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Agriculture (livestock product technology)

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Online 3rd ClimEd Training

- **Purpose:** to determine the optimal climatic conditions for the production of livestock products in Ukraine.
- **Objective:** with the help of ERA5 explorer (copernicus.eu) to determine the regions of Ukraine with the most favorable climatic conditions for breeding domestic breeds of cattle and cattle with the possibility of further production of meat and milk.
- **Select the theme (among the ClimEd proposed) or propose your own:** Agriculture (livestock product technology)
- **Select geographical region/ domain/ country of interest:** Lviv, Kherson, Luhansk, Chernihiv
- **Select existing or possible problem of concern/ interest**: Ability to use climatic conditions to improve production technologies, with minimal use of specialized facilities (reducing the cost of construction and operation of capital structures).
- **Formulate main aim and specific objectives of your group project**: Carry out a comparative analysis of climatic conditions of different districts / regions of the country, and choose the optimal one for further substantiation of energy-saving ecologically safe technologies of livestock production from cows and sheep.
- **Think to which UN SDGs results of your group project might correspond:** Achieve food security and improved nutrition and promote sustainable agriculture
- **Select variables/ parametrs which will be analysed:** monthly and annual anomaly temperature (klim.), precipitation anomaly (klim.), frost days and tropical nights, mean evaporation , surface solar radation , surface temperature trend
- **Select approach(s) and tools you might utilize for visualisation and data analysis:** https://cds.climate.copernicus.eu/cdsapp#!/software/app-era5-explorer?tab=app
- **https://climexp.knmi.nl/plot_atlas_form.py**
- **Climate Date Store Toolbox**
- **Think about expected result**: Determination of the most perspective region, for the further ground of optimal energykeeping technologically safe technologies, at the production of goods from the specialized breeds.

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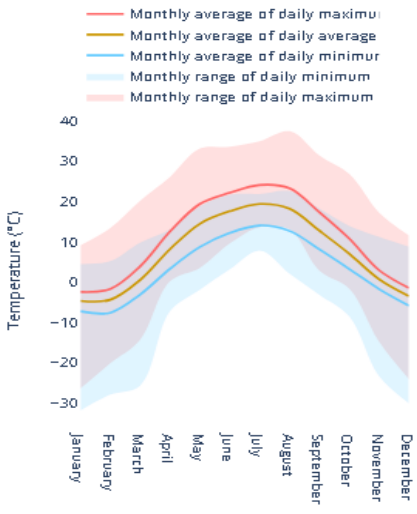
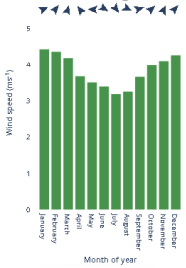
Chernihiv (51.51°N, 31.28°E)

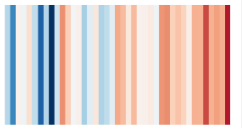


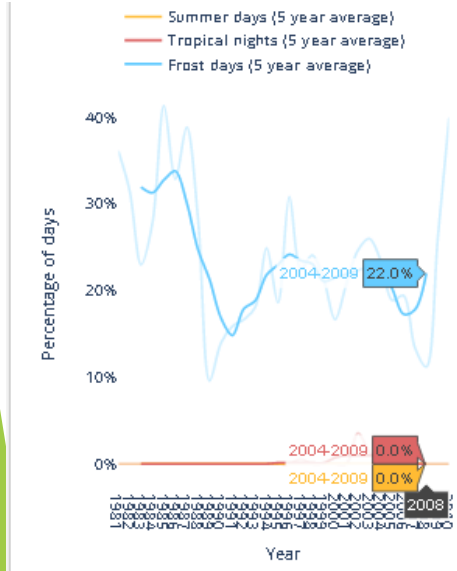
For the 1981-2010 reference period, the annual average temperature in this location was **5.5**°C. Monthly average temperature ranged from **-2.7**°C (February) to **15.6**°C (August).

Annual average wind speed



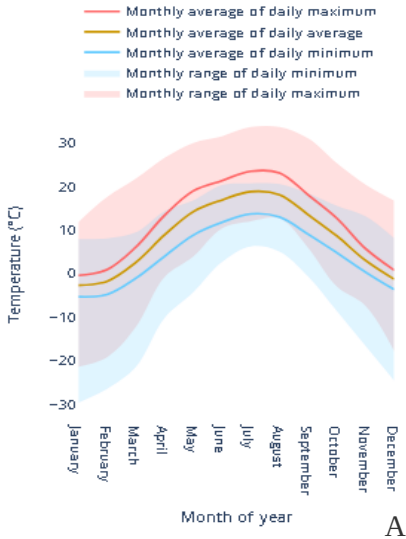
Warming stripes

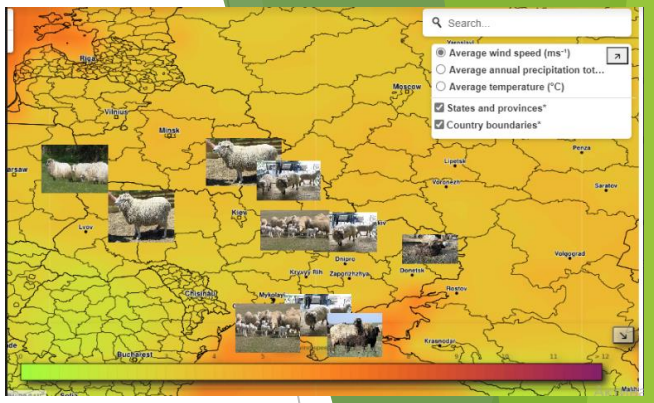




Summer days and tropical nights in 2004-2009 were not observed. The number of frosty days from 2004-2009 decreases to 22%.

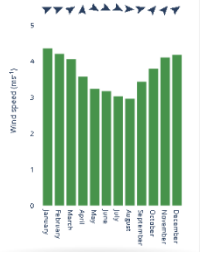
Lviv (49.84°N, 24.02°E)

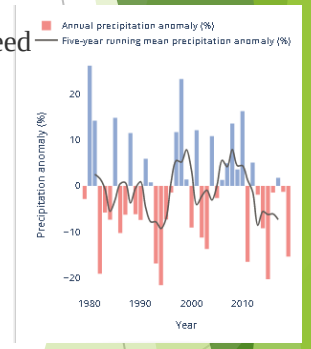


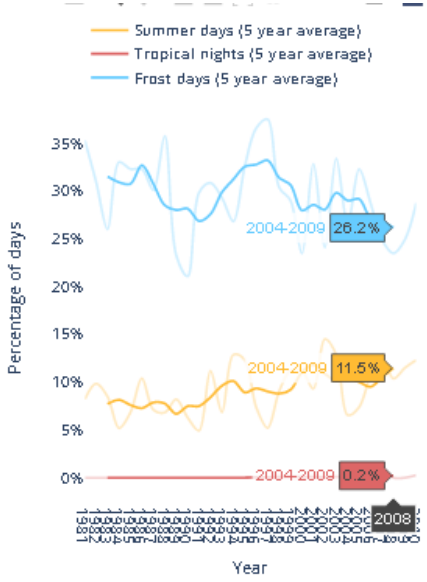


For the 1981-2010 reference period, the annual average temperature in Lvov was **8.3**°C. Monthly average temperature ranged from **-2.6**°C (January) to **18.9**°C (July), max 33.7°C (July, August), min -5.3°C (January).

Annual average wind speed







Tropical nights in the western part of Ukraine in the period from 2004-2009 has not changed, there is a slight increase of 0.2%. Summer days are gradually increasing and amount to 11.5%. The number of frosty days from 2004-2009 decreases and is 26.2%.

ClimEd

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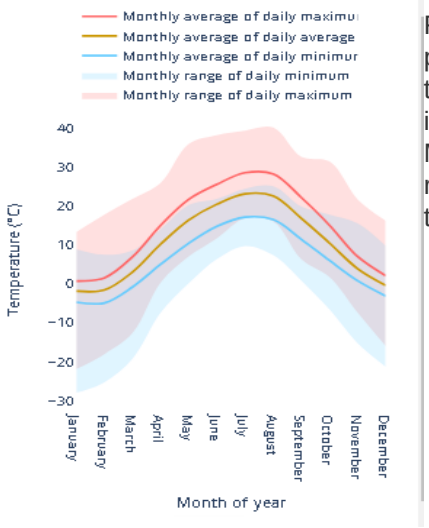
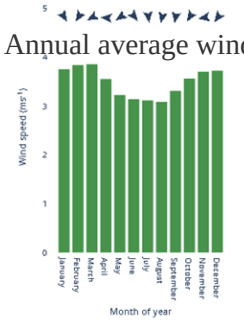
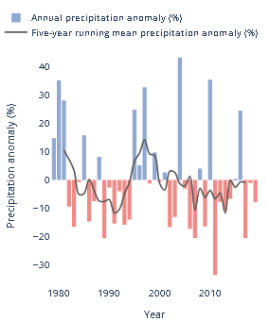
Kherson (46.66°N, 32.62°E)

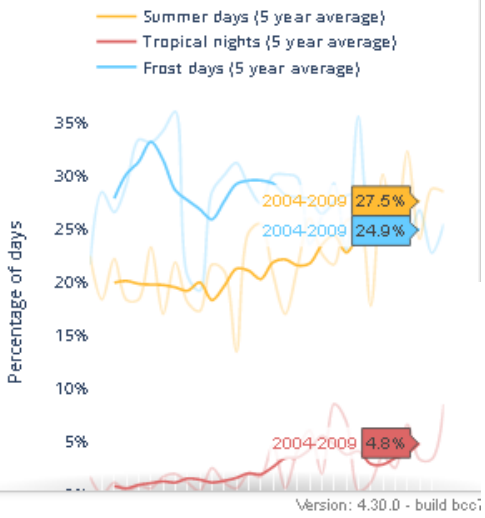


For the 1981-2010 reference period, the annual average temperature in **Kherson** was **10.3**°C. Monthly average temperature ranged from **-1.8**°C (January) to **23.1**°C (July).

Annual average wind speed

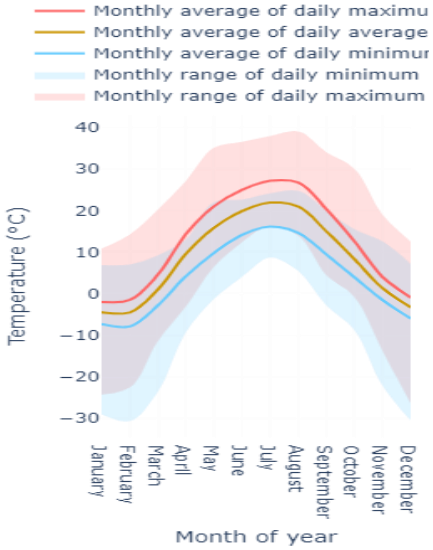






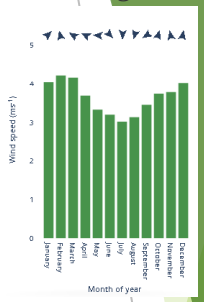
Tropical nights in the southern part of Ukraine in the period from 2004-2009 increased by 4.8%. Summer days also increase and amount to 24.9%. The number of frosty days from 2004-2009 decreases and is 27.5%

Luhansk (48.57°N, 39.32°E)

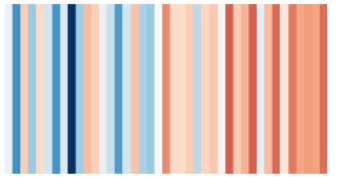


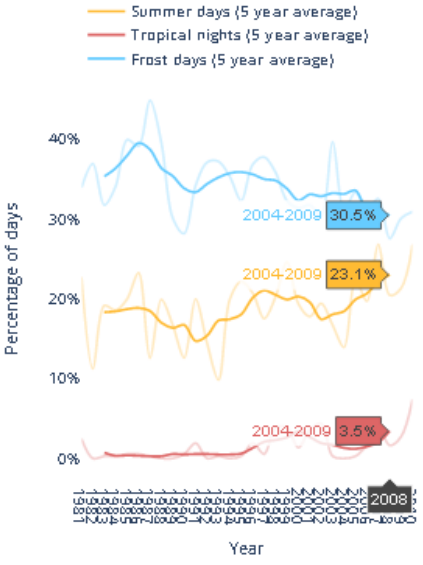
For the 1981-2010 reference period, the annual average temperature in Luhansk was 8.5°C. Monthly average temperature ranged from -4.5°C (February) to 22.0°C (July).

Annual average wind speed



Warming stripes





Tropical nights in the eastern part of Ukraine in the period from 2004-2009 increased by 3.5%. Summer days also increase and amount to 23.1%. The number of frosty days from 2004-2009 decreases and is 30.5%

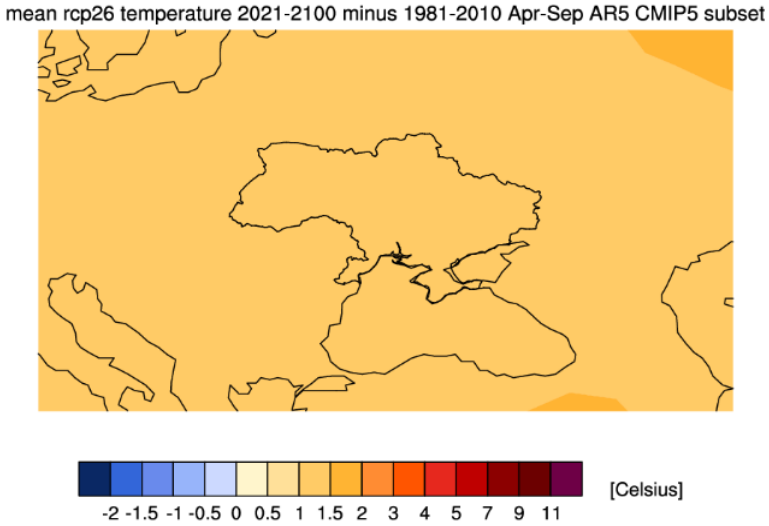
KNMI Climate Change Atlas

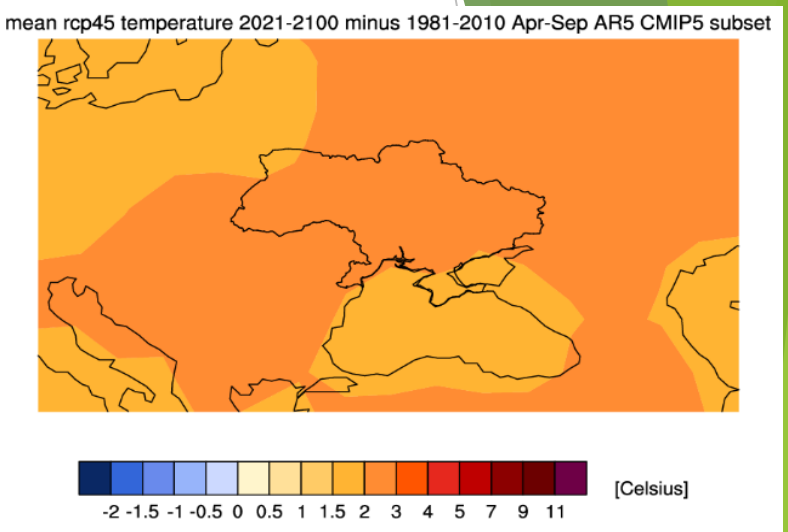
Historical+RCP2.6,
Historical+RCP4.5,
Historical+RCP6.0,
Historical+RCP8.5

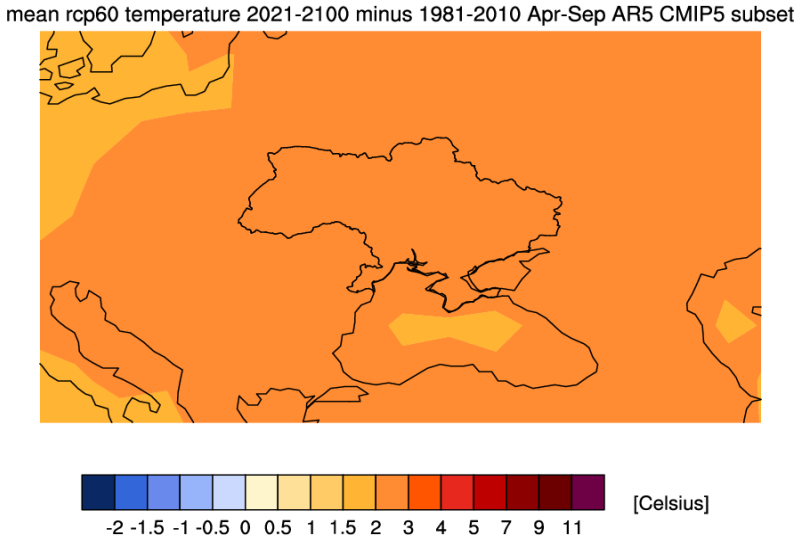
https://climexp.knmi.nl/plot_atlas_form.py

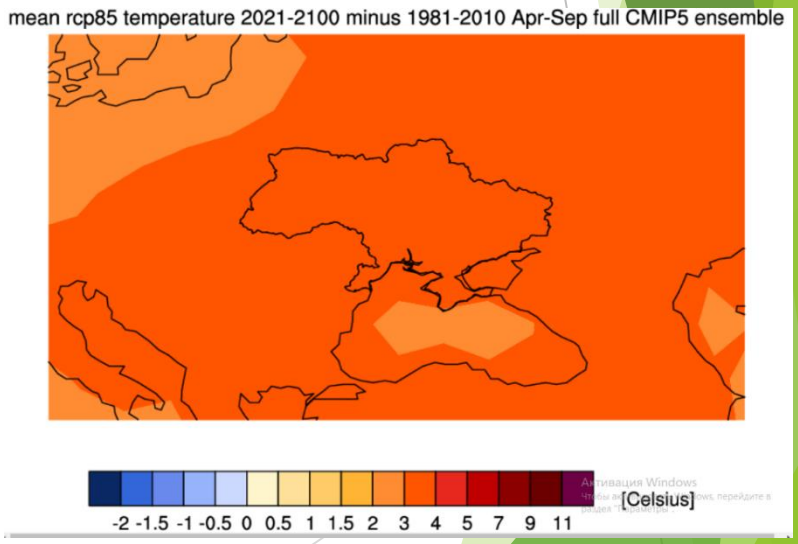
Temperature

Warm period





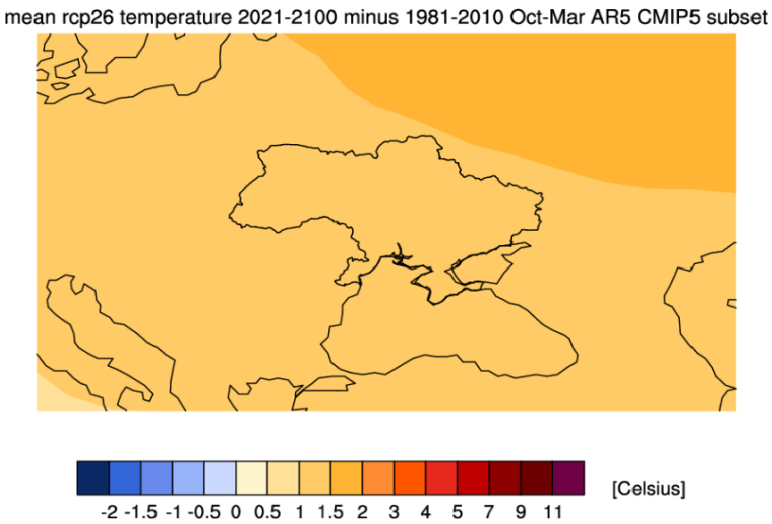


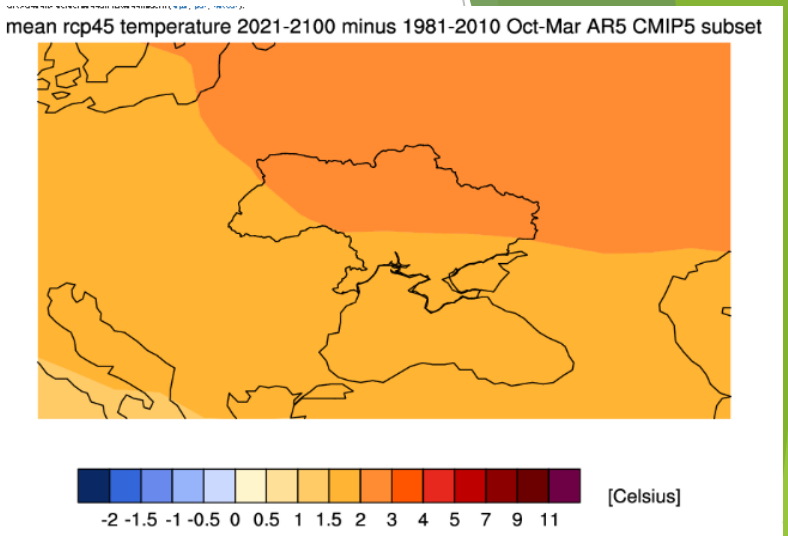


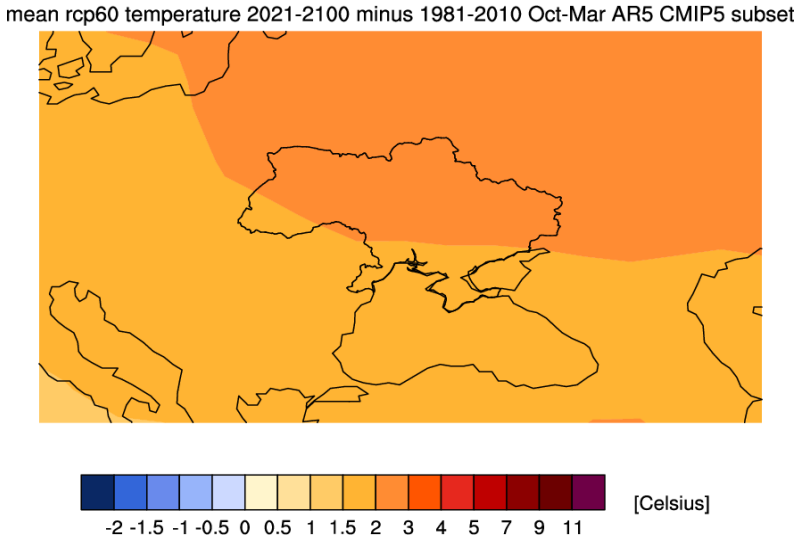
The average value of the near-surface temperature of the warm period (April-September), for scenarios: rcp2.6, rcp4.5, rcp6.0, rcp8.5. The base period is 1981-2010, the future period is 2021-2100. AR5 CMIP5 subset

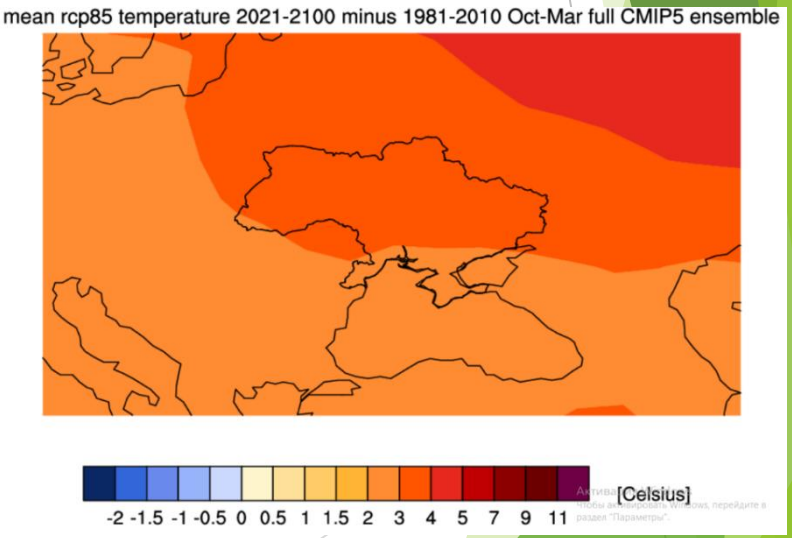
Temperature

Cold period









The average value of the near-surface temperature of the cold period (October-March), for scenarios: rcp2.6, rcp4.5, rcp6.0, rcp8.5. The base period is 1981-2010, the future period is 2021-2100. AR5 CMIP5 subset

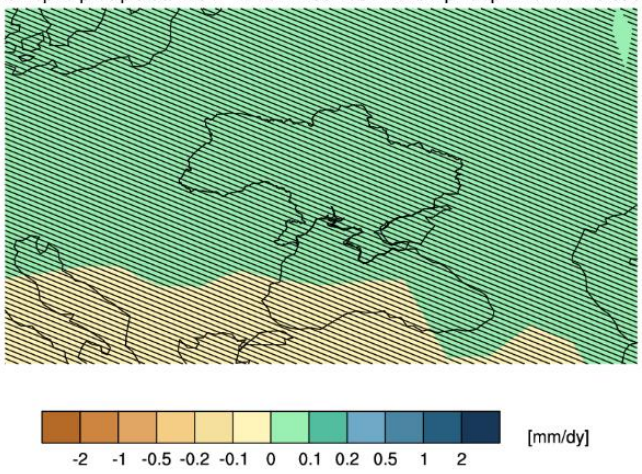
Precipitation

The hatching represents areas where the signal is smaller than one standard deviation of natural variability

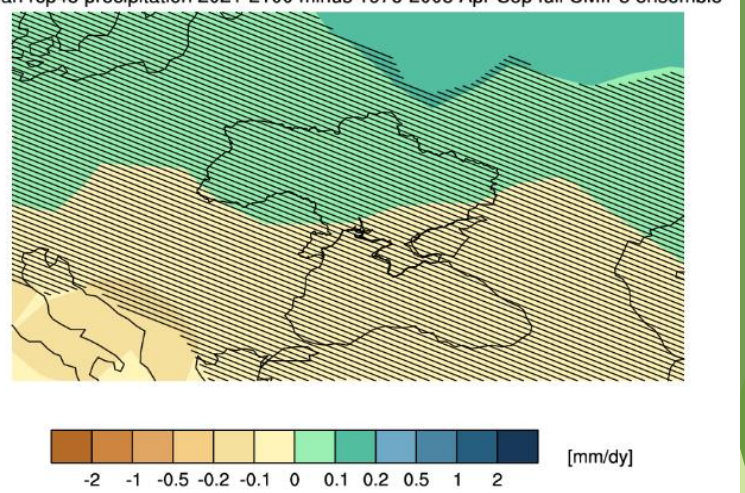
Warm period

mean rcp45 precipitation 2021-2100 minus 1981-2010 Apr-Sep full CMIP5 ensemble.

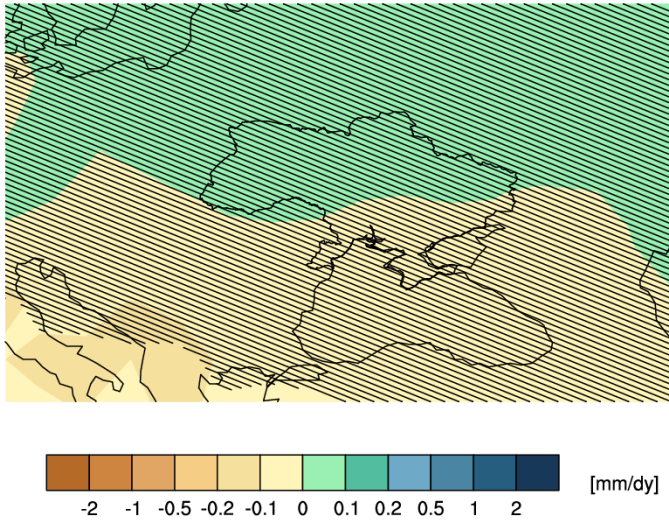
mean rcp26 precipitation 2021-2100 minus 1981-2010 Apr-Sep AR5 CMIP5 subset



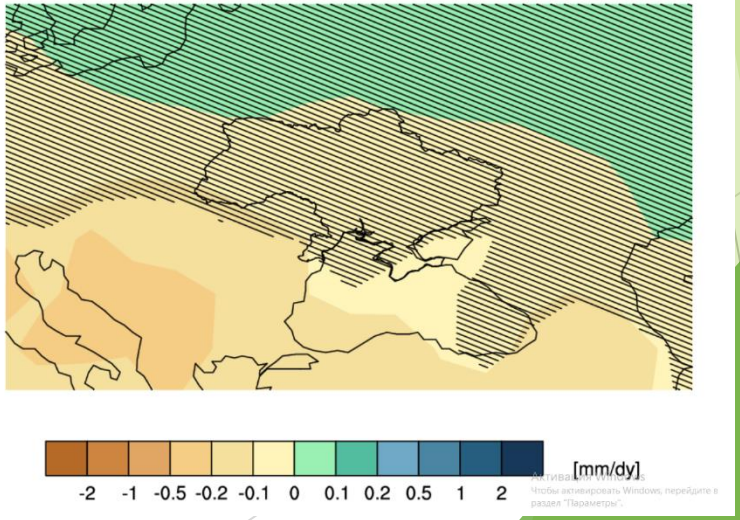
mean rcp45 precipitation 2021-2100 minus 1976-2005 Apr-Sep full CMIP5 ensemble



mean rcp60 precipitation 2021-2100 minus 1981-2010 Apr-Sep AR5 CMIP5 subset



mean rcp85 precipitation 2021-2100 minus 1981-2010 Apr-Sep full CMIP5 ensemble



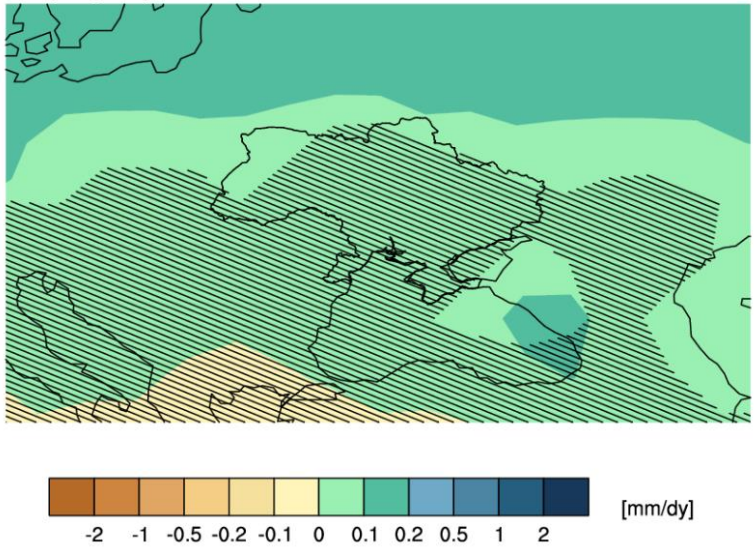
Precipitation

The hatching represents areas where the signal is smaller than one standard deviation of natural variability

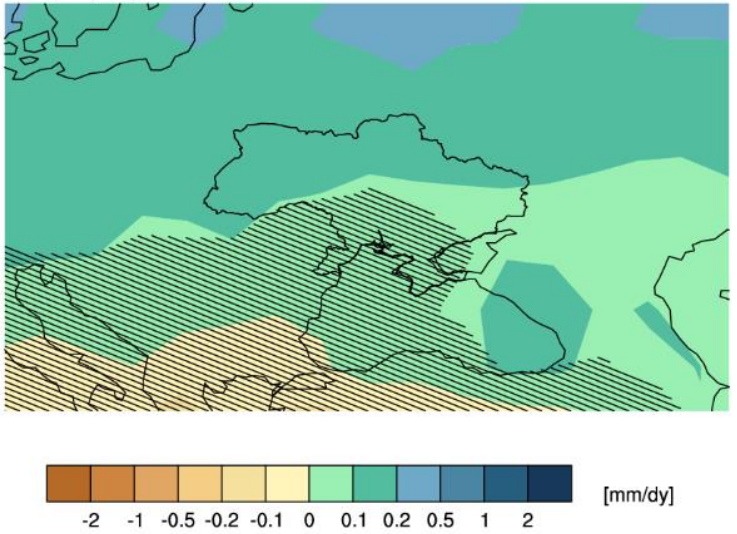
Cold period

mean rcp45 precipitation 2021-2100 minus 1981-2010 Oct-Mar full CMIP5 ensemble.

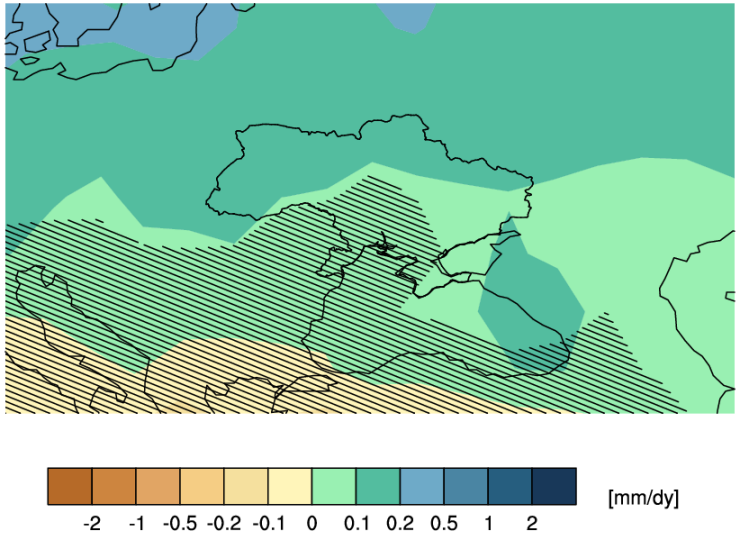
mean rcp26 precipitation 2021-2100 minus 1981-2010 Oct-Mar AR5 CMIP5 subset



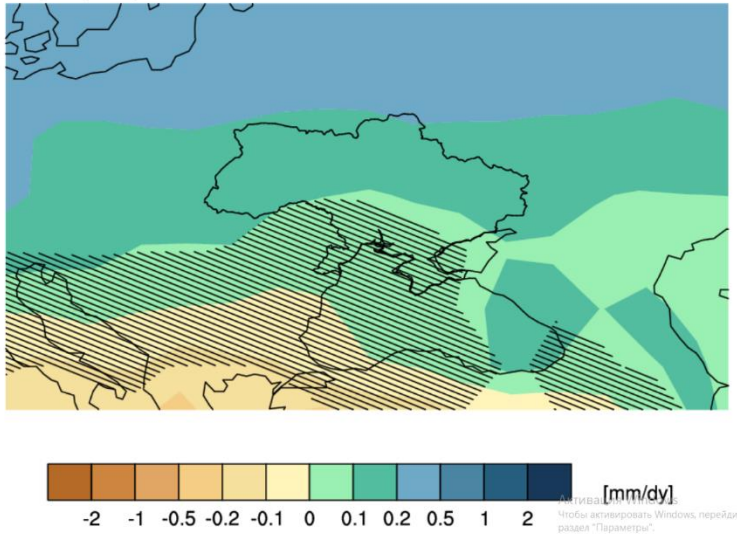
mean rcp45 precipitation 2021-2100 minus 1981-2010 Oct-Mar AR5 CMIP5 subset



mean rcp60 precipitation 2021-2100 minus 1981-2010 Oct-Mar AR5 CMIP5 subset



mean rcp85 precipitation 2021-2100 minus 1981-2010 Oct-Mar full CMIP5 ensemble

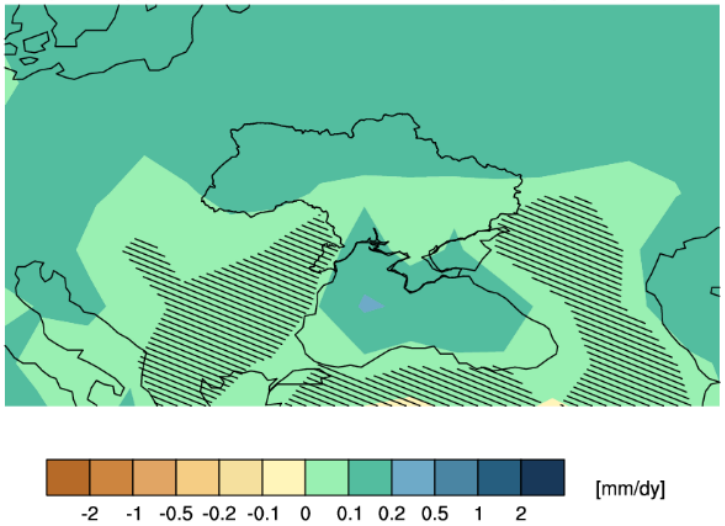


Evaporation

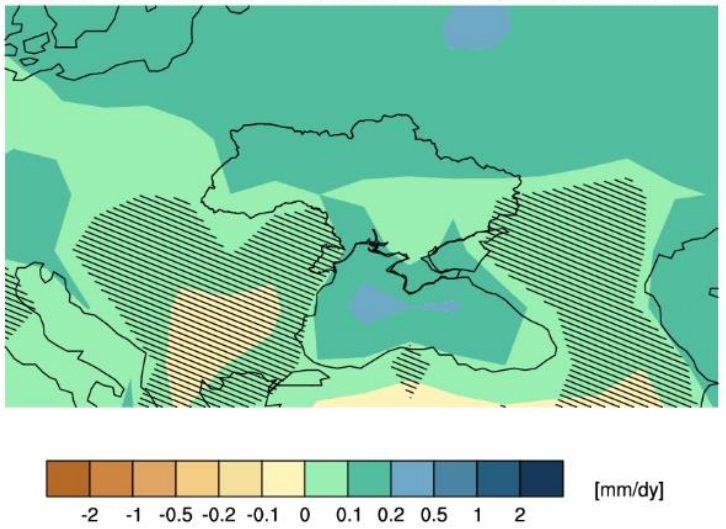
mean rcp45 evaporation 2021-2100 minus 1981-2010 Apr-Sep AR5 CMIP5 subset. The hatching represents areas where the signal is smaller than one standard deviation of natural variability

Warm period

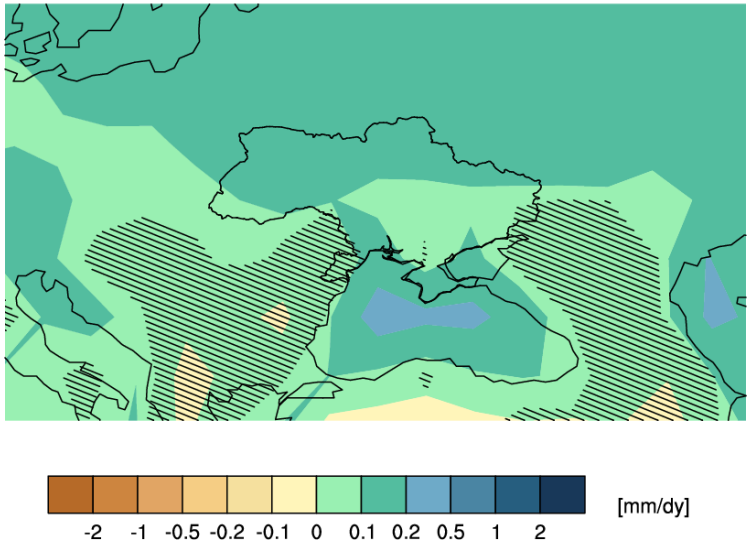
mean rcp26 evaporation 2021-2100 minus 1981-2010 Apr-Sep AR5 CMIP5 subset



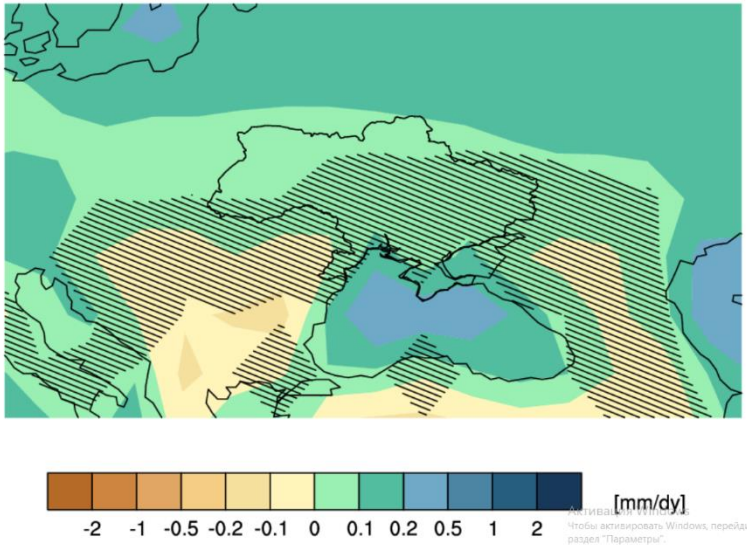
mean rcp45 evaporation 2021-2100 minus 1981-2010 Apr-Sep AR5 CMIP5 subset



mean rcp60 evaporation 2021-2100 minus 1981-2010 Apr-Sep AR5 CMIP5 subset



mean rcp85 evaporation 2021-2100 minus 1981-2010 Apr-Sep full CMIP5 ensemble

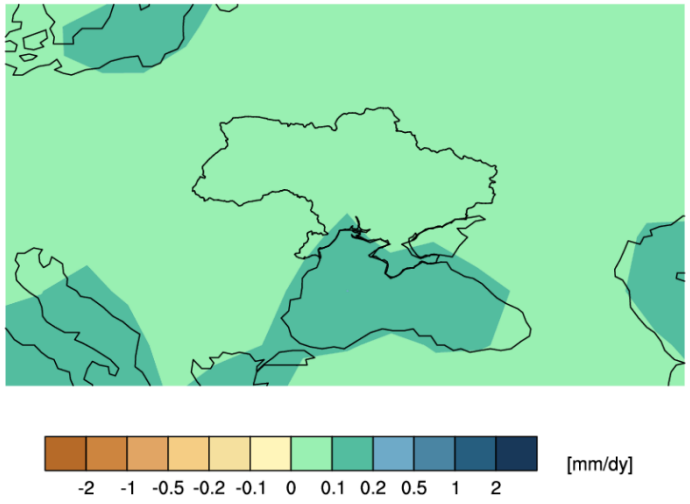


Evaporation

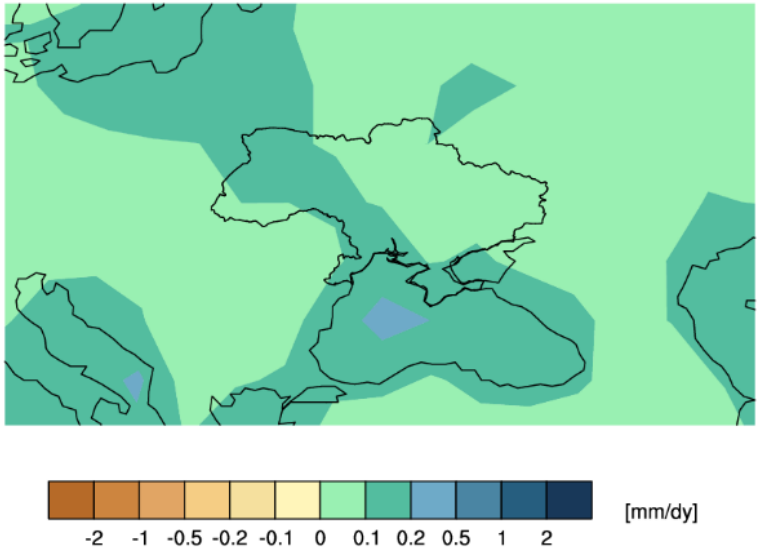
mean rcp45 evaporation 2021-2100 minus 1981-2010 Oct-Mar AR5 CMIP5 subset.

Cold period

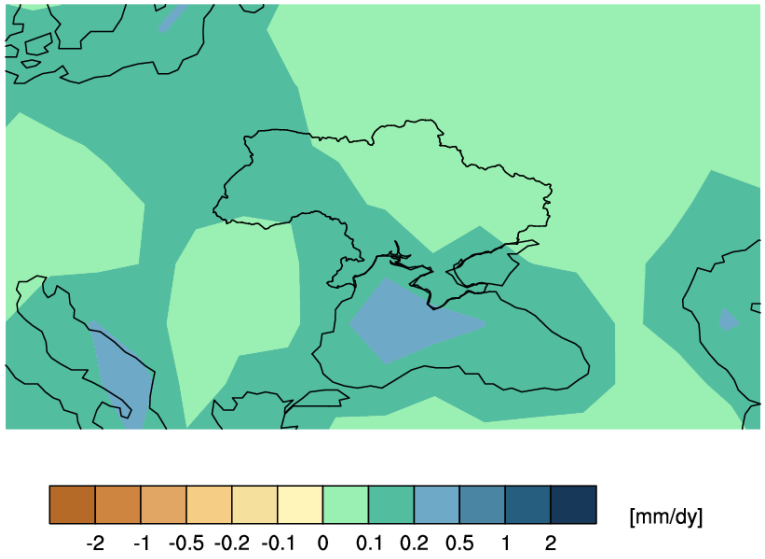
mean rcp26 evaporation 2021-2100 minus 1981-2010 Oct-Mar AR5 CMIP5 subset



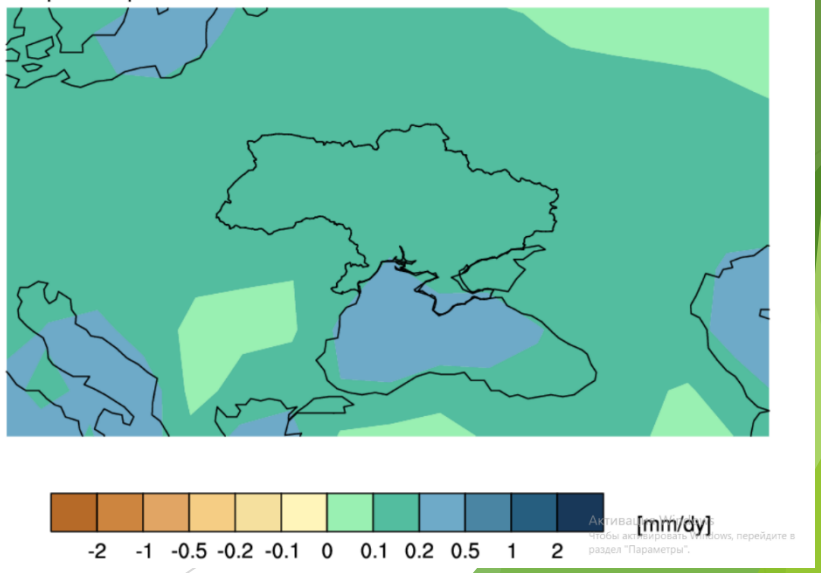
mean rcp45 evaporation 2021-2100 minus 1981-2010 Oct-Mar AR5 CMIP5 subset



mean rcp60 evaporation 2021-2100 minus 1981-2010 Oct-Mar AR5 CMIP5 subset



mean rcp85 evaporation 2021-2100 minus 1981-2010 Oct-Mar full CMIP5 ensemble

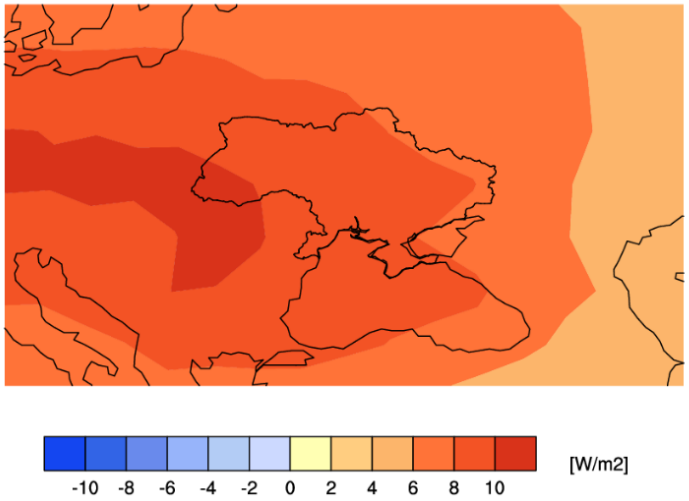


Surface solar radation

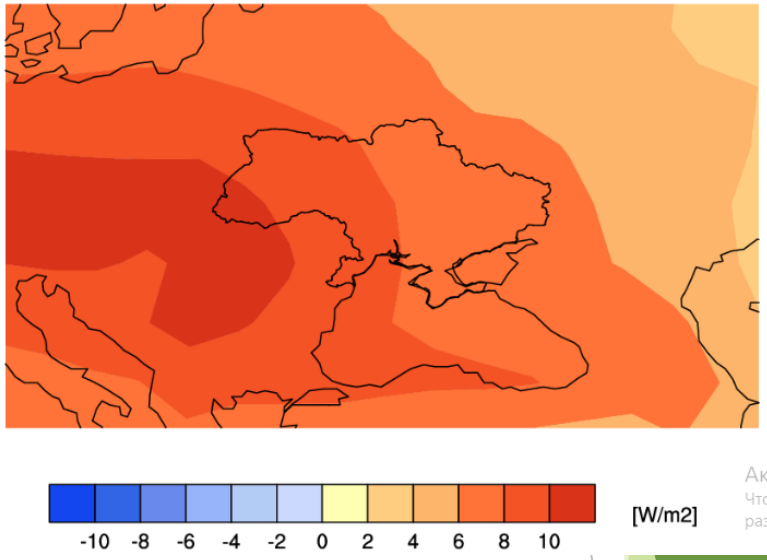
Warm period

mean rcp45 surface solar radation 2021-2100 minus 1981-2010 Aprt-Sep AR5 CMIP5

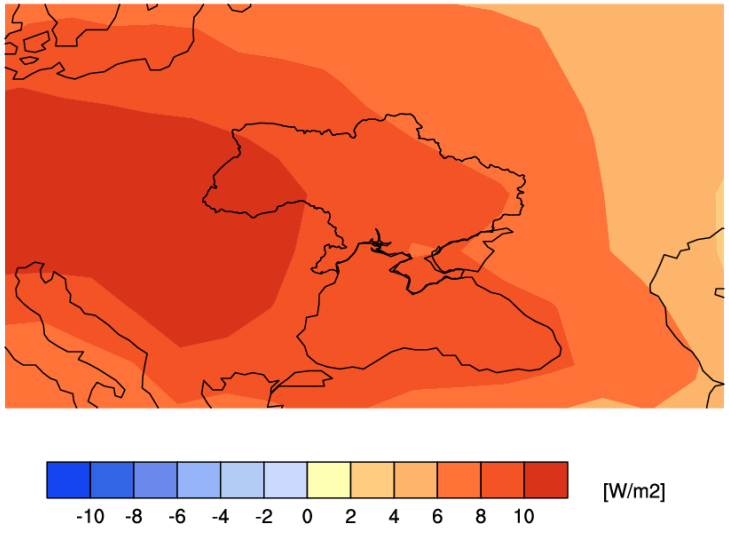
mean rcp26 surface solar radation 2021-2100 minus 1981-2010 Apr-Sep AR5 CMIP5 subset



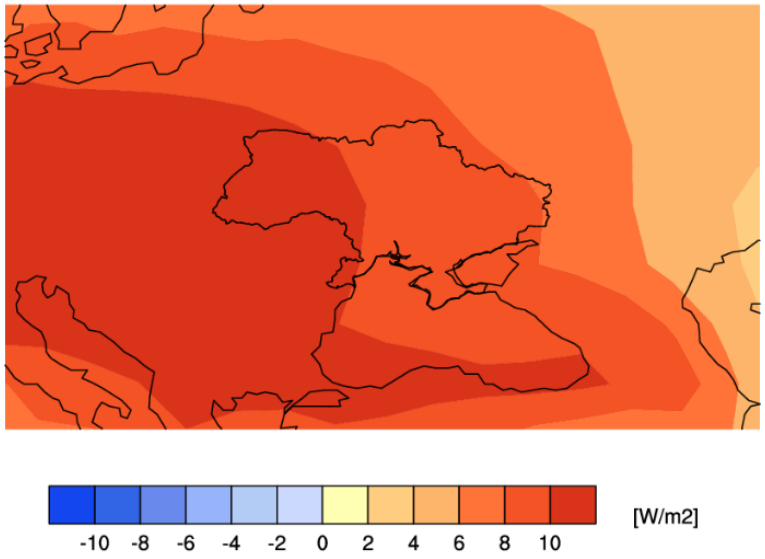
mean rcp45 surface solar radation 2021-2100 minus 1981-2010 Apr-Sep AR5 CMIP5 subset



mean rcp60 surface solar radation 2021-2100 minus 1981-2010 Apr-Sep AR5 CMIP5 subset



mean rcp85 surface solar radation 2021-2100 minus 1981-2010 Apr-Sep AR5 CMIP5 subset

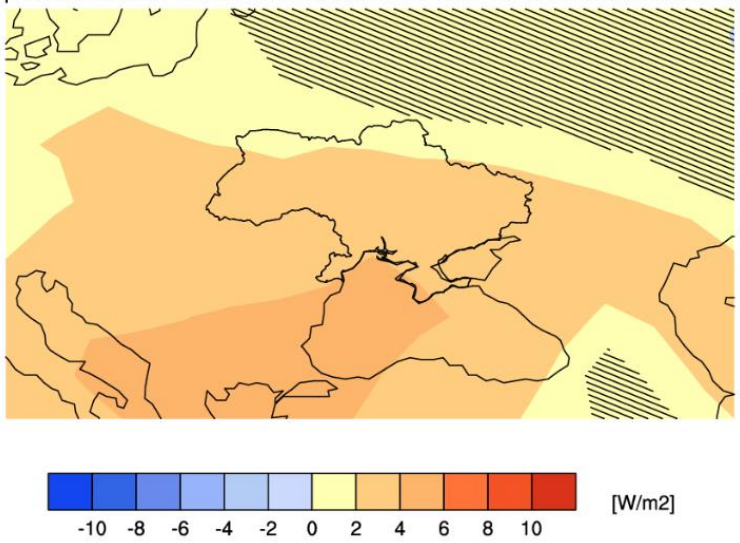


Surface solar radation

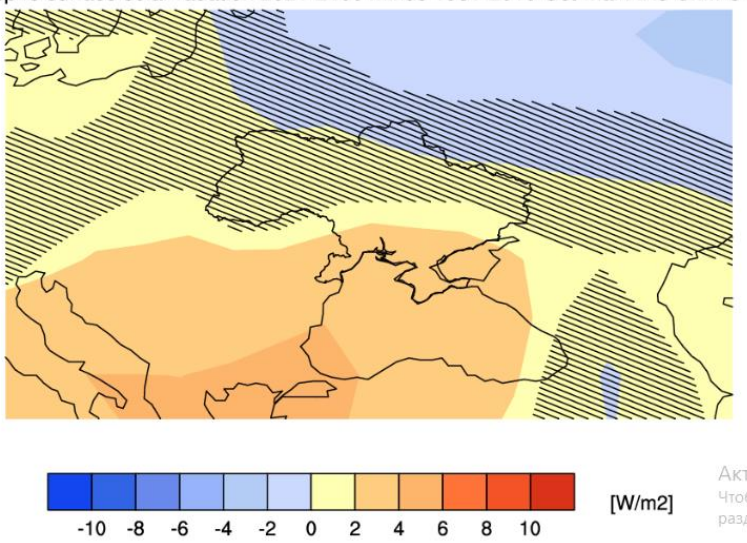
Cold period

mean rcp45 surface solar radation 2021-2100 minus 1981-2010 Oct-Mar AR5 CMIP5 subset. The hatching represents areas where the signal is smaller than one standard deviation of natural variability

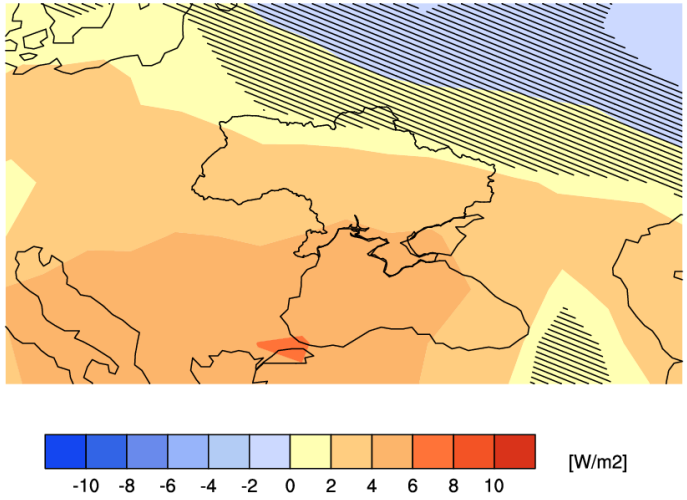
mean rcp26 surface solar radation 2021-2100 minus 1981-2010 Oct-Mar AR5 CMIP5 subset



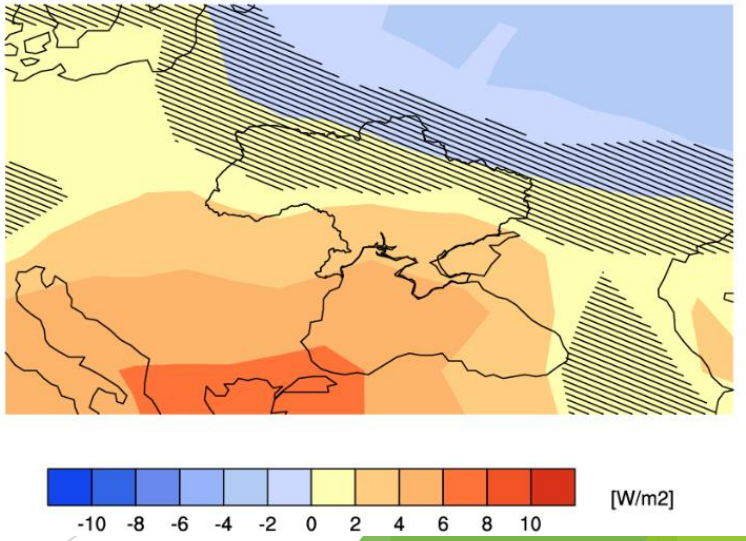
mean rcp45 surface solar radation 2021-2100 minus 1981-2010 Oct-Mar AR5 CMIP5 subset

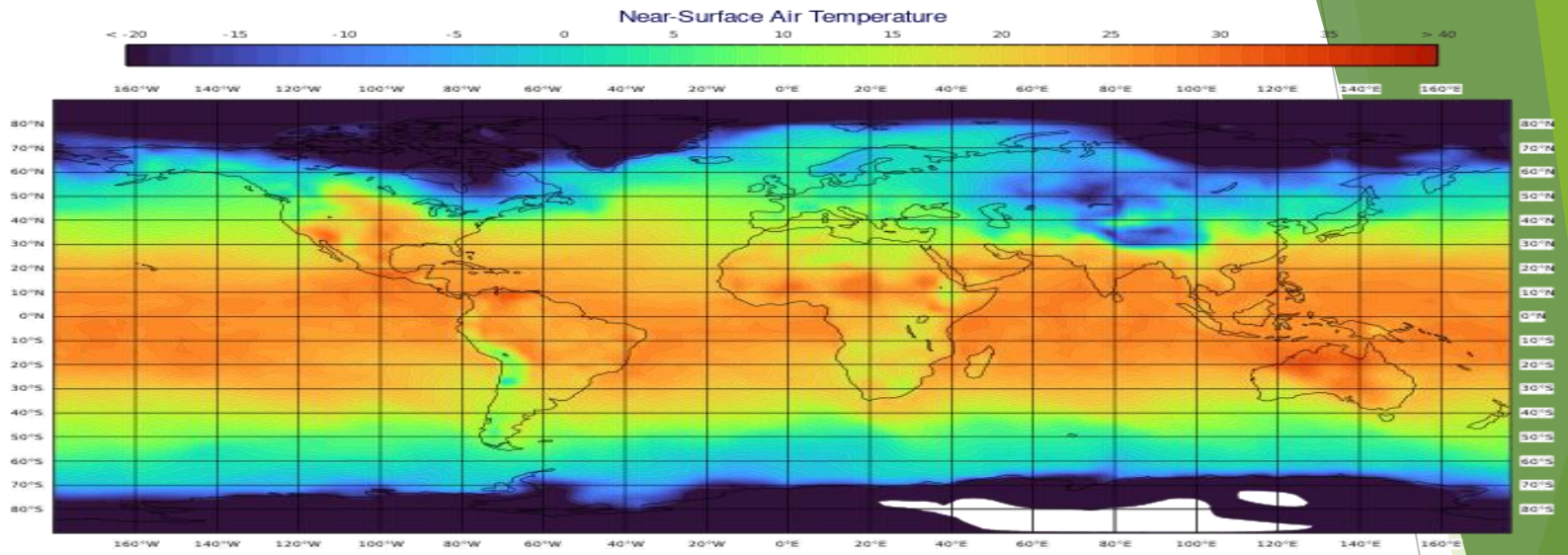


mean rcp60 surface solar radation 2021-2100 minus 1981-2010 Oct-Mar AR5 CMIP5 subset

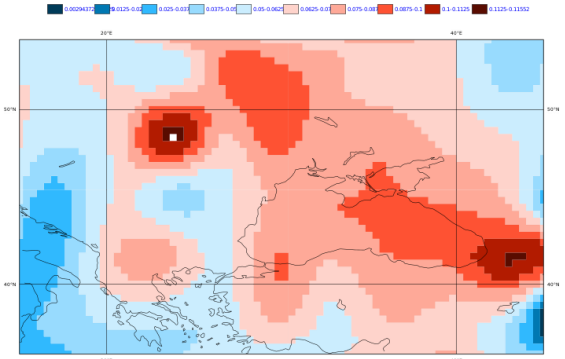


mean rcp85 surface solar radation 2021-2100 minus 1981-2010 Oct-Mar AR5 CMIP5 subset

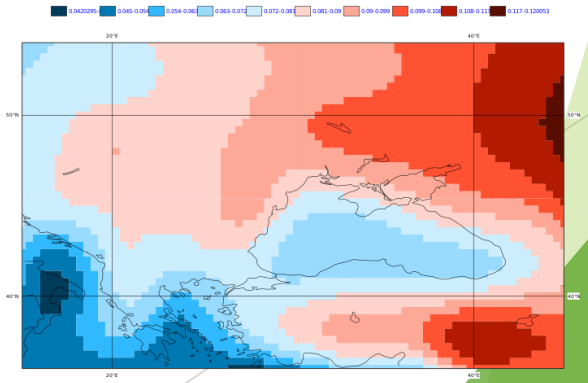




Surface temperature trend over the past 20 years (2000 - 2020)

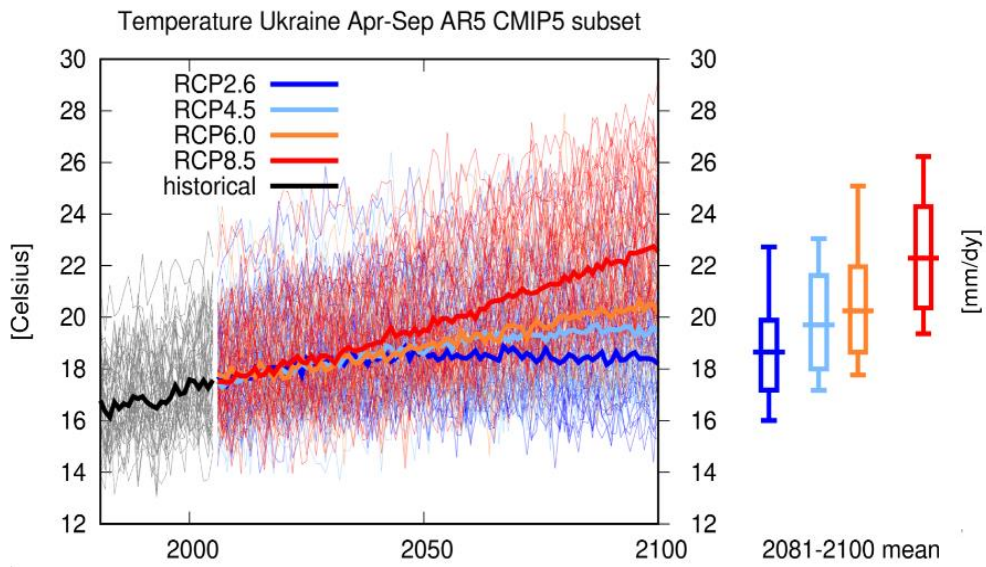


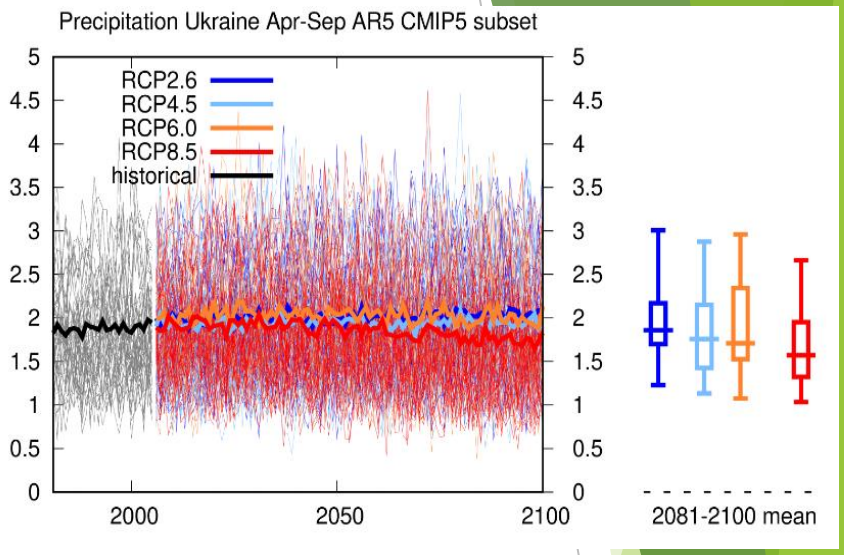
Standard temperature trend over the past 20 years (2000-2020)

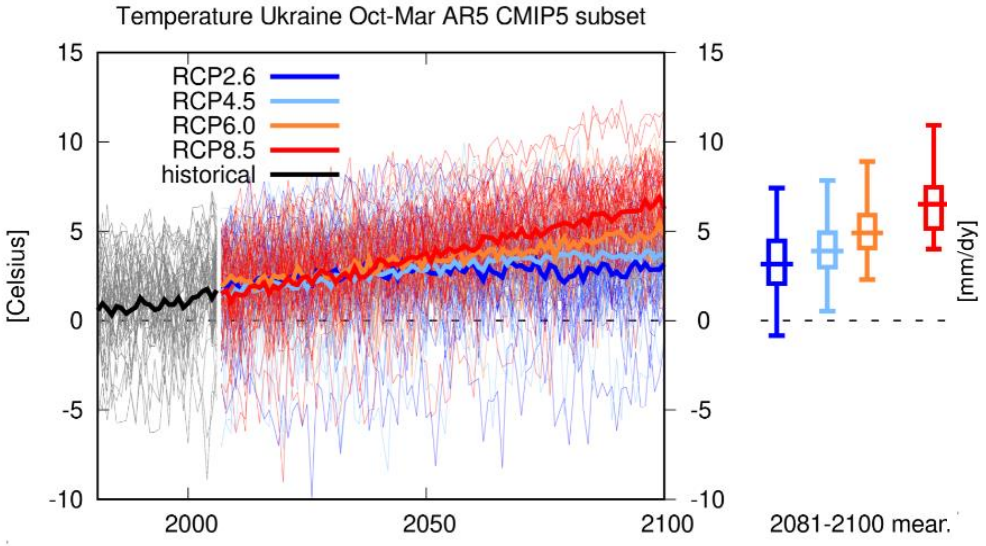


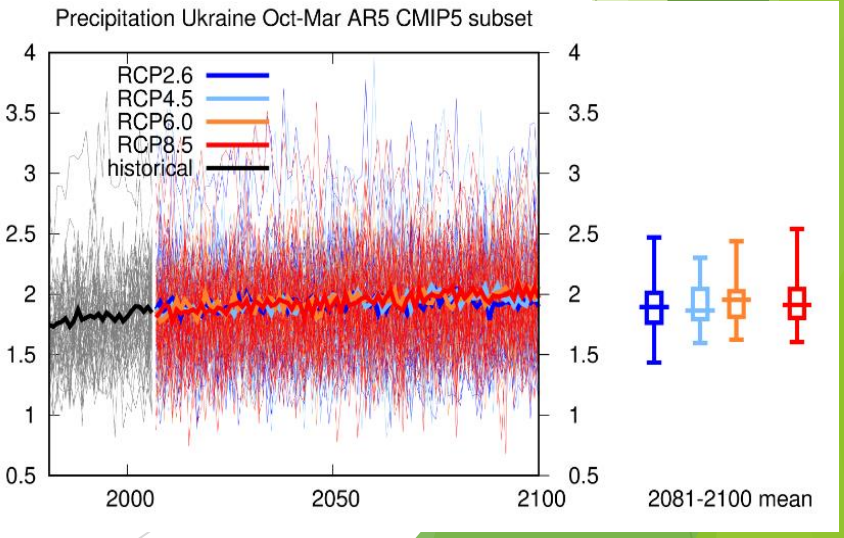
Temperature

Precipitation









Thank you for the attention