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Assessing Climate Change Impacts on Wadi Lakhdar Watershed: North Western Algeria

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ABSTRACT

Climate change poses significant challenges to water resources management, particularly in arid and semi-arid regions like the Wadi Lakhdar watershed in northwest Algeria. This study investigates the impacts of climate change on the Wadi Lakhdar watershed from 1990 to 2010, focusing on efficacy rainfall and groundwater recharge dynamics. Utilizing a calibrated Global Conceptual Model Gardenia, we assess changes in precipitation patterns, efficacy rainfall, and groundwater recharge rates over the study period. Our findings reveal notable shifts in precipitation distribution and intensity, resulting in altered patterns of efficacy rainfall and groundwater recharge within the watershed. By integrating empirical data and modeling techniques, this research enhances our understanding of climate-water interactions in the Wadi Lakhdar watershed and provides valuable insights for sustainable water resources management in the face of climate change.

Keywords: Climate change, Wadi Lakhdar, Gardenia

1 Introduction

The Wadi Lakhdar watershed, situated in the semi-arid region of northwest Algeria, is characterized by its vulnerability to climate variability and change. As global temperatures rise and weather patterns become increasingly erratic, understanding the impacts of climate change on water resources within this watershed is paramount for effective management and sustainability. The parameters of the model have been optimized to take into account the typical annual time step of our watershed, aiming for high values for quality criteria (a Nash criterion above 70% and a correlation coefficient above 80%), Efficient rainfall and annual recharge is calculated automatically with the Gardenia model. Our model gives us very satisfactory results , it show us the impact of drought on efficient rainfall , which automatically gonna disturb the groundwater recharge. Consequently, assessing changes in precipitation patterns and their effectiveness in replenishing groundwater aquifers is crucial for mitigating the potential risks associated with water scarcity and ensuring the resilience of local ecosystems and communities. Through this research, we seek to advance our understanding of the hydrological response of the Wadi Lakhdar watershed to climate change and contribute to the development of adaptive strategies for sustainable water resources management in arid environments.

2 Experimental

The GARDENIA calculation code [1, 2, 3, and 4] is a comprehensive hydrological model that simulates the key mechanisms of the water cycle in a watershed, including rainfall, evapotranspiration, infiltration, and runoff, through a series of reservoirs. Its development was carried out at the Geological and Mining Research Bureau (BRGM), INRGREF [5]. The model comprises three stacked reservoirs. The input parameters of the Gardenia model used for the prediction of annual discharge are defined as rainfall (mm), discharge (m^3/s), and potential evapotranspiration (ETP) (mm).

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3 Results and Discussion

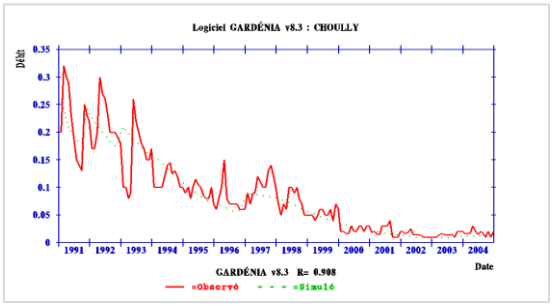

Figure 1: Results of Calibration on Annual Data from The Wadi Lakhdar Watershed (1990/1991-2004/2005)

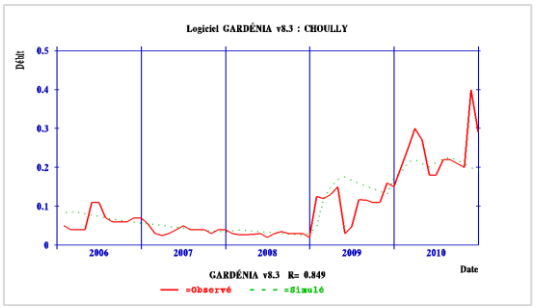

Figure2: Results of validation on annual data from the Wadi Lakhdar watershed (2005/2006-2009/2010)

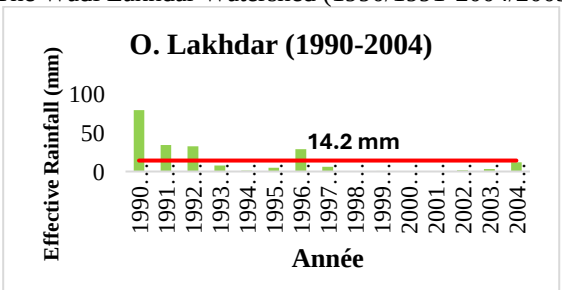

Figure3: Variation of annual effective rainfall for the calibration period of the B.V of Wadi Lakhdar Watershed (1990-2004).

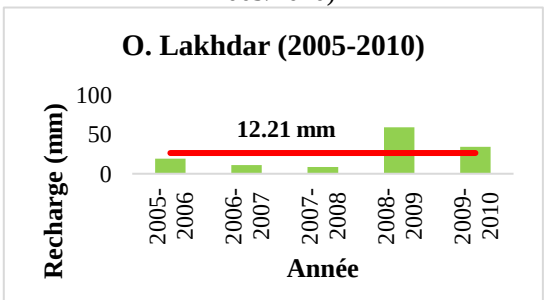

Figure 4: Variation in annual effective rainfall for the validation period of the Wadi Lakhdar Watershed (2005-2010).

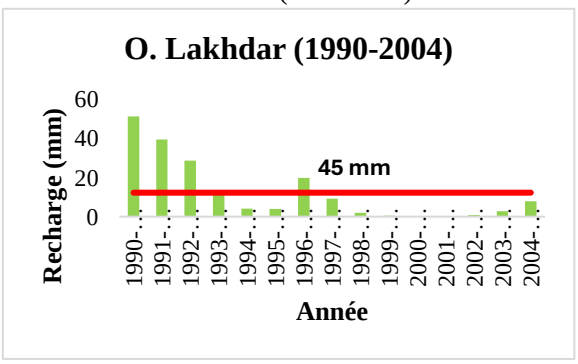

Figure5: Variation in the annual recharge of the Wadi Lakhdar Watershed for the calibration phase (1990/1991- 2004/2005).

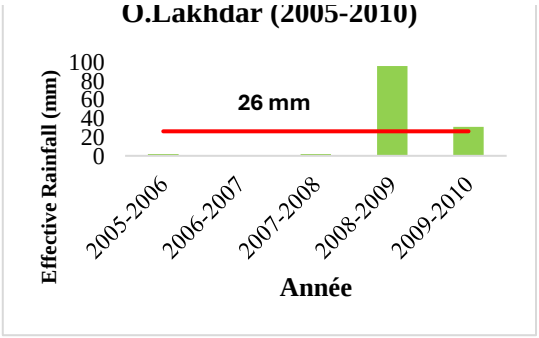

Figure6: Variation in the annual recharge of the Wadi Lakhdar Watershed for the validation phase (2005/06-2009/10).

In conclusion, our study sheds light on the impacts of climate change on the hydrological dynamics of the Wadi Lakhdar watershed in northwest Algeria. Through the analysis of efficacy rainfall and groundwater recharge patterns from 1990 to 2010. we have identified significant shifts in precipitation regimes and their implications for water availability within the watershed. Moving forward, it is imperative to continue monitoring and assessing the hydrological response of the Wadi Lakhdar watershed to ongoing climate change, while also exploring innovative strategies for water conservation.

References

[1] D. Thiery, 2003, 2011, 2013. Logiciel GARDENIA version 6.0. Guide d'utilisation. Rapport public BRGM n° RP52832. http://www.brgm.fr/publication/pubDetailRapportSP.jsp?id=RSP-BRGM/RP-52832-FR, 2003, 2011 et 2013.

[2] D. Thiery, Logiciel GARDENIA, version 8.2. Guide d'utilisation. BRGM/RP-62797-FR, 126 p., 65 fig., 2 ann. http://infoterre.brgm.fr/rapports/RP-62797-FR.pdf, 2014.

[3] N. Gaaloul, Modélisation mathématique du système aquifère multicouche Application : Bassin Nord - Aquitain (Oligocène-Eocène). Thèse de Doctorat, Université de Bordeaux I en Sciences et Techniques de l'Eau, 1992, 283 p.

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