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Discussions

Interactive comment on "Analysis of groundwater flow and stream depletion in the L-shaped fluvial aquifer" *by* Chao-Chih Lin et al.

Anonymous Referee #1

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1- General comments There are few analytical studies addressing flow field in multi-aquifer systems. This may be attributed to inadequacy of conventional solution techniques in dealing with such geometrically cornered entities. Aimed at reproducing a real-world scenario in a semi-analytical framework, the present manuscript also offers useful insights regarding the nature of multi-well hydraulics in L-shaped aquifers consisting of two anisotropic sub-regions with properly imposed interface conditions. Comparisons are also made with relevant numerical results and existing measurement data. The subject can further be clarified if the authors consider the comments listed below:

2-Specific comments

2-1 In addition to those reviewed in "Introduction", the following studies examine dif-

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ferent ways of simplifying natural aquifer settings through non-rectangular domains: Variational method of Kantorovich for modeling rainfall induced mounds in trapezoidal-shaped aquifers (Mahdavi and Seyyedian, 2014); the method of Strack's discharge potential for groundwater hydraulics in coastal promontories (Kacimov et al., 2016); and more recently, holomorphic functions for flow fields defined in circular meniscus (Kacimov et al., 2017). Moreover, the case of L-shaped domains has been treated analytically in different fields of engineering such as torsion of elastic bars (Kantorovich and Krylov, 1958) as well as heat conduction in plates (Mackowski, 2011). It is suggested to include above-mentioned works in the literature review.

2-2 Since (46) refers to water exchange along aquifer-stream interface AB (denoted by), it should take into account only contribution from hydraulic gradients in Region 1, i.e. the portion of aquifer which is directly in hydraulic connection with the stream. The second integral in this expression, which implies direct influence of Region 2 on SDR_A, thus seems irrelevant and should be removed. 2-3 When evaluating SDR_B, the first and second integrals in (47) should be taken from 0 to b1 and from b1 to b2, respectively, for the same reasoning as described before. 2-4 The extraction water comes from surrounding streams and compression of fully-saturated porous media, as clearly mentioned in the manuscript. Contribution from constant-head boundaries (AG and ED) is, however, ignored in the aquifer water-budget model and only the effects of AB and BD are addressed by (50). Obviously, Darcian flow (either inwardly or outwardly) is induced by non-zero head gradients perpendicular to AG and ED. Such water fluxes are also disregarded in Fig. 7.

3-Technical corrections 3-1 The dimension of 1D Dirac's delta function should be mentioned: [1/L] 3-2 The dimension of time should be changed to [T] in "Table 1". 3-3 Unbalanced parenthesis is detected in (34). 3-4 Equal sign is omitted in (24) and (25).

References:

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