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Parametric and non-parametric approaches to assess spatial variability of As and F- concentrations in uncertain geological settings of Tanzania.

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Groundwater pollution is becoming a serious problem to human health worldwide and affects sustainable Water Quality Management Plan in many countries. The occurrence of such pollutants can either be geogenic or anthropogenic of which geogenic pollutants are reported to be more dangerous due to uncertainty in their occurrence, interaction with groundwater and how they affect human health through drinking water supplies. Therefore, understanding the spatial variability of groundwater As and F concentrations is a critical issue to be considered in developing a sustainable Water Quality Management Plan in any country. In northern parts of Tanzania, due to lack of alternative drinking water sources, adjurisdiction and insufficient technology to detect and remove or lower pollutants concentrations, the maximum permissible concentration has been set to 4 mg/L and 0.05 mg/L for F and As respectively, contrary to the WHO drinking water guideline values of 1.5 mg/L F and 0.01mg/L As. The current study on groundwater contamination in Tanzania is focused on understanding the spatial variability of F and As concentrations and characterising regions with high concentrations that do not comply with drinking water guidelines. Due to limited data coverage, we are using both stochastic and nonparametric statistical approaches to understand their spatial distribution and associated uncertainty. In parametric approaches, we are developing geostatistical methods based on regression kriging (RK) and simulations to generate a series of images showing spatial distribution of As and F concentrations based on sample data. In nonparametric methods we are using ranked sums approaches to assess the relationship between detected concentrations in shallow wells, springs, boreholes, deep shallow wells and rivers in different geological settings. The resulting simulation images are classified using rule-based classifier to detect contaminated and uncontaminated areas and associated model of uncertainty in the spatial distribution of As and F concentrations. The results of this mapping of contaminated and contaminated sites provide spatial decision making tool for selecting sites for installation of wells with low pollutant concentration and also removal plants.