

IMPACTS OF TOPOGRAPHY AND LAND COVER CHANGES ON REGIONAL CLIMATE OVER THE EASTERN MEDITERRANEAN

INTRODUCTION

The influence of the topography (mountain ranges, lowlands etc) on the Mediterranean climate leads to different climate leads to the warm southern region from the cooler north regions. In addition, the wide indentation assists vegetation growth of Mediterranean forests and woodlands, whereas during summer, absence of precipitation and severe heat waves result to arid and semi-arid vegetation.

The objective of the study

- 1. Track the changes that may occur in the climate of the Mediterranean region due to changes in topography and land use
- 2. Assessment of the impacts of topography and land cover changes on regional climate over the eastern Mediterranean

DATA

The examined regional model is RegCM4.3. It's spatial resolution is 25x25km and for the future projections the model is using the A1B SRES emission scenario.

- 1. Minimum and maximum temperature (daily)
- 2. Total precipitation flux (3h)
- 3. Total evapotranspiration flux (3h)
- 4. Duration of sunshine (3h)

METHODOLOGY

simulations Different were performed with changes in land cover for the time period 1981-1990.

- 1. Model's default landuse
- 2. Evergreen Shrub
- 3. Evergreen Needleleaf Tree

4. Landuse from "Corine 2000" for the selected region in Figure 2d

The different simulated data were processed on a seasonal basis (winter and summer) and the differences between the different landuse types and the model's default landuse were calculated and compared.



CONCLUSIONS

Climate parameters, as well as human interactions such as landuse or water management practices, influence hydrology catchments, agricultural areas and forestry regions. This study describes an application of a regional climate model (RegCM4) in order to simulate the variability in precipitation, temperature, evaporation and sun duration under different landuse parameterizations, using the Greek region (eastern Mediterranean) as a case study. Two of the parameterizations used the "Evergreen Shrub" and the "Evergreen Needleleaf Tree" RegCM4 landuse for the whole study region (Figure 1). The last landuse data is taken from the Corine Land Cover European Union Programme (geodata.gov.gr/geodata/). Simulations taking into account landuse modifications in the study region are compared with the default RegCM4 landuse in the region. According to the analysis of the study: ✓ The most significant changes are presented by minimum and maximum temperature ✓ Sun duration is not affected by the different landuse parameterizations Y Precipitation and evapotranspiration present a significant increase in continental areas during summer, whereas in winter these two parameters are not quite affected by the different landuse parameterizations

✓ Significant changes are observed at coastal Greek region in the case of Corine landuse. There is a decrease of minimum temperature (winter) and an increase of maximum temperature (summer). There is also a decrease of evapotranspiration both during winter and summer

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➢ <u>RegCM4</u>

The first generation NCAR RegCM was built upon the National Center for Atmospheric Research (NCAR) – Pennsylvania State University (PSU) Mesoscale Model version 4 (MM4). The dynamical component of the model originated from the MM4, which is a compressible, finite difference model with hydrostatic balance and vertical σ -coordinates. Later, the use of a split-explicit time integration scheme was added along with an algorithm for reducing horizontal diffusion in the presence of steep topographical gradients. As a result, the dynamical core of the RegCM is similar to that of the hydrostatic version of Mesoscale Model version 5. The RegCM4 is thus a hydrostatic, compressible, sigma-p vertical coordinate model run on an Arakawa B-grid in which wind and thermodynamical variables are horizontally staggered using a time-splitting explicit integration scheme in which the two fastest gravity modes are first separated from the model solution and then integrated with smaller time steps.







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investiną in knowledge society European Social Fund MANAGTING ACCERTING Co-financed by Greece and the European Union

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1 programme for development

Acknowledgments: This research has been co-financed by the European Union (European Social Fund-ESF) and Greek national funds through the Operational Program "Education Solar Fund Lifelong Learning" of the National Strategic Reference Framework (NSRF) - Research Funding Program: Thalis. Investing in knowledge society through the European Social Fund

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