Hydrogeochemical characterization and salinization process of the intercalary continental water in the region of El Goléa, southern Algeria.

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Abstract :

Southern Algeria contains enormous groundwater resources, considered the most important from the point of view of potentiality and quality. The aquifer of the intercalary continental (CI) is in great demand in the region of El Golea, because of its chemical quality ranked among the best water mineral.

Key-Words: aquifer, intercalary continental (CI), chemical quality

I. INTRODUCTION

The salinity of underground water is one of the principle problems in the irrigated zones given the roles it plays in the deterioration of water quality and in the decrease of agricultural productivity[1]. In these arid and semi- arid regions, agriculture is mainly limited by the availability of water of irrigation since the main source of irrigation is the underground water[2]. The irrigated agriculture in these zones must take into account the risks of the increasingly progressive salinity of the soil due to the accumulation of salt resulted from irrigation[3]. The origin of this salinity can be justified bythe effect of weak precipitation followed by a pretty strong evaporation[3] or by the nature of geological formation[4]. The role of these two factors has been dealt with by many studies around the world[3], [4]. The study has proved these factors' role in the salinity of water. The objective of our study is to identify the chemical composition of this water along with the factors affecting it.

Materials and methods

The samples of the water of the forages were picked up between mars, 2015 and November, 2017. The 70th samples are well distributed in the zone under study. They were taken in polyethylene bottles of 500 ml to be analysed with anions (Cl^-, $SO4^{-2}$, $NO3^-$ et $HCO3^-$) and with cation (Ca^{+2}, Mg^{+2}, Na^+ et K^+) after filtration and acidification.

Sampling materials have been chosen in accordance with the objectives of our study; the analysis of the samples is conducted at the laboratory of radio analysis and environment at the University of Sfax. Calcium, Magnesium and Chlorides concentrated with titrimetry, sulphate with photo-colorimetric and sodium and potassium with flamed spectrometry of atomic absorption. The measures in situ of productivity (precision of ± 0,5 % of the measured value), the temperature (precision of ± 0,1 °C) and pH (precision of ± 0,01 pH unit) were realised by a conductimeter and un pH metre WTW 330i.

Results and disscusion

To explain the origin of the salinity of water in the intercalary continental in the zone of El Golea, a combination of statistical analysis through the analytical method that consists of the main component ACP and the use of the diagram of Durov are deemed appropriate. The presentation of the concentrations of the ions on this diagram (fig. 1) shows that the nape of the intercalary continental almost belongs to the kind that is calci bicarbonated and generally linked to the refilled type of its water that passes by rocks that are carbonated and evaporatic at the surface.

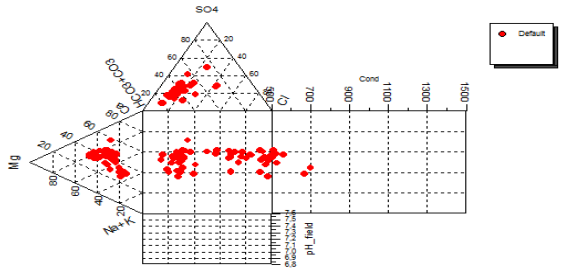

Fig 1: Diagramm of Durov for the various samples ofwater.

The cyrcle of correlations (Fig.2) below represents the space of the variables under investigation. The percentage of the variation showed by axe F1 is45,50 % while it is only 13,60% for axe 2. Thus, the total variation explained is 59.1 % for both axes.

In the space of variables, the value of Ca^{2+}, Cl^{-}, Mg^{2+}, SO_4^{2-} and productivity are the positive part of this axe. This means that the stream of this water is mineralised by carbonated and evaporatic rocks. On the other hand, the axe F2 is represented by K^{+} andNO_3^{-}. This means that the origin of these two elements is anthropic.

According to the correlation matrix, the low mineralization of the intercalary continental water explained by the low residence time of its water, which subsequently prevents the dissolution of the rocks in the aquifer. The statistical study by the application of the ACP allowed observing a probable drainance between the free water table and that of the continental interlayer, considering the low depth of the latter as well as the same chemical facies observed.

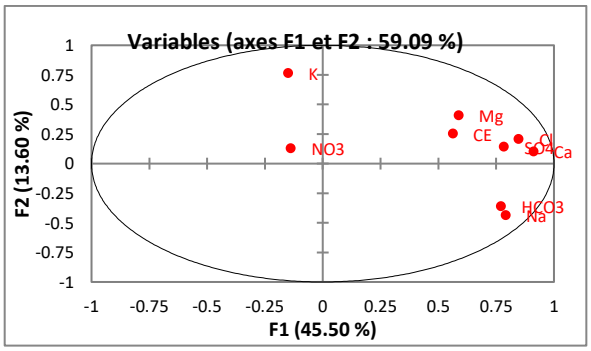

Figure2: Variables repartition in the correlation cycle following the factorial plan F1 and F2.

Conclusion

Our study has as an objective the identification of the origin of the chemical composition of this water, its spatial evolution and the various hydrogeochemical phenomena that may take place at the level of each aquifer.The samples of the water of the forages were picked up between mars, 2015 and November, 2017. The 70th samples are well partitioned in the zone under study. According to the statistical analysis with ACP we may say that the origin of the salinity of the intercalary continental influencing the zone of supply which is the saharian Atlas is composed essentially of carbonated rocks. We may also attribute the weak mineralization of this water to the weak depth of the nape that is characterised by weak thermic gradient which does not participate in the dissolution of the rocks in the aquifer.

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