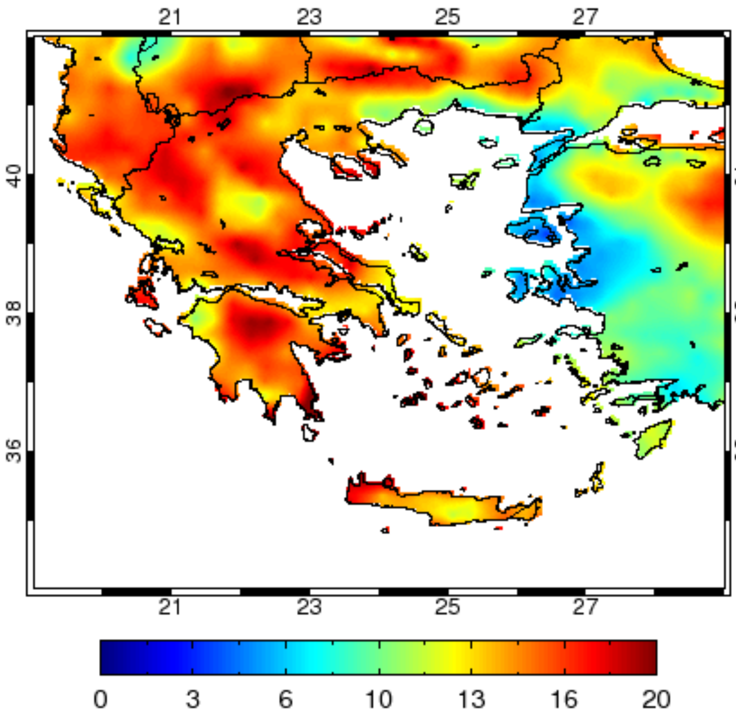
• In the near future (2021-2050) an increase of up to 20 more days of extreme fire risk (FWI>30) per year is expected

• By the end of century even greater increases are evident, reaching 45 more extreme fire risk days per year

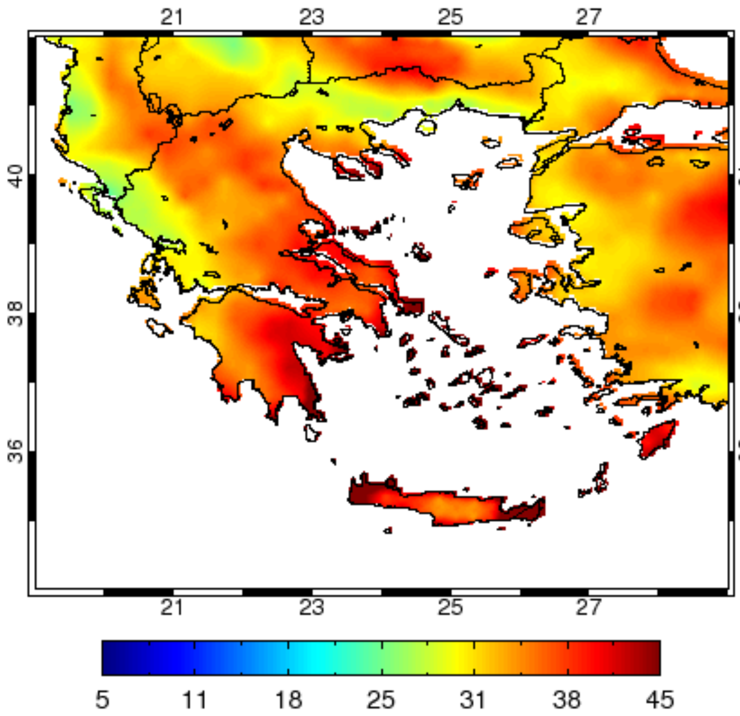
• The most notable increases are estimated in the Attica peninsula, Eastern Peloponnese, Central Macedonia and Thessaly

Extreme Fire Risk Projections - WCG

c. No of days with FWI>15 (near-control)

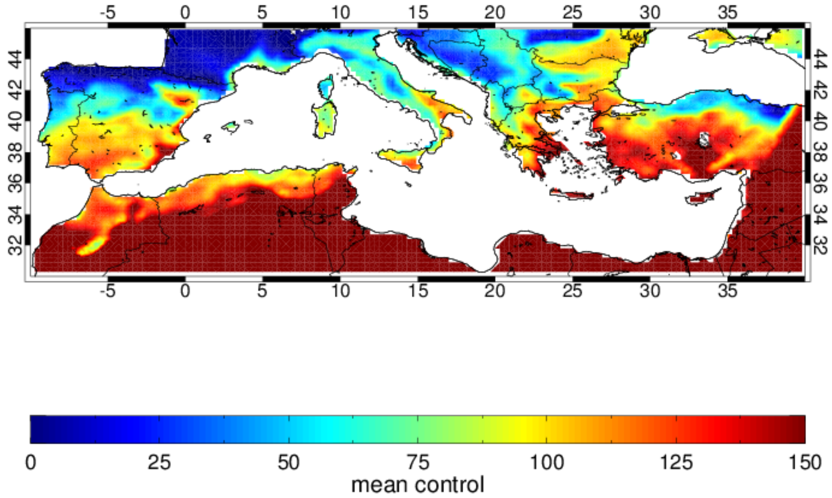


d. No of days with FWI>15 (distant-control)



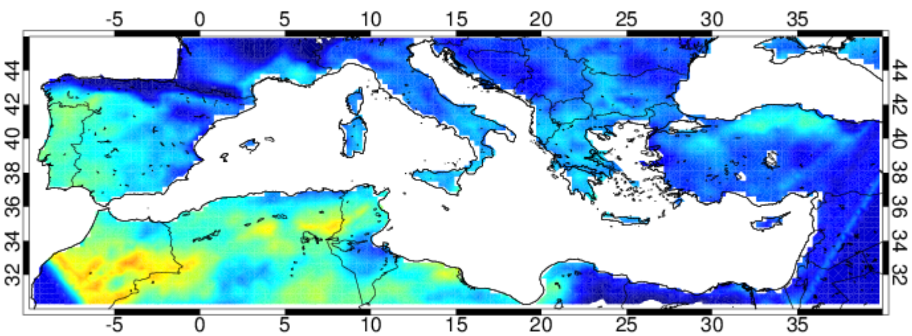
- In the near future increase reaches 20 more days with extreme fire risk per year
- The increase is higher for the distant future (2071-2100), with values ranging between 25-40 days

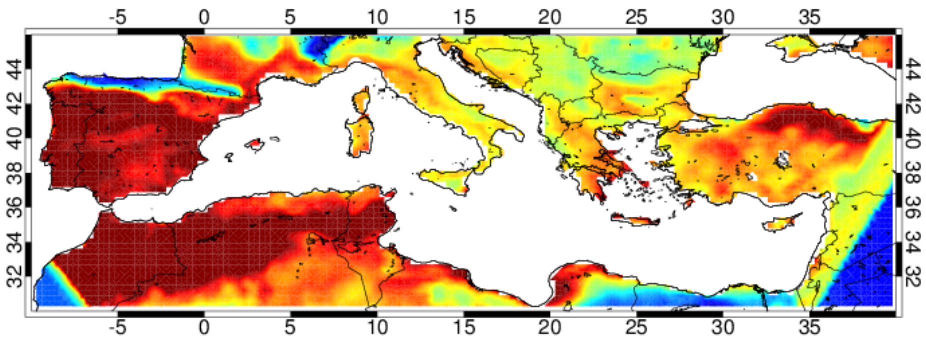
Number of days FWI>15

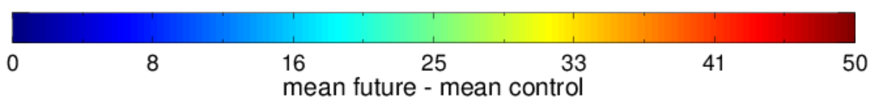


near future

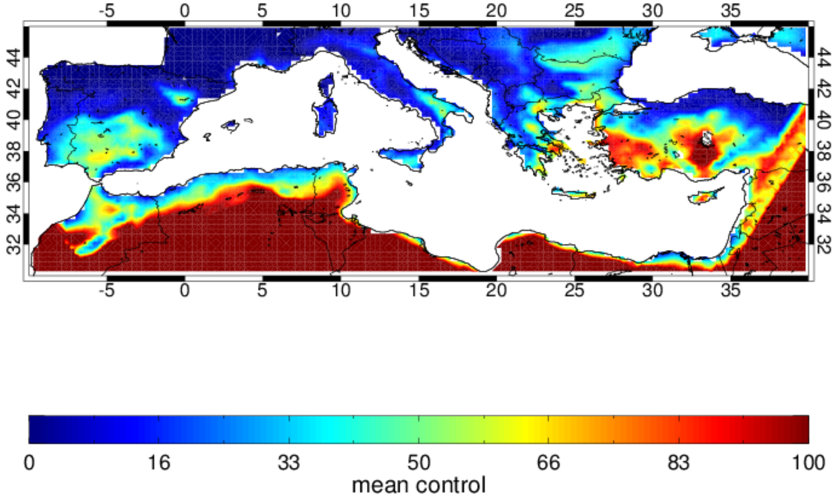
distant future





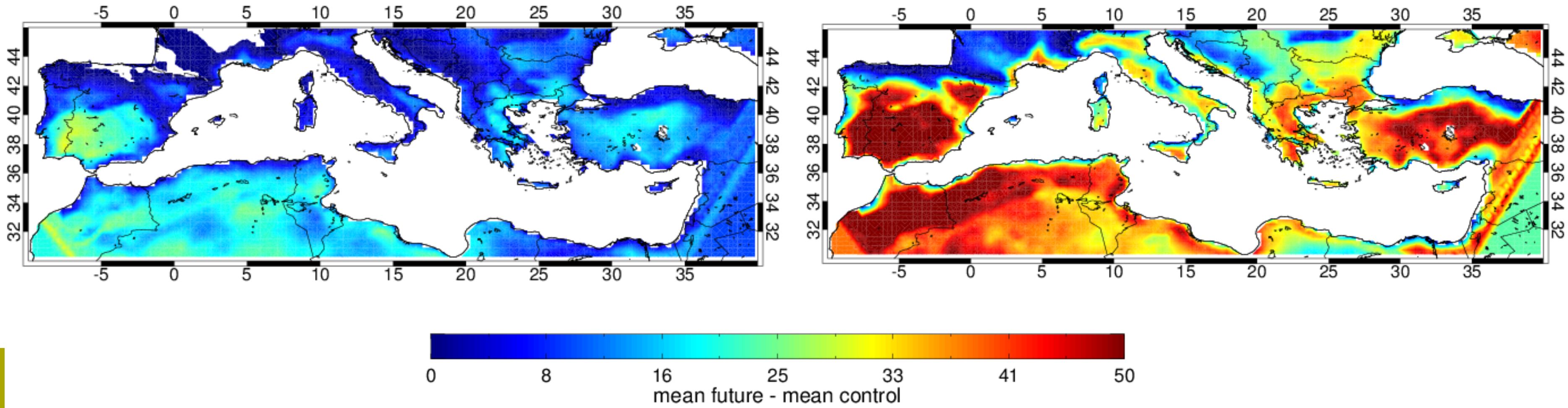


Number of days FWI>30



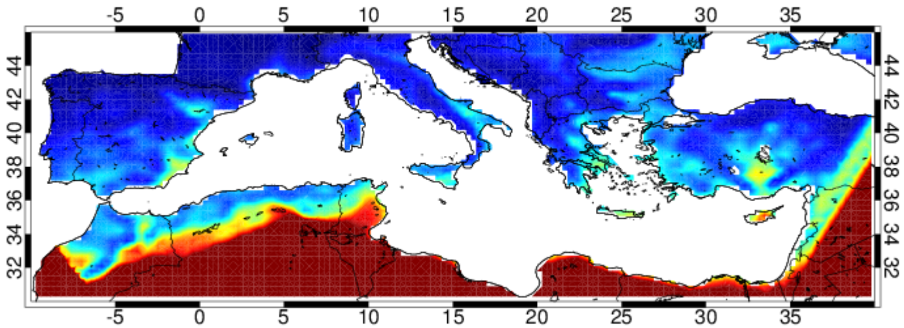
- In control period, 60-80 days per year with extreme fire risk over S. Spain, Turkey and E.Greece
- By 2071-2100, 30-50 more extreme risk days over the same areas

near future **distant future**



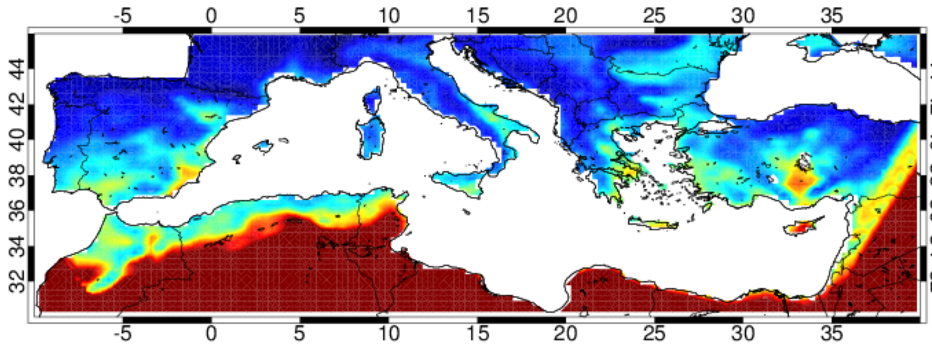
Mean May FWI

control period

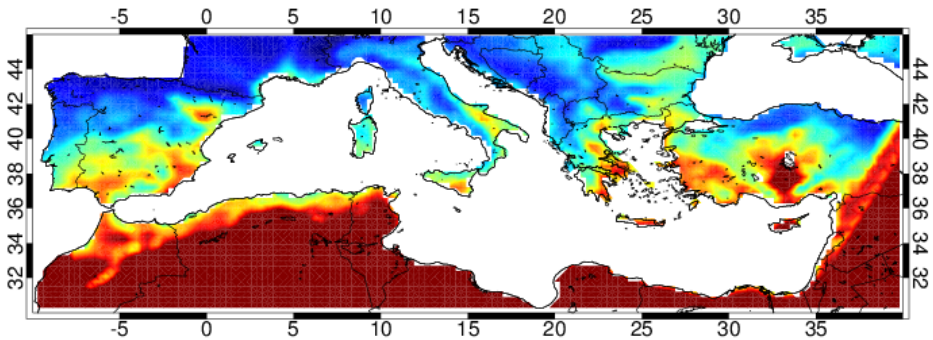


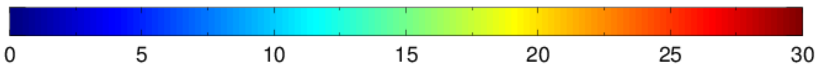
- Low mean values for the control period for the entire domain
- By 2071-2100, FWI is elevated over S. Spain, S. Italy, E. Greece and Turkey

near future



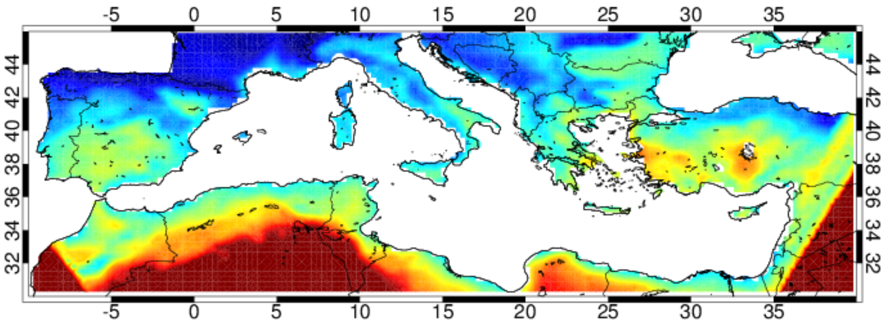
distant future





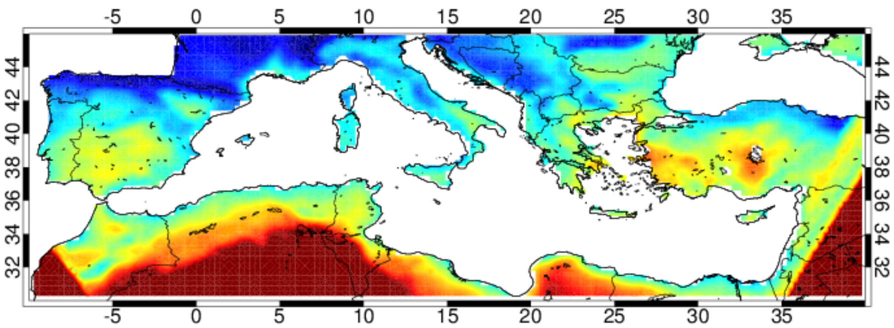
Mean August FWI

control period

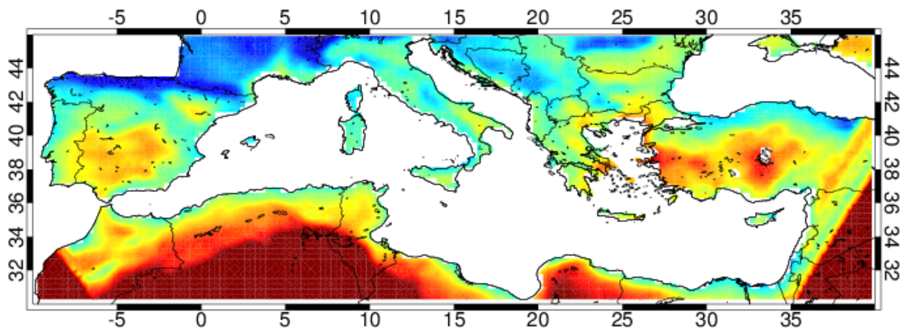


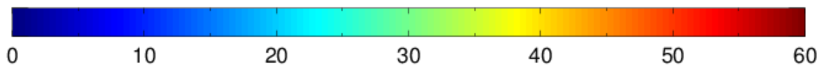
- The same pattern as before with values up to 45 in control period.
- Most vulnerable countries are S. Spain, E. Greece, S. Italy and Turkey

near future



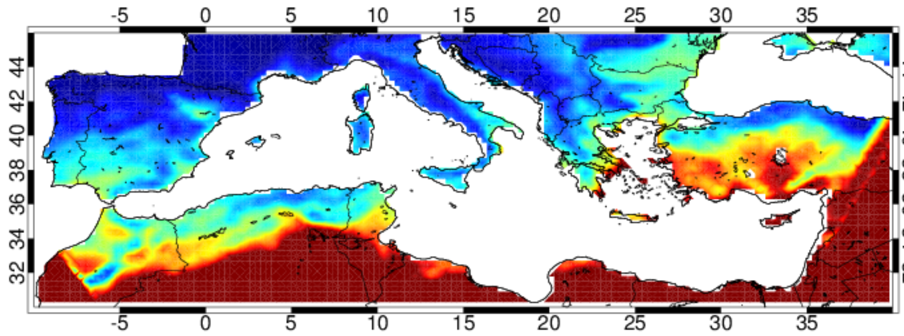
distant future





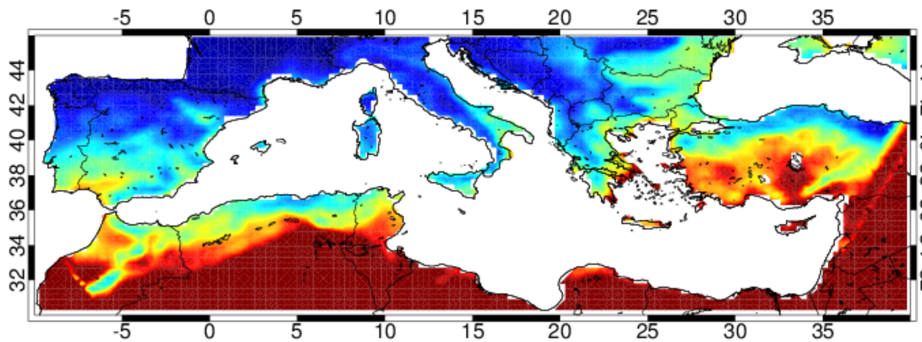
Mean October FWI

control period

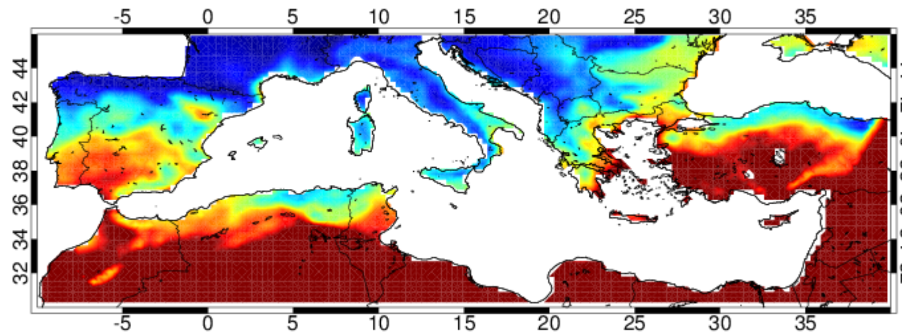


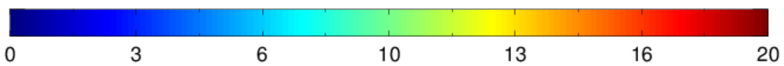
- Same pattern as before
- Greater increases in S. Spain, Greece and Turkey by 2100.

near future



distant future





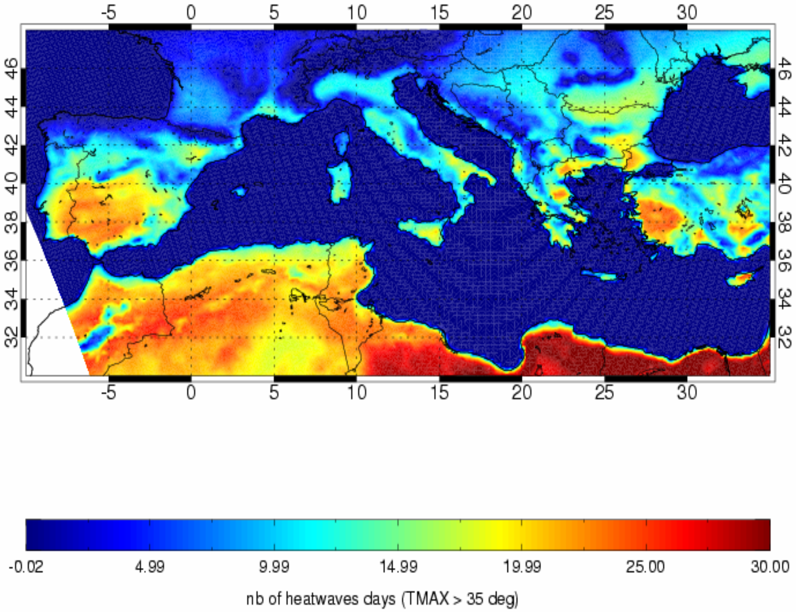
Method

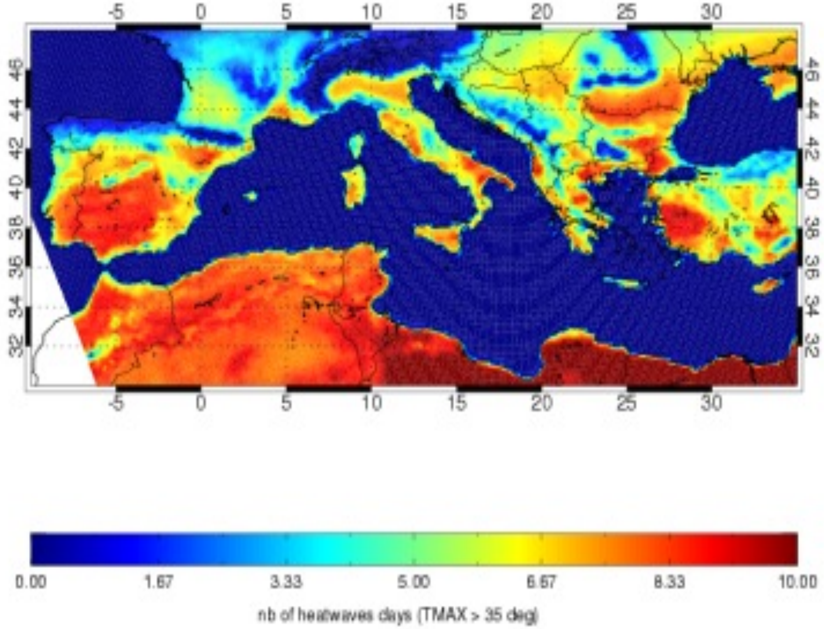
- We have used daily output data from 6 regional climate models developed at KNMI, CNRM, ETHZ, MPI, METO and METNO within the framework of ENSEMBLES

- The horizontal resolution is 25kmx25km
- The control run represents the base period 1961-1990 and has been used here as reference for comparison with future predictions

- Two 30-year future period have been employed, 2021-2050 and 2071-2100, to identify changes in climate and in fire risk likely to affect our study region.

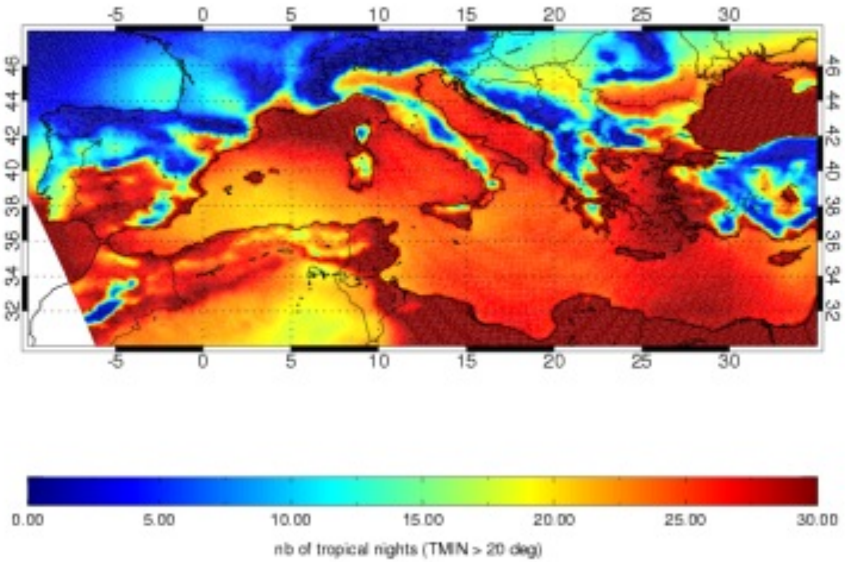
No of heatwave days ($T_{max}>35^oC$)

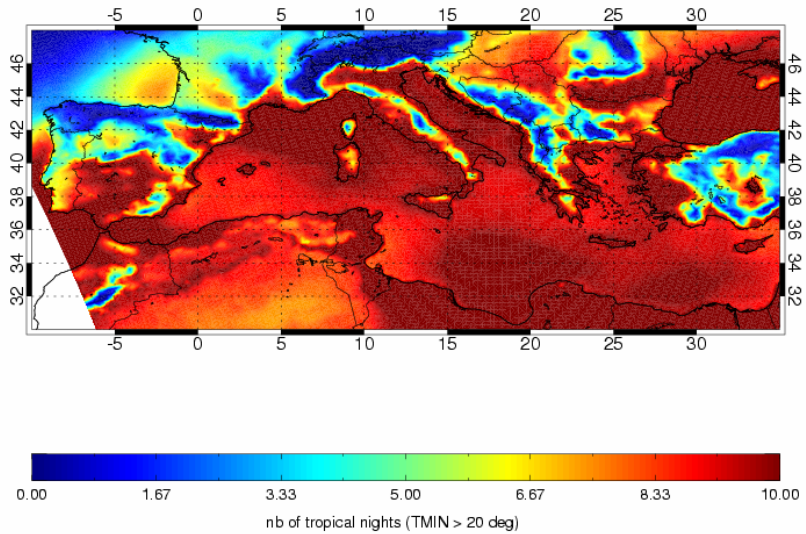




- Larger increases in continental areas
- No of days with $T_{max}>35^oC$ increases by up to 1 month by 2050(left plot)
- std (right plot) is smaller than the differences, so signal of changes robust

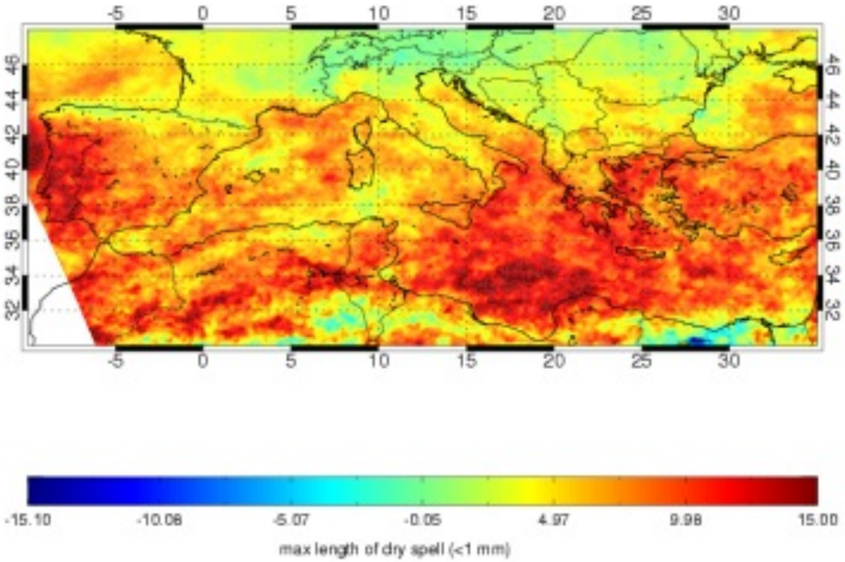
No of tropical nights (Tmin>20^{o}C)

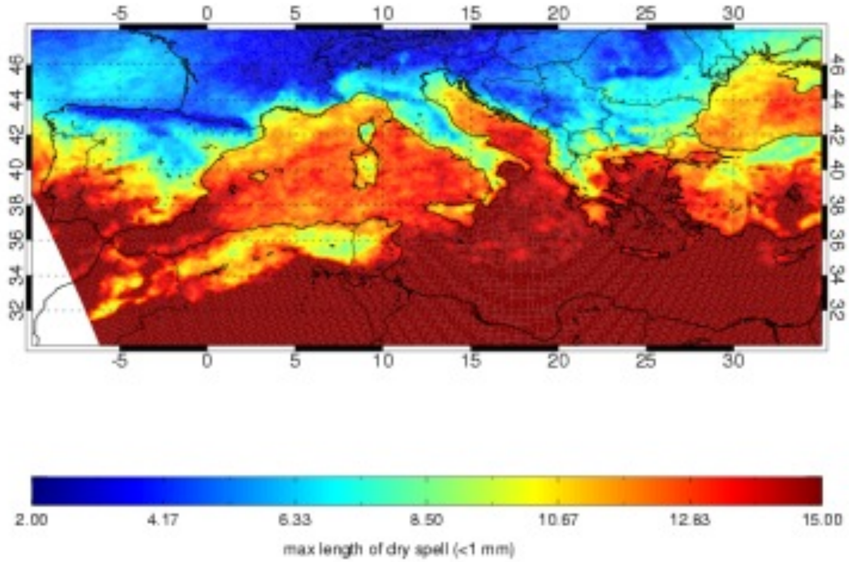




- Tropical nights increase more in costal areas
- ~1 more month with warm nights around the islands and coastal areas (left plot) by 2050
- Std of changes is smaller than the changes so RCMs signal fairly robust (right plot)

Dry spell length





- More than half month of dry spell length for areas in Spain and Greece by 2050 (left plot)
- RCMs show quite a varied picture since std is of the same magnitude of the changes

Downscaling FWI using Thin Plate Spline (TPS)

- **Thin Plate Spline (TPS) – 3Dimension Method (Hutchinson,1998)**

- The interpolation function at altitude h, latitude ϕ, and longitude θ is defined as:

$$\mathbf{F\ (\theta,\phi,h)=c_o+c_1\theta+c_2\phi+c_3h+\Sigma c_{i+4}\, d\, ln(d\ )}$$

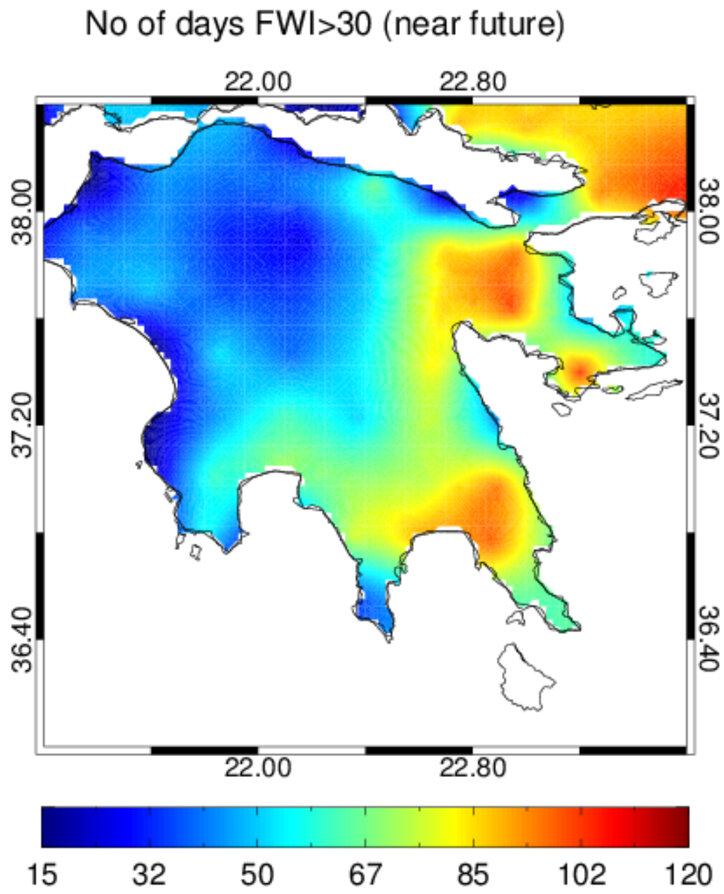
where the distance is $\mathbf{d=(\theta-\theta_i)^2+(\phi-\phi_i)^2}$ and $\mathbf{\theta_i, \phi_i}$ are the coordinates of input points.

The coefficients c_i are determined using the input points $\mathbf{(\theta_i,\phi_i,h_i)}$: $\mathbf{F(\theta_i,\phi_i,h_i)}$ **= climatic output of regional models** and conditions of orthogonality.

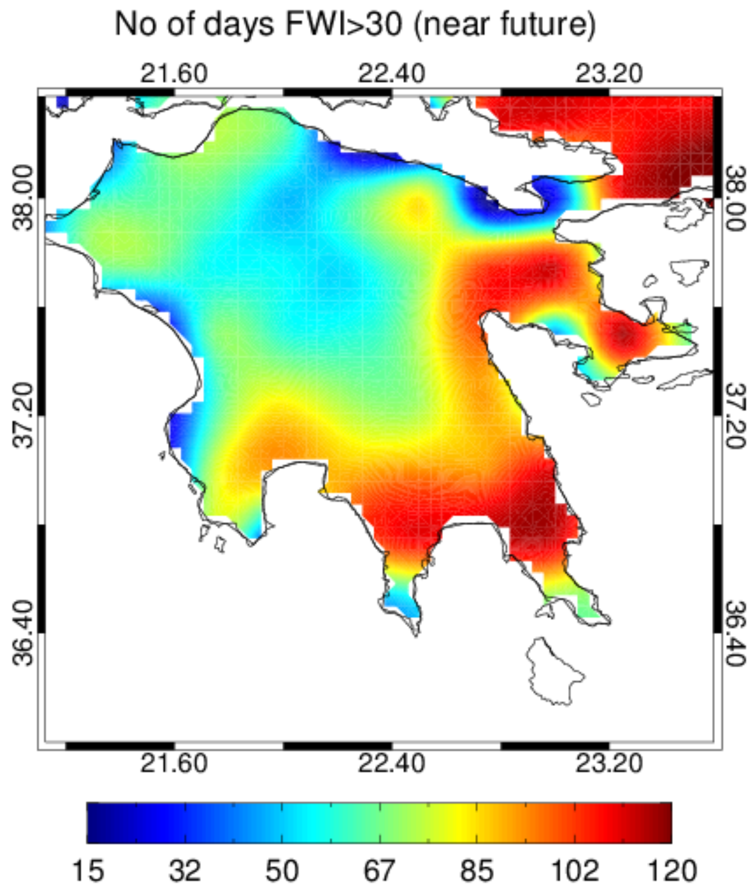
- Altitudinal data are incorporated into the interpolation procedure using a digital elevation model (DEM) with approximately 1km resolution.

- **Method's Advantages**
- Robust statistical method
- Operationally simple

Number of days with FWI>30 for 2021-2050



Before downscaling
Horizontal resolution 25x25km



After downscaling
Horizontal resolution 5x5km