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Variability of warm and cold spells in Athens, Greece, during the last 110 years

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This study focuses in the determination of the warm and cold spells in Athens, Greece and thereafter in the estimation of their time variability and trends during the period 1897-2007. The long term temperature record of the National Observatory of Athens exhibits a positive trend with respect to the annual mean, mean maximum and mean minimum temperature. The annual overall trend of the maximum temperature is found to be 1.3 oC/100yrs but becomes more than 2 oC/100yrs when summer period (June-August) is considered. The same trend for the last 30 years has become 3 oC, although part of this increase has been attributed to urbanization effects. Despite the general pronounced warming trend it is interesting to examine the evolution of the spells' time variability, using respective indices. The warm (cold) spell duration index is defined according to the joint CCl/CLIVAR/JCOMM Expert Team (ET) on Climate Change Detection and Indices (ETCCDI) as follows: Let Txij (Tnij) be the daily maximum (minimum) temperature on day i in period j and let the Txin90 (Txin10) be the calendar day 90th (10th) percentile centred on a 5-day window. Then the number of days per period is summed where, in intervals of at least 6 consecutive days: Txij $>$ Txin90 (Tnij $<$ Txin10). In the particular climatic regime of Athens in summer, the 90th daily maximum temperature percentile with respect to the 1960-1991 reference period corresponds roughly to 35 oC, which means that the observed increase, according to preliminary results, in the frequency and duration of warm spells in summer can potentially have serious social and economic impacts and increase mortality. This is in

agreement with the summary for Policymakers of the IPCC WGI Fourth Assessment Report, where temperatures of the most extreme hot nights, cold nights and cold days are likely to have increased due to anthropogenic forcing, while it is more likely than not that anthropogenic forcing has increased the risk of heat waves.