

## ***Interactive comment on “Water resources in the Badain Jaran Desert, China: New insight from isotopes” by Xiujie Wu et al.***

### **Anonymous Referee #1**

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### Comments to the Authors

The manuscript on “Water resources in the Badain Jaran Desert, China: New insight from isotopes” by Xiujie Wu, et al. is providing evidence that groundwater in the Badain desert is locally recharged and consists of young water based on stable isotope samples collected from groundwater wells, lakes and during evaporation experiments. The authors argue against opinions published earlier (e.g., Chen et al. 2004, Gates et al. 2008). Beside stable isotopes, a main argument against old groundwater originating from the Qilian Mountains – as proposed earlier - is that DIC based carbon-14 ages are impacted by old carbonates. The authors argue that evaporative enrichment of stable isotopes and the extrapolation of the evaporation line back to source water on the LMWL proves that recharge occurs locally. The manuscript is covering a very interesting topic and research site, it is well written and structured. The collected data (two

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campaigns, 21 stable isotope samples, 7 carbon-14 groundwater ages) is combined with data from earlier studies of other authors. The material collected for this work seems satisfying but the authors could improve the manuscript, especially the methods chapter and their presentation of figures and tables. I recommend to accept the paper for HESS after major revisions. My comments given below aim for an additional improvement of the manuscript.

#### General comments

- Since water resources are the main topic/title and there were plans to use these resources for a large water diversion project (Chen et al., 2004) in a very sensitive (arid) environment, a better description of hydrological components and an overall balance would be helpful. Would it be possible to calculate the recharge area that has to feed an evaporation loss of the lakes given? It would be interesting for the readers to get a better description of the hydrogeology and aquifer characteristics in the area (unconfined aquifer, page 11, line 3).
- Are the evaporation experiments and especially the pan size that were used representative for real evaporation processes? How were the pans constructed and installed? - Metal rings – e.g., in comparison to “class-A-evaporation pan” recommendations.
- The given evaporation lines should be directly compared and values discussed with those of other studies (e.g., Wu et al. 2014, Chen et al., 2004). Because a main argument for source water relies on an extrapolated value of the LMWL it would be necessary to provide best evidence for this value.
- The method section lacks precise description and detailed information (e.g., on conducted  $^{14}\text{C}$  corrections, gas preparation methods for stable isotopes). Would it be possible to correct for the described carbonate contribution based on measured values? Would it be possible to use DOC for  $^{14}\text{C}$ -dating or other dating approaches? Was hydrochemistry data evaluated from the collected samples as well?

Please find more detailed comments attached.

Please also note the supplement to this comment:

<http://www.hydrol-earth-syst-sci-discuss.net/hess-2016-692/hess-2016-692-RC1-supplement.pdf>

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