XXXVIII IAH Congress

Groundwater Quality Sustainability
Krakow, 12–17 September 2010

Extended Abstracts

Editors:
Andrzej Zuber
Jarosław Kania
Ewa Kmiecik

University of Silesia Press 2010

abstract id: **474**

topic: **1**
Groundwater quality sustainability

1.2
Groundwater vulnerability and quality standards

title: **Uranium and radon concentration in groundwater of the Taejeon area, Korea**

author(s): **Byong-Wook Cho**
Korea Institute of Geoscience and Mineral Resources (KIGAM), South Korea, cbw@kigam.re.kr

Uk Yun
Korea Institute of Geoscience and Mineral Resources (KIGAM), South Korea, Yunuk@kigam.re.kr

Chang-Oh Choo
Andong National University, South Korea, mineralogy@paran.com

keywords: uranium, radon, MCL

Uranium and radon are naturally occurring elements in groundwater and may lead to harmful effects in human beings. Nationwide survey on radionuclide concentration in groundwater was conducted for four years (1999–2002) after a NGO issued that uranium concentration in some groundwater in Taejeon area, Korea exceeded the US EPA proposed value (20 μg/L). The total number of the groundwater samples during the survey was 636. According to the survey, Taejeon area was regarded as one of the highest potential area in Korea. The geology of the area is rather complex. However, uranium and radon concentration in groundwater is commonly linked to geology, the area was simplified to 3 groups for this study, two-mica granite, biotite granite, and meta-sedimentary rock area. For estimation of the uranium and radon concentration in groundwater of the area, ninety-three groundwater samples were collected in 2000, 2006 and 2008. Most of these groundwaters are used for domestic purposes. Well depth ranges from 15 to 250 m with an average of 115 m (NIER, 2006).

The results of uranium and radon measurements in groundwater are given in Table 1. The uranium concentration in groundwater samples was found to vary from 0.01 to 3,607.0 μg/L with a median of just 4.43 μg/L. About 32% of the samples exceeded 15 μg/L of the WHO guideline based on its chemical toxicity. The radon concentration in these 82 groundwater samples was found to vary 140 to 40,010 pCi/L with a median of only 2,470 pCi/L and about 23% of the samples exceeded 4,000 pCi/L of US EPA's Alternative MCL (AMCL). Since uranium and radon concentration in groundwater is commonly linked to geology, the geology of the area was grouped into 3 for this study, two-mica granite, biotite granite, and meta-sedimentary rock area. The uranium and radon concentration in groundwater returned high in two-mica granite area and low in meta-sedimentary rock area (Tab. 1). Compared with the contents of other countries having similar geology (Morland et al., 1997; Salonen and Hukkanen, 1997) the value of uranium and radon concentration in the groundwater of the area is low. Radon concentration in groundwater has been monitored at a well with a sampling time of 2 or 3 days during early November in 2006 to see the effect of rainfall (Fig. 1). A large variation is observed, with a low value of 3,200 pCi/L after some precipitation, and increase up to 8,600 pCi/L before another precipitation. This large fluctuation associated with rainfall maybe due to direct infiltration of rainfall to the aquifer. Even though the monitored well depth is 134 m and having casing to prevent direct rainfall infiltration. This is one of the reasons why the relationship between uranium and radon concentration in groundwater and other possibly controlling factors, such as well depth, HCO_3 was poor in the area.

Table 1. Uranium and radon concentration 1.

Geology	Samples	Rn-222 (pCi/L)			U (μg/L)		
		Mean	Med.	Max.	Mean	Med.	Max.
Two-mica Gr.	54(45)	5330	3090	23000	117.06	11.14	3607
Biotite Gr.	20(18)	2990	1665	20500	26.39	0.98	402.3
Meta-sedi.	19(19)	*3807*	*1140*	40010	1.79	0.47	11.09
Total	93(82)	4392	2470	40010	67.74	4.43	3607

( ): radon sample

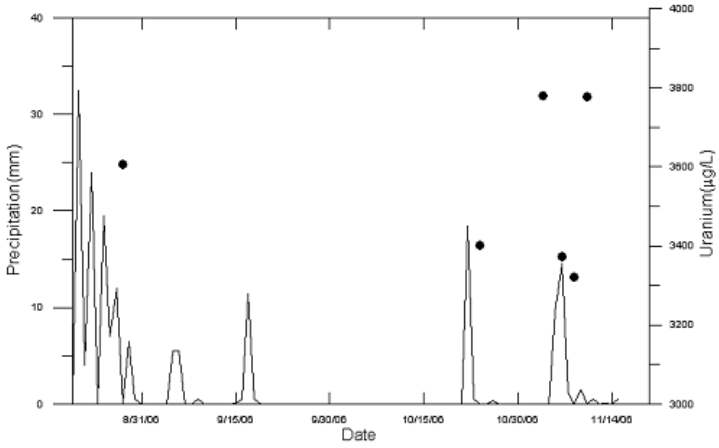

Figure 1. Radon concentration of a well in two-mica area as a function of time.

REFERENCES

Barcelona M.J., Gibb J.P., Helfrich J.A., Garske E.E., 1985: *Practical guide for groundwater sampling*. SWS Contract Report 374. p. 94.

Morland G. et al., 1997: *The hydrogeochemistry of Norwegian bedrock groundwater-selected parameters (pH, F, Rn, U, Th, Na, Ca) in samples from Vestfold and Hordaland, Norway*. NGU Bull, Vol. 432, p. 103–117.

NIER, 2006: *A study on the radionuclides concentrations in the groundwater*. NIER report, 200 p.

Salonen L., Hukkanen H., 1997: *Advantages of low-background liquid scintillation alpha-spectrometry and pulse shape analysis in measuring radon, uranium, and radium-226 in groundwater samples*. J. Radioanalytical and Nuclear Chemistry, Vol. 226, No. 1–2, p. 67–74.

International Association of Hydrogeologists

AGH University of Science and Technology

2-vol. set + CD
ISSN 0208-6336
ISBN 978-83-226-1979-0