Evaluation and Projection of Temperature and Precipitation Extremes in Canary Islands

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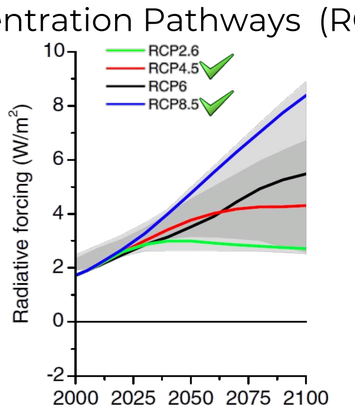
In this work, WRF (Weather Research and Forecasting) model was used to perform dynamical downscaling simulations, using the results from two different CMIP5 (Coupled Model Intercomparison Project Phase 5)-GCM models (GFDL and MIROC) for initial and boundary conditions. The simulations were carried out for three periods, a recent past period (1980-2010) and two in the future (2030-2060 and 2070-2100), and for two different greenhouse gases scenarios (RCP4.5 and RCP8.5), defined in the CMIP5.

Some of the indices defined by ETCCDI (Expert Team on Climate Change Detection and Indices) were selected to analyse the extreme temperature and precipitation events at present and their expected changes in the future periods. All these indices, obtained from WRF simulations, were compared, for the present period, with those computed from data acquired by weather stations located in the different islands, obtaining a good agreement, mainly for the MIROC-WRF experiment. The projections for the future periods show a general increase in events associated with maximum temperatures, such as the number of tropical nights, and a reduction of the return periods for extreme temperatures. However, the expected number of heavy precipitation events decrease in the future, contributing to a smaller amount of annual precipitation.

Regional climate model setup

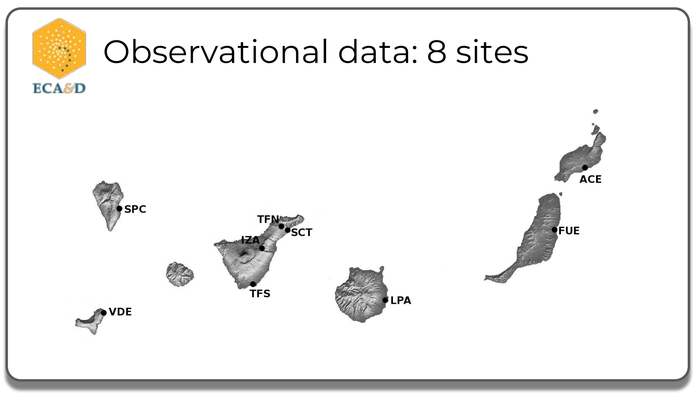
- Two Global Climate Models (GCMs)
  - GFDL-ESM2M
  - MIROC-ESM
- Two Representative Concentration Pathways (RCPs)

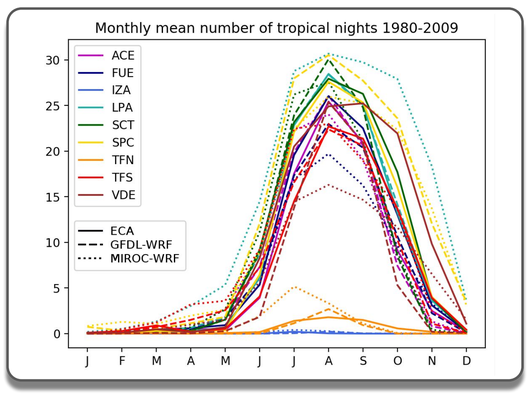


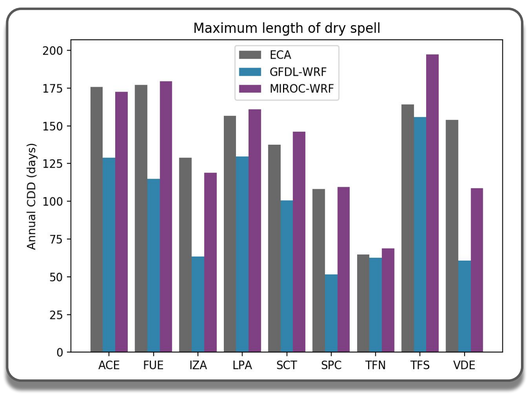
- Three nested domains

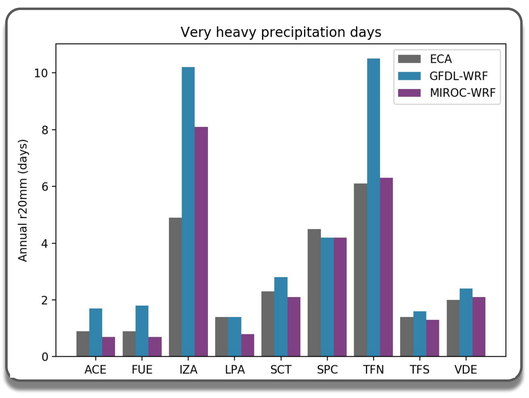
- Weather Research and Forecasting Model
  - 32 vertical levels
  - Micro-physics : WDM6
  - SW and LW radiation: CAM
  - PBL scheme: Yonsei University
  - Surface scheme: Noah
  - Cumulus: Kain Fritsch (D1 & D2)
  - 31 year simulations:
    - 1 year spin-up
    - Lateral and boundary conditions updated every six hours
    - Time-step: 15 s (D3).
  - Three periods:
    - 1980-2009, 2030-2059, 2070-2099

Results: Historical period (1980-2009)

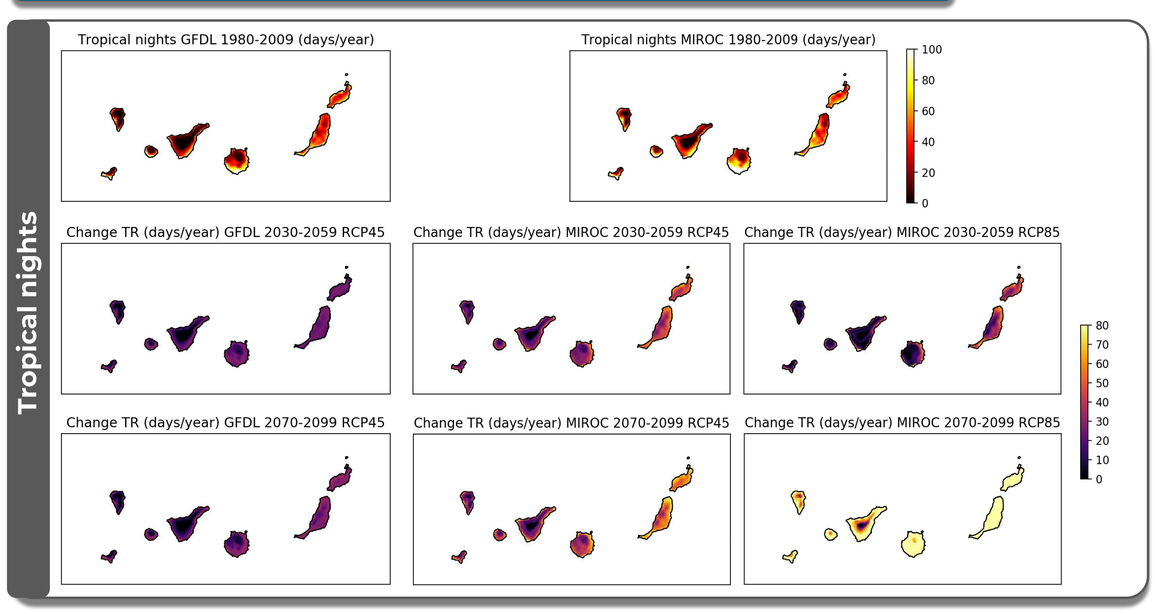


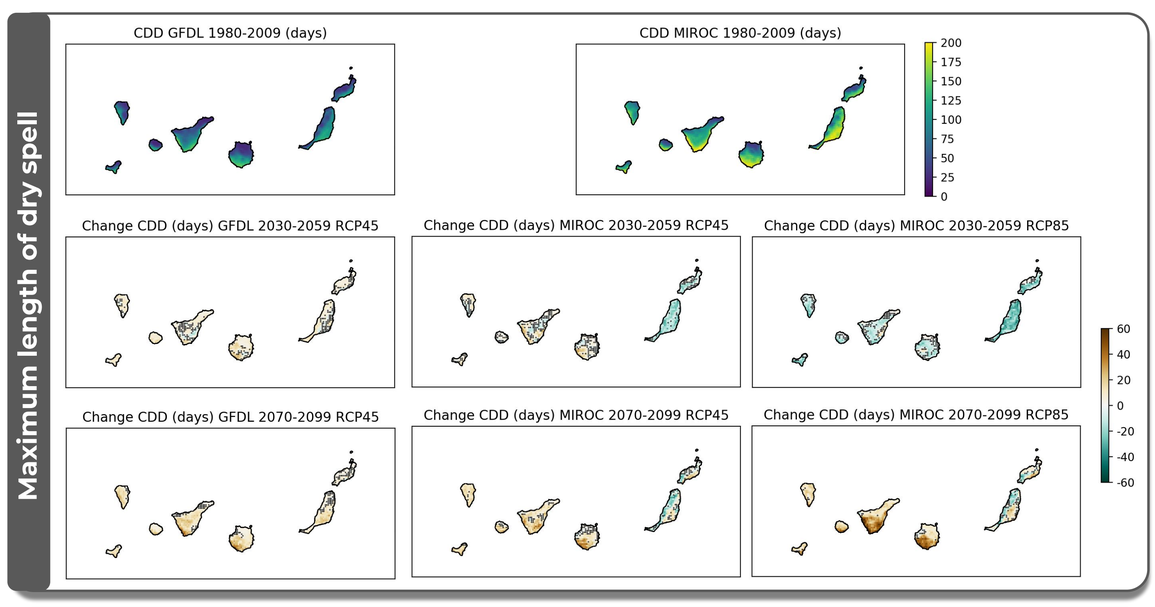


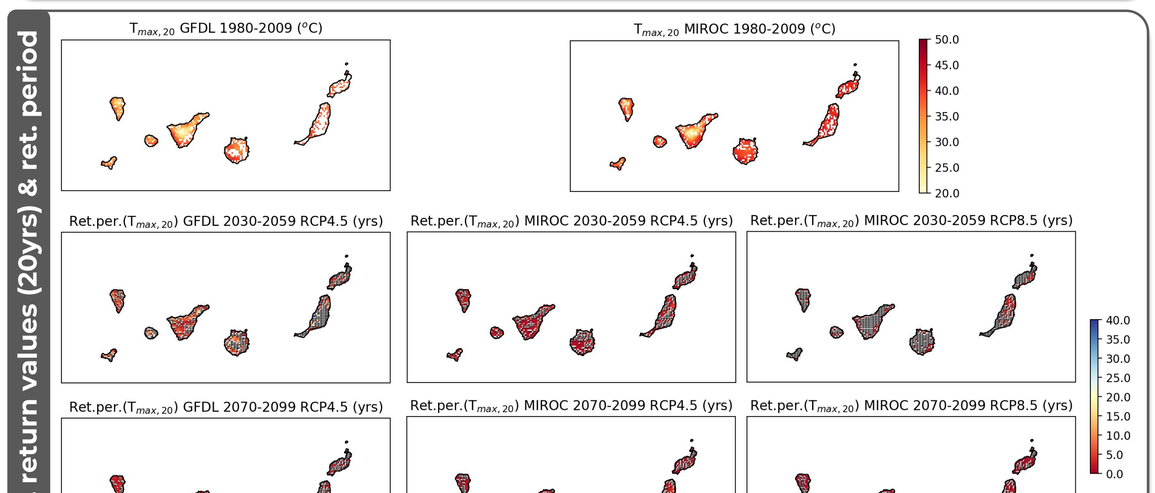


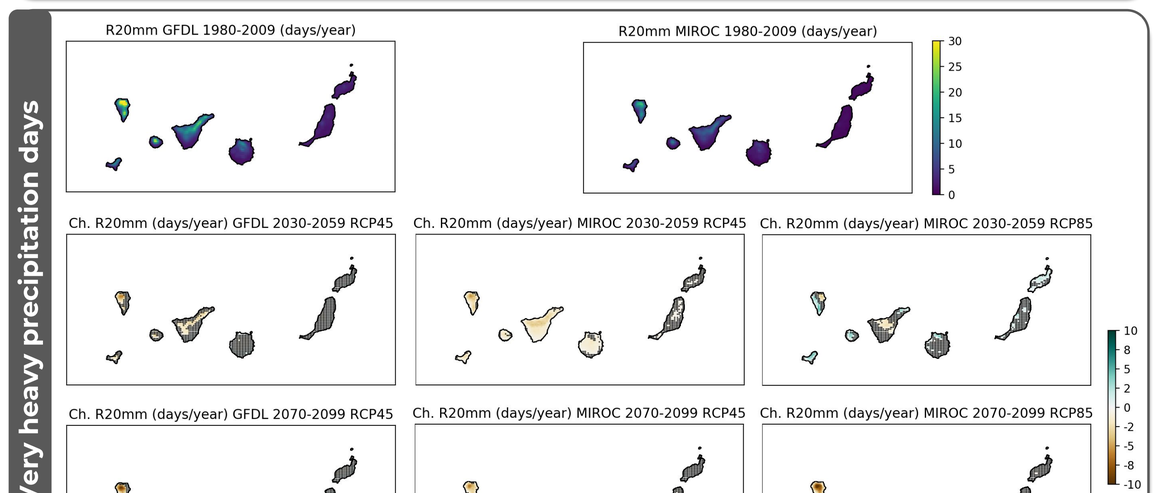


Results: Future projections (2030-2059 & 2070-2099)









Black dots shade those areas where the changes are not statistically significant

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Projects:
- CGL2015- 67508-R (MCIU)
- CLI05 (CajaCanarias)