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Investigating spatio-temporal linkages between interannual to pluridecennal fluctuations in precipitation and flow in the Seine river watershed and North-Atlantic climate based on wavelet and spectral analysis of hydrological and climate fields data

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In some previous works we demonstrated the existence of statistically significant links between interannual up to longer-term fluctuations of precipitation and flow in the Seine river watershed and the North-Atlantic Oscillation (NAO). Namely, interannual scales of variability common to both hydrological and NAO index time series were detected unsing continuous wavelet transform (CWT), that were found to explain up to one third of total Seine flow variance after removal of the annual cycle. At this stage of this research, the next step consists in investigating the spatio-temporal distribution of those links by using climate fields from NCEP 1950-2007 monthly 850 hPa reanalyses (SLP, geopotential, zonal/meridional wind), regionalized precipitation in the Seine watershed and Seine river flow near its outlet in the Seine estuary. As a first step we investigate the spatio-temporal variability of climate fields by analysing the spectral content of EOFs time series with CWT, comparing it with those of hydrological signals. Then, once typical scales of variability are detected, they are filtered out from the climate fields analyzed and plotted in order to visualize the corresponding spatial patterns. Third, composite and correlation maps between hydrological series and climate fields are drawn according to each detected scale of variability in both hydrological and climate signals. Namely, typical 5-9-yr and 16-22-yr are detected and are apparently associated to different spatial patterns compared to the original (i.e. unfiltered) signals; among the various results obtained, the 5-9-yr scales of variability characterizing both Seine flow and climate fields is mostly expressed in the end of the period of study (i.e. from $\sim$1985 to 2007), and seems to be associated to a shift of the northern low-pressure center of action from the Icelandic region further to the north-east, in the vicinity of the Scandinavian peninsula. These results are preliminary, but the study of the wavelet coherence and phase between hydrological and climatic signals/fields are presently undertaken in order to precise the links between spatial climate oscillations and regional-to-local hydrological variations.