

Open Climate Data up to 2100 for European Regions with a Focus on the Czech Republic

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ClimRisk.eu is a new web portal about climate change projections and underlying data needed for climate proofing. ClimRisk.eu is designed for investors planning their investments to withstand the future climate conditions. It is intended to help the public organizations to formulate their policies and plan specific adaptation measures. It is also a tool for companies and private entities to comply with the EU requirements to assess the sustainability of investments (EU Regulation 2021/1060, the so-called EU Taxonomy). ClimRisk.eu also serves as the data source for individuals and broad public and their climate-related personal interests.

Model selection

- derived from robust set of 30+ global climate models - **NOT** the Euro-Cordex regional models (projection does not match observed trends, figure 1).
- the decision is based on extensive testing (figure 3).
- Climate change data estimates are both state-of-the-art and anchored in the thorough analysis of past climate trends.

Two approaches to handling uncertainty

1. Climatic envelope

- for each period - distribution function from all GCM models and all scenarios (figure 2 left)
- robust approach
- Expression of uncertainty in the form of probability (5-25-50-75-95 percentile)

2. Individual scenarios

- standard approach (figure 2 right)
- more understandable for the public
- needed for many applications related to climate proofing

ClimRisk displays outputs in two spatial domains.

CZ – 0.5 km resolution

CE – 10 km resolution based on the E-OBS dataset

What data is the basis of the tool

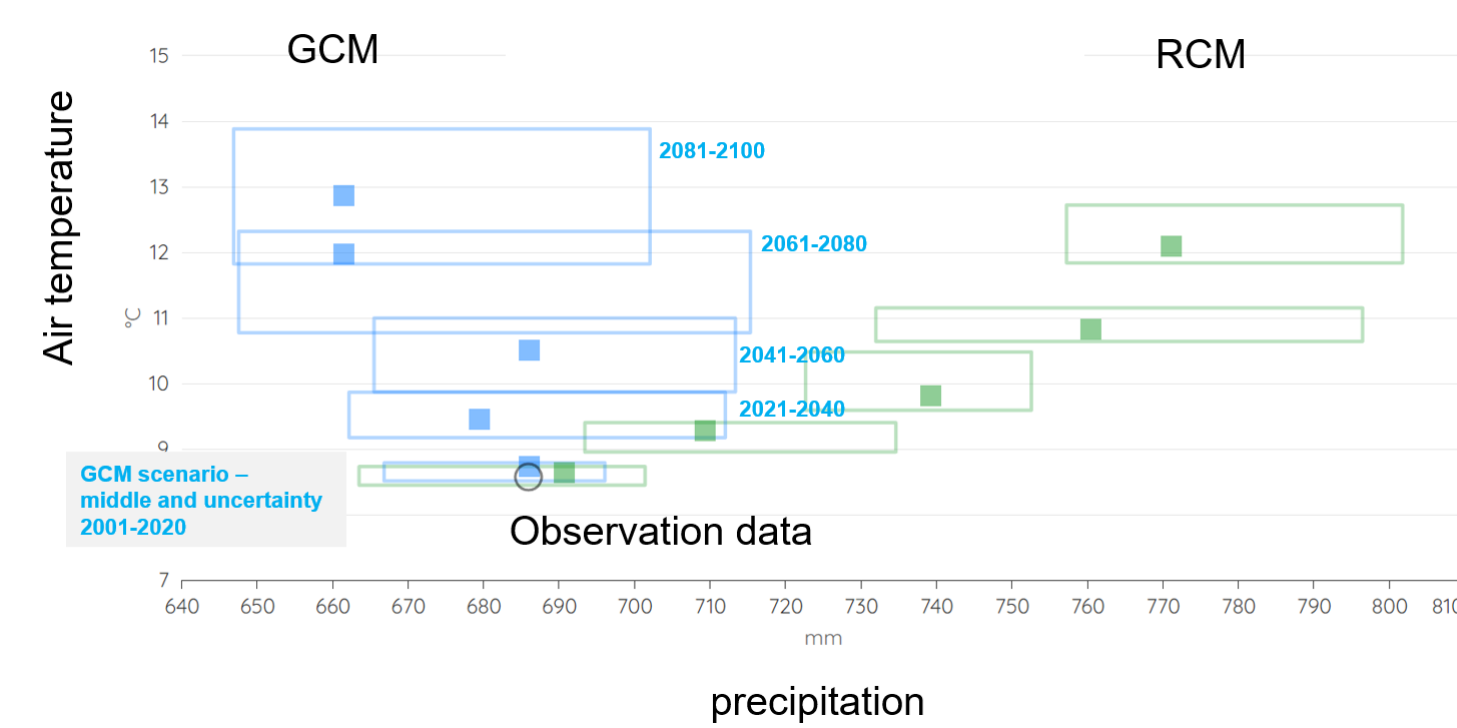


Figure 1. Comparison of climate model outputs for the Czech Republic according to GCM and RCM models

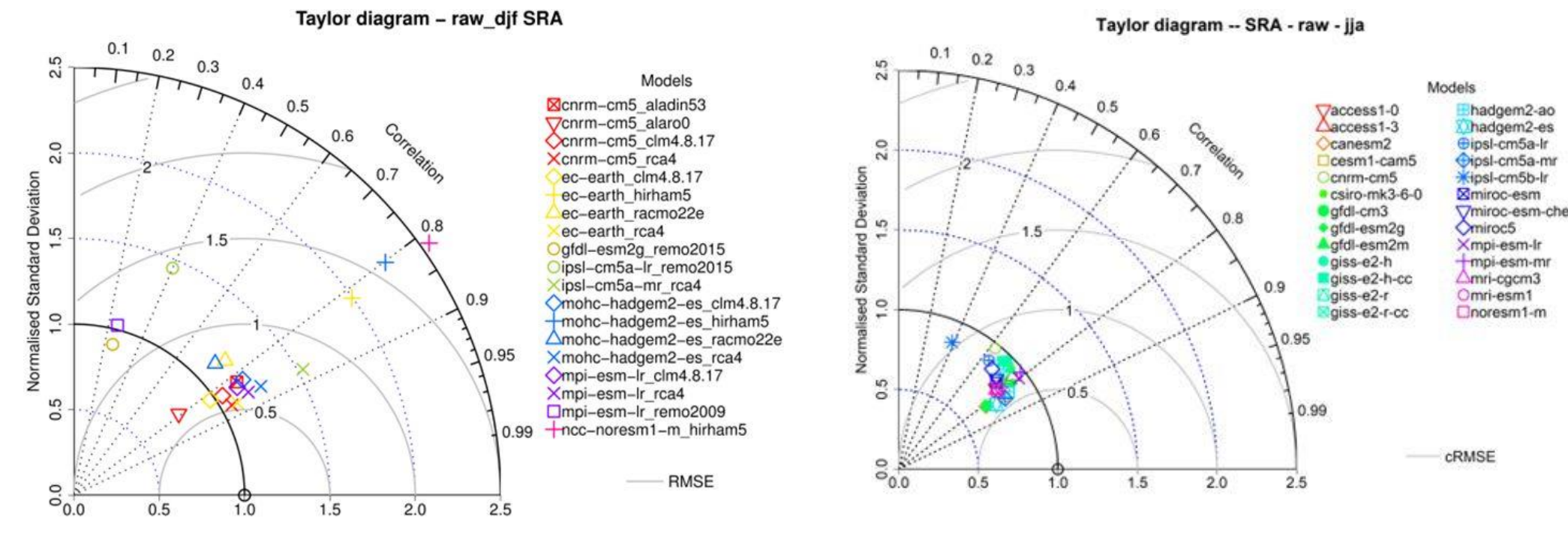


Figure 3. Taylor diagrams for GCMs and precipitation, DJF and JJA seasons, RMSE characteristic

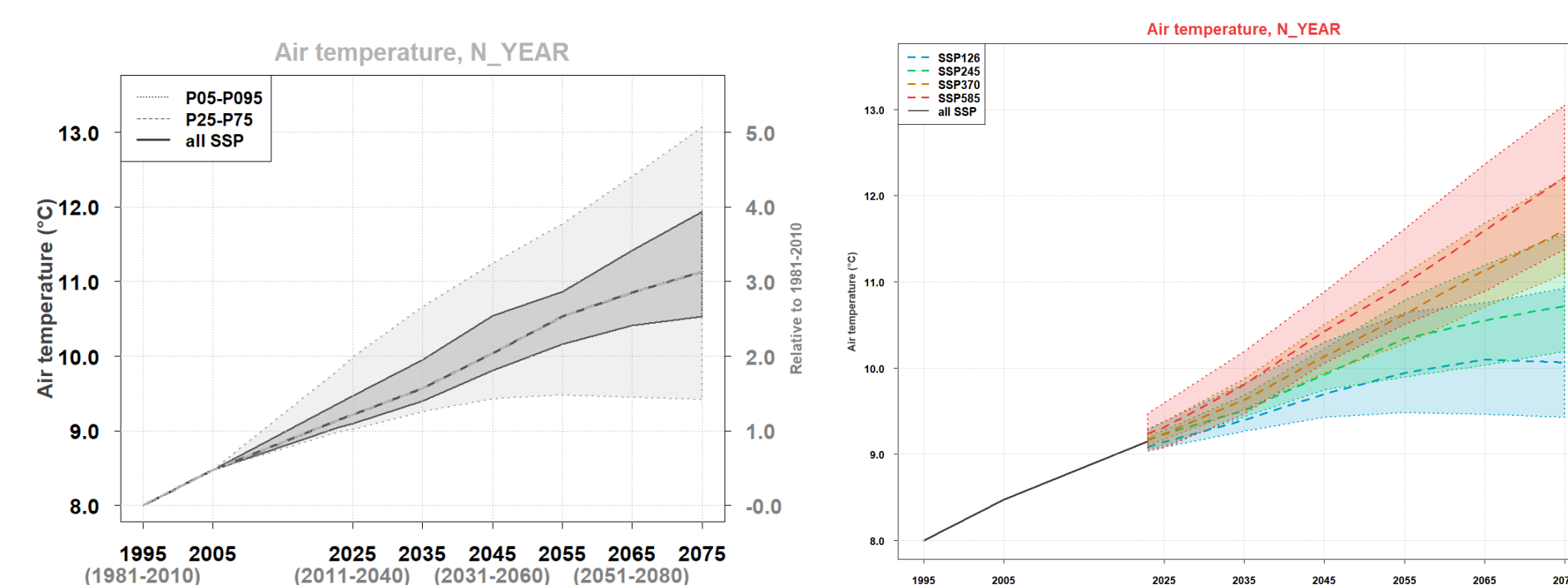
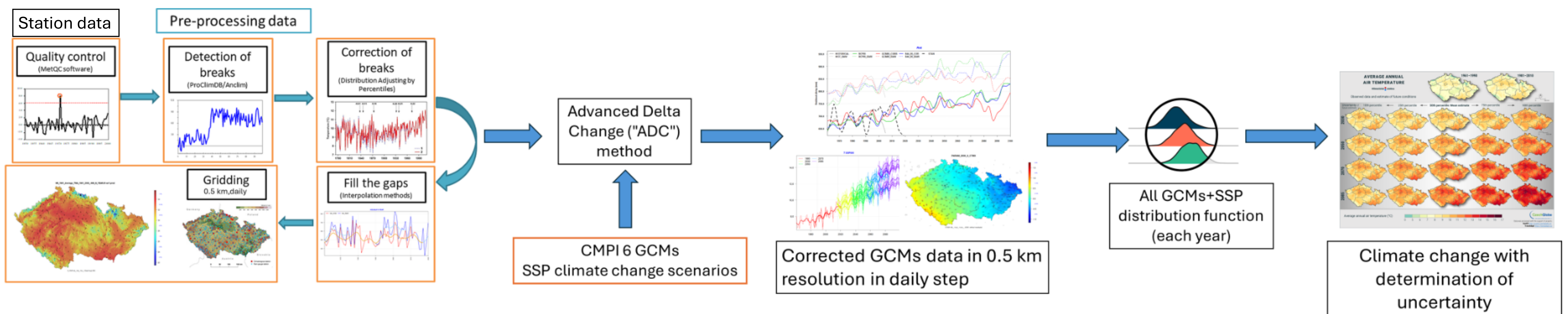


Figure 2. Change in air temperature in the Czech Republic processed using the climate envelope method (left) and the standard approach by individual scenarios (right).

Tab 1. Selected GCM Models (CMIP6 Simulations) in the climrisk.eu

Model	Nominal Resolution [km]	Notes
CMCC-ESM2	100	
CNRM-CM6-1-HR	50	Only SSP1-2.6 and SSP5-8.5 available
EC-EARTH3	100	
GFDL-ESM4	100	
MPI-ESM1-2-HR	100	
MRI-ESM2-0	100	
TaiESM1	100	



ClimRisk aggregation

- scenario SSP126
- scenario SSP245
- scenario SSP370
- scenario SSP585

26 meteorological characteristics

- Mean daily temperature [°C]
- Minimum daily temperature [°C]
- Maximum daily temperature [°C]
- Precipitation sum [mm]
- Mean wind speed [m/s]
- Relative humidity [%]
- Sunshine duration [h]
- Global radiation [MJ/m²]
- Number of hot days
- Number of tropical nights
- Number of extremely hot days
- Number of days in heat wave
- Number of frost days
- Number of ice days
- Number of days in cold wave
- Number of days in very cold wave
- Number of days with precipitation
- Number of days with daily precipitation ≥ 10 mm
- Number of days with daily precipitation ≥ 20 mm
- Number of days with low soil humidity in 40 cm
- Number of days with very low soil humidity in 100 cm
- Number of days with snow cover ≥ 3 cm
- Number of days with snow cover ≥ 10 cm
- Number of days with snow cover ≥ 30 cm

climate change for selected 30 years according to uncertainty variants

average change in individual 30 years

30-year periods

- 1995 (1981-2020)
- 2005 (1991-2020)
- 2023 (2009-2038)
- 2025 (2011-2040)
- 2035 (2021-2050)
- 2045 (2031-2060)
- 2055 (2041-2070)
- 2065 (2051-2080)
- 2075 (2061-2090)

Monthly, seasonal and annual data

- January
- February
- March
- April
- May
- June
- July
- August
- September
- October
- November
- December
- Spring (MAM)
- Summer (JJA)
- Autumn (SON)
- Winter (DJF)
- Summer half year (April to September)
- Winter half year (October to March)
- Year

Next steps

RCM – new generation (Convection-permitting model)

- To improve the representation of extreme precipitation and localized events, ClimRisk.eu now also incorporates outputs from the ALADIN-Climate/CZ regional climate model, including a convection-permitting prototype (CPP).
- Expansion of future climate scenarios in the Czech Republic from 28 to 32 variant.
- Very high resolution – 2.3 km (figure 4)
- Developed within the national project Perun. Calculated on a supercomputer within the Czech Hydrometeorological Institute

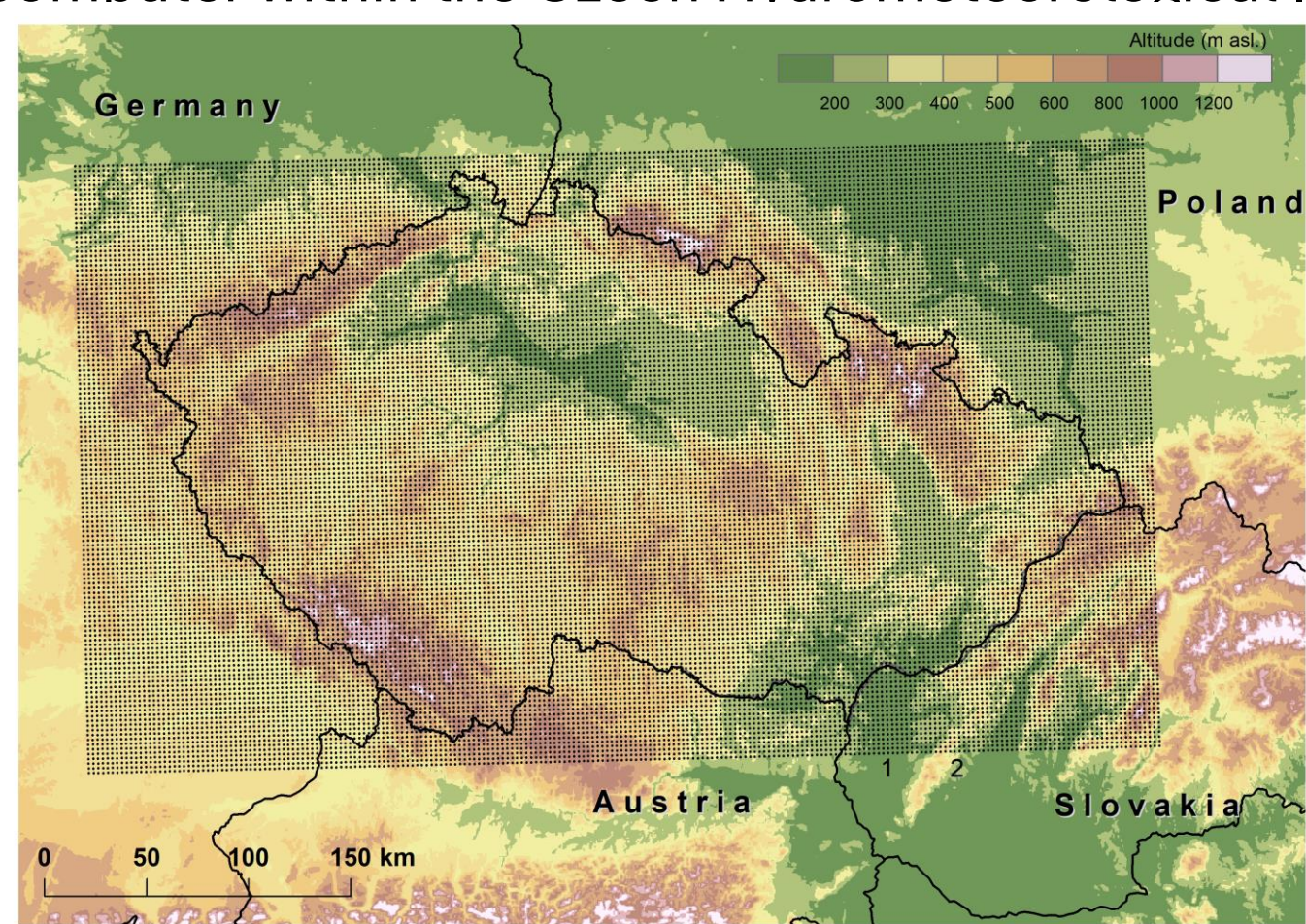
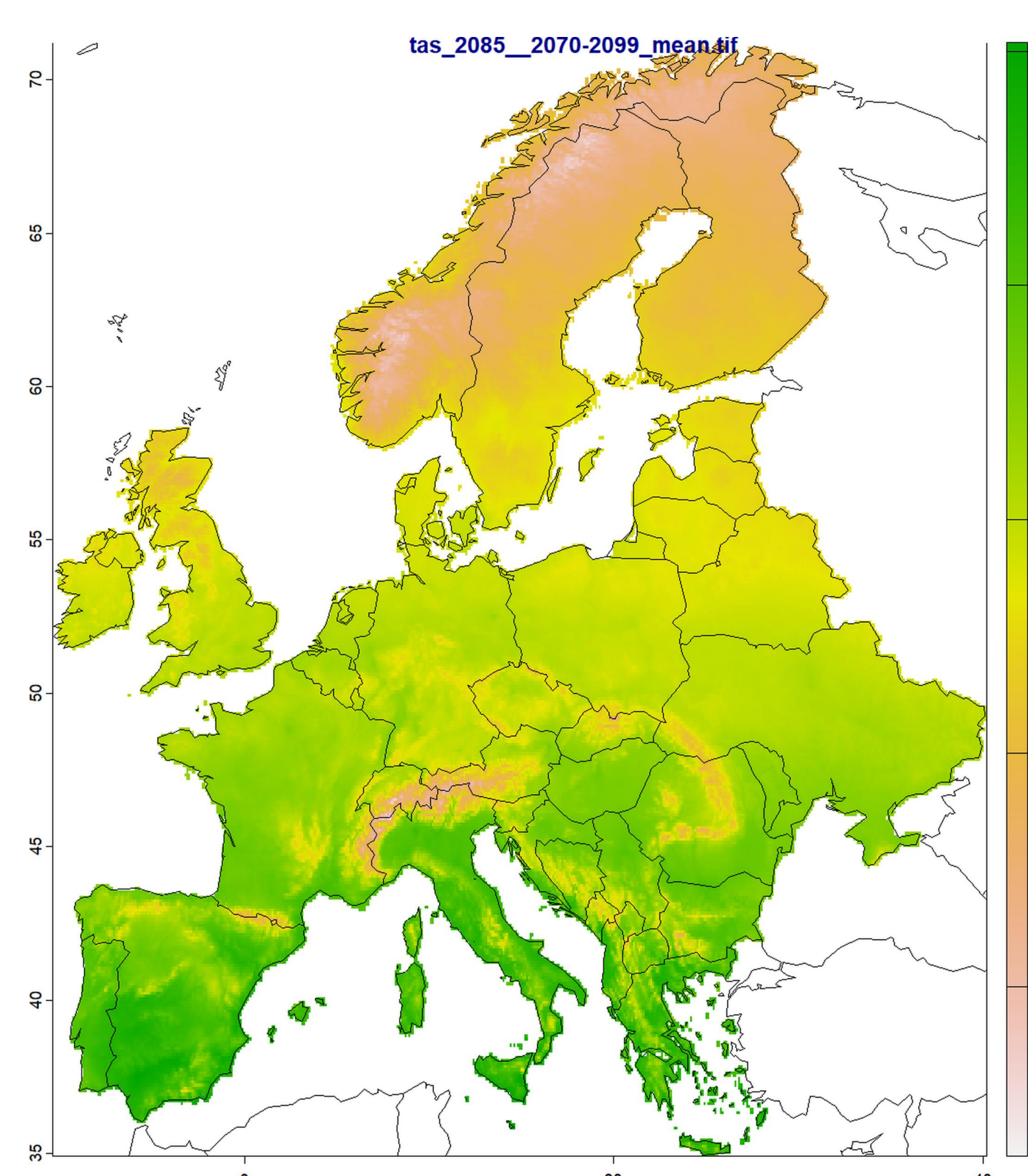


Figure 4. ALADIN-Climate/CZ domain (2.3 km resolution)

European domain



- CERRA dataset used for climate model correction and current climate analysis
- CERRA: the high-resolution dataset produced at a horizontal resolution of 5.5 km containing atmospheric and surface variables.
- It will be available in a few months

Figure 5. Sample outputs for the European version of climrisk.eu (air temperature 2070-2099)

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