18th April 2022

Dear Editor;

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.

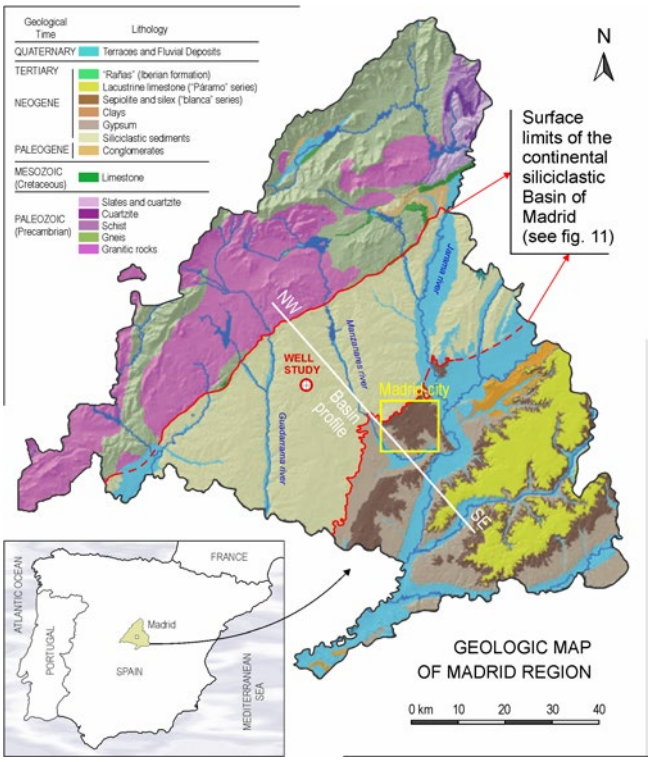
The modifications and explanations are referring to lines of seventh version of the manuscript. A document has been attached (seventh version) in which the proposed changes are differentiated in red text.
In reference to the figures we can send the files of the images in the format that is more convenient for the journal.

Responses to the editor comments

The authors modified the manuscript following the reviewer's recommendation. Unfortunately, they added some geological information and figures whose quality is not appropriate for a high-rank scientific journal. I list here a few comments.

1) Figure 4. The figure resolution in the PDF file is very poor. The resolution of the original image should be checked. Also spelling has to be double checked (Cuaternary? Tertiaty?). A scale bar for distances is missing.

Following the editor's recommendations, we have improved the resolution of figure 4 and corrected the spelling. A scale bar for distances has also been added.



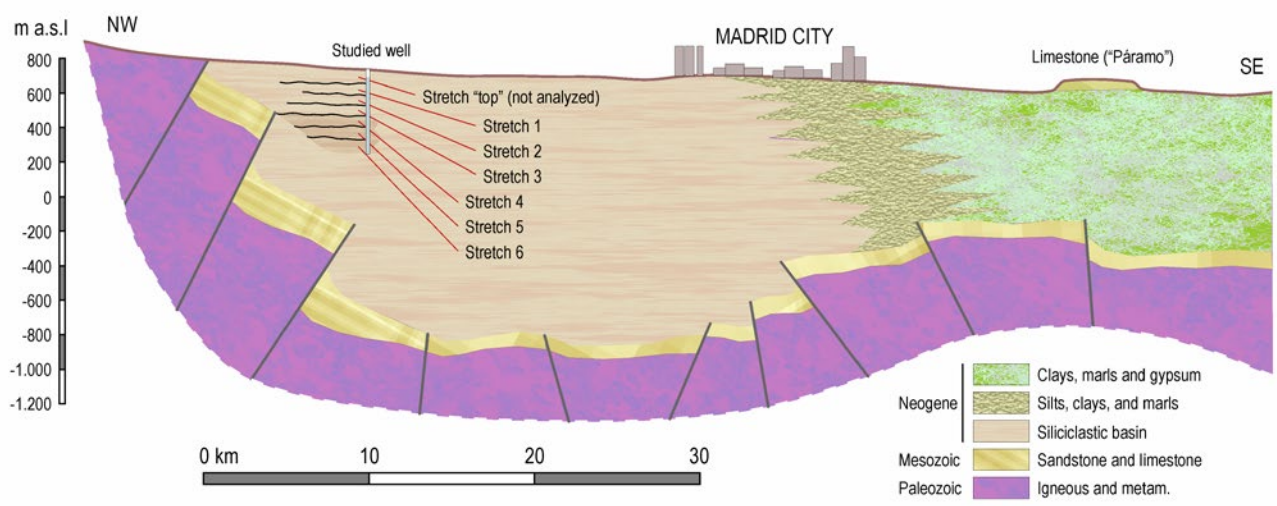
2) Caption of Figure 4. "Lithology" should be substituted with "Geological map". Expression "outlined profile" should be substituted, possibly with "location of the schematic cross sections shown in Figure 11".

Following the editor's recommendations, we have modified the caption in figure 4.

"Figure 4. Geological map of Madrid region (adapted from Diagnóstico Ambiental de la Comunidad de Madrid, 2020) with studied well location and location of the schematic cross sections shown in Figure 11."

3) Figure 11, graphical issues. The figure resolution in the PDF file is quite poor. The resolution of the original image should be checked. “m.o.s.l.” should be substituted with “m a.s.l.” on the vertical scale bar. “Km” should be substituted with “km” on the horizontal scale bar.

Following the editor's recommendations, we have improved the resolution of figure 11 and corrected the abbreviation.



4) Figure 11, geological issues.

a. The two deepest units are denoted through their age (Paleozoic and Mesozoic): the same should be done for the other three units (“Siliciclastic basin”, “Transition facies” and “Chemical facies”) and for the limestones of the Páramo unit: they seem to be units of Neogene age from Figure 4, but probably better details can be given.

The legend of figure 11 has been corrected by indicating the predominant lithologies and their age.

b. In Figure 4, the whole basin is denoted as “Continental siliciclastic basin of Madrid”. Moreover, the description in the text makes reference to geological formations (Tosco and Madrid formations), which are not shown in the cross-section. As a consequence, there is poor correspondence between Figure 4, Figure 11 and the text.

Following the editor's recommendation, we have changed the way of point out the continental siliciclastic basin of Madrid, by means of two red lines indicating its superficial limits. Also, the references to the different units and formations used in the text and in Figures 4 and 11 have been homogenized. The following have been modified:

“The aquifer is located in a detrital facies single arkosic unit separated into two lithostratigraphic units, which are differentiated by grain size and, therefore, by hydrogeological characteristics; due to the depositional process of the materials, they are differentiated from one area to another as well as vertically. The lower unit, the Tosco Formation, is composed of arkose that is generally very clayey with clayey sand. The upper unit, the Madrid Formation, consists of arkosic coarse-grained sand, gravel and clay. Although the Madrid Formation is sandier and permeable and overlaps the more clayey Tosco Formation, they are not considered different aquifers (López-Vera 1985) but rather a heterogeneous and anisotropic free aquifer system where more permeable layers are separated by clayey strata with a lower permeability (which qualifies as a multilayer aquifer).”

By:

“The aquifer is located in the continental siliciclastic basin of Madrid, which in literature is separated into two lithostratigraphic formations differentiated by grain size and, therefore, by hydrogeological characteristics; due to the depositional process of the materials, they are differentiated from one area to another as well as vertically. The lower formation is composed of arkose that is generally very clayey with clayey sand. The upper formation consists of arkosic coarse-grained sand, gravel and clay. Although

the upper formation is sandier and permeable and overlaps the more clayey lower formation, they are not considered different aquifers (López-Vera 1985) but rather a heterogeneous and anisotropic free aquifer system where more permeable layers are separated by clayey strata with a lower permeability (which qualifies as a multilayer aquifer)."

c. Clay and marl are included both in "Transition facies" and in "Chemical facies" and this cannot be correct. In general, expression "chemical facies" should be avoided.

Chemical facies term has been removed both in the text and in the figures. The description has been limited to the predominant lithologies given by recognized authors Llamas, 1976 and Navarro et al., 1993.

d. The lacustrine limestones of Páramo unit is drawn as a klippe, fully detached from subsurface geological units. This is not in agreement with the geological reconstructions that I found in the cited references and in many other geological papers.

The limestones of Páramo belong to a discordant sedimentary cycle which, due to their resistance to erosion, constitute what is known as the Páramo surface. As indicated in the cartographic reports produced by the Spanish Geological and Mining Survey, the 'Páramo limestones' do not represent a depositional level, but an erosion surface. This is the reason why in the schematic sections it is represented in this way, as shown in figure 11.

I recall below some of the comments by the last reviewer; these words should be carefully considered in the revision.

"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."

Before figure 11, in lines 558-569 the following has been modified and added:

"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."

By:

"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 from the more recent models on flow model considering the land subsidence obtained by A-DInSAR technique (Ezquerro et al., 2014; Béjar-Pizarro et al., 2014; Boni et al., 2020). 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. The classical subdivision of this basin (a part of the Tajo river Basin) into the lower and upper formations, whose contact is "gradual and arbitrary" (IGME, Mapa Hidrogeologico de España, scale 1:200.000, de Madrid, second edition, 1991), does not report their depth. However, according to the correlation sections of well logs shown in Caparrini (2006), the bottom of the upper formation, of coarser grain size, seems to be located above the depths analysed in the studied well. It should be noted that the same occurs with the water models carried out in the Madrid Basin, in which the water table variations are far above the depth upper depth analysed in the well studied. In this sense, the hypothesis that can be put forward on the basis of the data from the well analysed is that within a radius of 10 km around the well, a hydraulic differentiation should be considered from a depth of ~200 m onwards."