EMS Annual Meeting Abstracts
Vol. 14, EMS2017-850, 2017

Relationship between monthly precipitation and 850 hPa air temperature in a typical East Mediterranean mountain area

Fadi Karam (1) and George Mitri (2)

(1) Lebanon Industry Value Chain Development Project, Development Alternatives Incorporated, Dimitri Hayek St, Confidence Center, Sin el Fil, Lebanon. *Associate Professor (contractual basis) in Climatology & Agro-Meteorology, Faculty of Agricultural Sciences & Veterinary Medicine, Dekwaneh, Lebanon, (2) Institute of the Environment, University of Balamand, Koura, Lebanon

The relationship between precipitation and the 850 hPa air temperature was studied over two mountain areas in Lebanon to investigate temporal variability of precipitation, deduce the impact of climate variability on Lebanon's society and environment and improve understanding of drought occurrence.

The European E-OBS rainfall gridded data set (v14.0) of rainfall and maximum air temperature for the period of 1955-2016 with a spatial resolution of 0.25deg×0.25deg was obtained for this study. The Global 30 Arc-Second Elevation Data Set ($GTOPO_30$), a global raster Digital Elevation Model (DEM) with a horizontal grid spacing of 30 arc seconds (approximately 1 kilometer) developed by USGS was used for the elevation file within the gridded dataset. More specifically, collected data were representative of two different mountainous areas, namely Laqlouq with an average elevation of the grid cell at 1550 m (central coordinates: lat. 34.133665deg and long. 35.846516deg), and Jroud Kfar Bebnine region with average elevation of the grid cell at 1490 m (central coordinates: lat. 34.383deg and long. 36.126deg). The methodology of work consists of studying the correlation between monthly precipitation and monthly mean maximum air temperature at two locations typical of the 850 hPa height. The Standardized Precipitation Index (SPI) was calculated at 1, 3, 6 and 12-month scales using monthly precipitation data of the same investigated period by means of the SPI Calculator (National Drought Mitigation Center of the University of Nebraska-Lincoln). Consequently, the obtained SPI values were assessed for correlation with monthly mean maximum air temperature at the two studied locations. Correlation analyses were further investigated for statistical significances.

Overall, results showed a strong negative correlation between monthly precipitation and monthly mean maximum air temperature at both locations. SPI-1 and SPI-3 were found to be positively correlated with monthly mean maximum air temperature at the 850 hPa height, while SPI-6 and SPI-12 showed negative correlations, indicating seasonal decrease of precipitation for the onset of October -March rainfall season. We believe that spring intensification of rainfall deficit during April-May was led by unusual increase of the 850 hPa air temperature and evaporative demand. As a result, a decrease in seasonal rainfall was observed to be directly related to agricultural drought occurrence experienced over Lebanon.
We intend to complement this study by expanding the examination of the relationships between precipitation and mean monthly maximum air temperature to other locations of the 850 hPa height along Lebanon's Mediterranean mountain's chain.

Keywords: 850 hPa air temperature, Standardized Precipitation Index, rainfall season, drought.