Hydrology and Earth System Sciences

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Discussions

Interactive comment on "Forchheimer flow to a well considering time-dependent critical radius" *by* Q. Wang et al.

Anonymous Referee #2

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General comments

The paper presents a new concept of describing the critical radius between Darcian and Non-Darcian Flow in a time dependent way. The work is well embaded into previous work on the issue of Forchheimer flow near wells. It contains a comparison with previous solutions dealing with Forchheimer flow near wells and clearly describes difference and extensions. The derivation of the time-dependent critical radius uses established methods and is sufficiently complete. The paper contains an appropriate discussion of results. The authors examined the impact of several important quantities/parameters on the behaviour of the newly derived solution for the time-dependent critical radius. The presentation of results is of mixed quality. The paper is well structured and presents a sufficient number of figures and tables, but the quality of figures

and the use of English language should be improved. However the amount in new information is rather limited. It should be considered to reduce the draft to a technical note. In this line several parts of the discussion can be shortened.

Specific comments

p 14097, line 15: "some researcher": clarify who / p14098, line 14/15/16: content of the sentence is unclear / p14099, line 6: clarify under which conditions the analytical solutions of Sen (1988) and Wen et al. (2008) are valid / p14098, line 11: why referring to Sen (1988) and Wen et al. (2008) in the context of quasi-steady state flow (with respect to the sentence in line 6)? / p14101: line 2: give literature reference of this formula / p14101: line 25: recommendation of reference to table 2 / p14102: line 5: Where does this sentence refer to? Is that assumtion taken for the following statement? Then "We assume..." or "Under the assumption of ..." / p14103: line 1-4: account for the fact that hydraulic conductivity is assumed to be constant (homogeneous aquifer), this is an important assumption when dealing with well flow problems / p14107: line 13/14: please specify the sets of aquifer parameters / p14108/14109: Why it is necessary to introduce the solution of Sen (1988) in detail in equations (33)-(36)? And if the solution is introduced, why are not those of Papadopoulos & Cooper (1967) and Mathias et al. (2008), as stated in line18? Recommandation: remove Eq (33)-(36). / p14109: line 10: specify what figures 4a and b show: a comparison of the distance drawdown curves for all 4 models/solutions / p14111: line 26: How can that be explained by using Eq. (37)? / p14113: line 2: Why $r\_D=0.1$, when explaining figure 8 which refers to $r\_D=1$? / p14113: line 9: "The convergence of this iteration method has been verified." How? (Where was that done in the previous sections?)

Figures:

/ figure 2a: dotted lines are very difficult to distinguish / figure 2b: lines in legend difficult to refer to lines in the plot / figure 4a,4b: either in the legend or in the caption should be assigned which flow model (Darcian, fully non-Darcian,...) refers to which

model/solution (Mathias et al. (2008)...) dotted lines are very difficult to distinguish (4a), recommendation of using the same linestyle in both plots / figure 5: specify the caption: the plot shows the time-dependent critical radius $R\_CD(t)$ for different values of the inertial force coefficient beta / figure 6: specify the caption: the plot shows the time-dependent critical radius $R\_CD(t)$ for different values of the critical specific discharge / figure 7/8: Why using different scales at the y-axis? Recommendation of using log-log-plots for both figures / figure 5,7,8: recommendation of using the same linestyle in all plots (same lines for the same values in beta) and keeping the order in the legend constant dimensions are missing at labels (Fig 2, 4-8) / in general: plots should be made more fashionable (strong recommendation)

Technical corrections

p14097, line 2: in respect of/with respect to / p14097, line 28: what ist dolostone? / p14098, line 2/3: greater than / p14100: line 4: simplify / p14100: line 20: set to / p14100: line 21: is in linear relation to / p14100: line 23: space character after calculate is missing / p14101: line 3: in case of / p14103: line 7: compose (without of), probably change the sentence construction / p14115: line 10: "Wasserbewegung durch den Boden" / p14110: line 13: "Therefore, the new solution agrees..." (skip the "it is not suprise to see that") / p14110: line 15: "Another fact that can be seen in Fig. 4b is that the new solution..." / p14111: line 8: skip the "that" / p14111: line 13: "Therefore, R_CD does not depend on beta under quasi-steady state flow conditions, it only depends reciprocally..." / p14111: line 23: "show" instead of "represents" / p14113: line 17/18: "...deflection point in the curve , that becomes larger in time with increasing $beta\_D$." / p14114: line 5: "larger" instead of "longer" / very often space characters are missing (in particular in front of brackets) / in general expression in english should be improved

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