D.3.4.1 – Regional high-resolution Hydrological Maps

Document Control Sheet

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Work Package Title	Modelling present and future salt ingression in Adriatic coastal aquifers
Work Package number	3
Work Package Leader	University of Urbino “Carlo Bo” – (UNIURB)

Status	Final
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1. Introduction

Besides the hydrogeological setting, which has been considered to design the vulnerability scenarios contained in deliverable 3.2.3., precipitations are the most important natural factor controlling the dynamics of aquifers on short term time scales. In order to outline the evolution of vulnerability profiles of coastal aquifers, the definition of future precipitation scenarios is, hence, a key aspect. In this activity, the climatic scenarios are modelled by taking into account the worst-case emission scenario (RPC 8.5 of IPCC 2014) projected for the time interval 2070-2100. The goal of this activity is to provide a prediction for this important boundary condition that will be integrated with the actual local relative sea level change derived with the inter-related activity 3.3. and designed to predict the local response in terms of saline intrusion.

2. Methodological approach

Maps of the future change in selected climate variables (daily minimum and maximum temperature and daily cumulated precipitation) and some climate-extreme indices (such as intense precipitation or dry spell length) defined by Expert Team on Climate Change Detection Indices (ETCCDI) have been produced.

The future change is defined as the difference between a future 30-year climatology (average of the period 2071-2100) and a historical climatology (1976-2005), calculated from an ensemble of global climate models (GCMs) driving an ensemble of regional climate models (RCMs) as part of the WCRP Coordinated Regional Downscaling Experiment (CORDEX), considering in particular the EURO-CORDEX initiative which provides regional climate projections for Europe at 0.11 degrees (EUR-11, ~12 km) spatial resolution. Future projections are evaluated under the RCP8.5 Representative Concentration Pathways (RCPs) emission scenario (scenario characterized by increasing greenhouse gas emissions over time, for which anthropogenic radiative forcing reaches 8.5 W/m2 at year 2100 and continues to rise). When RCMs are driven by a large-scale global model, in addition to the uncertainties inherent in the specific RCM at hand, additional uncertainty is inherited from the driving GCM. In this study, results are presented for both the twelve model members and for their mean.

The considered ETCCDI indices are:

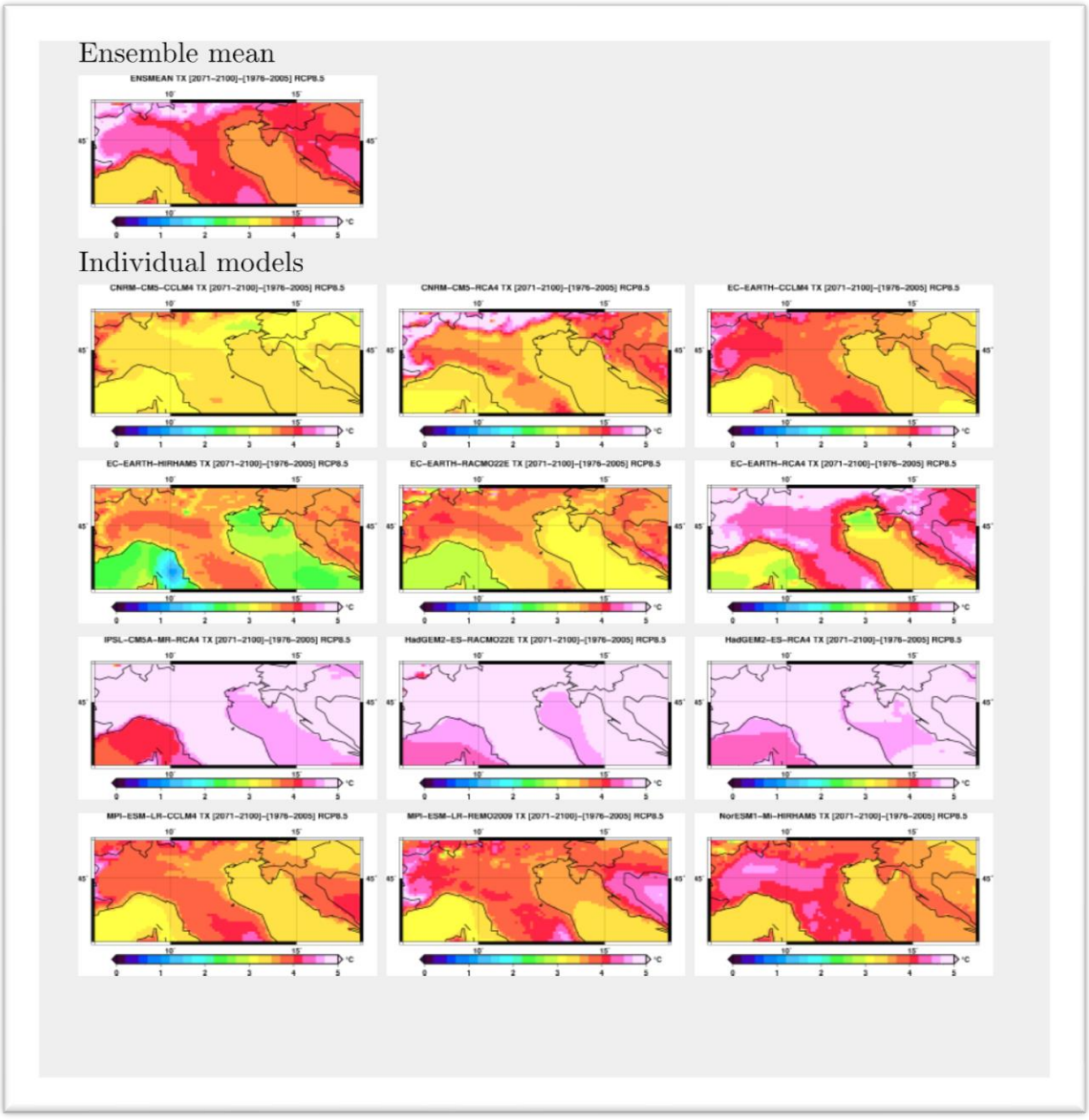
- CDD (the maximum number of consecutive dry days): the maximum length of a dry (daily precipitation < 1mm/day) spell in a year
- R95pTOT (precipitation due to extremely wet days): the total precipitation in a year cumulated over all days when daily precipitation is larger than the 95th percentile of daily precipitation on wet days (days with precipitation ≥ 1 mm/day).
- R20mm (heavy precipitation days): the number of days in a year with precipitation ≥ 20 mm/day.
- Rx5day (Highest 5-day precipitation amount): yearly maximum of cumulated precipitation over periods of consecutive 5 days.

3. Results

The results of the 12-model run and the mean ensemble for future changes in temperature and precipitation compared to the control time interval are reported in Annex 1.

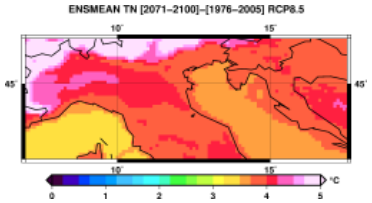
ANNEXES - Model based climatic indices

1. Maximum Temperature

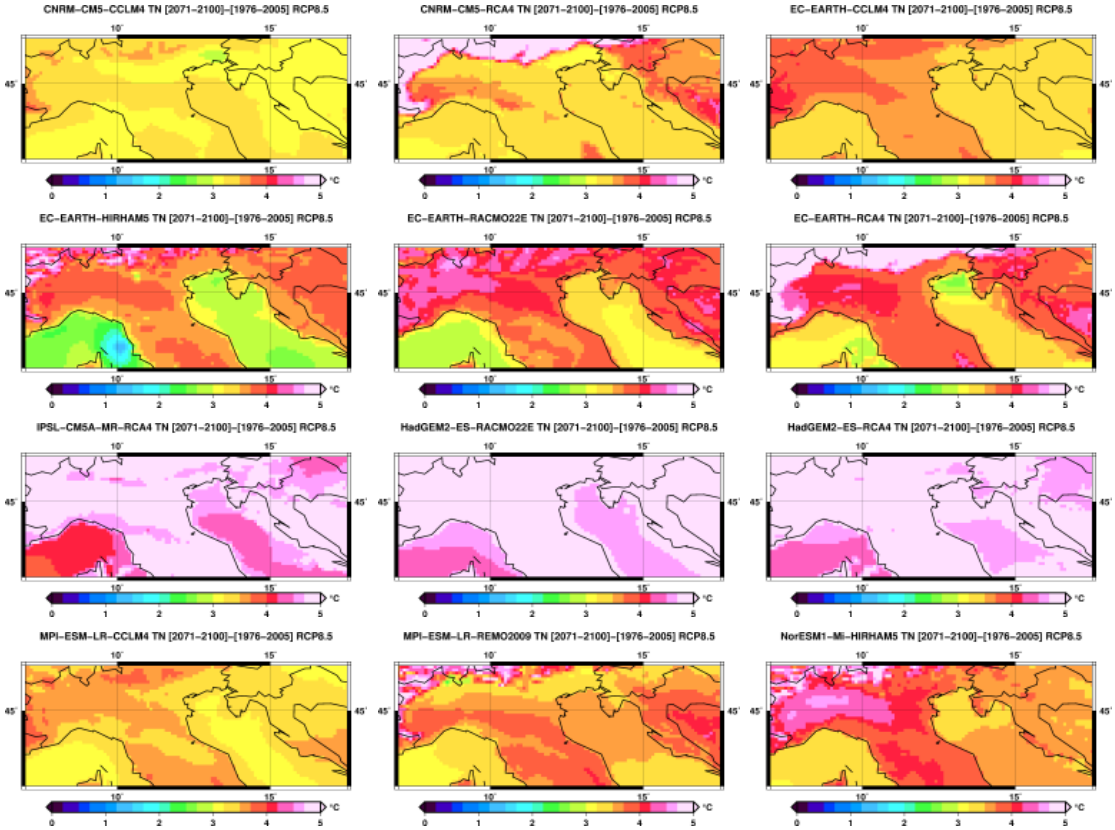


1.2 Minimum Temperature

Ensemble mean

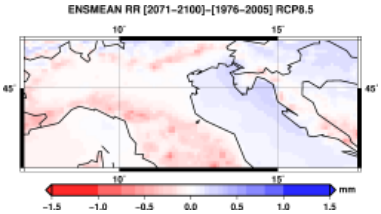


Individual models

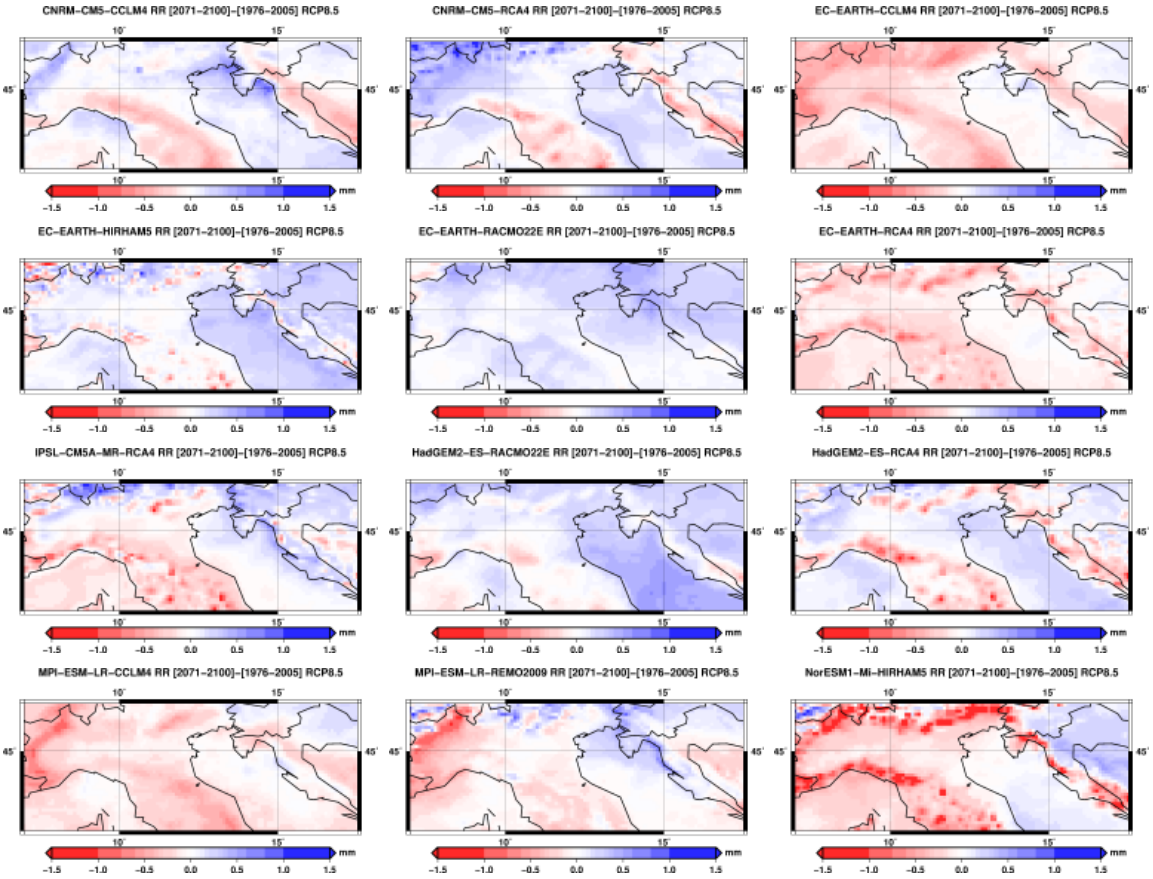


1.3 Precipitation

Ensemble mean



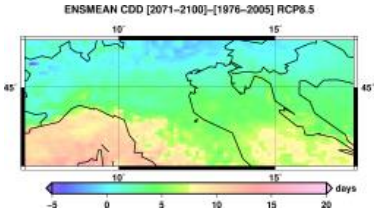
Individual models



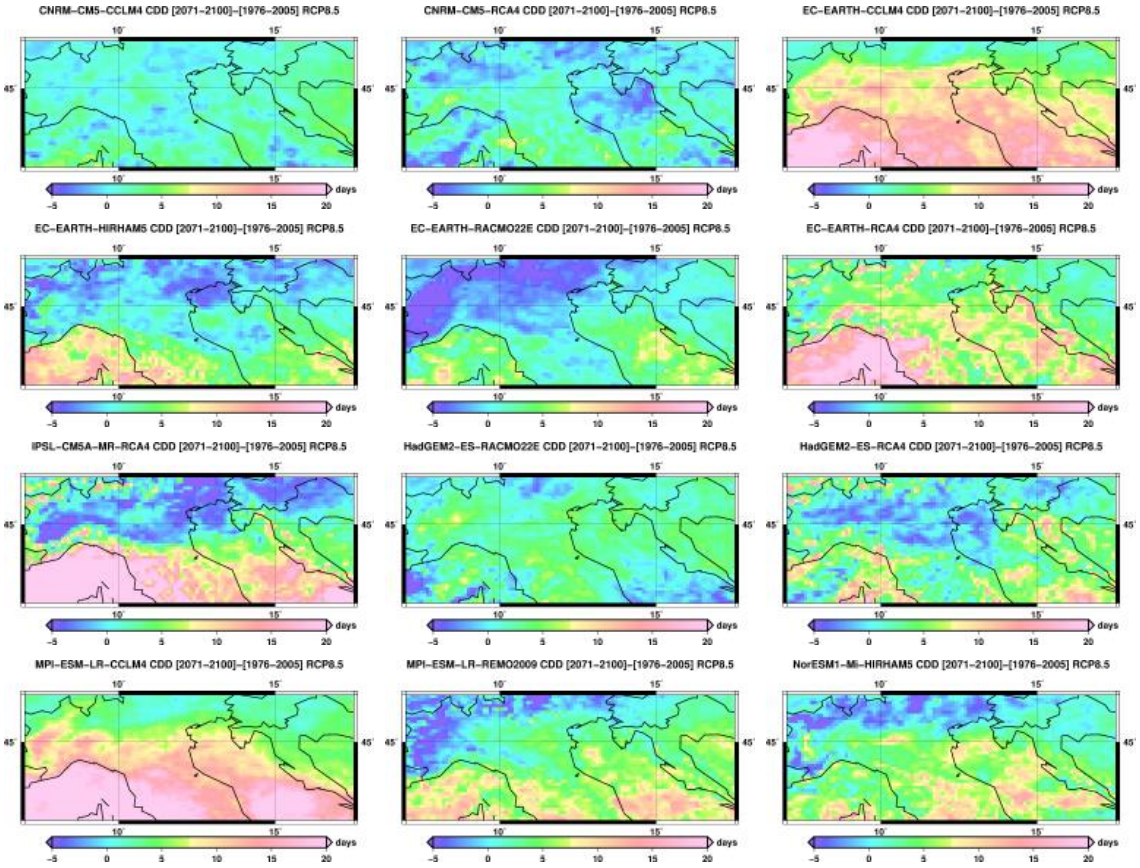
1.4. CDD-Consecutive dry days

Maximum length of a dry spell in a year, which is the maximum number in a year of consecutive dry days (precipitation < mm/day).

Ensemble mean



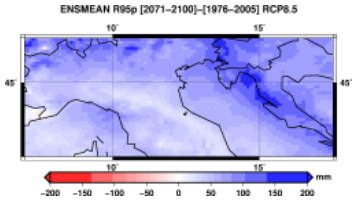
Individual models



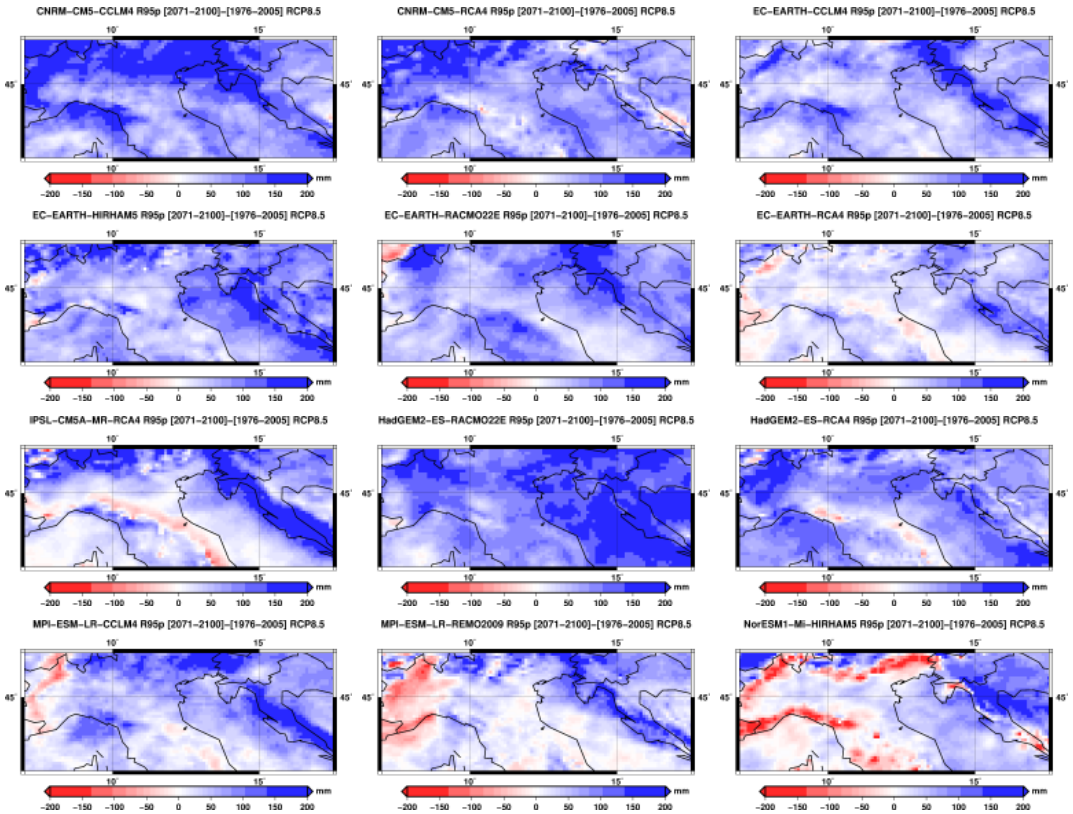
1.5. R95pTOT

The total precipitation in a year cumulated over all days when daily precipitation is larger than the 95th percentile of daily precipitation on wet days. A threshold based on the 95th percentile selects only 5% of the most extreme wet days over a 30-year long reference period

Ensemble mean

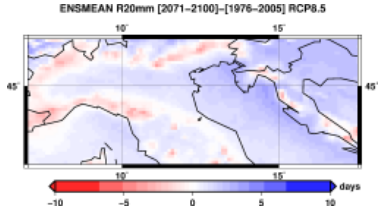


Individual models

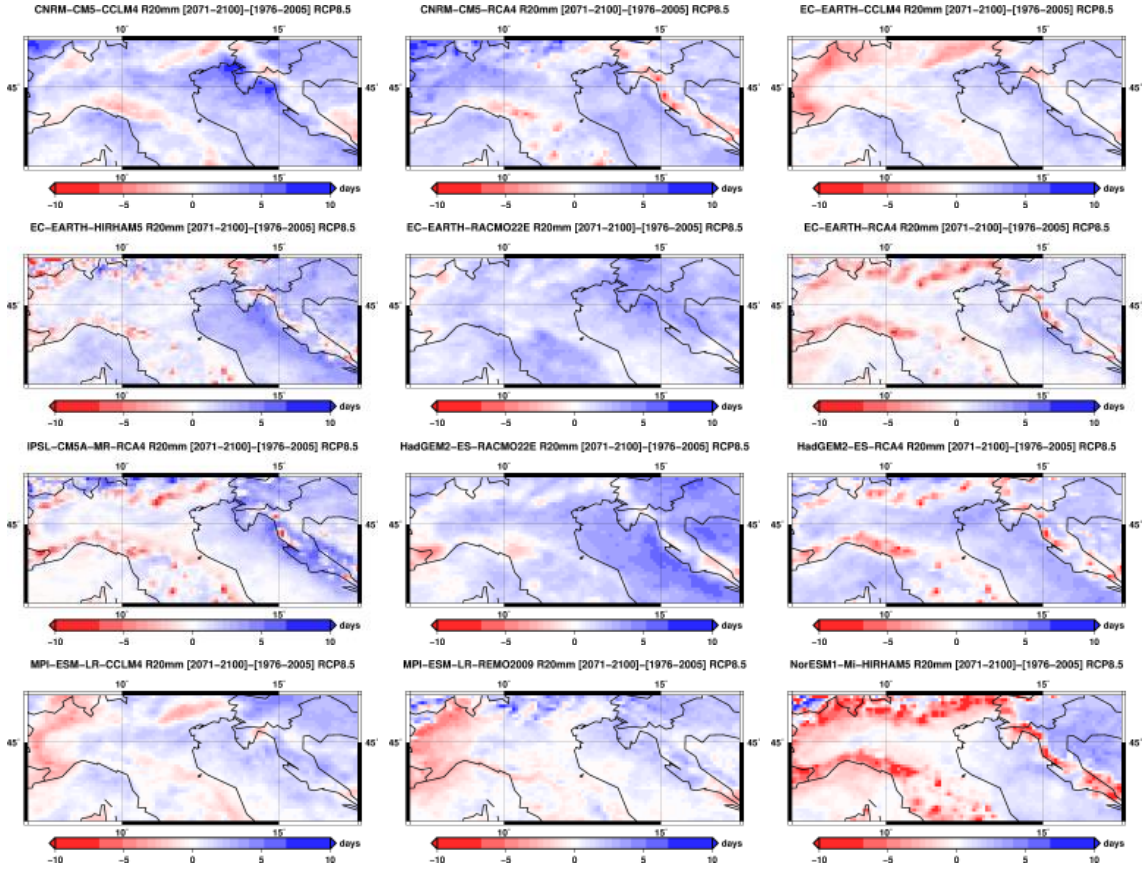


1.6. R20mm - Number of days in a year with precipitation greater than or equal to 20 mm/day

Ensemble mean

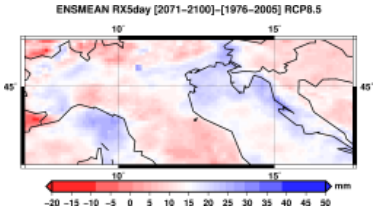


Individual models



1.7. Rx5day - Yearly maximum of cumulated precipitation over consecutive 5-day periods.

Ensemble mean



Individual models