CLIMA PROOF

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Department of Water, Atmosphere and Environment

WITH FUNDING FROM
AUSTRIAN DEVELOPMENT COOPERATION

The foundation of bias correction

Observational Datasets

UN environment

National Workshops

June 2019

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Introduction

Why are good observations important?

Garbage in → garbage out

- Bias correction algorithms are based on observations
- Model data is modified so that its statistical properties become the same as observations
- Bias correction of climate models with bad observations will not improve the data – results can be even worse
- Bias correction only makes sense when observations are better than the model

Observational Datasets

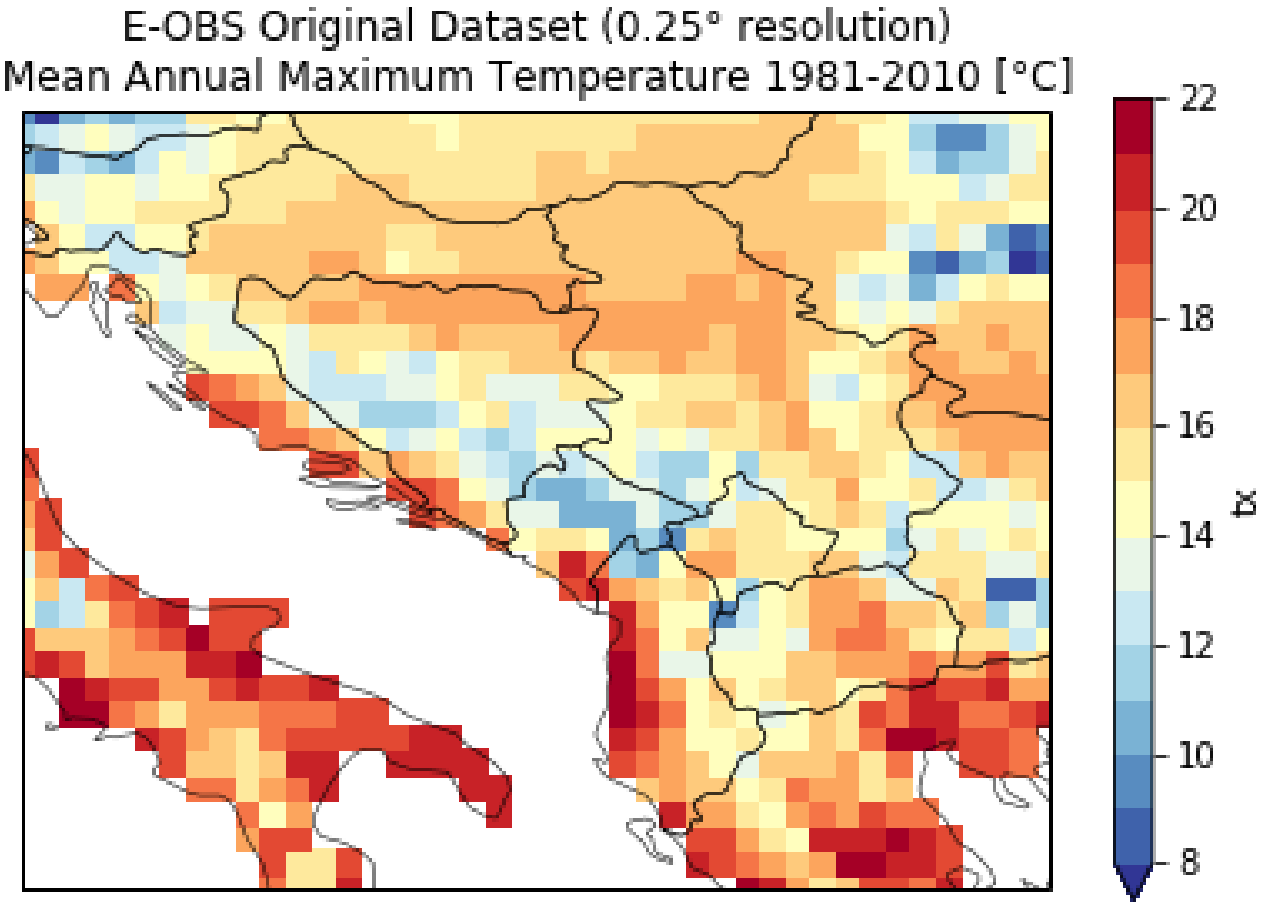
Overview of **best freely available gridded observational datasets** used within the Climaproof project:

- E-OBS
  - Temperature (max, min), Precipitation
- CHIRPS
  - Precipitation
- SARAH-2
  - Global Radiation
- Carpatclim / Danubeclim
  - Temperature, Precipitation, Radiation, Wind, Humidity,…
- ERA5 Reanalysis
  - Wind, Humidity, Temperature, Precipitation, Radiation,…

E-OBS (Heylock et al., 2018)

- Based on the European Climate Assessment and Data (ECA&D) and data provided by National Meteorological and Hydrological Services
- Freely available gridded dataset for
  - Temperature: minimum, maximum, mean
  - Precipitation amount
  - Sea level pressure
- Daily data for the period 1950 – 2017
- Resolution: 0.25° x 0.25°
- Expansion:
  - Lat. 25°N -75°N
  - Lon. 40°W-75°E
- Updated regularly
  - Version 17 used within Project – download via https://www.ecad.eu/download/ensembles/download.php
- Quality is limited by the number of station data provided by each country

E-OBS (Heylock et al., 2018)



CHIRPS (Funk et al., 2015)

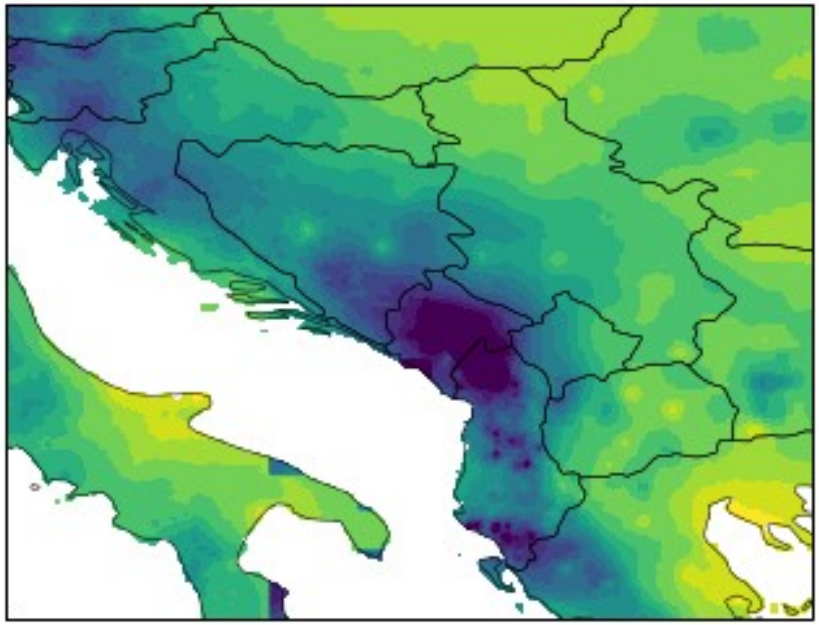
CHIRPS = Climate Hazards Group InfraRed Precipitation with Station data

- Incorporates 0.05° resolution satellite imagery with in-situ station data to create gridded rainfall time series

- Daily data from 1981 - near present
- Resolution: 0.05° x 0.05°
- Expansion:
  - Lat. 50°N – 50°S
  - Lon. 180°W – 180°E

Comparison E-OBS & CHIRPS

CHIRPS Original Dataset (0.05° resolution)
Mean Annual Precipitation 1981-2010 [mm]



E-OBS Original Dataset (0.25° resolution)
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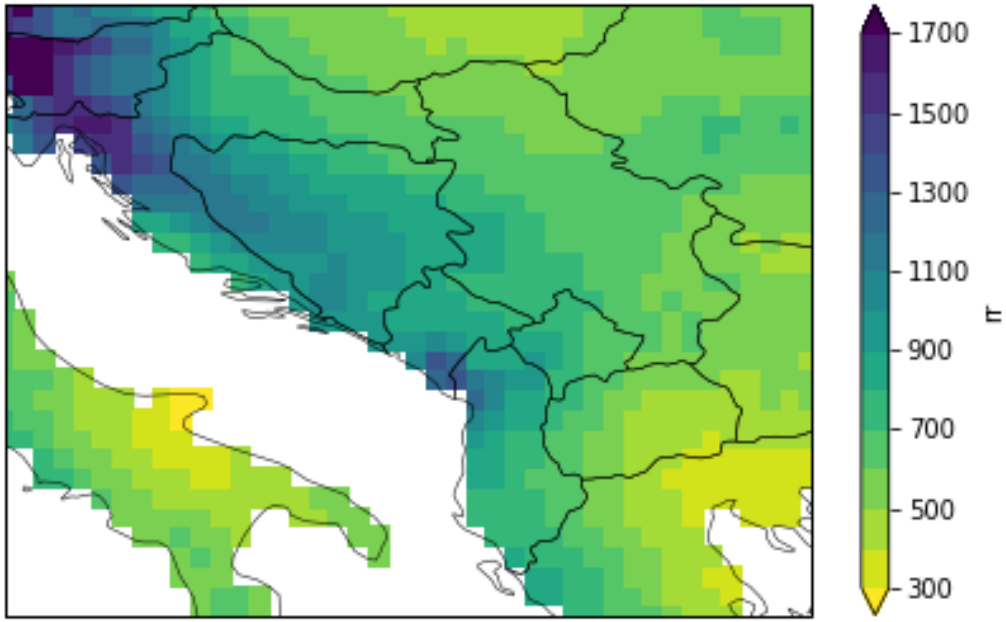


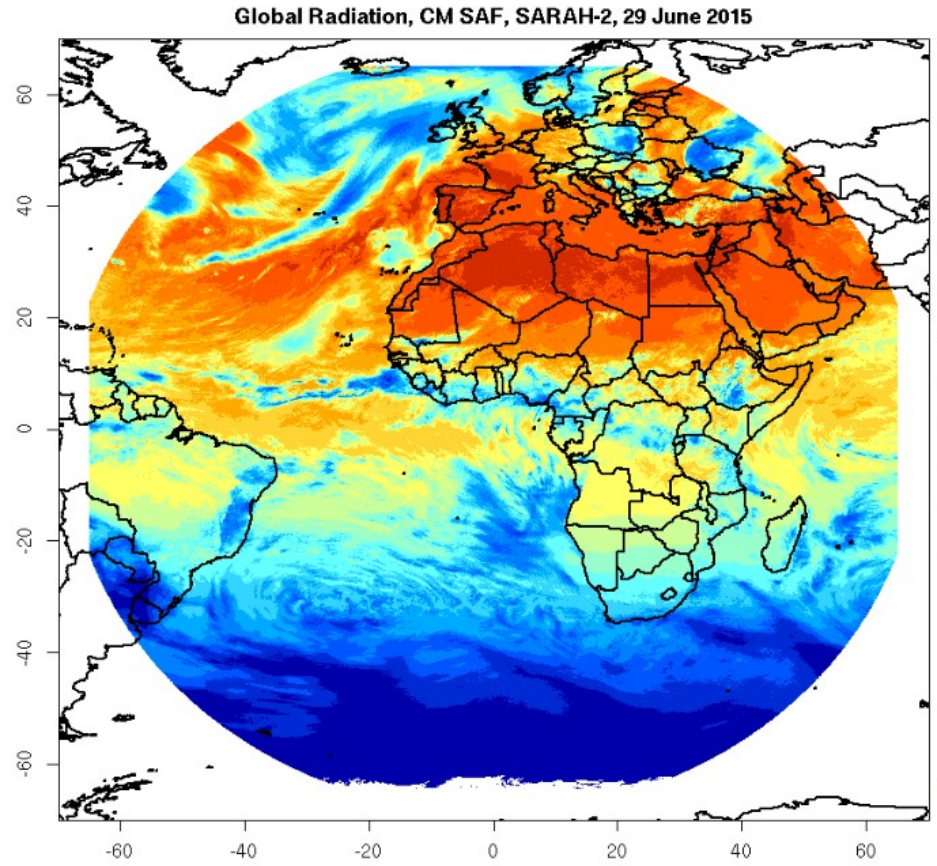
SARAH-2

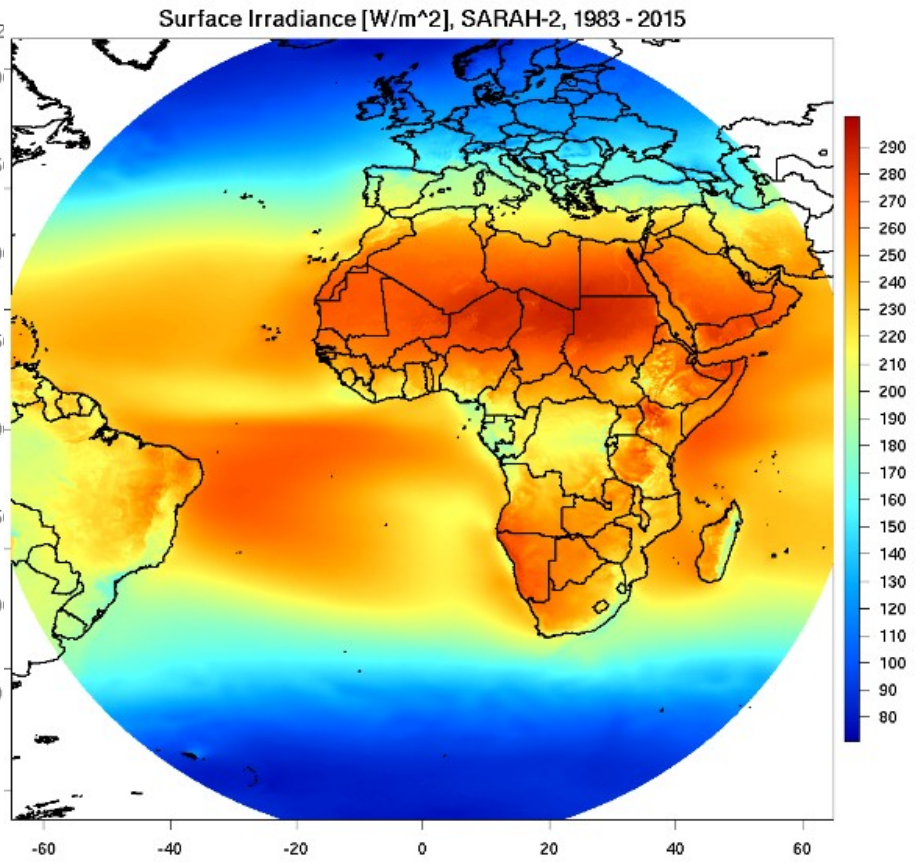
SARAH-2 = Surface Solar Radiation Data Set – Heliosat – Edition 2

- geostationary Meteosat satellites
- Satellite-based climate data record of:
  - solar surface irradiance,
  - surface direct irradiance (direct horizontal and direct normalized),
  - sunshine duration,
  - spectral information, and
  - effective cloud albedo

- Monthly and daily means and 30-min instantaneous data
- Time period: 1983 – 2015
- Expansion: lat ± 65°; lon ± 65°
- Resolution: 0.05° grid

SARAH-2





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ERA5 (ECMWF, 2016)

5th generation of ECMWF atmospheric reanalysis

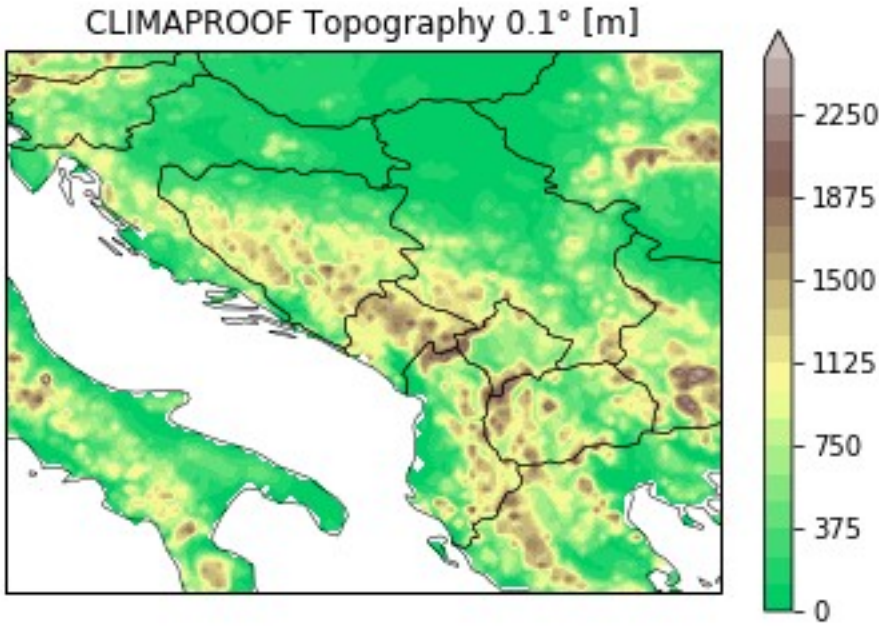
- Reanalysis combines model data with observations into a complete and consistent dataset using the laws of physics (data assimilation)
- ERA5 will replace the ERA-Interim reanalysis

- Covers the period from 1979 – near present
- Hourly data
- Resolution: 0.28° x 0.28°
- Expansion: global

Common Grid

- 0.1° x 0.1° resolution
- Projection: WSG 1984

- Created from NOAA GLOBE Digital Elevation Model (30-arc-seconds resolution) by selecting every 12th grid point
  - Points from CARPATCLIM domain overwritten with height of dataset
- Same grid type used in CARPATCLIM → no interpolation of these datasets needed



Getting Final Observations

Regridding to common grid

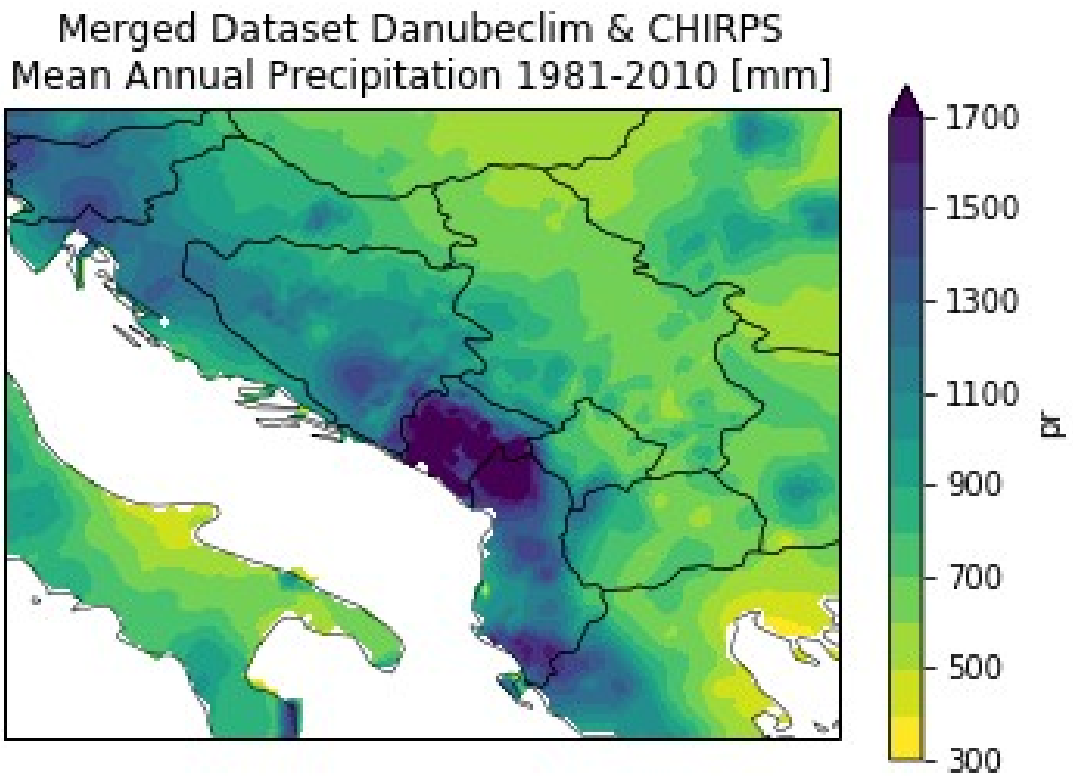
- Method based on the Earth System Modelling Framework (ESMF) software ESMF_RegridWeightGen (implemented in NCL)
  - Can handle different kinds of grid projections
- Patch-method: ESMF version of a technique called "patch recovery" commonly used in finite element modelling
  - Better results than inverse distance interpolation

Merging datasets

- Temperature: Carpatclim & E-OBS
- Precipitation: Danubeclim & CHIRPS
- Radiation: Carpatclim & SARAH
- Wind: Carpatclim & ERA-5
- Humidity: Carpatclim & ERA-5

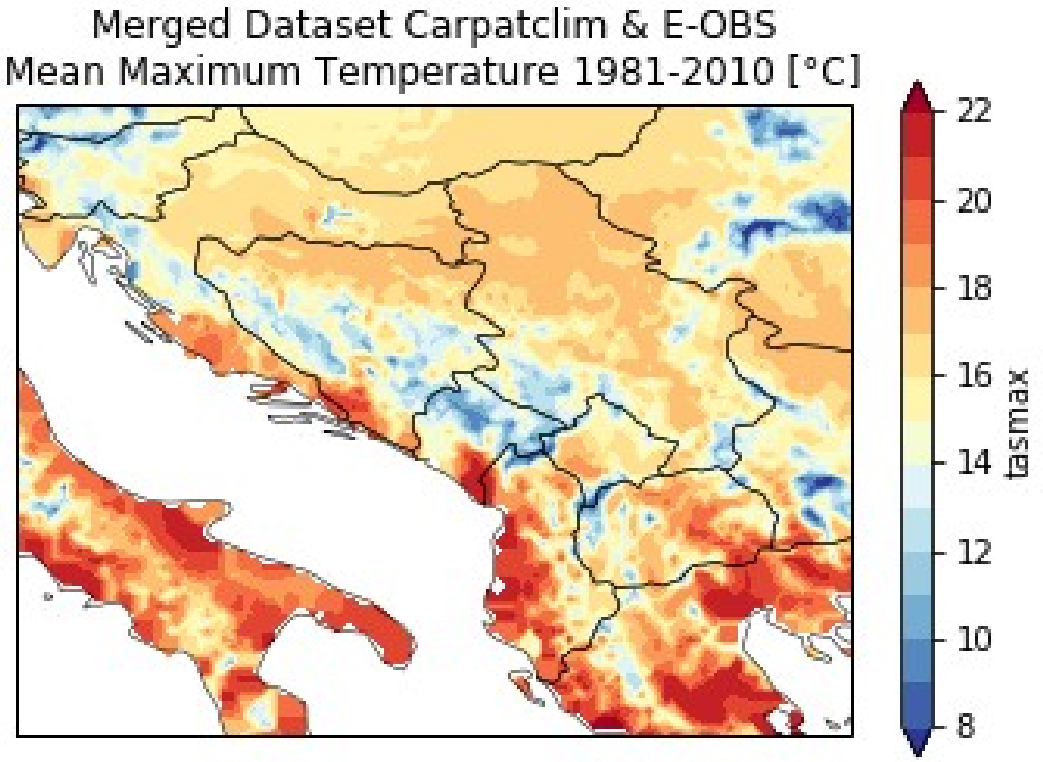
Final Datasets: Precipitation

Merged CHIRPS and DANUBECLIM data



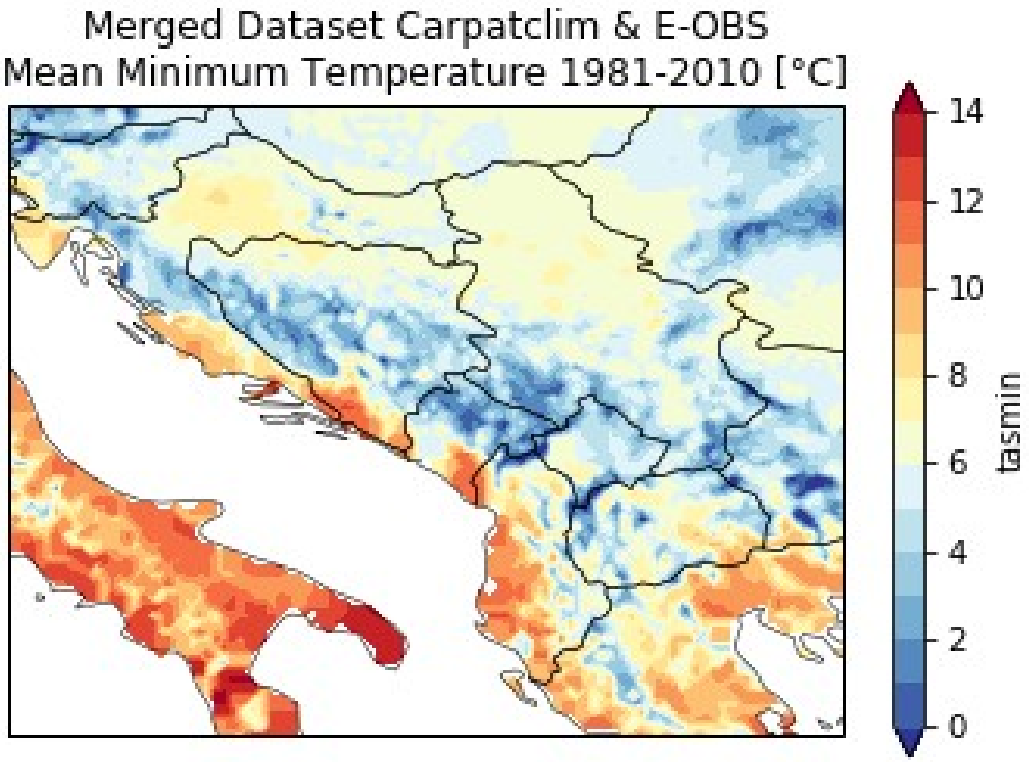
Final Datasets: Maximum Temperature

Merged E-OBS and CARPATCLIM data



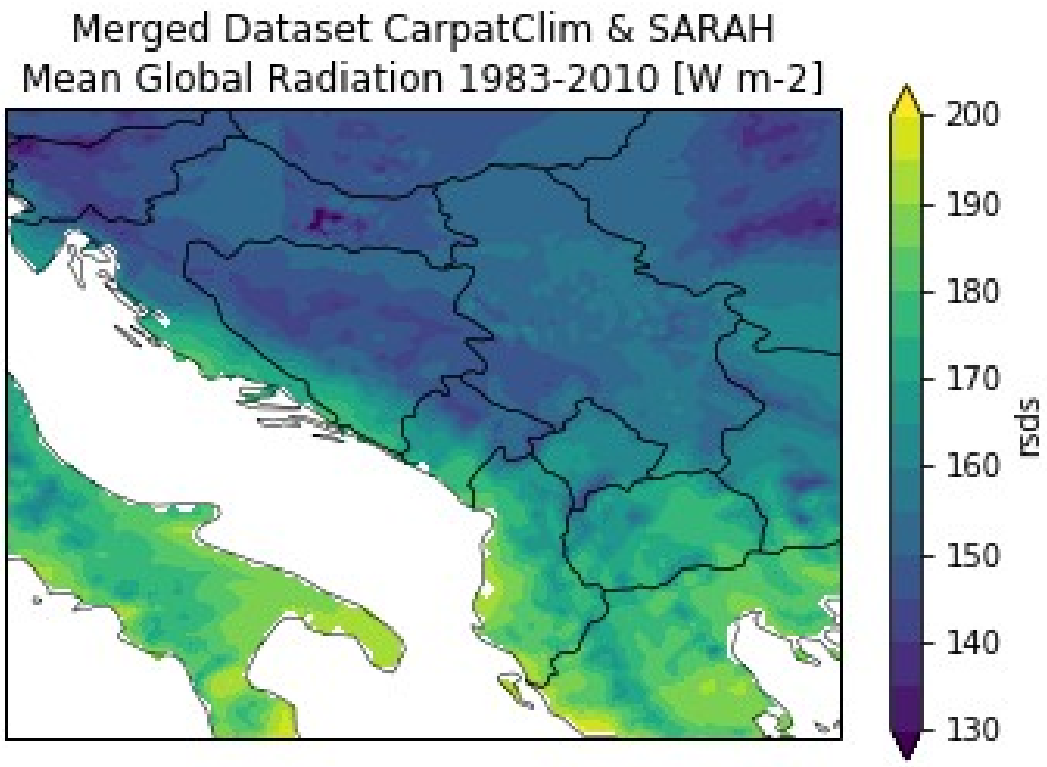
Final Datasets: Minimum Temperature

Merged E-OBS and CARPATCLIM data



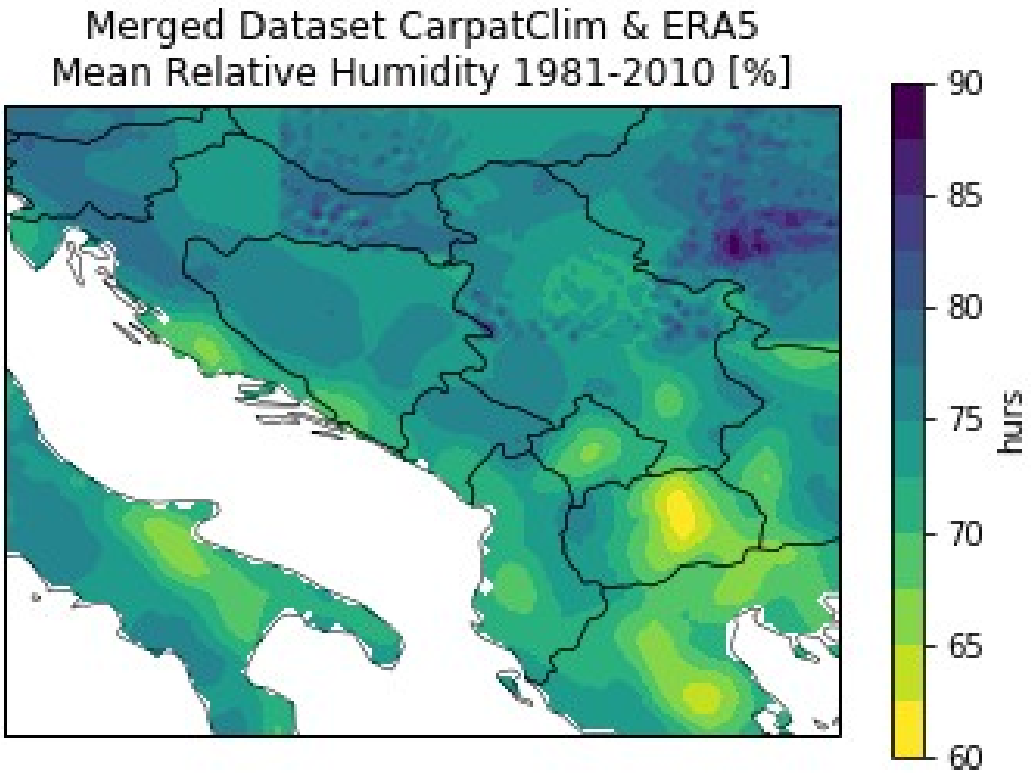
Final Datasets: Global Radiation

Merged SARAH and CARPATCLIM data



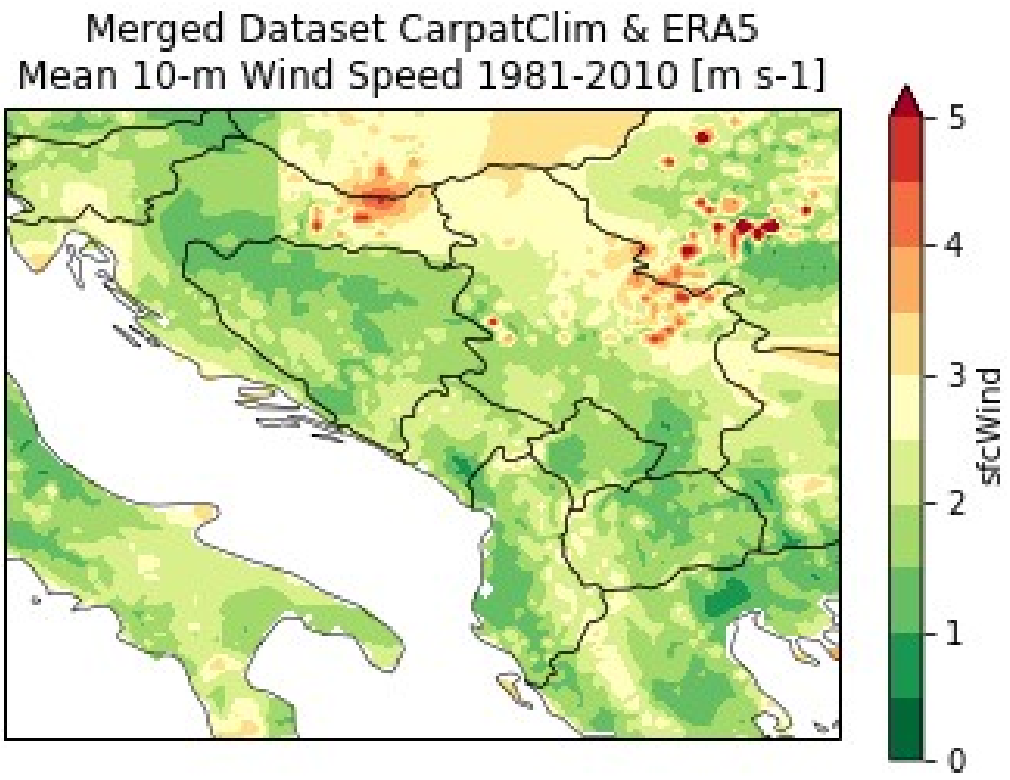
Final Datasets: Relative Humidity

Merged ERA5 and CARPATCLIM data



Final Datasets: Wind Speed

Merged ERA5 and CARPATCLIM data



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