Reply to:

Uranium concentration in ground water samples belonging to some areas of Western Haryana, India using fission track registration technique

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Dear Editor,

I have read the above cited paper very carefully. The undersigned has been involved in the analysis of geological materials and hydro-geochemical reconnaissance surveys attached with mobile geochemical laboratories in different parts of India for uranium exploration activities of the Atomic Minerals Directorate for Exploration and Research. I have also contributed on uranium determination in diverse matrices vide my publications:

Also, my three recent publications;


Based on my experiences gained so far, I would like to share some of my observations as follows:

1. There are three essential parameters for the reliability of measurement results for naturally occurring water samples:
   a. Sampling: Water sample should be free from suspended matter/sediments. It should be filtered before collection and its preservation. For preservation of water samples, it should be acidified with AR nitric acid to pH-1.
   b. Time interval between water collection and analysis. For un-acidified water samples, water sample should be analysed on the same day.
   c. Methodology adopted for uranium analysis.

Complete and unequivocal preservation of samples, whether domestic waste or natural water is a practical impossibility. The physicochemical and biological changes continue inevitably after sample collection. This warrants the need and use of Mobile Geochemical Laboratory for on-the-spot/quick analysis of water samples.

Hydro-geochemical reconnaissance program for the exploration of uranium seems to be very simple in terms of sampling, analytical techniques, interpretation of data etc., when in fact; it is a difficult task if the elapsed time interval between sampling and analysis is more. It is due to the fact that the degree of variations in the contents of major cations and anions and uranium are in unpredictably significant manner as stated below, leading to erroneous results and their interpretations. The samples must not be contaminated with the elements to be determined and should not undergo physico-chemical changes which result in loss or increase of uranium and other elements. There is always a need of periodic self-evaluation of data, that is, from collecting samples to reporting results.

The water samples collected and sent for analysis should be a true water sample that is, free from suspended or particulate materials, properly stored or preserved so that it should be free from any variations in the content of water samples (IAEA, 1973; 1988; Robbins, 1978; APHA, 1980).

2. On page 353, MATERIALS AND METHODS section of the manuscript, both these essential parameters (A and B) of water sampling have not been stated in the manuscript. Hence to proceed further for analytical measurement is a waste of time and it has no meaning. Results and discussion based on such unreliable results will be highly misleading.

Changes in Uranium contents of samples: Uranium levels also changes considerably probably due to adsorption, co-precipitation etc. It is necessary that before acidification of water sample, it should be from suspended particulate materials, if not, should be filtered; otherwise, uranium levels may not be a true value and may increase or decrease. A gain is presumed to occur when suspended particulate material with comparatively high uranium levels slowly equilibrates with the water. Losses probably occur due to the container walls. In general, for the preservation of samples for the determination of metal ions at trace levels, the water samples should be acidified after filtration only. In addition, the presence of fluoride above 1.5 mg/l in water samples effects the variation in the contents of uranium in un-acidified samples to a greater extent with respect to time-interval between water sample collection and analysis. When the water sample is collected, the equilibrium between rocks and water is disturbed. With passage of time, fine colloidal suspension (particles) floats on the surface of the water sample in the container (probably calcium fluoride, CaF₂). As calcium fluoride is a very good co-precipitant of uranium, it adsorbs uranium from the whole sample volume. Therefore, when we analyse samples for uranium contents, these particles enriched in uranium shows high uranium contents which may not be a representative value/true value of uranium in samples. Fluoride
contents above 1.5 mg/l has been reported in this part of the country. In my opinion, actual value of uranium contents in such water samples (containing fluoride) should not be abnormally very high. With further passage of time, you will find deposition of salts in the bottom of the container [there is a well known method for: “Determination of ultratrace levels of uranium by selective laser excitation of precipitates” by Johnston and Wright (1981)]. In this work, selective excitation of probe ion luminescence is applied to the analysis of uranium co-precipitation in to calcium fluoride; and also “Detection of Ultratrace Levels of Uranium In Aqueous Samples by Laser-Induced Fluorescence Spectrometry” (Perry et al., 1981)

3. On page 353 MATERIALS AND METHODS section of the manuscript as stated, “fission track registration technique was used for the assessment of uranium concentration level”. In the fission track method, the small volume of water used might result in observation of small fluctuations in concentrations, caused by temperature differences or chemical gradients hence the result is not representative of the average value in surface water or ground water. Laser-induced fluorescence is a direct and reliable method for the measurement of low uranium concentrations when the number of samples is very large. However, of the direct methods, the fission track method seems to be the nearest competitor.

4. Experimental data for the relationship of standard uranium concentration (c) and T and ‘spiked’ samples should be given. This method requires constant checking and recalibration. The reliability/quality of measurement results of water samples depend on strict adherence to each step of sampling, preservation of samples, time–interval between sampling and analysis (for filtered but unacidified water samples) and on the methodology adopted and not simply analysed by any person or laboratory or any technique.

I hereby request the authors to kindly further document the reliability of their findings as stated above.

REFERENCES