



Low flow trends in France: analysis of 236 undisturbed catchments over 40 years

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The French National Agency for Water and Aquatic Environments (ONEMA) set up a project for creating a nationwide network of trustworthy river discharge stations aiming at monitoring the evolution of low flow regimes. A preliminary data analysis and the advice of data providers lead to a dataset of 236 undisturbed streamflow series from catchments across France. Such series consist of at least 40 years of daily data, with the period 1968-2007 providing the best trade-off for data availability in time and space.

In order to investigate low flow trends, a set of low flow indices have been calculated from each series to describe drought timing and severity, such as the date of annual minimum discharge and volume deficit for a given threshold.

Trends were calculated at two different levels: firstly through the Mann-Kendall test applied to the indices at each site (At-site Analysis), and secondly through a regional test applied to sets of stations that had been grouped into homogeneous regions (Regional Analysis). The regions' homogeneity is based on the similarity in hydrological, climatic and geological characteristics. The results of the two analyses were mapped to show trends over the past 40 years and showed very similar patterns. Nationwide no consistent signal was detected, however consistent patterns appear in several geographical areas. Trends towards earlier and more severe droughts (in terms of intensity, duration and volume deficit) were detected in southern France. On the contrary drought durations are found to decrease in the north west and north east of France, the signal being particularly consistent across different indices for the north west region (Brittany).

Considering all the indices together the trend study at at-site and regional level confirms that the detected trends are part of coherent patterns of change. However the causes of the trends remain unclear at this stage (natural climate variability or impact of climate change).