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The Age of Groundwater – definitions, models and why we do not need this term.

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Abstract

The use of environmental tracers to characterize time scales when investigating groundwater is a technology that has been in use for half a century. Its usefulness is beyond controversy. However, the use of the word “age” for groundwater connected with these techniques is misleading due to its inherent connection to the general understanding of human age. “Age” as in the understanding of human age cannot be determined for groundwater, although it is a useful zero-order concept abundantly used in this context. This paper describes three basic definitions of “age” for groundwater (1: idealized age as in particle tracking and piston flow, 2: mean residence time involving an age distribution and 3: apparent age) and discusses their context in view of recent developments in numerical groundwater modelling. It further gives arguments why the term is “age” unnecessary in modern hydrology and groundwater management and how not using it can enhance efficiency in system understanding: not using age needs less modelling effort and allows comparing models directly with measured values instead of comparing models with models.

1. Introduction

Every human being has an intuitive understanding of the word *Age*. Even if you ask a four-year old child, you will perhaps not get a direct answer, but it will probably raise four fingers before hiding behind mother’s legs. This demonstrates that we are aware of the meaning of age from very early childhood. Every human being knows that age, by definition, means the time difference between the moment of birth and the moment of the question. This age can be given with a remarkable precision:

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