Modelling Maximum Precipitation in a Mountainous Area of Greece Under Global Warming

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We investigated the fitting of generalized extreme value (GEV) distributions to maximum precipitation over the Mesochora mountainous catchment in central-western Greece under present and future climate scenarios.

Precipitation was modelled as a stochastic process coupled with atmospheric circulation models. An automated and objective classification of daily patterns (CPs) based on optimized fuzzy rules was used to classify both observed CPs and ECHAM4 GCM-generated CPs for 1xCO\textsubscript{2} and 2xCO\textsubscript{2} climate scenarios. We fitted the GEV distribution by maximum likelihood, allowing for non-stationarity over time in its parameters of location \(\mu(t)\) and scale \(\sigma(t)\), and compared different models by likelihood ratio tests.

The historical data on annual daily maxima for 1972-1992 were fitted well by the stationary model, with no need for the inclusion of linear time trends in location (\(P=0.09\) by likelihood ratio test) or scale (\(P=0.15\)). The stationary model was also adequate for 1xCO\textsubscript{2} for the period 1961-2000 (\(P=0.43\) and \(P=0.67\) for the linear terms in location and scale, respectively). However, the series for 2xCO\textsubscript{2} for the period 2061-2100 required a cubic time trend to obtain satisfactory fit (\(P<0.0001\)). This series showed a decline to a minimum around 2080, followed by an increase to a maximum around 2092 and subsequently a further decline. The scale appeared to be stationary (\(P=0.92\)).