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Hydrology and Earth System Sciences Discussions

Interactive comment on "Evapotranspiration computed by Darcy's Law: Sudan case study" *by* O. A. E. Abdalla

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I would like to thank the referee for his/her thorough and valuable comments and his/her constructive suggestions. The comments drew my attention to the poor choice of words in the paper on one hand and to the weak points on the other. Consequently, I have undertaken some steps for clarification and justification to address the referee comments and to improve the paper's quality as follow:

General Comments: 1- The referee has shown concerns regarding the value of evapotranspiration compared to the average annual rainfall. The computation of evapotranspiration in the paper is meant for the loss of groundwater by evapotranspiration. I agree with the referee that the value of 1.25 mm/year evapotranspiration is too little compared to an average annual rainfall of 200-400 mm/year. However this value only represents the loss from the groundwater via evapotranspiration. It does not account for the evapotranspiration loss from the vadose zone or from direct surface evaporation

which both make the main contributors. To clarify this point the title “Groundwater discharge via evapotranspiration computed by Darcy’s Law: Central Sudan Case Study” has been suggested. The text will be revised accordingly to eliminate such confusion. 2- The referee suggested that the derived estimates of evaporation should be verified against another method or other values, and he/she suggested remote sensing. The applicability of remote sensing as a technique that is mostly used in studying surface features is questionable in case of 40-50m deep ground water. However, the current value of evapotranspiration loss in groundwater system has been compared with values cited in the literature of similar regions such as the Sahara, sub-Sahara and Kalahari where isotope techniques were used to estimate the groundwater loss to evaporation/transpiration (e.g Christmann & Sonntag, (1987) and De Vries et al. 2000). This comparison is addressed in the revised form of the paper.

Specific Comments Referees’ comments listed under “Other comments and corrections” are addressed in the corresponding points as follow: 1- Title changed to “Groundwater discharge via evapotranspiration computed by Darcy’s Law: Central Sudan Case Study” 2- Replaced mm/a by mm/year in all text. 3- Deleted for 4-7 corrected the references 8- revised the figure captions 9-The variation in hydraulic conductivity in the same basin is attributed to the nature of the sediments. Fluviolacustrine sediments are known for lateral variations and consequently varying conductivity. 10-11 Quality of figures 3, 5 and 6 is improved as requested by the referee. 12- Elaborated in the conclusion.

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