Hydrogeochemistry of alluvial groundwater in agricultural area: A case study in Gumushacikoy Aquifer, Turkey

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Ground and surface water quality can be affected by three different forms of pollution, which are chemical, biological and physical pollution. These polluting factors can influence natural environment and human health. Nitrates in soil and groundwater generally moves relatively slow and there is approximately 20 years lag time between the detection of the pollutant the pollution activity and in groundwater. In this study, groundwater pollution originated from agricultural activities and municipal wastewaters were investigated in Gumushacikoy urban area. The water analyses from 49 water wells in the plain, taken over a 2-year period, were used to determine the NO_3^-, NO_2^- and NH_4^+ contamination in the alluvial groundwater. The concentrations of nitrate (NO_3^-) in groundwater of Gumushacikoy Plain range from 0-15.61 mg/l, nitrite (NO_2^-) 0-0.007 mg/l and ammonium (NH_4^+) 0-0.5 mg/l. Most of the drinking water samples high in nitrite and ammonium concentrations and exceeding the limit of 0 mg/l (TSE 266, Turkish Drinking Water Standard). However other chemical parameters such as pH, EC, TH, Ca^{+2}, Mg^{+2}, Na^+, K^+, HCO_3^-, Cl^-, SO_4^{-2} and F^- were also measured. The pH and EC values of of the well water samples are changing between 6.8 – 9.9. and 439-1276 respectively. Drinking water well of the some villages have low pH value acoording to the Turkish Drinking Water Standard. Total hardness of the groundwater samples are ranging between 2.5-57.75 according to the FH. These water samples range between "very soft" and "very hard". Water type of the Gumushacikoy groundwater is Ca-HCO_3. Carbonate hardness of the all drinking waters have bigger than %50. To the chemical analyse results, most of the well waters which are using for drinking purposes should not be used when considering to the NO_2^-, NH_4^+, pH, total hardness. The present state of the quality of the Gumushacikoy alluvial groundwater necessitates taking some technical measurements in order to preserve and improve water quality.

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The concept of convergence in surface roughness and its relationship to rock and mineral surface reactivity

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In material science, the evolution of surface topography by processes such as abrasion has been traditionally quantified by roughness parameters. These parameters characterize quantitatively analyzed surfaces by a statistical treatment of {x, y, z} data. With this approach, we are able to quantify the evolution of surface deviations on a regular relief. However, complications arise because most natural rock surfaces show a multitude of wavelengths in terms of surface relief. To detect and quantify the alteration of rock surface topography, a statistical treatment of surface data must accommodate the occurrence of surface "building blocks" of different length. This is important because various surface building blocks typically show different reaction velocities during dissolution or precipitation.

Our approach makes use of so-called *convergent* surface roughness parameters, in which surface roughness parameters are calculated for differently-sized "footprints" from vertical scanning interferometry (VSI) data. We show several applications demonstrating the importance of convergent surface roughness parameters. In a study of oxidative weathering of organic matter (OM) in black shales, we can demonstrate that root mean square roughness (*Rq*) is tied to the distribution of OM components having a high reactivity for oxidative weathering. In a second study, convergent *Rq* data measured at iron oxide incrustations of oxidative-weathered uranium-bearing shale correlate linearly but inversely with the uranium (U) concentration of the incrustation. These surface data show a relationship between the occurrence of macropores (d ~ 500 nm) and the U content of the weathering product. As a third example, we demonstrate the application of surface roughness data to determine corrosion rates of volcanic glass surfaces. All examples underscore the importance of statistical surface parameters in the identification and characterization of the surface components that dominate reactivity.