

Time series and trend analysis of Austrian springs

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On average, nearly half of the Austrian drinking water supply is provided by spring water. The actual demand of spring water depends highly on the region and is up to 100 % in alpine areas of Austria. The quantity, duration and seasonal patterns of the recharge of spring waters is expected to be altered due to climate change effects, affecting the runoff dynamics and storage behaviour. Thus, an adequate characterization of spring runoff patterns is essential for taking decisions in the future water management. Therefore, long-term data of 96 springs, which belong to the monitoring network of the Hydrographic Service of Austria, were investigated applying time series and trend analysis methods. The data sets contained spring discharge, electric conductivity and water temperature until end of 2017 with a temporal resolution of down to 15 minutes. Trends of the data were analyzed and compared between ten and twenty-year periods indicating an impact of climate change on the spring parameters. Moreover, the runoff pattern of each spring was characterised by its seasonality (Pardé Coefficient) and response time (autocorrelation). Based on these discharge attributes, 5 clusters of spring types were identified. Statistical evaluation indicates that springs with distinct seasonality show shorter response times, whereas the discharge with long response times usually fluctuates slightly within a year. Additionally, the regional linkage of the spring groups was explored indicating no distinct correlation between runoff pattern and the geological setting of the aquifers. These results highlight the significance of accurate spring characterization with regard to changes of spring runoff dynamics and storage behaviour for coping with the future challenges of water resources management.