

DETERMINATION OF GROUNDWATER RECHARGE IN ABADIA DE GOIÁS, GOIÁS STATE, BY APPLICATION OF ARTIFICIAL TRITIUM TAGGING METHOD

D.C.R. Poli ⁽¹⁾, P.E. Aoki ⁽¹⁾, V. Lepki ⁽¹⁾, S. Saad ⁽²⁾, L. Araujo ⁽²⁾, G.A. Pedroso ⁽²⁾

⁽¹⁾ Instituto de Pesquisas Energéticas e Nucleares, IPEN-CNEN/SP, Travessa R, 400-05508-900 Sao Paulo, Brazil

⁽²⁾ Comissão Nacional de Energia Nuclear, CNEN HQ, Rue General Severiano, 90-22294 Rio de Janeiro, Brazil

CNEN, the National Nuclear Energy Commission is a governmental body responsible for the collection and disposal of radioactive wastes and the enactment of regulations concerning waste disposal sites. Brazilian public concern about radioactive wastes forcefully sprang up as a consequence of the Goiânia accident involving the rupture of a ¹³⁷Cs medical source which resulted in four casualties and radiation injuries in several people. Low level solid radioactive waste was generated as a result of the environmental clean up operation within the city. This waste includes drums, metal boxes and concrete packages with 6000 t weight, 3500 m³ volume and 49.60 TBq activity.

A site for a near-surface repository has already been selected about 20 km from Goiânia City and 2.5 km from Abadia de Goiás town. In this local, artificial tritiated water was used as a tracer for monitoring the movement of the moisture in the unsaturated zone and determining the groundwater recharge. The groundwater recharge is the input rain into the saturated zone and is essential for urban water supply, agriculture and water resource evaluation. The region studied is located in the central part of Brazil. The area is covered by lateritic soil. The climate is semi-arid tropical with mean temperature of 23.2 °C, mean annual humidity of 66% and mean annual precipitation of 1520 mm. Almost all of the total rain precipitation, 75%, occurs from November to March. The driest season runs from June to August with precipitation corresponding to 2% of the total amount.

Injections of tritiated water were made in July 1991 at a depth of 50 cm below the surface out of the root zone of vegetation. Five-point injection were made at a 10 cm radial distance in a cross shape. 2.5 cm³ of tritiated water with a 5.55×10^4 Bq·cm⁻³ concentration were injected in each point. Soil samples were taken with a hand auger after four, nine and twelve months from injection. For extraction of moisture, soil samples were distilled in a vacuum system and the tritium estimates were carried out by liquid scintillation counting. The recharge was calculated from tritium and moisture profiles.

Results showed a good correspondence between soil and groundwater recharge. Highest recharge obtained was 30.07 cm and the lowest one was 11.63 cm. The mean value for the recharge was 21.32 cm, equivalent to 14.36% of the precipitation in the period from July 1991 to July 1992. A value of 30% for the tracer recover was obtained, which is adequate for this kind of work.