

Interactive comment on “Estimation of effective porosity in large-scale groundwater models by combining particle tracking, auto-calibration and ^{14}C dating” by Rena Meyer et al.

Anonymous Referee #2

Received and published: 28 June 2018

(1) Scientific significance. The paper presents a case study in which inferences about the regional distribution of groundwater travel times are based on 18 measurements of ^{14}C at 7 locations. In addition to the measurements, an existing groundwater flow model and a voxel-based geologic model were available and used. Only porosity (in 7 zones) was optimized, using the existing flow model with advection-only particle tracking.

The resulting porosity field was used in a direct age simulation to generate the mean travel time distribution throughout the aquifer system. The distribution of travel times was explained in the context of the geologic structure of the system, which in turn was

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extended to a discussion of the general vulnerability of the system to various forms of contamination (natural, sea water intrusion, and anthropogenic).

The paper largely uses concepts and methods that are well known. Groundwater models have been calibrated to travel times (many examples). One aspect of the paper that is not well represented in the literature is the sequential calibration of an existing flow model to travel times using only porosity, but this too has been used before, as for example in Starn, J.J., C.T. Green, S.R. Hinkle, A.C. Bagtzoglou, and B.J. Stolp. 2014. Simulating water-quality trends in public-supply wells in transient flow systems. *Groundwater* 52(S1): 53-62.

(2) Scientific quality. The methods and analyses are sound. The discussion of travel times in the context of the geology is especially good. Although the researchers reach a different conclusion than another study in the same geographic area, the differences are explained well and make good sense. Once the relation of travel time and geology was established (in this paper), the geologic voxel model was used to make broad statements about the susceptibility of groundwaters in the area. The paper is a good example of using relatively few data points, along with existing data, in a thoughtful way that should enhance proper management of the resource.

(3) Presentation quality. The graphs and tables could easily be made clearer. Suggestions on how to do that are included in an attached PDF document.

Please also note the supplement to this comment:

<https://www.hydrol-earth-syst-sci-discuss.net/hess-2018-99/hess-2018-99-RC2-supplement.pdf>

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2018-99>, 2018.

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