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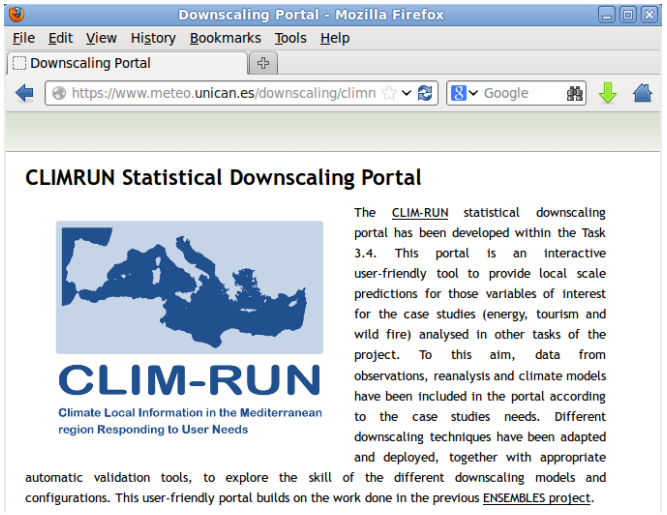
# Statistical downscaling of non-standard parameters

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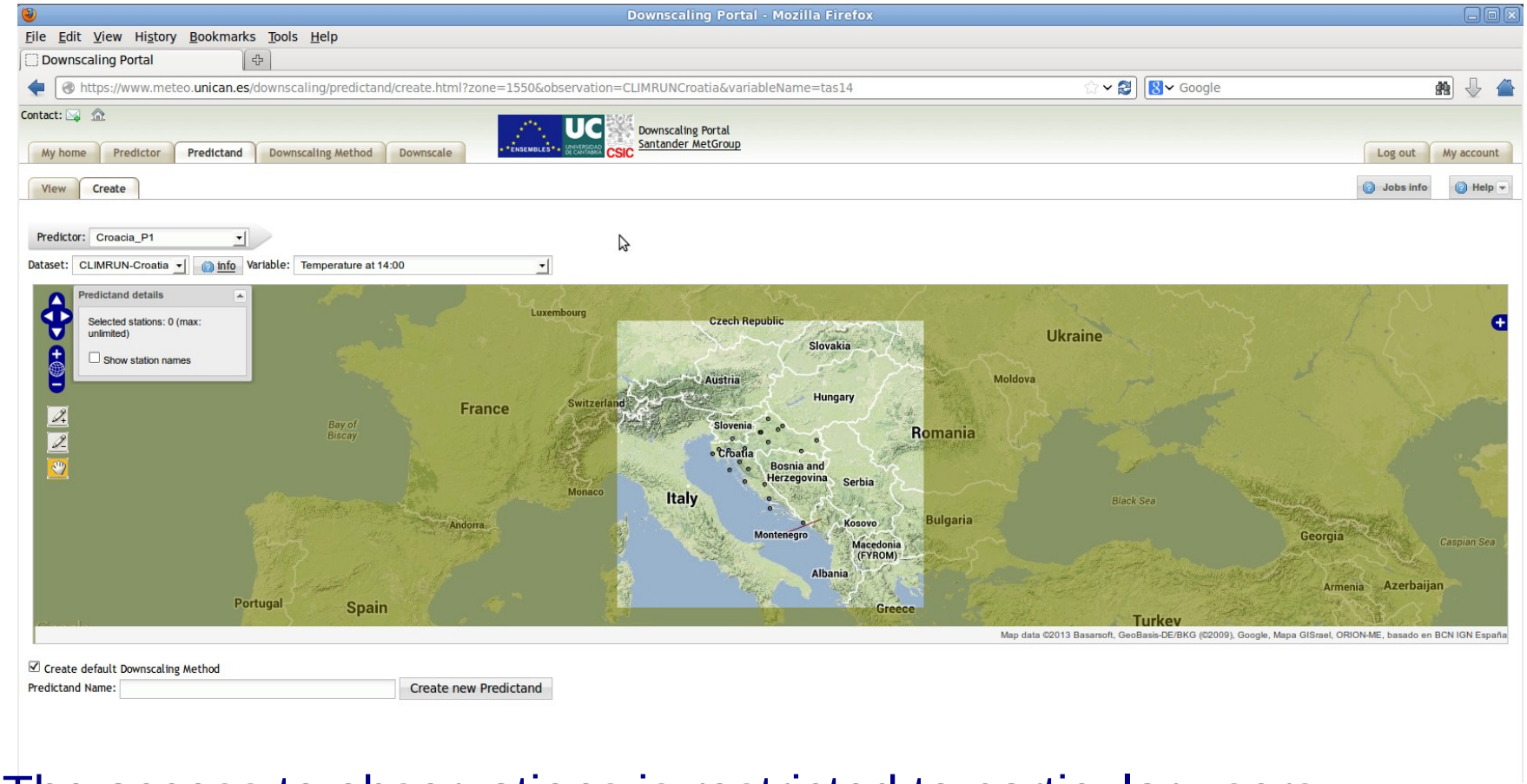
# Objectives

- Assess the **suitability of performing statistical downscaling directly to weather derived indices** of interest for CLIM-RUN stakeholders (direct downscaling).
- Comparison to those values resulting of applying statistical downscaling through the meteorological drivers (component downscaling).
- Assess the **best practical application** of the statistical downscaling approach for those indices.

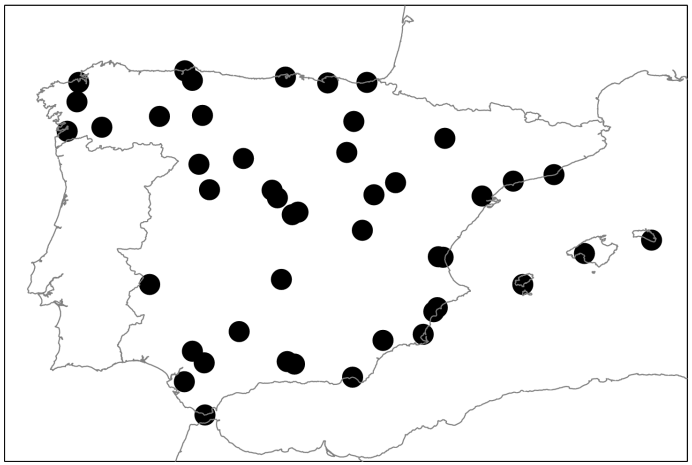
- The **ENSEMBLES statistical downscaling** portal has been adapted to user's needs. http://www.meteo.unican.es/downscaling/climrun



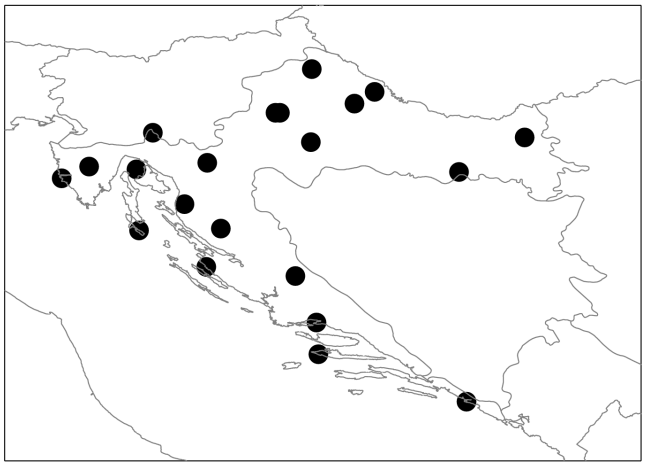

- The access to observations is restricted to particular users.

- Two case studies:

1. Fire Weather Index (**FWI**) over Spain (wild fires), particular interest in summer.
2. Physiological Equivalent Temperature (**PET**) over Croatia (tourism).



45 stations (1979-2003)



21 stations (1981-2010)

**FWI:**

- temperature, relative humidity and wind velocity at noon and total precipitation of the previous day.
- Formulation described in van Wagner and Pickett (1985) was considered to compute the FWI.

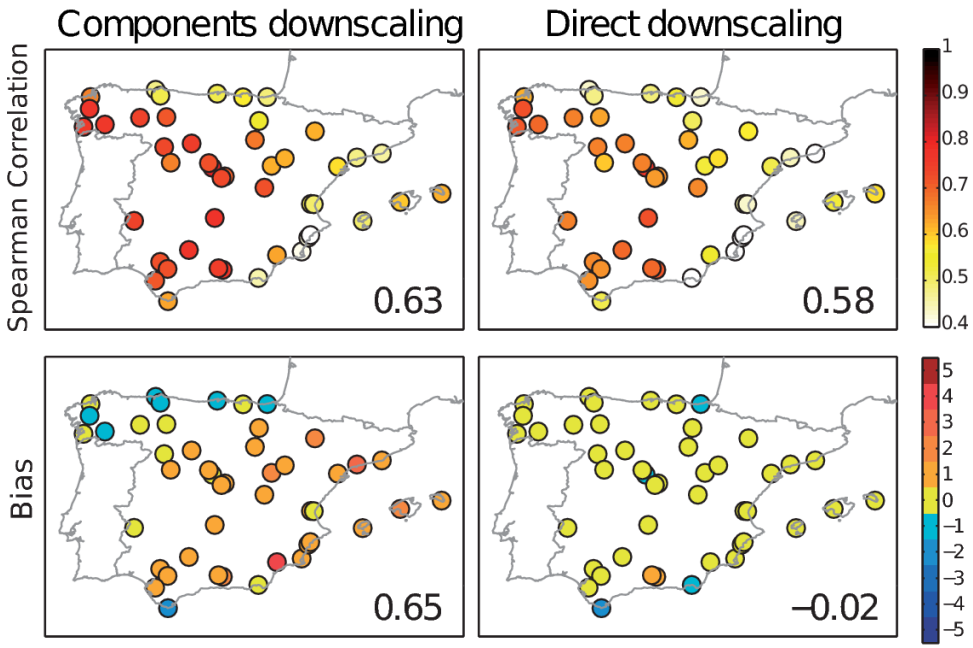
**PET:**

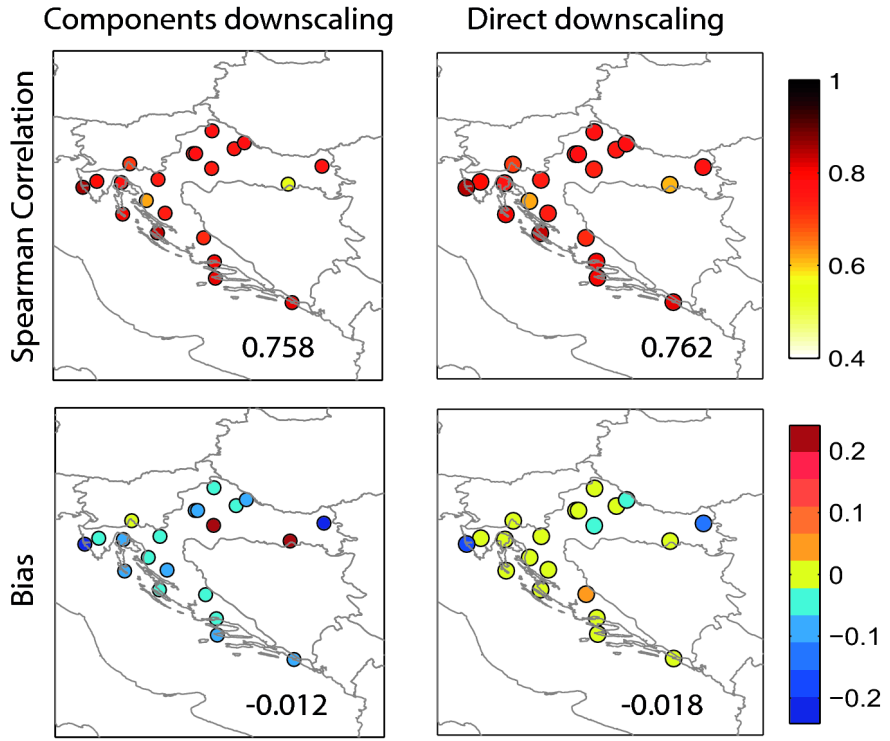
- temperature, relative humidity, wind velocity and cloudiness at 2pm.
- RayMan software developed by Matzarakis et al (2007, 2010).

FUME

# *Results in perfect model conditions*

- **Analog based downscaling** approach using T2m, T, R and U and V for 850 mb from ERA-Interim as predictors.
- The analog method provides **physical and spatially coherent series** for all the meteorological variables driving the FWI and PET.
- Different sets of predictors and domains were tested (see Bedia et al (2013) and D3.5).

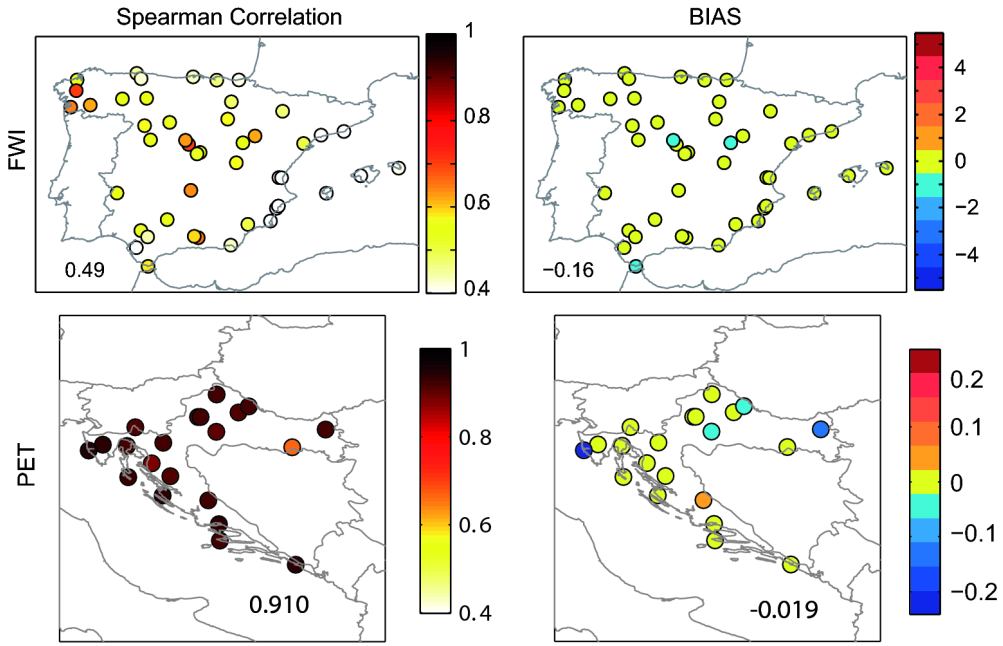



- **Similar downscaling skill** is found from both approaches in terms of correlation and bias, except for the FWI which lower bias is found for the direct downscaling.

# *Results in perfect model conditions*

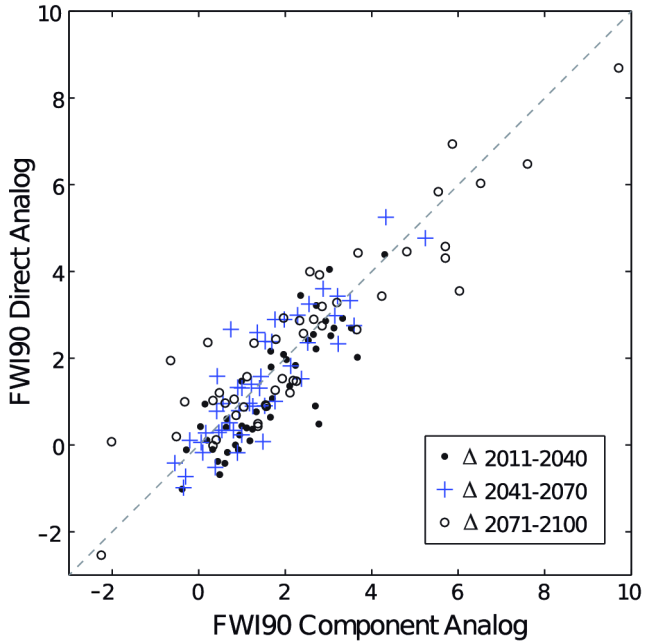
- It is reasonable to apply other statistical downscaling method directly to the indices.
- A **linear regression based model** is applied to the PET and the JJAS FWI, both normally distributed.

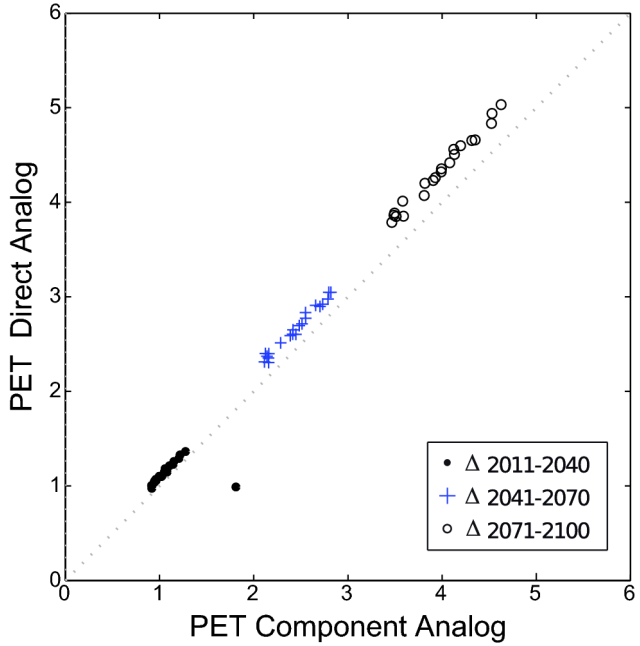



- The **skill of this method is higher** than the analog approach for both indices.
- Note that the FWI correlation values decreases for JJAS (0.31) respect to the results for the whole year (0.63).

# *Results from climate projections*

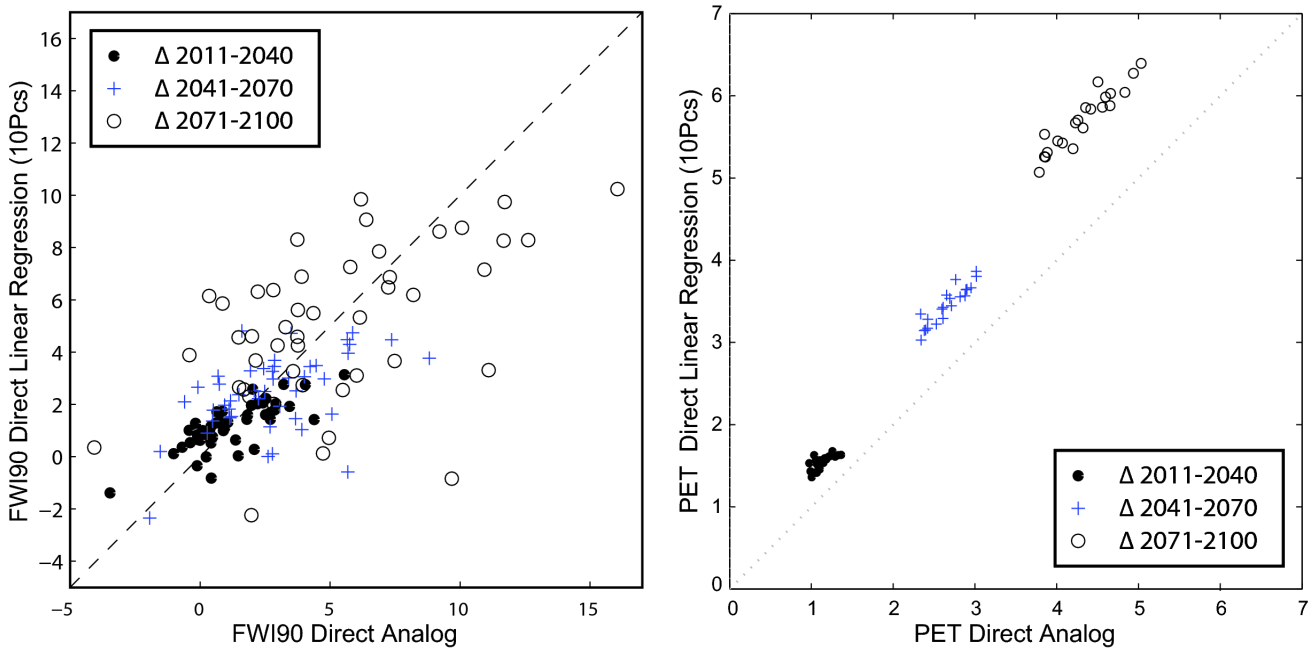
- Future projections from the **ECHAM5** model (run 3) are compare to the 20C3M control scenario using the delta method.
- 2011-2040, 2041-2070 and 2071-2100.




- Values from the component and direct downscaling approaches are **comparable**.
- Both methods register higher values in the last period, especially for the PET.
- Higher spatial variability for the last period. This indicates lack of robustness of the analog method in this period also detected by Gutierrez et al 2013.

# *Results from climate projections*




- Deltas from the direct analog and regresion based downscaling models are similar for the near future.
- Higher differences are observed for the last period (2071-2100).

# Conclusions

- Added-value of the statistical downscaling.
- Results reveal the suitability of performing statistical downscaling directly to two weather-derived indices (FWI and PET).
- It is possible to apply the direct downscaling for those impact studies where the intermediate climate information is not relevant.
- Same study could be extended to other indices of interest defined in other sectors.

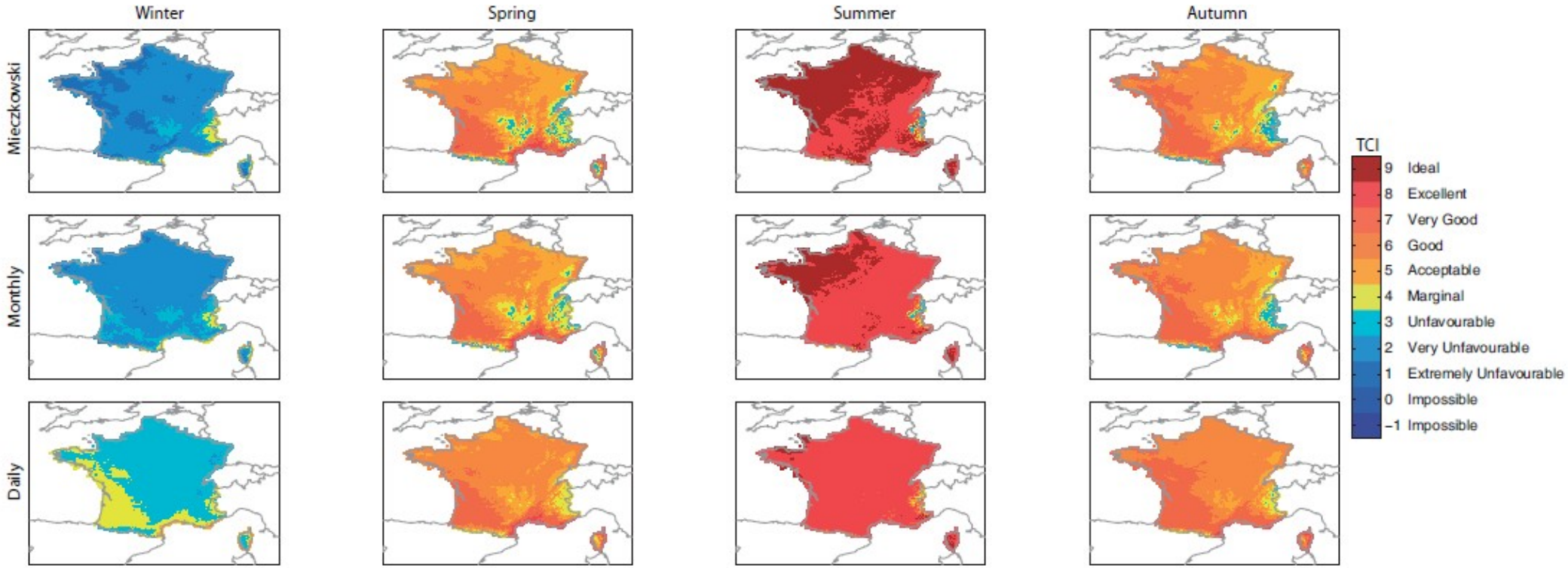

- Bedia et al 2013. *Robust projections of fire weather index in the Mediterranean using statistical downscaling*. Climatic Change DOI 10.1007/s10584–013–0787–3, 2013
- Casanueva et al 2013*. On the regional projections of weather-derived indices: Two case studies in tourism and fire danger sectors.* In preparation.

# TCI Savoie

- SAFRAN data (hourly data).
- Relative humidity from E-OBS.

TCI components

| Subindex | Monthly Climate Variables |
|---|---|
| Daytime Comfort Index (CID) | Maximum daily temperature (ºC) (Tmax) and minimum daily relative humidity (%) (Hmin) |
| Daily Comfort Index (CIA) | Mean daily temperature (ºC) (T) and mean daily relative humidity (%) (H) |
| Precipitation (P) | Total precipitation (mm) |
| Sunshine (S) | Total hours of sunshine (h) |
| Wind (W) | Average wind speed (m/s or km/h) |




- Significant differences depending on the TCI computation, especially for winter and summer.

- Daily values are more interesting since it allows the caculation of probabilities of certain conditions (e.g., scores above 80 or below 50).

However:

- **Is this a proper index for a mountainous region?**
- **This index uses Heat Index which best measures the combined effects of temperature and humidity, so it works well for the warm period of the year but not for winter.**