

Interactive comment on “Groundwater mean transit times, mixing and recharge in faulted-hydraulic drop alluvium aquifers using chlorofluorocarbons (CFCs) and tritium isotope (^3H)” by Bin Ma et al.

Anonymous Referee #1

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General Comments The paper reports CFC, tritium, carbon-14 and stable isotope measurements for groundwater in the Manas River Basin in China and uses them to estimate mean transit times for the complex mixtures of groundwaters in the area resulting from the complicated geology.

The complications of the subject combined with English that is not quite right make this a difficult read. However, the paper addresses relevant scientific questions suitable for publication in HESS, with novel concepts and ideas. Substantial conclusions are reached.

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The methods are valid and described satisfactorily, and title and references are well done. There is a problem with the abstract (see below) and consequently the overall structure needs improvement. Some of the figures are complex and could be explained better.

Specific Comments

1) A major problem is that there appears to be a disconnect between the abstract/conclusions and the rest of the paper. The following sentence from the abstract/conclusions:

“The thrust faults were found to play a paramount role on groundwater flow paths and MTTs due to their block water features, where the relatively long MTTs were found near the Manas City with shorter distance and smaller hydraulic gradients.”

is not supported by any discussion in the paper. Yes, it may be supported by implication from the results, but such support needs to be made explicit (possibly in its own subsection since this is an important conclusion).

2) The meaning of the phrase “block water features” is not clear, possibly it means areas where there are strong (semi-vertical) contrasts in hydraulic conductivity (due to the thrust faults).

3) Use of “apparent” ages in the preliminary discussion (Section 4.2.1) is defensible as described.

4) Strictly, groundwater has “residence time” or “mean residence time”/“MRT” (being the time water takes to travel through a groundwater system to where it is sampled by a bore), rather than “transit time” or “mean transit time”/“MTT” which is generally reserved for streamflow (being the time for water to transit through the catchment and into the stream). Consequently, the word “residence” should be substituted for the word “transit” wherever “transit” appears. And also “MRT” for “MTT”.

5) A selection of comments on the English are given below, to help the clarity of the

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writing. There are many other very small infelicities in the English.

Technical Corrections

P1 L24-25 Change to “Quite ‘modern’ recharge is found in the south of the fault with young (post–1940) water fractions of 87–100 %, . . .” from “The quite ‘modern’ recharge in the south of the fault with young (post–1940) water fractions of 87–100 % is obtained, . . .”

P2 L51 “instead of” not “over for”

P2 L53 “closed” not “close”

P3 L89 “common” not “true”

P3 L90-91 “Pumping from long-screened wells (of which there are over 10,000, Ma et al., 2018) . . .” not “Pumping from the long–screened over 10 000 boreholes (Ma et al., 2018) . . .”

P3 L93 “result from” not “impacted by”

P3 L94 “insufficiently recognised” not “insufficient recognition”

P4 L106 “total” not “totally”

P4 L107 “intermittently active” not “intermittent activity”

P4 L117 “depth” not “buried depth”

P6 L177 “Manas River Basin” not “MRB”

P9 L259 & 264 “slope” not “slop”

P10 L300 “we use” not “one assign”

P10 L304 “increasing” not “elevated”

P11 L323 “indicates a larger fraction of 1960s precipitation recharge for G4 . . .” not

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“indicate that more fractions of the 1960s precipitation recharge was occurred for G4 . . .”

P12 L370 “generally” not “totally” and “overlap” not “overlapping”

P13 L397 delete “far”

P14 L413 “series” not “serious”

P14 L423 “Overall” not “Totally”

P15 L448 “permit” not “permitting”

P15 L465 “other sources” not “either source” (?)

P15 L466 “decreases” not “decrease”

P16 L488 “which did not contribute groundwater recharge” not “which had non–contributes to groundwater recharge”

P17 L520 delete “have occurred”

P19 L578 “. . . area) imply invasion of modern contaminants, . . .” not “. . . area), implying the modern contaminants invading, . . .”

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