

ABSTRACT

SOUZA, F. **Determination of ^{234}U and ^{238}U activity concentrations in groundwaters from three deep wells drilled in Itu Intrusive Suite (SP).** 2006. 102 f. Dissertação (Mestrado) – Instituto de Astronomia, Geofísica e Ciências Atmosféricas, Universidade de São Paulo, São Paulo.

Activity concentrations of (^{234}U) and (^{238}U) were determined in groundwaters drawn from three deep wells drilled in rocks from Itu Intrusive Suite (SP), two located in Salto town (S and SY wells) and the other one in Itu (I well). Sampling was done from September, 2004 to December, 2005, and twelve samples of each well were collected monthly.

For those determinations alpha spectrometry technique was used, providing high precision results, as shown by the very good agreement of the data obtained in the analyses of 23 duplicates.

The waters from the three wells presented a considerable enrichment of ^{234}U in relation to ^{238}U , indicating an important radioactive disequilibrium of these isotopes. In I well, the activity concentrations of (^{238}U) varied from ($1,06 \pm 0,03$) to ($2,1 \pm 0,2$) mBq/L and those of (^{234}U) spanned from ($3,1 \pm 0,2$) to ($6,0 \pm 0,4$) mBq/L, whereas ($^{234}\text{U}/^{238}\text{U}$) activity ratios did not present significant variation, during the sampling time interval, presenting an average of $2,8 \pm 0,1$. The S waters showed the lowest uranium concentrations and the largest diversity of (^{238}U) and (^{234}U) activity concentrations, which varied from ($0,26 \pm 0,02$) to ($1,07 \pm 0,08$) mBq/L and from ($1,8 \pm 0,1$) to ($7,0 \pm 0,5$) mBq/L, respectively, and also presented variable ($^{234}\text{U}/^{238}\text{U}$) activity ratios, spanning from ($2,79 \pm 0,07$) to ($8,1 \pm 0,3$). In SY well, (^{238}U) activities varied between ($0,8 \pm 0,1$) and ($4,2 \pm 0,3$) mBq/L and those ones of (^{234}U) from (14 ± 1) to (53 ± 4) mBq/L, whereas ($^{234}\text{U}/^{238}\text{U}$) ratios fell in the interval from $12,6 \pm$

0,3 to $18,3 \pm 0,4$, with the highest activities of both radioisotopes registered during the dry season and the lowest ones in the rainy time period.

The ($^{234}\text{U}/^{238}\text{U}$) activity ratios, which were invariable during sampling period of I well, indicated the contribution of rainfall to recharge the aquifer. The observed correlation between those ratios and uranium concentrations, for S and SY wells, showed complex and distinct recharging processes. The waters from S have a contribution of at least three mixing components (meteoric water, groundwater from the sedimentary aquifer, probably very depleted in uranium, and groundwater from fractured granite). The waters from SY, besides a rainfall contribution, seem also to have a component related to leaching of uranium from the granite, with preferential solubilization of ^{234}U , since the aquifer is under oxidant condition.

Considering the ensemble of waters from the three investigated wells, the total dissolved solids varied from to 125 to 330mg/L, whereas uranium concentrations spanned between 0,032 and 0,42 ng/g, indicating that their ingestions do not cause any risk to the health human being.