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Interactive comment on "Flowing wells: history and role as a root of groundwater hydrology" *by* Xiao-Wei Jiang et al.

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Review of "Flowing wells: history and role as a root of groundwater hydrology by Xiao-Wei Jiang, John Cherry, and Li Wan, MS No.: hess-2020-270 for Special Issue: History of hydrology (HESS/HGSS inter-journal SI)

1. Granted, this is supposed to be a "review article," but I found it to be hopelessly long, rambling, and repetitive. The text is more suited to a lengthy technical report or a first draft of a book.

Response: Thanks for the suggestion. We will condense the paper.

2. I find that I am in disagreement with the main thesis of the article. That is, that the study of "flowing wells since the early 19th century led to the birth of many fundamental

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Discussion paper

concepts and principles of groundwater hydrology." The reason is that the physical laws and geology that control groundwater flow are the same for flowing and non-flowing wells.

Response: We agree that many physical laws that control groundwater flow are the same for flowing and non-flowing wells. However, flowing wells, which have visible groundwater at the surface, always attracts the interest of people. As we demonstrated in the manuscript, the concepts stemmed from flowing wells in confined aquifers include permeability and compressibility, while the principles include Darcy's law, role of aquitards on flowing well conditions and the piston flow pattern, steady-state well hydraulics in confined aquifers, and transient well hydraulics towards constant-head wells in confined or leaky aquifers. Because all of these principles are applicable even if flowing well conditions have disappeared, how these principles were initially developed had been forgotten by many groundwater hydrologists. As stated in the advertisement of the current special issue History of Hydrology, "As a hydrological community, we are keen to further our science, and it is therefore of utmost importance to understand what the roots of our science are." It is desirable that integrating the root of flowing wells into textbooks and courses of groundwater hydrology would inspire the interest of beginners, and also lead to a deeper understanding of the science of groundwater (Deming, 2016).

3. There are several pages devoted to a discussion of the definition of the term "artesian." While it is true that the literature on this is conflicting and worthy of review and discussion, it's an example of how this manuscript rambles everywhere in its discussion. It lacks focus.

Response: As pointed out by the reviewer, it is worth reviewing and discussing the conflicting usage in the literature. In our opinion, the conflicting usage of "artesian" is one reason that leads to neglecting the role of flowing wells on the evolution of groundwater hydrology. Therefore, we use several pages to discuss the birth and confusing usage of the term "artesian". To make the paper focus, we will decide whether to remove this

part or put this part in the Supplement.

4. The authors claim that it is a "misconception that flowing wells must be geologically controlled"(line 749). Seems to me that all groundwater flow is affected by the geology and is therefore "geologically controlled." Perhaps what is needed here is a straightforward definition of what the authors mean by the term "geologically controlled."

Response: We totally agree with the referee that all groundwater flow is affected by the geology and is therefore "geologically controlled." In fact, this term was initially defined by Freeze and Cherry (1979). We have defined this term in Lines 153-155 (To differentiate the two types of flowing wells due to different causes, Freeze and Cherry (1979) defined geologically-controlled flowing wells and topographically-controlled flowing wells. As shown in Fig. 1, the former develop in confined aquifers and receive recharge at upland outcrops, while the latter occur in the topographic lows of unconfined aquifers.")

Summary Recommendation: Accept with major revision. If the editors want to publish a lengthy paper, that decision is up to them. In any case, my opinion is that the paper needs focus and condensation.

Response: Thanks very much! We will focus and condense the paper.

References:

Freeze, R. A., and Cherry, J. A.: Groundwater, Prentice-Hall. Inc., Englewood Cliffs, N.J., 1979.

Deming, D.: The Importance of History, Groundwater, 54, 745-745, 10.1111/gwat.12458, 2016.

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