27th March 2022

Dear Editor and Reviewer;

We thank you for your review and comments; We attach the response indicating the changes we have made. We are confident that we have given a satisfactory response.

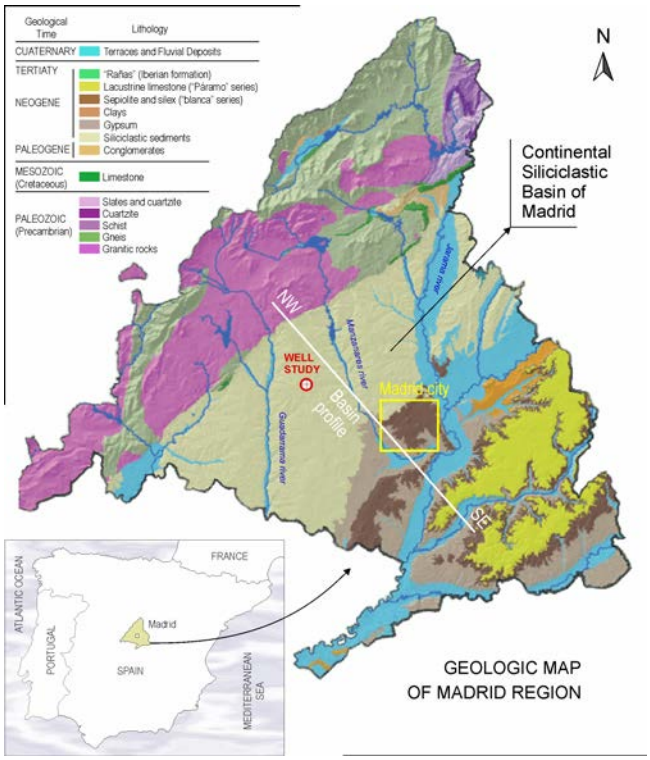
The modifications and explanations are referring to lines of sixth version of the manuscript. A document has been attached (sixth version) in which the proposed changes are differentiated in red text.

Responses to the reviewer comments

My main concern is about the final part of the discussion where the authors aim at synthetizing their results into a conceptual model (Figure 10). The conceptual sketch is to my opinion not representative of the quality of the work performed. In its current form, figure 10 looks like a free-hand drawing and the discussion around it (547-570) remains very general, restricted to basic information. Consequently, the discussion ends on a rather weak assessment of the implications of this work while statements about their innovative/outbreaking aspects are expected. Since the Madrid basin in an extensively studied area with lots of data available, the reader might expect the results of this work to be integrated into this previous knowledge and improve conceptualization of such complex system. One could imagine a comprehensive conceptual model synthetizing previous characterization regarding the geometry and hydraulic properties of the aquifer system, and where the new knowledge arising from this work would complement/improve such conceptualization. If this is not the intent of the authors, I would recommend the authors to limit this part of the manuscript as much as possible and focus on the actual outcomes of the study.

Following the reviewer's suggestion, first a new figure (which becomes figure 4) with a geologic map and the location of the studied well within the Madrid Region has been included. This figure will ease a better understanding of the characteristics of the area. In L-285 the reference to the figure has been included:

"The Madrid Basin has a triangular shape and is bound by several mountain ranges, the "Central System" of Iberian Peninsula of igneous-metamorphic nature, located at NW of the Madrid Basin, being the main contributing source area (Fig. 4)."



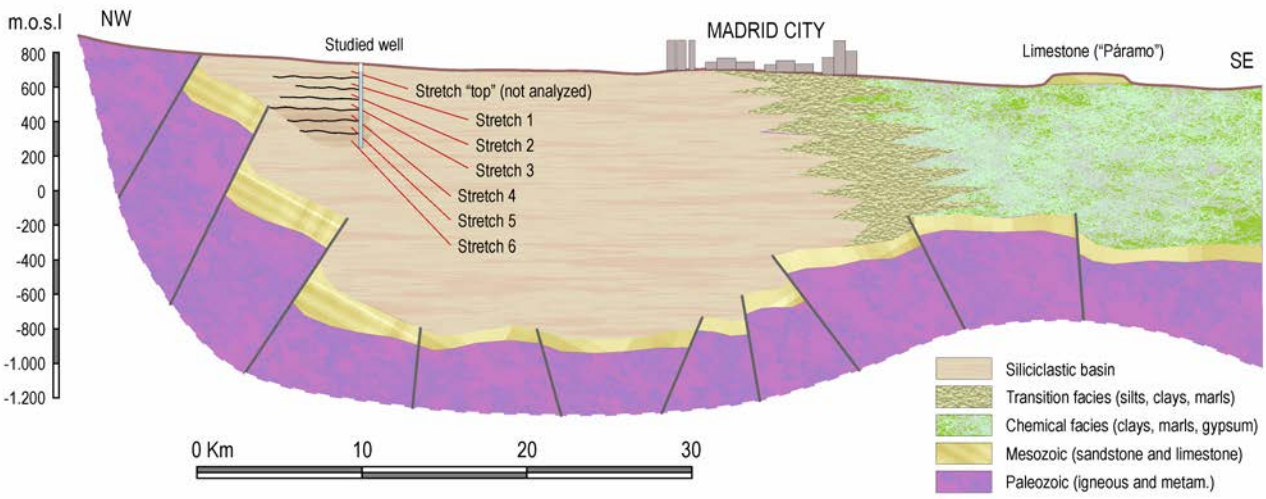
"Figure 4. Lithology of Madrid region (adapted from Diagnóstico Ambiental de la Comunidad de Madrid, 2020) with studied well location and outlined profile."

The rest of the names of the figures have been corrected.

Also Following the reviewer's suggestion, we have replaced Figure 10 with a new figure (now figure 11) that includes the conceptual model of the Madrid Basin.

In L-558 to 562:

"The described results can be added to the conceptual models developed both from Toth's (1962) scheme (López Vera et al., 1977; Navarro et al., 1993; Heredia et al., 2001; Martínez-Santos et al., 2010), and to the more recent models on flow modelling from land subsidence obtained by A-DInSAR technique (Ezquerro et al., 2014; Béjar-Pizarro et al., 2014; Boni et al., 2020) (Fig. 11). It should be emphasized that the hydrogeological hypotheses that can be made as the scheme included in Fig. 11 must be contrasted with results in more wells within the siliciclastic Basin of Madrid."



"Figure 11. Schematic geologic section of the Madrid Basin (adapted from Llamas, 1976 and Navarro et al., 1993) with stretches established in the studied well."

New references have been included in the reference list.

Toth, J.: A theory of groundwater motion in small drainage basins in central Alberta, Canada, Journal of Geophysical Research, *67*(11), 4375-4388, 1962.

López-Vera, F.: Hidrogeología regional de la cuenca del río Jarama en los alrededores de Madrid (Vol. 91). Instituto Geológico y Minero de España, Book, p. 227, 1977.

Heredia, J., Martín-Loeches, M., Rosino, J., Del Olmo, C., Lucini, M.: Síntesis hidrogeológica y modelización regional de la cuenca media del Tajo asistida por un SIG, Estudios Geológicos, 57(1-2), 31-46, https://doi.org/10.3989/egeol.01571-2125, 2001.

Martínez-Santos, P., Pedretti, D., Martínez-Alfaro, P.E., Conde, M., Casado, M.: Modelling the effects of groundwater-based urban supply in Low-permeability aquifers: application to the Madrid Aquifer, Spain, Water Resour. Manage., 24(15), 4613-4638, https://doi.org/10.1007/s11269-010-9682-0, 2010.

Ezquerro, P., Herrera, G., Marchamalo, M., Tomás, R., Béjar-Pizarro, M., Martínez, R.: A quasi-elastic aquifer deformational behavior: Madrid aquifer case study, J. Hydrol., 519, 1192-1204, https://doi.org/10.1016/j.jhydrol.2014.08.040, 2014.

Béjar-Pizarro, M., Ezquerro, P., Herrera, G., Tomás, R., Guardiola-Albert, C., Hernández, J. M. R., ... Martínez, R.: Mapping groundwater level and aquifer storage variations from InSAR measurements in the Madrid aquifer, Central Spain, J. Hydrol., 547, 678-689, https://doi.org/10.1016/j.jhydrol.2017.02.011, 2017.

Bonì, R., Meisina, C., Teatini, P., Zucca, F., Zoccarato, C., Franceschini, A., ... Herrera, G.: 3D groundwater flow and deformation modelling of Madrid aquifer, J. Hydrol., 585, 124773, https://doi.org/10.1016/j.jhydrol.2020.124773, 2020.

Llamas, M.R. y Cruces de Abia, J., Conceptual and digital models of the ground water flow in the Tertiary Basin of Tagus river (Spain), IAH Memoirs, XI, 186-202, 1976.

Diagnóstico Ambiental de la Comunidad de Madrid, Consejería de Medio Ambiente, Ordenación del Territorio y Sostenibilidad Comunidad de Madrid, (www.comunidad.madrid/sites/default/files/doc/medio-ambiente/diagnostico_medioambiental_2020.pdf), 2020.