

# ISOSCAPE FOR GROUNDWATER RECHARGE ASSESSMENT OF THE CONTINENTAL TERMINAL SHALLOW AQUIFER OF THE TOGO COASTAL SEDIMENTARY BASIN

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**Abstract:** In the Coastal Sedimentary Basin (CSB) of Togo, the shallow aquifer of the Continental Terminal (CT) is the most stressed water resource despite the continuous degradation of its quality. To be able to discuss the sources of groundwater degradation in this aquifer, knowledge of the origins of the waters that contributes to its renewal is very important. This study proposes to use the stable isotopes of rainwater, surface water and aquifers to understand the recharge of the CT aquifer. Using a  $\delta^{18}\text{O}$ - $\delta^2\text{H}$  diagram, the groundwater representative points are aligned around or below the local meteoric line of slope 7.3. This suggests that this aquifer is recharged by precipitation from oceanic origin and evaporated waters. The isoscape map of the CT waters revealed an enrichment of the isotopic signature from south to the north. The enriched signatures of the waters of the northern sector of the CT and those depleted in the southern sector are aligned on straight lines with the same slope of 4.9, thus revealing the same conditions of groundwater recharge with contribution of surface water.

## 1. INTRODUCTION

In the south of Togo, groundwater from a shallow aquifer (Continental Terminal -CT-) and two deep aquifers (Paleocene and Maastrichtian) are the most used for drinking water. However, the easy access to water from the CT aquifer with a water level of between 5 and 10 meters at the level of the coast where the population is higher means that this aquifer remains the most used. However, according to previous studies, the water in this shallow aquifer is of poor quality [1,2]. Knowing the origin of the waters that feed this aquifer is indispensable to detect the potential sources of pollution impacting water quality and solve the question of factors of degradation of this shallow groundwater. This work aims to use stable isotopes of the water molecule both to assess the origin of water contributing to the recharge of Togo CSB aquifers and to demonstrate whether a groundwater isoscape map can be used to understand the recharge mechanisms of processes CSB shallow aquifer.

## 2. METHODS

To understand the CSB's groundwater recharge dominant sources, we sampled 265 surface water (rivers and lakes) and groundwater during the 2020 and 2021 field works. Rainwater were sampled monthly from October 2020 to August 2022 on four stations installed as part of this study.

### 3. RESULTS

The isotopic compositions of rainwater vary from -6.3‰ to 2.8‰ for  $\delta^{18}\text{O}$  and from -36.6‰ to 20.9‰ for  $\delta^2\text{H}$

The isotopic signature of groundwater aquifers are aligned around the local meteoric line (LMWL) with slope 7.3. However, there are also water points, especially that of the CT located between LMWL and the surface water of slope 6.1. this reveals that the waters of the CT aquifer are recharged by precipitation waters but also evaporated waters.

To understand the origin of these recharge waters, the  $^{18}\text{O}$  isoscape map produced with the CT groundwater signature shows more enriched waters in the northern sector of the basin (Fig.1). The alignment of the CT water points of the enriched northern sector just like that of the southern sector around the straight lines with a slope of 4.9 and which pass through the oceanic water point makes it possible to conclude that the waters of the CT aquifer are mainly recharged by precipitation having undergone evaporation.

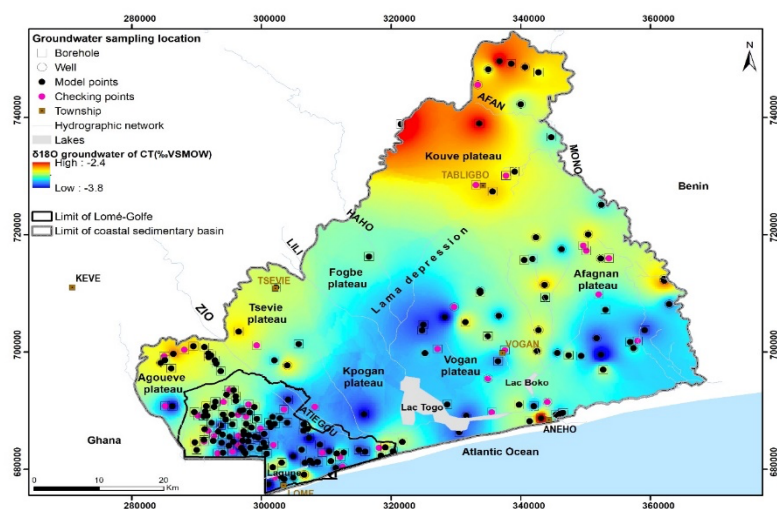


Fig 1  $\delta^{18}\text{O}$  isoscapes for Coastal Sedimentary Basin CT shallow groundwater

### 4. CONCLUSIONS

This study attempted to start from the evaluation of the stable isotopes of rainwater, surface and groundwater to understand the origin of CT recharge of the shallow aquifer of Togo. From the isoscape map, it is clearly shown that rainwater is the main source of groundwater recharge throughout the basin.

### REFERENCES

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