

## **Abstract**

This work consists in characterizing the temporal and spatial variability of hydroclimatic parameters (rainfall, flow rates) at the level of two large basins in Algeria (the Cheliff basin located in the west and the Medjerda in the east). It also seeks to find out the link between this climatic and hydrological variability with the climatic fluctuations materialized by the various climatic indices (NAO, SOI, WeMOi and N-A). The approach adopted is based on the statistical treatment of time series linked to the dimensions of "time and space".

The main objective of this thesis is to determine and quantify the relationships between hydroclimatic variability and climate fluctuations at the scale of each studied basin and its main sub-basins, by using spectral analytical methods adapted to the study of non-stationary processes (continuous wavelet analysis, wavelet coherence analysis). Several modes of variability are identified on the basis of the analysis by station (precipitation and flow): annual, interannual and decennial cycle. Frequencies of 1 year, 2 years, 2-4 years, 4-8 years and 8-16 years have been identified over different periods at the level of each basin, thus allowing a decomposition of the spatial variability of the signals highlighted by the wavelet method. Moreover, three main discontinuities are identified in 1970, 1980 and 1990 for rainfall, and three others in 1970, 1986 and 2000 for discharge. A very strong coherence between the variability of flows and rainfall in the Cheliff and Medjerda basins has been noted. In the Cheliff basin it varies from 72% to 85%, and in the Medjerda one from 70% to 76%.

The results indicate that the dominant climate indices on rainfall variability patterns at the study basin level are NAO, WeMOi with a contribution of 66% -73%. The dominant climate indices on the modes of flow variability are NAO and SOI for the Cheliff basin and NAO and WeMOi for the Medjerda basin, with a contribution varying from 65% to 73%, depending on the sub-basins.

Furthermore, the components of precipitation and flow at different scales (annual, interannual and decadal), associated with the predominant climatic patterns at these time scales, also indicate a general pattern for Cheliff and Medjerda. These time scales are characterized either by common modes of variability, or by the predominant (localised) modes of a particular climatic mode of variability.

**Keywords:** Cheliff basin; Medjerda basin; hydrological variability; climatic fluctuations; continuous wavelet analysis; wavelet coherence; climatic indices.