



Growing Degree Days and precipitation as assessment factors for future responses in agriculture over selected Greek areas with different climate conditions

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ABSTRACT: Assessment of future precipitation and Growing Degree Days variations prevailing in an area is essential for the research regarding climate and climate change. The current study focuses on 3 selected areas in Greece that present different climatic characteristics due to their location as well as intense agricultural activity and aims to assess the future response and spatial distribution of precipitation and Growing Degree Days (GDD) and how these can affect the main cultivations in the study area. Future precipitation and temperature data from the ENSEMBLES anthropogenic climate-change (ACC) global simulations of 6 Regional Climate Models (RCMs) were obtained and analysed. The analysis and climate simulations were performed for the future periods of 2021-2050 and 2071-2100 under the A1B and B1 scenarios. Data extraction was conducted using the Mathworks version 2014a. Mann-Kendall test was applied to investigate possible trends. Spatial distribution of precipitation and GDD was performed using a combination of dynamic and statistical downscaling techniques and Kriging method within ArcGIS 10.2.1.

Results regarding the future response of precipitation indicated that for both scenarios and future periods, precipitation is expected to be critically decreased in all study areas. Ardas River basin characterised by the continental climate will be tempered, while in the Sperchios River basin it will be smoother due to the influence of some minor climatic variations in the basins' springs in the highlands where milder conditions occur. Precipitation decrease in the Geropotamos River basin which is characterized by Mediterranean climate will be more vigorous. On the other hand, GDD are expected to increase. The increase in the Sperchios River basin will be the highest, followed by the Ardas and the Geropotamos River basins. Moreover, the cultivation period will be shifted from April-October to April-September which will have social, economic and environmental benefits.

In the upcoming decades, the existing cultivations can find favourable conditions and can be potentially expanded onto higher altitudes. Nevertheless, reductions in precipitation amount can act as an inhibitor towards the expansion and thus the economic development of the agricultural section in Greece and in the Mediterranean region in general.

KEYWORDS: Agriculture; Growing Degree Days; precipitation; climate change; downscaling spatial interpolation; Greece