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Recent trends in climate variability and extremes at local scale: A case of Paris region

Justine Ringard (1), Marjolaine Chiriaco (2), Sophie Bastin (1), and Florence Habets (3)

(1) LATMOS/IPSL, CNRS, Guyancourt, France (justine.ringard@latmos.ipsl.fr), (2) LATMOS/IPSL, UVSQ Université Paris-Saclay, Guyancourt, France, (3) METIS/IPSL, CNRS Sorbonne Université, Paris, France

Both GCM and RCM show strong uncertainties about climate variability and extremes at the local scale because of their resolutions but also because of the number of processes involved at local scale. Recent studies have shown that some specific anomalies in Europe are not fully explained by the large-scale dynamical situation, and are exacerbated by local processes involving coupling, non linearities. It is therefore essential to separate the contribution of large scale versus local feedback into local climate variability. The aim of this work is to describe changes in temperature, relative humidity and precipitation at the local scale (Paris region) in order to identify the most important seasonal changes, independently of large-scale circulations. Three datasets are used: (1) observational data from SIRTA (south of Paris) available from 2003 to the present (SIRTA-ReOBS homogenized dataset); (2) ERA-I reanalysis including temperatures and relative humidity from 1979 to the present (0.75° x 0.75°) extracted at a pixel including the SIRTA site; (3) Precipitation data from the SAFRAN product available from 1959 to 2016 (8km x 8km) extracted at a pixel including the SIRTA site. Based on the Tmax and Tmin from the reanalyses and on the precipitations from SAFRAN, we compute several extreme indexes. The trends and their significance are calculated by the Mann Kendall test for each season and independently of the large-scale circulation using weather regime classification. The results show that the winter season in this area is marked by a decrease in frost phenomena and particularly nocturnal frosts related to the increase of temperatures in blocking weather regime (+1.7°C since 1979). With regard to rainfall, there is a significant increase in average daily intensity during the NAO+ regime. The summer season is characterized by a strong increase of the temperature mainly in NAO- regime (+2.1°C since 1979). However, there is an increase in very warm days and nights mainly during the NAO+ phase. This increase in extremes is accentuated by the strong decrease in relative humidity during the same regime (-11.4% since 1979). Precipitation have a significant increase in days of heavy precipitation (days>10mm) in NAO- regime. The blocking weather regime, generally conducive to heatwaves, shows no significant trends in terms of temperature and extremes. This study will allow in future work to identify possible feedbacks acting at the local scale and thus improve understanding of climate variability and extreme events.