

26 May 2022

HS2.1.4
Mountain
hydrology
under
global
change

EGU22-7825

Water cycle and water resources of the Pyrenees under climate change: the PIRAGUA datasets

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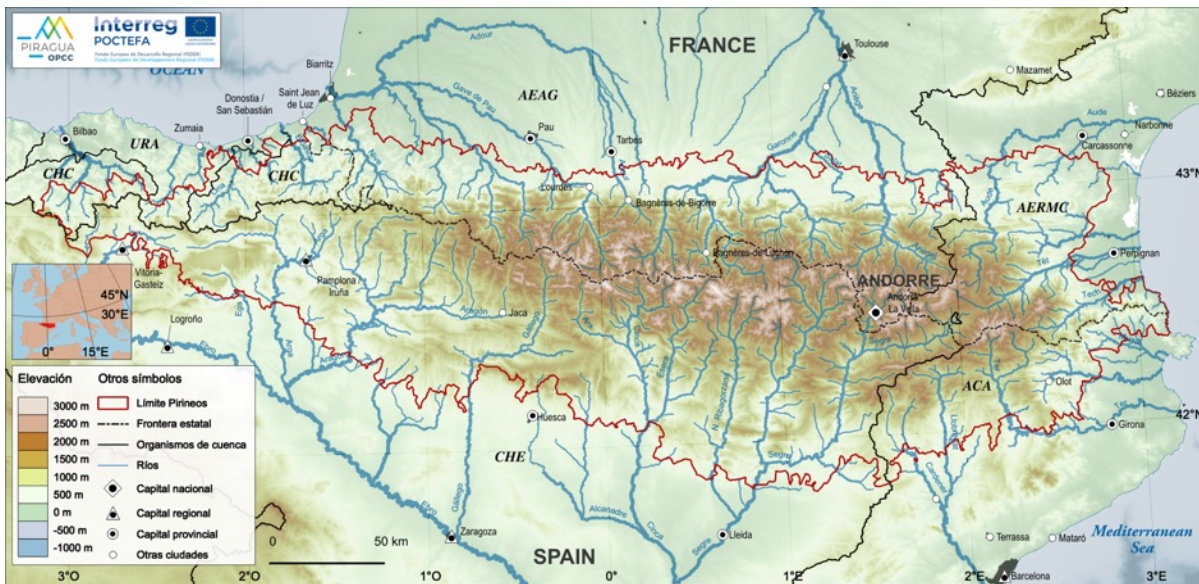
[9]: Andorra Research + Innovation, Andorra.

The PIRAGUA project

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The PIRAGUA dataset

L. Palazón,
S. Beguería,
the PIRAGUA Team



The Pyrenees Range: a transboundary mountain region (Spain, France, Andorra).

The main source of water resources for a large region in SW Europe, particularly vulnerable to the consequences of climate change.

Characterize the hydrological cycle and the water resources of the Pyrenees Range in a climate change context, in order to improve the territories' adaptation capacity.

Project results → regional datasets

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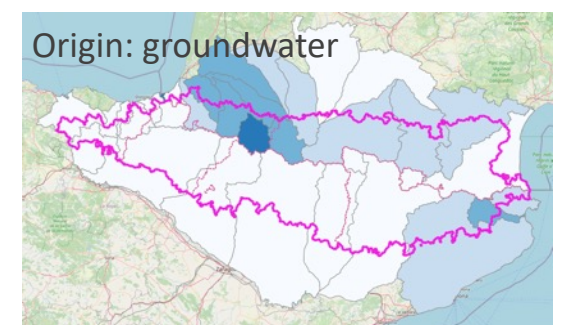
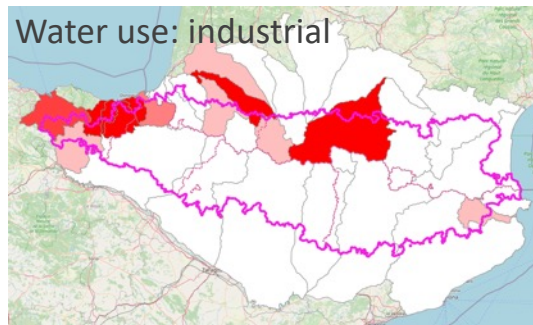
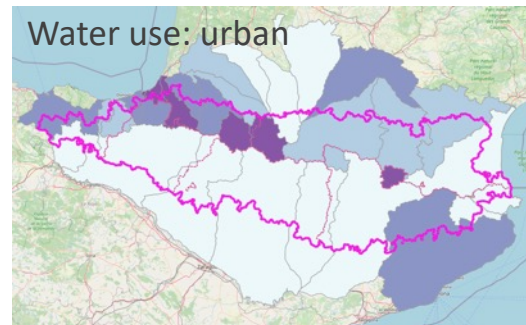
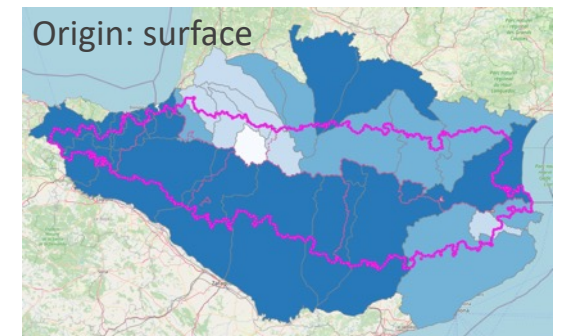
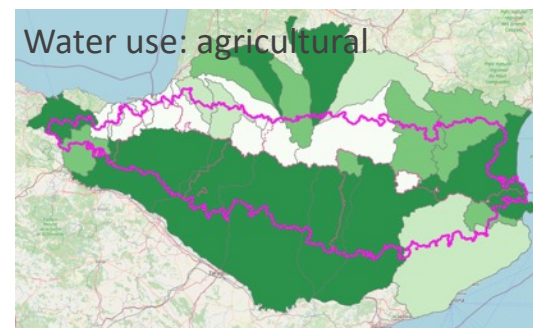
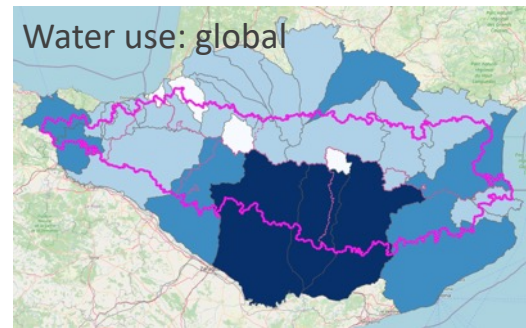
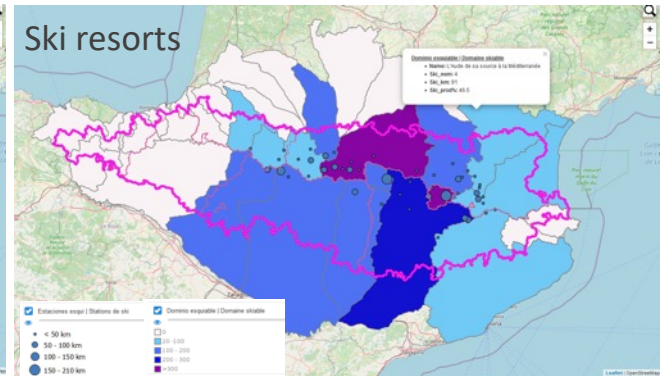
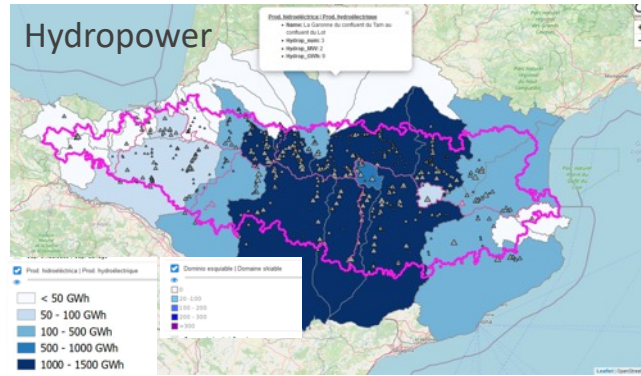
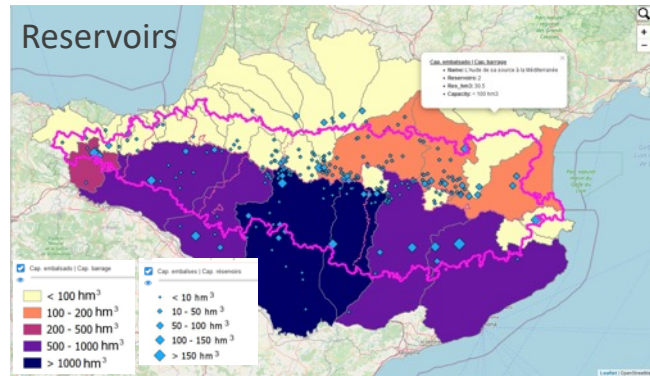
PIRAGUA_resources

Geospatial information about water resources, water use, and management

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The PIRAGUA dataset

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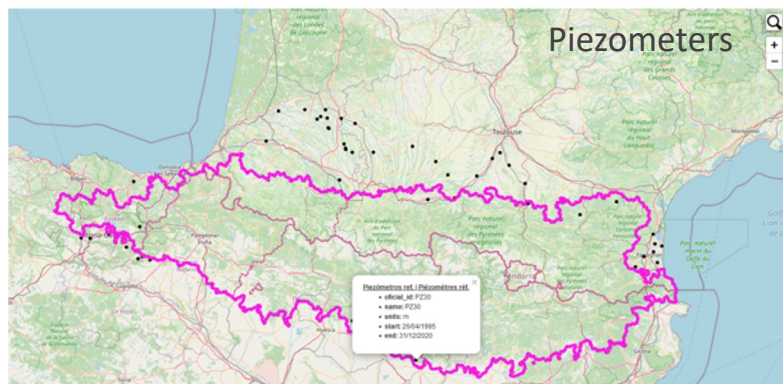
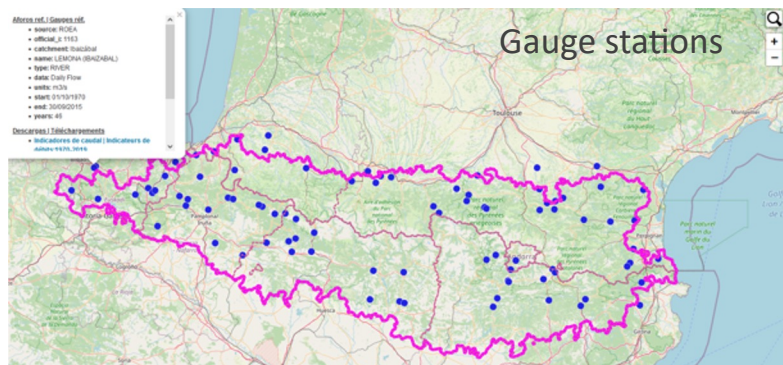
PIRAGUA_indicators

Daily streamflow and aquifer level indicators and trend analysis (1950-2019)

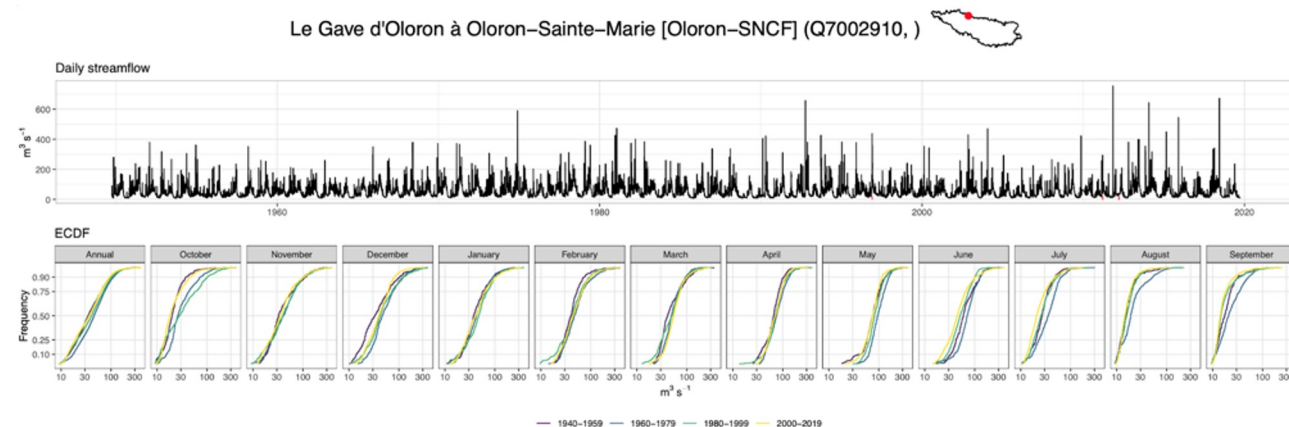
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Le Gave d'Oloron à Oloron-Sainte-Marie [Oloron-SNCF] (Q7002910,)



ECDF statistics (median, range, skewness and kurtosis)

Annual	October	November	December	January	February	March	April	May	June	July	August	September
34.5, 82.4, 0.5, 0.5	19.9, 26.14, 0.35, 0.44	32.5, 91.31, 0.69, 0.41	32.9, 89.9, 0.58, 0.46	37.5, 69.75, 0.54, 0.41	40.2, 49.26, 0.32, 0.48	41.35, 80.43, 0.66, 0.4	65.75, 70.1, 0.09, 0.48	75.5, 90.18, 0.3, 0.48	59.5, 93.11, 0.43, 0.5	26.9, 32.15, 0.26, 0.44	15.3, 16.22, 0.43, 0.42	16.75, 21.53, 0.42, 0.4
45.8, 94.5, 0.4, 0.51	26.1, 56.65, 0.63, 0.4	41.86, 52, 0.46, 0.49	46.4, 96.2, 0.53, 0.43	42.5, 71.05, 0.37, 0.48	46.5, 89.6, 0.52, 0.39	49.62, 62, 0.42, 0.46	74.75, 90.22, 0.31, 0.5	96.96, 0.31, 0.57	71.89, 1, 0.28, 0.47	35.3, 47.55, 0.23, 0.56	19.42, 5, 0.6, 0.3	21.40, 5, 0.53, 0.48
40.6, 90.4, 0.4, 0.54	26.7, 89.91, 0.65, 0.47	39.4, 90.2, 0.43, 0.48	42.05, 104.23, 0.57, 0.4	47.5, 84.2, 0.32, 0.47	43.1, 78.22, 0.38, 0.43	51.74, 25, 0.28, 0.53	70.8, 78.72, 0.25, 0.47	82.05, 85.3, 0.31, 0.49	50.9, 72.3, 0.36, 0.53	25.5, 38.02, 0.45, 0.51	15.8, 16.61, 0.41, 0.46	14.8, 24.51, 0.71, 0.3
36.6, 81.2, 0.43, 0.54	18.33, 92, 0.86, 0.42	36.65, 91.81, 0.56, 0.3	39.45, 62.43, 0.36, 0.5	41.45, 80.81, 0.46, 0.4	44.3, 77.04, 0.43, 0.45	54.3, 70.15, 0.36, 0.46	70.8, 70.71, 0.14, 0.59	75.8, 73.81, 0.12, 0.52	44.7, 82.41, 0.44, 0.42	20.85, 34.36, 0.56, 0.4	14.5, 15.71, 0.47, 0.46	14.2, 16.85, 0.85, 0.36



- Quantiles: q10, q25, q50, q75, q90
- Range, skewness, kurtosis: iqr, dsk, dku
- Low-flows: vcn3
- Extreme flows: rl20

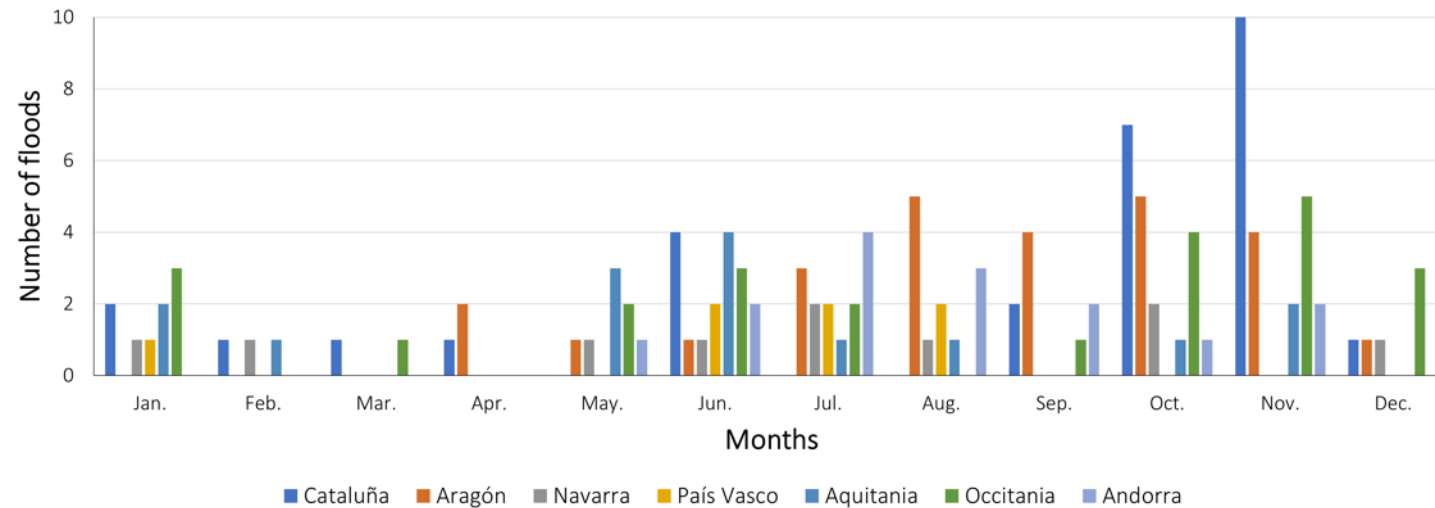
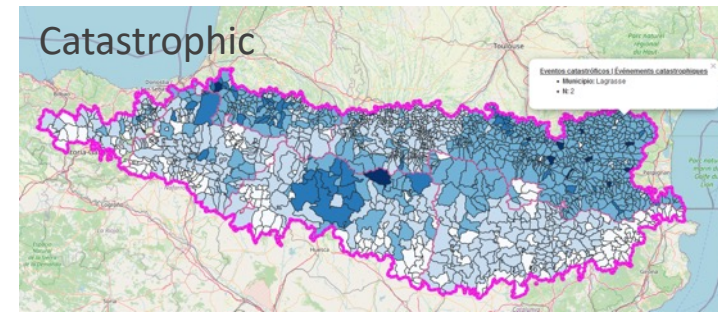
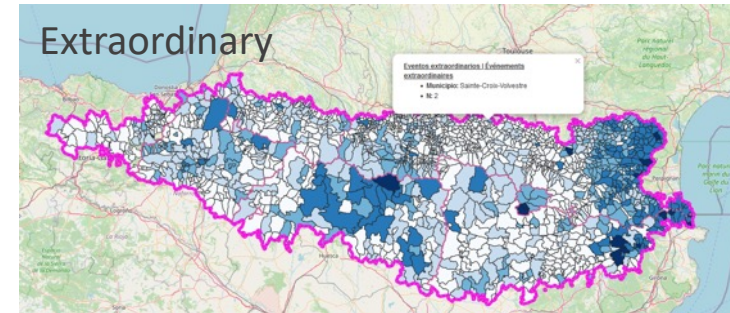
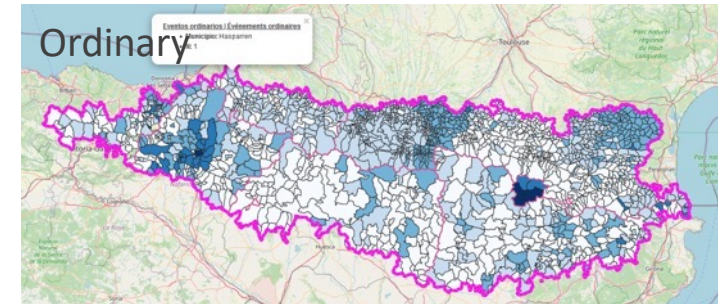
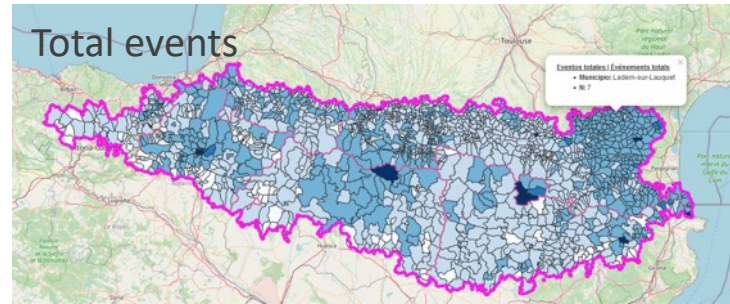
PIRAGUA_flood

Number and classification of flood events at the municipal level (1981-2015)

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The PIRAGUA dataset

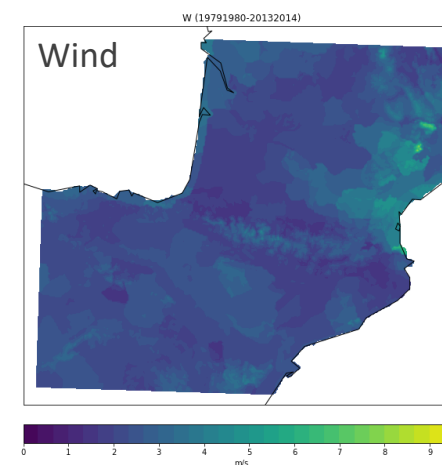
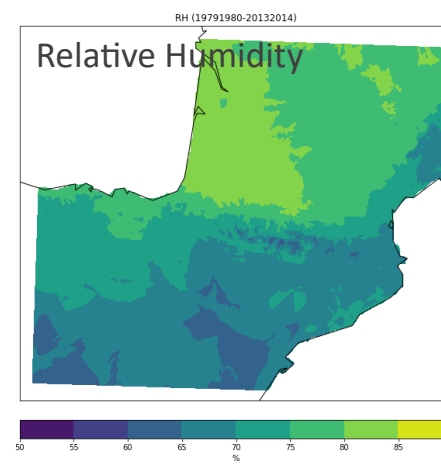
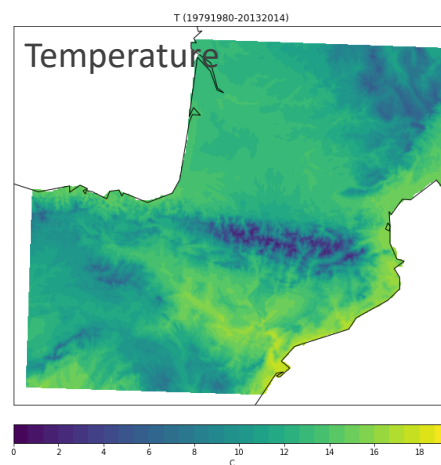
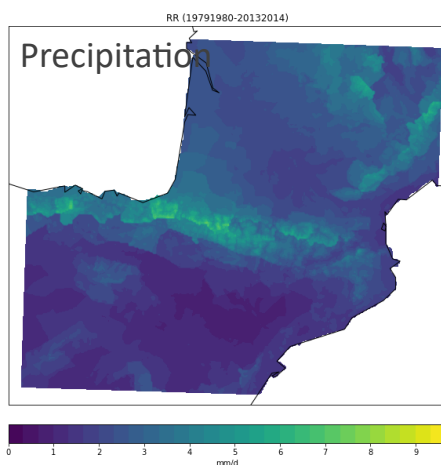
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PIRAGUA_atmos_analysis

Daily grids of meteorological variables for the historical period (1981-2010)

- AEMET + Météo-France observations
- ERA5 as first guess
- Optimal Interpolation method



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PIRAGUA_atmos_climate

Statistical downscaling of climatic variables for historical and future periods (1981-2100)

- **Multisite and multivariable analogue resampling**
 - Based on PIRAGUA_atmos_analysis
 - Standardized, detrended time series
 - Precipitation transformed using quadratic root
 - The analogy criterion is the mean square error of anomalies
 - Trend is added after computing analogues.

- 6 climate models (RCM/GCM):
 - bcc-csm1-1
 - CNRM-CM5
 - Inmcm4
 - MIROC-ESM
 - MPI-ESM-MR
 - MRI-CGCM3
- 2 RCPs (4.5 and 8.5)

12 data sets

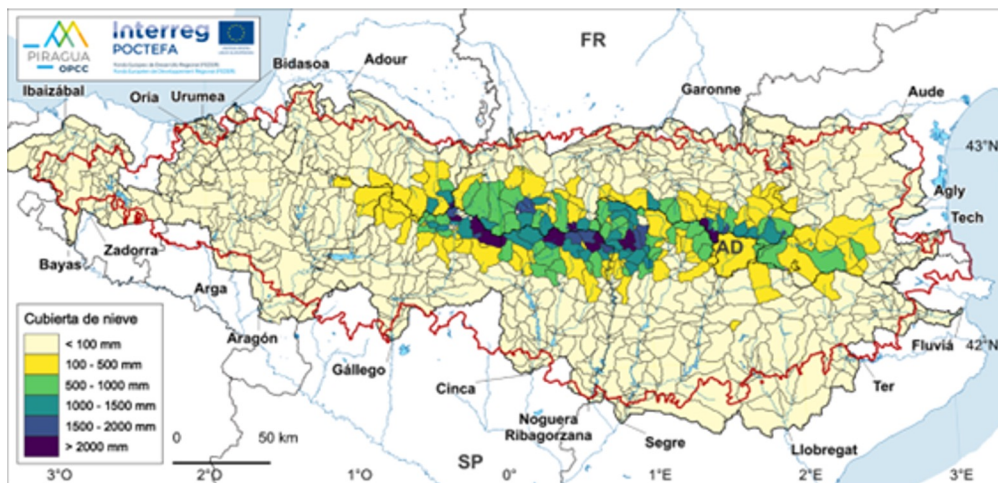




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PIRAGUA_hydro_analysis

Water balance components and water resources, historical (1981-2010)



- Forced with PIRAGUA_hydro_analysis
- Two hydro models: SWAT, SASER

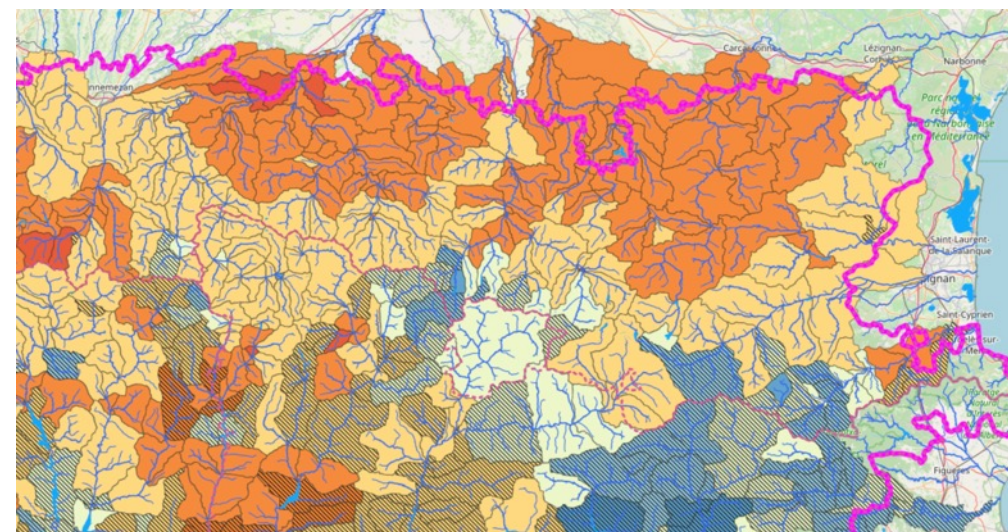
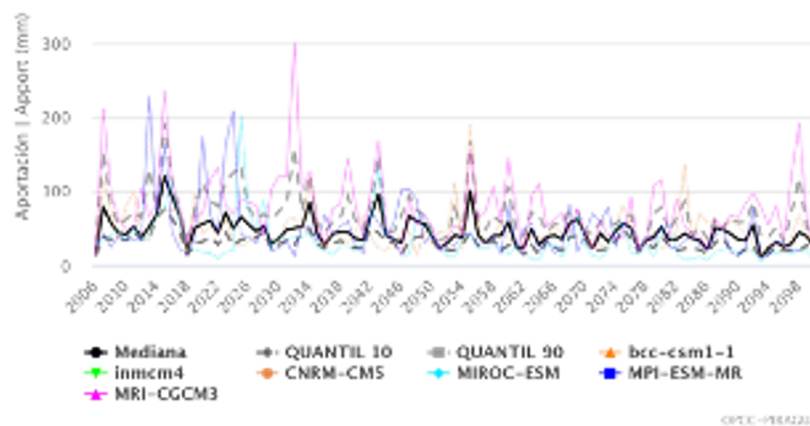
Spatial and temporal data on:

- Precipitation, temperature
- Evapotranspiration potential, real
- Soil water, snowpack
- Snow fusion, groundwater recharge, runoff production
- Streamflow

PIRAGUA_hydro_climate

Water balance components and water resources, future (1981-2100)

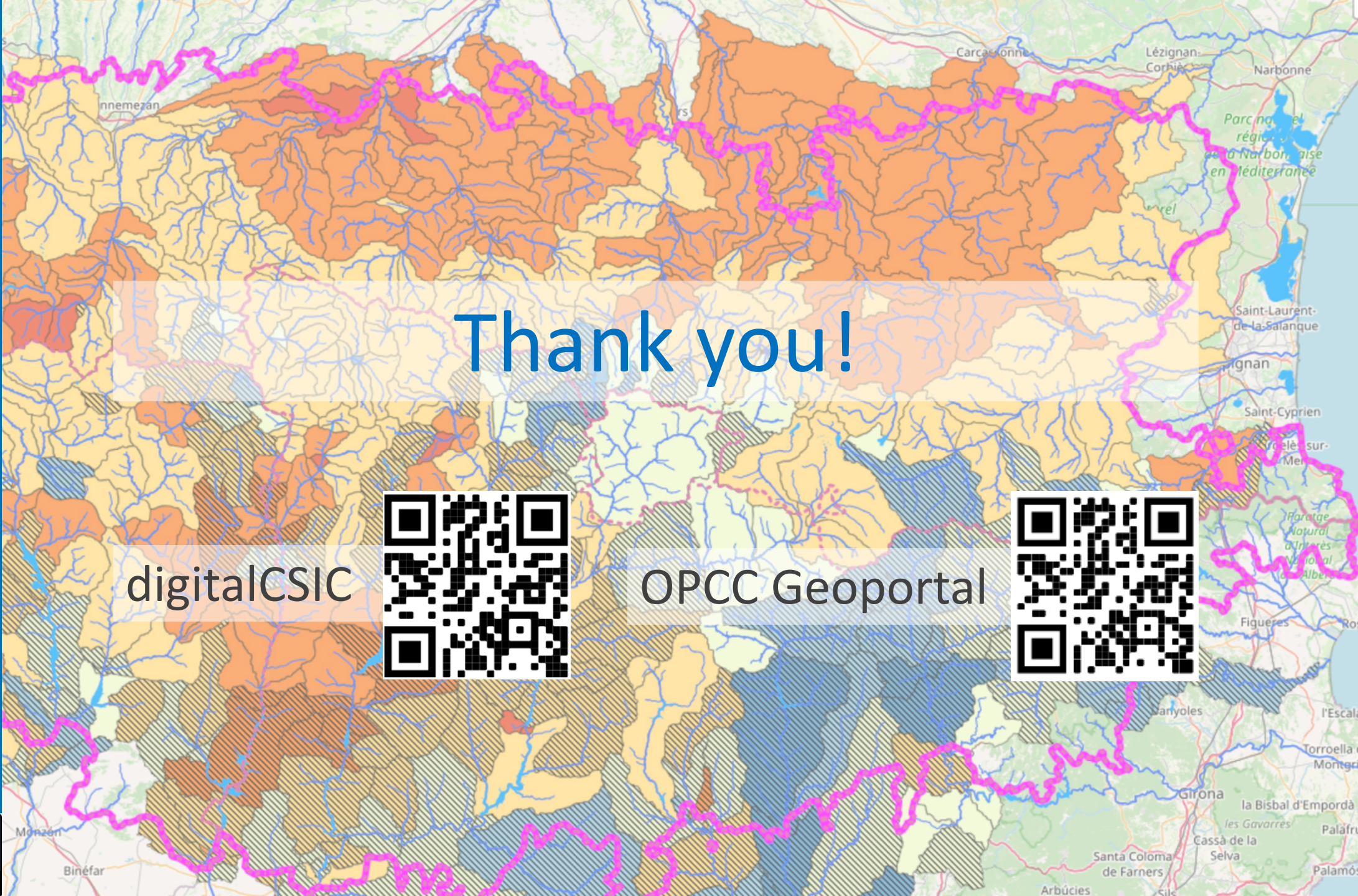
- Forced with PIRAGUA_hydro_climate



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Thank you!

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