# Comparison of various definitions of heat and cold waves in Europe

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Heat and cold waves are extreme events which often affect large parts of Europe and cause serious impact on health, but also economic impact on tourism, transportation of goods, heating/cooling of buildings and others. Therefore, it is an important task for National Meteorological and Hydrological Services (NMHSs) to monitor and report on such events and to issue warnings where possible. This requires well-defined criteria to identify a heat or cold wave.

In a climatically very heterogeneous region like Europe it is quite a challenge to find a uniform definition which is applicable for the whole continent, and thus to compare and analyze large-scale heat waves. In practice, a variety of very different definitions of heat and cold waves are used from country to country, dependent on local climatic conditions and specific user requirements.

This was a motivation to initiate a comparative study of various heat and cold wave criteria. A selection of definitions was taken from the literature, partly with slight modifications, which describe these events in a very different way. This selection includes definitions based on fixed threshold temperatures, temperature anomalies, percentiles, human adaption capability and combinations of all these. For all selected definitions, indices are computed, such as beginning, end and duration of these events, the number of days actually above or below defined thresholds, intensity (highest/lowest temperature within duration) and the day with the highest intensity. All calculations were done for gridded daily maximum and minimum temperature from SYNOP data at DWD and from the E-OBS data set. For each selected index, definition and month, results are plotted on maps.

To assess the performance of the definitions/criteria, results are compared with reports of NMHSs taken from the web. This preliminary analysis shows that percentile and anomaly approaches seem to be most suitable.