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## **Return level estimations : may we still consider the series of extremes as stationary?**

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Dimensioning of civil engineering works is based on the statistical evaluation of return levels for some defined return periods, depending on the required reliability. This evaluation is conducted using statistical extreme value methods, whose hypotheses are that the extreme value sub-series are homogeneous, stationary and identically distributed. More and more, homogeneity is checked by meteorological centres. Stationarity means no cycles, nor trends. Diurnal or seasonal cycles present in meteorological data may be avoided in using one maximal or minimal value per day, in the season when the parameter is the most likely to reach extreme values. As far as trends are concerned however, climate change context does no more allow to consider the series as stationary without at least testing the hypothesis. Recently, we had to re-evaluate 100-year return levels for high temperature, needed to dimension air conditioning systems for nuclear power facilities. We then designed a technique to first search for a trend in high value series, and then, extrapolate it to estimate 100-year return levels. The trend identification is conducted in assuming that the parameters of the statistical laws for extremes vary with time, in a polynomial or line segment way. The paper will present the method as well as illustration on high temperature in France and the effect of 2003 heat wave.