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Spatial and temporal variability of Aridity Index in Greece

Panagiotis Nastos (1), Nadia Politi (1), and Kostas Douvis (2)

(1) Laboratory of Climatology and Atmospheric Environment, Faculty of Geology and Geoenvironment, National and Kapodistrian University of Athens, University Campus, GR-15784 Athens, Greece , (2) Research Center for Atmospheric Physics and Climatology, Academy of Athens, 131 3rd September Av., GR-11251 Athens, Greece (Contact E-mail: nastos@geol.uoa.gr)

Drought events have deteriorated in most European regions during the last decades in frequency, duration, or intensity. Besides, increased drying associated with higher temperatures and decreased precipitation have contributed to changes in drought. Drought-affected areas are projected to increase in extent, with the potential for adverse impacts on multiple sectors, e.g. agriculture, water supply, energy production and health, according to IPCC.

The objective of this study is the spatial and temporal variability of the Aridity Index (AI) per decade, in Greece during the period 1951-2000, as far as the projections of AI for the period 2051-2100, based on simulations of ensemble regional climate models (RCMs), for A1B SRES scenario.

The climatic data used for the analysis concern monthly values of precipitation and air temperature from 28 meteorological stations; 22 stations from the National Hellenic Meteorological Service and 6 stations from neighboring countries. According to the United Nations Environment Programme (UNEP), AI is defined as P/PET, where P is the average annual precipitation and PET is the potential evapotranspiration, estimated by the Thornthwaite method; PET and P must be expressed in same units, e.g., in milimetres. All the meteorological data processing was carried out by the application of Geographical Information System (GIS).

The results of the analysis showed that within the examined period a clear shift from “humid” class that characterized the greater area of Greece in 1950’s to “sub-humid” and “semi-dry” classes appeared in mainly the eastern regions of Greece, such as eastern Crete Island, Cyclades Islands, Evia and Attica in 1990’s. The future projections derived by the simulations of ensemble RCMs indicated that drier conditions are very likely to appear in Greece associated with significant socio-economic consequences. The decreasing precipitation along with the high rates of evapotranspiration, because of increase in the air temperature, will cause an effective decrease in ground humidity, a condition that can severely affect the effective use of the land for such activities as agriculture or stock-farming.