



## The increasing frequency of "Heatwave Regime"-like circulation patterns occurrence over western Europe: patent observations and fears about the future

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The so-called Weather Regimes (**WR**) are actually Large Scale Circulation (**LSC**) patterns that one finds through classification of **every day LSC** patterns. Extreme events are rare by definition and **WR**'s, the *most frequent* circulation patterns are often inappropriate tools for their study. It can be more advised to classify **only** circulations of those days where extremes of a given type occurred. In this way, "**Heatwave Regimes**" (**HWR**) may be defined (as well as "**Precipitation Regimes**", etc...). Here, for simplicity reasons, **HWR** is defined as the mere composite of **LSC** patterns of "**Hot Days**"; the precise definition of "**Hot Days**" proves irrelevant.

Using station TX from 30 Météo-France stations since the mid 20<sup>th</sup> century, we define an Heatwave Index (**HWI**) for each individual summer. In the same way, an appropriate Circulation Index is defined for each Summer; we call it "**Heatwave Circulation Index**" (**HWCI**) and define it as the 90<sup>th</sup> percentile of the anomaly pattern correlation coefficient between individual days **LSC**'s and the **HWR** pattern.

Dividing observations into two successive periods, we display separate scatter plots of **HWI**'s vs **HWCI**'s. It clearly appears that the increase of **HWI** originates both from Global Warming and from accompanying **LSC** changes towards more frequent **HWR**-like patterns.

Models can poorly forecast station **TX** and **HWI**; however a strong correlation exists

between individual station **TX Q90** and re-analysed corresponding **T850 Q90**. We characterize the end of the 21<sup>st</sup> century intensification of extreme heatwaves comparing *Control* and *Scenario* scatter plots of **T850 HWI**'s vs **HWCI**'s. It clearly appears that the trend observed during the 20<sup>th</sup> century will persist and contribute to the worsening of summer conditions over France; this conclusion can be separately reached analysing three different Control-Scenario simulations.