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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Application of tritium in precipitation and river water in Japan: A case study of groundwater transit times and storage in Hokkaido watersheds" *by* M. A. Gusyev et al.

Anonymous Referee #2

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This work is important to the scientific community as it addresses issues that will be of great importance in the future. They are trying to estimate timescales for residence times of groundwaters in river basins. These groundwaters are important in the maintenance of base flow in the river during all seasons. It is important to have such knowledge of such parameters for proper management of water sheds both in terms of water quantity and quality. They suggest that a small number of tritium measurements can be used to obtain such information and give an example in a study in a Japanese watershed. In general the paper is clear and uses a well-known approach to analyzing tritium data in rivers, i.e. the EPM. Their analysis of the tritium results to determine timescales for the rivers seems to be correct and they do furnish a clear rationale for the conclu-

sions they reach. As far as the quality of the data, the New Zealand laboratory is known for the high quality of their isotopic measurements. One technical point I would make is that they report too many significant figures at times, i.e. the results should be 4.66 +/- 0.07, not 4.659 +/- 0.067. The references list the papers necessary to understand where the model comes from and what they are trying to do with the data. The biggest problem I have with the paper is the input source function, i.e. tritium concentrations in precipitation that are used in the model. The long-term source function is very well constructed with the use of measured data, correlations and concentrations estimates derived from wines. However, with the short timescales for some of the groundwaters in the river basins, results are extremely sensitive to the concentrations in incoming precipitation in the few years just before the stream measurements were made. It is very hard for a reader to know what recent input concentrations are as they use a log scale to address tritium concentrations over the bomb peak period. I think an inset of a secondary graph for the last few years would improve this presentation. It would let the reader know what concentrations they are using in the model for the last few years which is extremely important at the timescales they find in the paper. They clearly understand the importance of the input function by the way they use stable isotopes and other methods to slightly adjust the input function. Two issues are of concern to me. First they only have one precipitation measurement from the time of the study which seems to be higher than what would be expected. Secondly they suggest that some of the issues they have in estimating timescales are caused by snowmelt which is higher in tritium than expected. However, typically in the Northern Hemisphere, tritium concentrations in precipitation are lowest in the winter and during snow accumulation and higher in the spring and summer which appears to be the opposite of what they are suggesting. Unfortunately no snow measurements seem to have been made. They suggest that only one measurement of tritium in stream water is necessary for understanding timescales in watersheds. While this may be true for the stream, it is evident that they should also suggest that measurements of precipitation are important for a correct analysis of the watershed. Overall I would give the paper an excellent for scientific significance, and good for both scientific quality and presentation quality. It gives a good rational for the use of tritium to study the timescales of water within river basins. It also shows that at this stage of the bomb transient, a small number of measurements could yield valuable information for water managers. The relative simplicity and low cost of this approach makes it very desirable.

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