

Interactive comment on “A soil moisture monitoring network to characterize karstic recharge and evapotranspiration at five representative sites across the globe” by Romane Berthelin et al.

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This paper propose an interesting network for monitoring soil humidity in contrasted karst area. This experiments have a high potential to understand subsurface flow in karst and I recommend the publication.

Reply: We thank the reviewer for his/her useful and valuable comments that will help to improve the manuscript. We will apply all suggestions and clarify points as suggested in her/his comments.

C1

With 5 places in the world, the ambition to discuss impact of climate on recharge seems unrealistic, but the device is well design to validate models with a dataset including a large range of variability/configurations.

Reply: Indeed, the quantitative comparison of the impact of climate on recharge will be questionable as too many different parameters can have an influence apart the climate. Instead of focussing on differences among the sites caused by climate, the network allows to analyse differences that are caused by the integrated influence of different parameters. However, the repetition of the measurements settings at each site will at least allow a qualitative comparison. We will clarify the respective formulations in the manuscript accordingly.

Introduction: At the system scale, rainfall/discharge models are the one of the most popular method to quantify the karst recharge. This should be mentioned with examples.

Reply: We will mention rainfall/discharge models used to quantify the karst recharge including and provide the respective references.

The aims of this paper is to propose a soil moisture monitoring network in karst area. This is not the first time that the soil moisture is monitored in karst area, I know some examples in China, in Houillon et al. 2016 as part of the SNO KARST in France with interesting results. This should be mentioned in your introduction.

Reply: We will add further the literature and consider the suggested examples to mention previous work using soil moisture in karst systems.

L11 Hartmann et al. 2014 are not the first to use tracer in karst system, if it is the most popular approach, older references should exist.

Reply: We apologize for this confusion, Hartmann et al. 2014 is a review paper including diverse references using tracer in karst system. We will precise it in the text and add other references.

C2

I wonder if all the selected sites are included in areas where precipitation and ETO are known? Otherwise Future models of soil moisture partitioning will have low constraint. To fully valorize a 15 min sampling rate, the rain gauge should be close to the monitoring device and have the same sampling rate.

Reply: We thank the reviewer to point this out. Indeed, climate stations are installed close to all our sites. Since the stations are operated by our collaboration partners, their temporal resolution differs due to energy supply or storage limitations. For the site in Puerto Rico the measurement rate is 5 min. For the sites in Germany and Australia, the rate measurement is 10 min. For the one in Spain it is 30 min and 1 hour for the one in the UK. We will provide this information and discuss possible consequences of varying temporal resolution in the revised version of the manuscript.

In the same way concerning valorization of this dataset, are this site located in catchment where regional karst spring is also monitored? This should open nice confrontations between entire aquifer approaches and the proposed one. This could be mentioned in the manuscript.

Reply: This valuable comment was already addressed to us in the past. For that reason, CTD diver probes measuring water levels were recently installed at the sites drained by a spring. No data has yet been downloaded but we will mention the value of observing the aquifer response in addition to the soil moisture monitoring plots in the manuscript as suggested.

Slope is one of the main driver to describe infiltration in soil, as mentioned P4L2. The value of the slope are not given. Are all the site located in the same range of slope value? Photo suggest that site are all in flat areas? In the same way, the geomorphologic location can be a main driver: upper part of a plateau or depression areas where preferential recharge take place? This could be mentioned.

Reply: Almost all sites are at locations with similar slope. Except for the German site, as it is located in a mountainous area with steeper slopes, which are typical for moun-

C3

tain karst regions. We will add the slope values in the description table. Concerning the geomorphological location, most of the sites are located at slopes close to the plateau of the karst system in order to avoid disturbance by groundwater discharge. The respective information will be provided in the revised manuscript.

Soil description is mainly qualitative, what about bulk density, porosity, conductivity.

Reply: Soil texture analyses are currently conducted in the laboratory and we will add their results to the revised version of the manuscript. Due the difficulty to transport the soil samples from the sites back to Freiburg, bulk density, porosity, or conductivity measurements were not possible.

The observed (non)sequential reactions can be explain by properties heterogeneity with deep. At this scale, the decrease of properties with depth suggested in introduction is not obvious and should be validated site by site.

Reply: We will clarify this point in the manuscript. Preferential flow (non-sequential reactions) might take place at different places or not. It is a hypothesis based on literature that we will use for future analysis. As our currently available data is not complete enough for detailed analysis, we will replace our interpretations on non-sequential reactions with a short outlook (also see our 2nd reply to reviewer #1).

If you choose to present monitoring network into a GI paper, without waiting for more results, this suggest that this network is design for a long time. In conclusion, you speak about 3 years, it is surprising.

Reply: The 3 years represent the temporal frame of the PhD project that will be the first to work on the collected data. We hope that the monitoring network will continue to be maintained in the future depending on the collaborators' possibilities and interest. We will clarify this point in the manuscript to avoid confusion.

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C4