



Changes in aridity conditions within homogeneous regions of Turkey in the 20 - early 21 centuries

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Periods of decrease and increase of annual humidification across Turkey in the 20th – early 21st century were examined according to the aridity index changes, calculated as the ratio of annual precipitation to potential annual evapotranspiration (known as the P/PET; UNEP, 1992). The study uses the annual evapotranspiration evaluated by Penman method.

The territory of Turkey can be divided into nine regions which are quasi-homogeneous by the type of annual aridity index variations during the period 1901-2012. The version 3.21 of dataset from the Climatic Research Unit of the University of East Anglia with spatial resolution of 0.5 x 0.5 degree has been used. Application of principal component analysis (PCA) and hierarchical cluster analysis with the Pearson correlation coefficient as the measure of similarity gave close results. The dynamics of humidification within each zone during the 20th – early 21st century was investigated. The fastest speed of annual humidification rise in the early 21st century was observed in the east and north-east of Turkey, the slowest change occurred in eastern Marmara. Regions were grouped into annual trends humidification using nonlinear trends of aridity index in each region. So, weak slow aridization of the central regions of Turkey, including Central Anatolia, Southeast Anatolia, the western part of Black Sea and eastern Mediterranean, had been in progress till 1960-1970. Afterwards, following the stabilization of the humidification conditions an increase in humidification occurred. It was only exclusion in Southeast Anatolia, where dry conditions prevailed after 1975 mainly due to decrease the continental spring precipitation.

The slow aridization of the area of quasi-uniform changes of the annual humidification, located on the territory Marmara, Aegean, the eastern part of Black Sea, Eastern Anatolia and the western Mediterranean, took place between the periods of rise in humidification during the first 20-40 years of the study period and after 1980-1990. Humidification slowly increased throughout the study period in the eastern Marmara.

Analysis of the precipitation anomalies (according to Standardized Precipitation Index values) within regions revealed that the increase in annual humidification in the last decade in most parts of Turkey is associated with a rise in positive anomalies of winter precipitation. Annual humidification in the east and north-east of Turkey increased due to the increase of spring precipitation.

The frequency of severe drought in May-August in Turkey (according to PDSI) increased in the period 2001-2010 compared with 1975-2000. Large-scale droughts were observed more frequently.

Thus, heterogeneity and different rates of change in the regions, trends, periods of stabilization of humidification were determined by regionalization. Increased frequency of droughts in the early 21st century in Turkey resulted in reducing of summer humidification. However, annual humidification decreased primarily due to the compensation of precipitation in the other seasons.