

On the use of multivariate statistical methods in trend analysis: assessment of spatial and intervariable consistency and identification of the most representative station

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This contribution introduces two multivariate statistical methods, namely the principal component analysis (PCA) and cluster analysis, into the research on long-term trends in climatic elements, and demonstrates the benefits of their use. The study is based on linear trends of 11 climatic elements at 21 stations in the Czech Republic and is carried out on a seasonal basis. The cluster analysis of stations allows the spatial consistency of trends to be quantified. The groupings of stations appear to be spatially incoherent and seasonally variable, which indicates that local peculiarities of the relatively complex terrain affect the station trends to a considerable extent. PCA, if applied to the trend magnitudes for a set of variables at a network of stations, allows one to find out mutual relationships among the individual variables' trends. Expected relationships, such as a connection of daily temperature range increases with increases in sunshine duration, and decreases in cloud cover and relative humidity, are confirmed by PCA. In addition to it, PCA allows one to uncover other relationships, which would not have been expected a priori, such as a seasonally varying link between precipitation probability and precipitation amount. PCA is also proposed as a tool for identifying the station where the trends are most representative for the whole region analyzed.