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Hydrology and Earth System Sciences Discussions

Interactive comment on "Groundwater compartmentalisation: a geochemical analysis of the structural controls on the subdivision of a major aquifer, the Sherwood Sandstone, Merseyside, UK" *by* E. A. Mohamed and R. H. Worden

Anonymous Referee #2

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In their article, E.A. Mohamed and R.H. Worden try to convince the reader that the Sherwood sandstone aquifer close to Meyerside, UK, is divided into independent compartments. And this is of importance because such compartmentalization due to the movement of large normal faults in the area will control very significantly the seawater intrusion. The question is important, and interesting.

However, the arguments developed in the paper are not convincing at all to me. The way of presenting the observation is far from being acceptable. I only slightly exaggerate if I write that the argument presented by the author is the following: "there is

compartmentalization because the map that we have drawn by hand show compartmentalization". Such presentation of the data cannot convince anybody. It is very probable that, indeed, the authors are correct in their conclusion, but the demonstration is not acceptable.

Therefore, in its present state, this paper can only be rejected.

Because my overall opinion is that the conclusions of the paper are not supported by clear evidence at the present stage of the work, I do not want to enter into a detailed discussion, however, I would like to point a few specific issues that are contributing as well to my negative appreciation of this paper.

1. Page 947, lines 17-19: Stating that "automated geostatistical method" are "not suited to the irregular location of sampling points" is completely incorrect. Geostatistics in the mining industry was developed especially to estimate ore grades from irregular samples.

2. Because the faults are dividing the domain into blocks, I think that it is very important to describe precisely these faults and not only giving very general information related to their displacement. Figure 1 is not sufficient to understand the geology. I recommend that a series of cross-sections should be provided. Personally, I cannot figure out the structure of the domain just from the information provided. I for example don't understand that the block on the north-eastern side containing apparently the carboniferous aquiclude is considered has belonging to the same compartment (B1 on fig. 7) as the block made of sherwood sandstones just on the western side of the Boundary fault (fig 1)?

3. There are different aquifers as it is indicated in table 1. The heads in the different aquifers are different. And at agiven location depending on the horizons that are intersected by the well, different aquifers may be taped. Mixing head data or geochemical data from different aquifers on the same map can be completely

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misleading. From my reading of the paper, I could not figure out what is mapped. This must absolutely be clarified.

4. If the authors want to convince the reader they have to show the data and not only their interpretation (the maps). How else can we believe in the results? Figure 3 is rather convincing. The other data should also be presented in a convincing way. I urge the authors to show some quantitative analysis of their data.

5. The paper contains quite a number of obvious statements for the readership of HESS. They should be removed. Example: “The area contributing recharge to a well is the surface area that defines the location of the water entering the groundwater system”

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