High Altitude Meteorological Observations in Central Greece

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Introduction

Data availability is severely limited in high-altitude regions (Shea *et al.,* 2015) mainly due to the remoteness and difficulty in accessing the sites. However, high mountain ecosystems are among the most sensitive environments to changes in climatic conditions occurring on global, regional and local scales (Ruiz *et al.,* 2008). Due to significant warming observed globally during the recent century, the international scientific community has focused more attention to understand the cause and effect interaction on the ecosystems and their individual components to climate changes (Borgaonkar *et al.,* 2011). In many mountain regions of the world, high altitudes appear to experience a stronger warming than the surrounding lowlands (Vuille, 2011) and that the warming is more closely related to an increase in daily minimum temperature than a change in the daily maximum (Diaz and Bradley, 1997; Beniston, 2006; Giambelluca *et al.,* 2008).

Objectives

The main objective of this study is to evaluate the variability of meteorological parameters measured by two high altitude meteorological stations (OITI and KALLIDROMO) that have never been analyzed before, located in two mountainous Natura 2000 sites of Central Greece, in the Region of Sterea Ellada (Figure 1). The stations were settled in the framework of the Project: Conservation of priority forests and forest openings in "Ethnikos Drymos Oitis" and "Oros Kallidromo" of Sterea Ellada. The data sets recorded in the meteorological stations cover the periods 2014-2018. OITI is a weather station located in site Greveno, National Forest Park of Mt. Oiti (38°49'26.00"N - 22°16'57.00"E - 1896 m). KALLIDROMO is a weather station located in site Gravia, Mt. Kallidromo (38°44'29.87"N - 22°28'12.00"E - 998 m). The National Park of Mt. Oiti extends at altitudes of 400 – 2116 meters and includes most of the highest peaks of the mountain (except the highest, Pyrgos, at 2152 m). The Mt. Kallidromo extends at altitudes of 43–1393 meters.

Figure 1. Map presenting the sites of OITI and KALLIDROMO meteorological stations (left image). The right image presents the snowy OITI station during its installation on December 2013.

Results

The meteorological parameters of Air Temperature (ºC), Relative Humidity (%), Precipitation (mm), Photosynthetically Active Radiation – PAR (μmol/m²s), Barometric Pressure (mbar), Wind-Direction (°), Wind Speed (m/s) and UVA (W/m²) were analyzed. For OITI station we analyzed the additional parameters of Soil Temperature (°C), Soil Moisture (vol%) and Hourly ETo (mm). Only the graphs for the Air Temperature and Precipitation covering the period January 2014 - December 2018 are presented in this study in Figures 2 & 3 respectively.

The measurements of OITI show that the coldest month is January (–2.03 ºC) and the warmest is July (15.2 ºC). The measured extreme values are: -18.1 ºC (January 9, 2017) for the minimum Air Temperature and 28.3 ºC (June 30, 2017) for the maximum Air Temperature. Also the mean PAR value is 339 (μmol/m²s), the minimum 0 and the maximum 2795 (μmol/m²s). The mean Precipitation value is 69.1 mm with an extreme value of 307 mm to be measured in

September 2018. Finally the mean Relative Humidity value is 75.5%

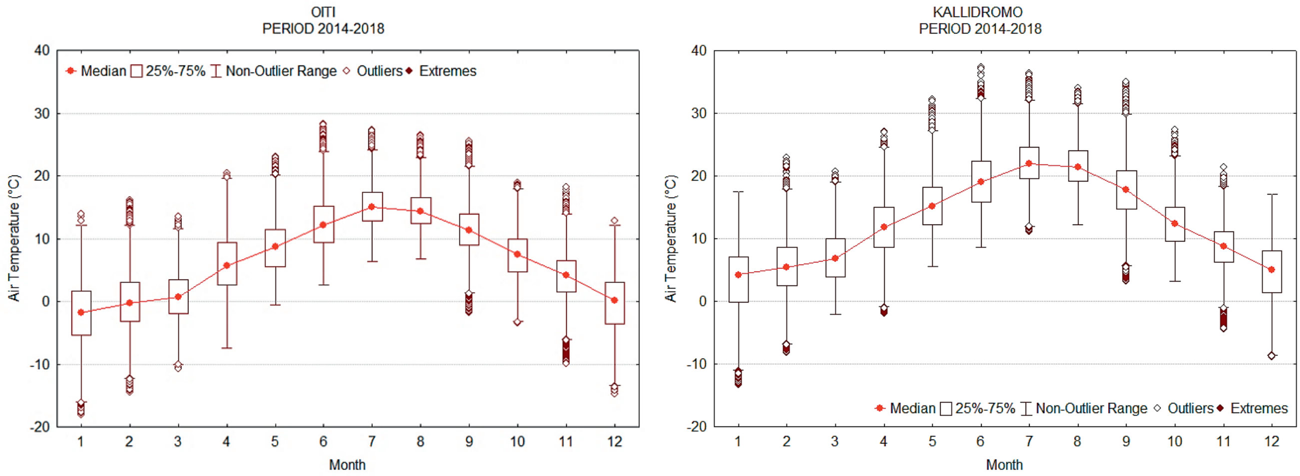

Figure 2. Air Temperature graphs for OITI (left) and KALLIDROMO (right) weather stations.

The measurements of KALLIDROMO show that the coldest month is January (3.49 ºC) and the warmest is July (22.1 ºC). The measured extreme values are: –13.3 ºC (January 8, 2017) for the minimum Air Temperature and 37.3 ºC (June 30, 2017) for the maximum Air Temperature. The mean PAR value is 192 (μmol/m²s), the minimum 0 (μmol/m²s), the maximum 1,354 (μmol/m²s). The mean Precipitation value is 66.2 mm and the Relative Humidity value is 72%.

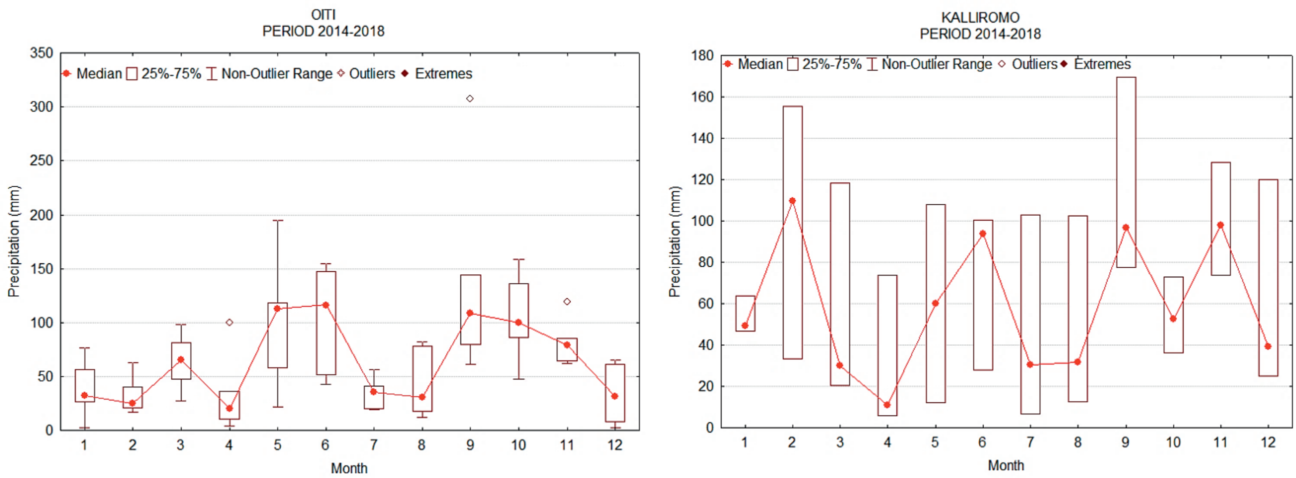

Figure 3. Precipitation graphs for OITI (left) and KALLIDROMO (right) weather stations.

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