Climatic Variability in the Upper Section of the Larbaâ River, Taza Province: Droughts Periods and Exceptional Precipitations

Brahim Bougdira[1, *], Nessraddine Adouk[1], Badr Layan[2], Sedik El Yadari[2]

[1]Departement of Geography, Chouaib Doukkali University, El Jadida, Morocco

[2]Department of Geology, Sidi Mohamed Ben Abdellah University, Fez, Morocco

Email address:

brahimbougdira@gmail.com (Brahim Bougdira), n.adouk9@gmail.com (Nessraddine Adouk),
layan.floods@gmail.com (Badr Layan), seddikelyadari@gmail.com (Sedik El Yadari)

[*]Corresponding Author

Abstract

The Mediterranean region has been experiencing sudden and inexplicable spatial and temporal variations in its climatic characteristics over the past two decades. Precipitation is one of the most significantly impacted parameters, as it serves as the primary source of water on the Earth's surface. The Larbaâ catchment, located at the forefront of the Eastern Rif Mountains and covering an area of approximately 247 square kilometers, provides an ideal environment for studying such climatic variations. To conduct the study, we utilized observational series of monthly and annual rainfall over a span of 65 years (from 1958 to 2023). Then, by utilizing the moving average method, we investigated the interannual variability of precipitation within the Larbaâ Basin. Geographic Information Systems (GIS) were employed to track the spatial variability of rainfall throughout the observed period, ultimately assessing the correlation between precipitation and both the North Atlantic Oscillation (NAO) and the Mediterranean Oscillation (MO). Subsequently, we identified drought periods and their severity using indicators such as EM, SPI, and API. Furthermore, we analyzed a daily precipitation series over a 39-year observation period (from 1981 to 2020) primarily to detect exceptional rainfall events that possibly caused violent floods, particularly in the Sebt Boukellal rural center. By comparing the laws of random phenomena, such as the GEV Law, Log Normal, Gumbel, and Pearson Type III Law, we were able to identify the most suitable law for determining the return periods of exceptional precipitation, ranging from 5 to 100 years.

Keywords

Larbaâ Catchment, Climatic Variability, Drought Periods, Exceptional Precipitation