

## SALINITY AND TDS VARIATIONS OF WATER WELLS FROM MEDIAS CITY, SIBIU COUNTY

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**Abstract.** This paper investigates groundwater changes, from Medias City, regarding salinity and total dissolved solids (TDS) values. According to the data obtained from seven water wells, significant and high values for salinity and TDS can be observed. Collating the obtained results with drinking water quality standards issued by Law 311 of 28 June 2004 concerning the quality of drinking water, Environmental Protection Agency (EPA) and World Health Organization (WHO) it is noticed that all seven water wells samples have chemical parameters concentrations that exceed the maximum admissible concentration (MAC) established by assembly organisms. For analytical and chemical analyses, a portable WTW Multi 350i multiparameter device was used. Results reflect a chemical and organic contamination for groundwater from Medias Town signifying unacceptability for drinking.

**Keywords:** water wells, salinity, total dissolved solids (TDS), contamination

### INTRODUCTION

Water is the source of all and every existence on the Blue Planet. Water is an incredible and interesting element, due to its versatility, shape variedness (ice, fluid, steamer, aerosol; lake, sea, stream, groundwater) and ubiquity. Unfortunately, water is a susceptible and limited resource. Water is directly affected by the anthropogenic activities (industry, agriculture, house activities, traffic, mining activities). Ground water represents only 1.70% of total water volume on Earth (Sorocovichi, 1996). Underground water composition can be slightly influenced and changed due to its low volume, and direct contact with the soil matrix. Changing temperatures from a season to another, extreme and lack of precipitation affect the water volume. Groundwater volume decreasing causes increasing of chemical and organic compound concentrations. Salinity and total dissolved solids concentration are directly affected by this ordinary process. But, anthropogenic activities enhance the increasing of chemical indicators.

Water wells have a significant importance, by reason of utilization as potable water source, which implies health risks. Inhabitants from Medias City use water wells as fresh water for drinking, cooking, irrigation and other house activities. High concentration of chemical parameters can breathily affect their health. Hereby, assessing the quality of groundwater creates an idea regarding the possible use of water wells, avoiding health risks.

**Study Area.** Medias is a 44.000 small city situated in the Hartibaciu Plateau, almost in the central part of the country (46°9'50" N; 24°21'3" E). Hartibaciu Plateau has a classical earth flow area represented by glimee relief. Annual temperature and humidity means are between 7 C and 8°C, respectively 87%. Chira and Malacu, in 2008 mention the existence of groundwater aquifers between 1.2 and 10 meters depth. Horhoi in 2001 noticed two classes of aquifers: phreatic aquifers found at low depths and depth aquifers.

Inhabitants use water wells as potable water sources for at least 50 years due to lack of sewage systems.

## MATERIALS AND METHODS

**Sampling and determination methods.** Starting with 2012, November, seven water wells were the objectives of this study, until 2013, May. Samples were collected two times at a month in clean polyethylene bottles (100 ml), and kept at 4°C in a freezing combine, until analysis. Water wells samples were collected with help of buckets and supply plants. All wells have as structure body, concrete tubes with different dimensions (30cm-45cm; 130cm-150cm) and are covered with metal or nonmetal plates. All water wells are used in house activities (cooking, irrigation and drinking).

In summer season a decreasing water volume could be noticed, and in rainy season turbidity was enhanced. Physico chemical analysis (pH, salinity, total dissolved solids and electrical conductivity) were applied with help of multiparameter WTW Multi 350i. After each sample measurement, electrodes were washed with distilled water and dried with clean paper napkins.

## RESULTS AND DISSCUTIONS

Physico-chemical analysis reveal high values for salinity, total dissolved solids and electrical conductivity. Parameters values exceed maximum admissible concentration issued by WHO, EPA and Law 311 / 2004 regarding water quality. Maximum admissible concentration for salinity is 0.1‰, for TDS is 1500 mg/l, pH is  $\geq 6,5$ ;  $\leq 9,5$  and for electrical conductivity is 2500  $\mu\text{S}/\text{cm}$ . Sample F3 has a salinity of 0.7‰ in more than a half of sampling campaigns, specifically in the melting and raining season.

Sample F5 has same high values in the raining season. It can be observed high values for salinity distinctively in November and April sampling campaigns. December 2012 was poor in precipitation, but cold and it can be noticed lower values for salinity, followed by April of 2013. Sample F5 is the only sample with lowest values ( $<0.1\%$ , 0.1‰ and 0.2‰), all low values were obtained in April and May. During the four seasons, chemical analytic analysis reflects variation. Rainy and melting periods reflect high values for salinity and dry seasons present low values for salinity (Figure 1). High values for total dissolved solids (818mg/l-865mg/l) were acquired in dry season (December 2012, April and May 2013). Lower value (715mg/l) for TDS was obtained in the most rainy and melting period (March 2013) Figure 2.

Sample F7 presents the highest concentration for total dissolved solids (TDS), of 870 mg/l (obtained in first part of April 2013). In same sample campaign it can be observed the lowest TDS concentration (155mg/l) for sample F5. Sample F5 presents lowest concentrations of TDS for all TDS measurements during the study. Sample F1 has constant values for all TDS concentrations (for same sample in all samples campaigns and all samples).

Values for pH ranged between 7.02 pH units and 8.53 pH units; pH values do not exceed maximum admissible concentration established by Low 311 / 2004, regarding quality of water and Environmental Protection Agency (EPA).

**Salinity variations**

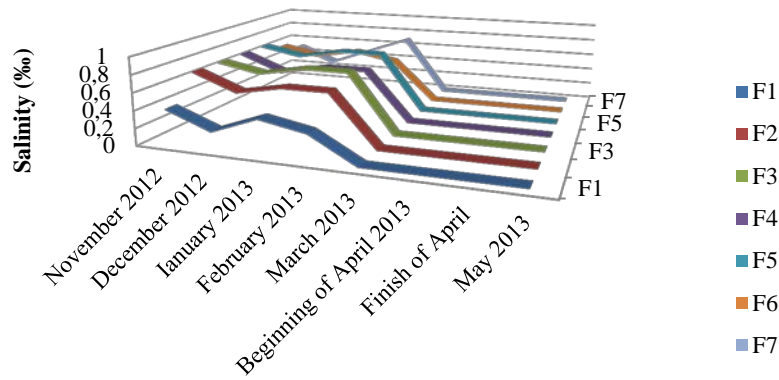


Fig. 1. Salinity variations for water well samples from Medias City

**TDS Variations**

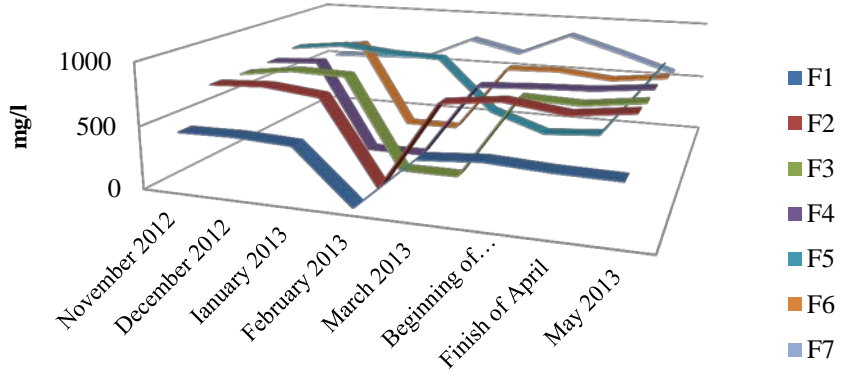


Fig. 2. Total dissolved solids variations

**pH-salinity correlation  
May 2013, sampling campaign**

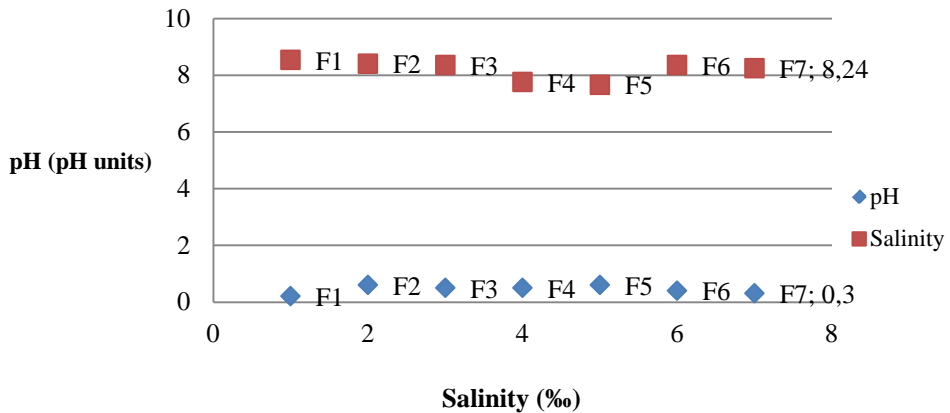


Fig. 3. pH-salinity correlations for May 2013 sampling session

Significant observations were obtained in sampling campaign from May 2013. For mentioned sample sett, analysis reflects lowest values for pH and higher concentrations for salinity (Figure 3).

Decreasing values for pH can be correlated with increasing values for salinity. May of 2013 was rich in precipitations. High values for pH can be demonstrated by dilution of chemical compounds, respectively alkalinity of water wells (8.19 pH units as mean value). Diluted chemical and organic compounds decrease water wells salinity (0.4‰ as mean value).

## CONCLUSIONS

Variations of salinity and total dissolved solids, for water well samples from Medias City were observed and present in this paperwork. Lack and abundance of precipitations could be the cause of variations. High values for salinity exceed maximum admissible concentrations issued by Low 311 /2004, Environmental Protection Agency (EPA) and World Health Organization (WHO). Salinity values increase in dry season and decrease in rainy season. Physico-chemical analysis reflects high values for total dissolved solids. Values for pH are constant during all sample campaigns and do not exceed maximum admissible concentration (MAC). Water wells from Medias City present chemical and organic contamination due to high values for salinity and total dissolved solids, observation which makes water wells not suitable for drinking.

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