



Present and future responses of Growing Degree Days for Crete Island in Greece

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Climate affects practically all the physiological processes that determine plant life. A major challenge and objective of the agricultural science is to predict the occurrences of specific physical or biological events. For this reason, flower phenology has been widely used to study the flowering in plant species of economic interest, and in this concept, temperature and heat units have been widely accepted as the most important factors affecting processes leading to flowering. Determination of heat requirements in the first developing phases of plants has been expressed as Growing Degree Days (GDD), and it is useful for achieving a better understanding of the flowering season development in several plant species, and for forecasting when flowering will occur.

Temperature and GDD represent two important spatially-dynamic climatic variables, as they both play vital roles in influencing forest development by directly affecting plant functions such as evapotranspiration, photosynthesis and plant transpiration. Understanding the spatial distribution of GDD is crucial to the practice of sustainable agricultural and forest management, as GDD relates to the integration of growth and provides precise point estimates.

The aim of the current study was to estimate and map through downscaling spatial interpolation and multi-linear regression techniques, the future variation of GDD for the periods 2021-2050 and 2071-2100, under the A1B and B1 IPCC emission scenarios in relation with the reference period for Crete Island in Greece. Future temperature data were obtained, validated and analysed from the ENSEMBLES European project. A combination of dynamical and statistical approach was conducted in order to downscale and perform the spatial interpolation of GDD through ArcGIS 10.2.1. The results indicated that in the future, the GDD will be increased and the existing cultivations can reach maturity sooner. Nevertheless, rough topography will act as an inhibitor towards the expansion of the cultivations in higher altitudes.