Spatiotemporal characteristics of meteorological drought based on remote sensing data in the Tensift Basin (Morocco)

OUKADDOUR Kaoutar [1] , FAKIR Younes [1,2] , LE PAGE Michel [3]

(1) *GEOSCIENCES Laboratory, Department of Geology, Faculty of Sciences Semlalia, Cadi Ayyad University, Marrakech, Morocco. kaoutaroukaddour@gmail.com, fakir@uca.ac.ma.*
(2) *CRSA, Mohammed VI Polytechnic University UM6P, Ben Guerir, Morocco.*
(3) *CESBIO, University of Toulouse, IRD/CNRS/UPS/CNES, Toulouse, France. michel.le_page@ird.fr.*

Over the past few decades, Morocco has experienced several major drought events that harmed the environment and society. The peril of drought lies in its impact on different parts of the entire hydrological cycle, which in turn may distinguish various typologies of drought. Drought generally originates as a meteorological phenomenon that causes water deficit in hydrological systems (rivers and water tables…) which in turn affects natural vegetation and crop yields. This ultimately results in the spread of drought to different parts of the earth-atmosphere system.

However, the spatiotemporal characteristics of droughts could improve drought monitoring, adaptation measures, and strategies for mitigating drought impacts. This study focuses on the Tensift basin, which is one of the largest basins in Morocco and is considered drought-prone due to its geographical location and climate change impacts. The spatiotemporal drought characteristics of several dry events over the past 40 years were investigated. Indeed, we define drought events through the standardized precipitation index (SPI) time series. The SPI has been commonly used for drought assessment, quantifying precipitation deficits on different time scales. The use of several time scales allowed us to highlight the spatial occurrence, temporal characteristics, and impacts of drought on different hydrological and agricultural landscapes. SPI was used to determine the severity, magnitude, duration, and spatial extent of droughts in the study area. Based on a threshold level of SPI, drought events statistics, over 40 years were derived at the watershed scale to highlight regional differences at multiple time scales. The used data were driven from multi-source satellite products and satellite drought-based indices were calculated using automated algorithms chains. Nevertheless, the sparse network of observation stations data-scarce regions, especially in developing countries, is often an obstacle to drought monitoring. To overcome this limitation, remote sensing observations of precipitation are increasingly used over large-scale regions. The results reveal significant changes in the drought patterns since 2011 in the Tensift basin. They show persistent drought events in terms of severity and extent of drought with the absence of remarkable wet periods. These open insights for monitoring droughts and timely drought assessment over a semi-arid region using a monthly time scale.