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Heat Stress in South Romania in Connection to Large-Scale Circulation Patterns

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During the last decades, many European regions has experienced an increased frequency and duration of heat waves, with a strong impact on human health. The climate of the Romania became visibly warmer since the mid 1980s in winter, spring and summer, exhibiting a significant increasing frequency of hot temperatures, especially in summer. These trends are particularly evident in southernmost lowland regions of Romania, densely populated and also, with a great agricultural value. The present study investigates the heat stress in the southern Romania over a 50-year period (1961-2013), by means of apparent temperature and temperature-relative humidity relationships, as response to the day- and night-time heat wave occurrences. The study uses the ROCADA daily gridded climatic dataset and focuses on multi-day heat wave events, identified by considering at least two consecutive hot days (Tmax>35C) followed by tropical nights (Tmin>20C), during the May-September interval. The large-scale circulation patterns associated to heat wave occurrences were also analyzed using the COST733 catalogues, in order to understand the key atmospheric processes related to the spatial manifestation of these extreme events in southern Romania. The trends in heat stress were estimated using the Mann-Kendall non-parametric trend test (10% statistically significance level). The results suggest an intensification of heat stress in most study region, particularly in the areas under a prevailing influence of continental airflows, due to the increasing frequency of heat wave (both during the night and day) and to the lengthening of hot day intervals. These trends are also indicated by the shifts in the upper (extreme) tail of daily distribution of extreme temperatures, especially of the daily maximum temperatures. The results emphasizes the role of quasi-stationary anticyclonic circulation type, which was identified as most responsible for the onset and duration of heat waves in southern Romania, explaining the occurrence and magnitude of heat stress in most densely populated areas.

Key words: south Romania, heat stress, heat waves, apparent temperature, circulation patterns