

Radioisotopes in Hydrology

- A number of radioisotopes are used in hydrological studies.
- Determining the age of ground water is important for several Reasons -
 - Groundwater age translates roughly to circulation and renewability, which is critical for water resource planning.
 - The age of groundwater relates also to its vulnerability to contamination.
 - Modern groundwaters will have more direct pathways from the surface, facilitating infiltration of contaminants from surface activities in the recharge area. Old groundwaters are isolated from the surface and perhaps less vulnerable to anthropogenic contamination.

TABLE 4.1
Process for Age-Grading Considerations

Isotope	Half-Life	Biophysics Half-Time	Source (Target Nuclide)	Biophysics Concentration
Radionuclide Concentrations				
^{14}C	5730 y	+1 y	Geopositive (^{14}C)	Steady state
Radon, R	4.10 y	+1 y	Thomsonianian biophysical	1000 R/L or 1000 units
^{13}C	4.10 y		Geopositive (^{13}C)	0.01 R/L
^{14}C	5730 y		Unknown, but increasing	0.1 R/L, increasing
^{15}C	Stable	200 y	Electron ionization systems	7 ppm, increasing
^{16}C	Stable	100-200 y	Religious ionization systems	^{16}C -12.1 R/L up to 2000
Sub-Radionuclide Concentrations				
^{14}C	200 y		Geopositive (^{14}C)	0.7 R/L up to
^{15}C	+10 y	+1 y	Geopositive (^{15}C)	0.0001 R/L
Rad Concentration History				
^{14}C	5730 y	+4 y	Geopositive (^{14}C)	100 pM, or 10 R/L up to
^{15}C	220,000 y		Geopositive (^{15}C)	0.1 pM up to
^{16}C	100,000 y	+1 y	Geopositive (^{16}C)	0.01 pM up to
			Subradon, (^{16}C)	^{16}C -1.0 R/L up to
^{17}C	12.4 My	+1 y	Geopositive (^{17}C)	100,000 pM up to
			Subradon (^{17}C) up to 1000	+1000 R/L up to
^{18}C	Stable		Subradon (^{18}C) and ^{19}C up to 1000	0.100 R/L up to
^{19}C	Stable		Subradon (^{19}C)	0.001
^{20}C	Stable		Subradon (^{20}C) up to 1000	0.01 R/L up to

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Radioisotopes In Hydrology

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Radioisotopes In Hydrology:

Radioisotopes in Hydrology International Atomic Energy Agency,1963 **Practical Isotope Hydrology** S. M. Rao,2006
In Indian context Isotope Techniques in Hydrology International Atomic Energy Agency,1968 **Introduction to Isotope Hydrology** Willem Gerrit Mook,2006 This publication presents in a simple but scientifically rigorous manner the consequences of natural processes to stable isotope concentrations and radioactivities and discusses the implications of these processes *Isotopes in Hydrology, Hydrogeology and Water Resources* B. P. Singh,Bhishm Kumar,2005 Table of Contents
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Application of sealed sources 122 Ch 9 Sediment studies 149 Radioisotopes in Hydrology International Atomic Energy
Agency,1963 *Isotope Hydrology* Pradeep Kumar Aggarwal,2012 Isotope Hydrology uses stable and radioactive isotopes of
water and its dissolved constituents to trace hydrological processes including the pathways of rainfall and snowmelt to and
interactions between aquifers lakes and rivers The potential of using stable isotopes of water was recognized in the 1930s
but not fully explored until the 1950s since when the scope and nature of isotope applications in hydrology have blossomed
Improvements in measurement techniques have facilitated use of isotopes in many contexts and isotope hydrology has
become mainstream as documented in this volume of reprinted papers and accompanying commentaries An excellent
resource for graduate and post graduate level courses in hydrology reproducing many important papers which are otherwise
difficult to access **Environmental Isotopes in Hydrogeology** Ian D. Clark,Peter Fritz,1997-07-23 Groundwater is an
increasingly important resource to human populations around the world and the study and protection of groundwater is an
essential part of hydrogeology the subset of hydrology that concentrates on the subsurface Environmental isotopes naturally
occurring nuclides in water and solutes have become fundamental tools for tracing the recharge history and contamination of
groundwater *Guide to the Safe Handling of Radioisotopes in Hydrology* International Atomic Energy Agency,1966
Radioisotopes in Hydrology ,1963 *Isotopes and Radiation Technology* ,1967 Environmental Isotopes in
Hydrogeology Ian D. Clark,Peter Fritz,2013-11-20 Groundwater is an increasingly important resource to human populations
around the world and the study and protection of groundwater is an essential part of hydrogeology the subset of hydrology
that concentrates on the subsurface Environmental isotopes naturally occurring nuclides in water and solutes have become
fundamental tools for tracing *Tokyo, 1963. Application of Radioisotopes in Hydrology. Symposium, Tokyo, Japan, 5-9
March 1963. A Programme.* Symposium on the Application of Radioisotopes in Hydrology (INTERNATIONAL ATOMIC
ENERGY AGENCY),1962 Isotope Hydrology: A Study Of The Water Cycle Joel R Gat,2010-01-08 Within the realm of the

newly evolving discipline of environmental sciences the stable isotope methodology is being used to an ever increasing extent especially in the study of the water cycle and of paleo climatology This book introduces the rules of the game by reviewing the natural variability of stable isotopes in the hydrosphere describing the physico chemical basis of isotope fractionation and applying this knowledge to natural waters as they move through the hydrologic cycle from the ocean to the atmosphere the biosphere and the lithosphere There is a special focus on the processes at the surface atmosphere and land biosphere atmosphere interfaces since these are the sites of major changes in isotope composition In response to the increasing awareness of our changing climate a discussion on the global view of the changing water cycle in the past and future winds up the presentation a

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Radioisotopes in Hydrology. Proceedings of the Symposium on the Application of Radioisotopes in Hydrology held by the International Atomic Energy Agency in Tokyo, 5-9 March 1963 Symposium on the Application of Radioisotopes in Hydrology (INTERNATIONAL ATOMIC ENERGY AGENCY),1963

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