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# High-resolution dynamical downscaling of extreme climate using RCPs and landcover scenarios over Romania

Mihaela Caian (1), Liviu Oana (1,2), Mihai Adamescu (3), Alexandru Dumitrescu (1), Sorin Cheval (1,4), Constantin Cazacu (3), and Claudiu Angearu (1)

(1) National Meterological Administration, Bucharest, Romania (mihaela.caian@gmail.com, liviu.oana88@gmail.com, alexandru.dumitrescu@gmail.com, sorincheval@yahoo.com,claudiu.angearu@meteoromania.ro ), (2) West University of Timișoara, Romania (liviu.oana88@gmail.com), (3) Research Center for Systems Ecology and Sustainability, University of Bucharest, Romania (mihaicristian.adamescu@g.unibuc.ro), (4) „Henri Coandă" Air Force Academy, Brașov, Romania

There already exist multiple signals related to changes in the frequency and/or intensity of extreme events at regional scale in the actual transient climate. Regional changes in extremes are also estimated by Earth System Models for the following decades. The development of climate scenarios became a major aim for climatologists and interdisciplinary research all-over the world. Regional climate modelling receives increasing importance at national level, since it can: - use higher spatial resolution as required for impact studies; - assimilate local observations from national network; - tune the models such as to improve the model's parameterisations and reliability over the area of interest; - easily perform anthropic-change or idealised scenarios for applications and process understanding.

We show here results of high-resolution dynamical downscaling over Romania using the CMIP5 climate scenarios, for the extreme climate events of warmest summers. An optimal configuration for the study area of the non-hydrostatic RegCMV4.5 model was preliminarily chosen based on an evolutionary algorithm for 7 parameter primary classes. A downscaling at 5km resolution was performed for each of the 5 warmest July months in RCP4.5 scenario (2020-2050) and the 5 warmest in the historical simulations (1970-2000), selected for four coupling global models: Ec-Earth, MPI-ESM-MR, HadGEM2 and CNRM-CM5 - using AZURE Microsoft infrastructure. In addition, we used a new land-cover forcing for the scenarios as estimated from the VOLANTE project in order to achieve more realistic regional scenarios. The main focus was to assess regional changes during extreme warm conditions. The downscaled coupling models were verified for the historical period over Romania against observational data. The scenarios show differences among coupling models, including significant regional trends difference.

However, we obtain that during the warmest years, their occurrence appears to be driven by a common mechanism leading to these extremes over the area: the leading patterns of change and the large-scale preconditioning are similar among models for climate-homogeneous areas. This also indicates enhanced models reliability in reproducing such regional extremes.

The climatic changes under warmest summer are discussed also in relation with each: land-cover and external forcing changes.