

## ***Interactive comment on “Conceptual and numerical modeling of the Guaraní Aquifer System” by L. Rodríguez et al.***

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It should be noted at the outset that this reviewer is at a disadvantage because of lack of familiarity with the hydrogeology of the Guaraní Aquifer System (GAS) and the general geology of the region. Because of the importance and transboundary nature of that aquifer, probably the largest in the American continent, as well as the lack of basic and/or adequate data, this manuscript would be of interest to the HESS readership as it further advances the limited information on that system. It is apparent that the authors' manuscript represents a preliminary conceptualization and modeling exercise, and that more work is waiting to be performed on the GAS. However, the presented work is interesting and I enjoyed reading it.

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On reading this manuscript, a number of questions arose:

–How the K (hydraulic conductivity) values of the different spatial zonations, especially the ones for the increasing number of zones, such as Z3 to Z5, were determined? How many K determinations are available and what is their distribution? Given the scarcity of data, it seems unnecessary to correct the K values for temperature (eq. 1). By the way, how much difference did the K correction make?

–How certain are the boundaries where the GAS is not outcropping, such as in the Argentinean side, north in Brazil, etc? Was some sensitivity analysis run on the boundaries to check the impact of boundary conditions on the results?

–How was the steady-state (initial) condition was determined and how was it checked to ensure that it was indeed at equilibrium?

–How were the various leakance coefficients determined? The statement that “they were previously estimated based upon riverbed characteristics” seems vague and needs specification.

–Showing the spatial distribution of pumping would be instructive to the readers.

–Showing the distribution of the “317 observed piezometric levels” (also indicating at least the decade they were measured) would be useful to the readers.

–The authors state (in p. 9900, L. 8-9) that “In the absence of transient head data for calibration, all available observations were assigned to the last period.” (The authors also stated that they used “yearly periods.”) However, earlier they stated that “those [piezometric] levels span a 30-40 yr time window starting in the 70's...” which means that they have some idea of at least the decade in which the measurements were performed. Why then all those measurements were assigned in the “last period,” i. e., the last year of the simulation?

–Recharge was determined as a fixed percentage of precipitation without much justification. Are there any independent studies to verify or support the adopted percentage

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of precipitation?

–With regard to model structure identification, it would be helpful to readers to summarize the meaning of each criterion used in Table 3.

–It would also be helpful if an explanation of the different colors in the left figure of Fig. 4 were provided. By the way, I missed noting an explanation/justification of the southern boundary conditions, which should be pointed out.

–I also noted a number of English language mistakes/misprints that need to be corrected, as well as a few other minor items. The ones I noticed are as follows:

p.9886, L. 15: "... budget terms resulted very similar. . ." you mean "budget terms were very similar"? p.9887, L. 17: Need a reference for: "...Y-T-T . . .shared by Argentina, Bolivia and Paraguay" p.9892, L. 19: "...aspects that were overlooked in previous versions." –Explain; specify. p.9893, L. 14: "underlying permic deposits" you mean "underlying Permian deposits"? p.9896, L. 3: "being the first step the steady state." Revise as "the first step being the steady state." p.9898, L. 17: Change "there still great uncertainties" to "there are still great uncertainties" p.9899, L. 14: Change "consisted on using" to "consisted of using" p.9900, L. 2: Change "An addition source" to "An additional source" p.9902, L. 13: Change "components resulted very similar" to "components were very similar" p.9904, L. 5: "was 3514" is "3516" in Table 2. p.9905, L. 26-27: "this is logic because. . ." you mean "This is reasonable because. . ."? p.9907, L. 25: Change "hydraulic conductivities values" to "hydraulic conductivity values" p.9908, L. 1: Change "region of interest augments, calibrated K also increases in both, its..." to "region of interest increases, calibrated K also increases in both its. . ." p.9908, L. 25: Change "Given de amount" to "Given the amount" p.9909, L. 8: Change "leakage along those reaches resulted very small," to "leakage along those reaches was very small," p.9909, L. 15-16: Change "process manifested by . . .outflow, being its magnitude..." to "process was manifested by . . .outflow, its magnitude being..." p.9909, L. 25: Change "were groundwater" to "where groundwater" p.9909, L. 27: Change "did not intent to"

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to "did not intend to"

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