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Interactive comment on "Atmospheric significance of aeolian salts in the sandy deserts of northwestern China" *by* B.-Q. Zhu

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Reply to 'Interactive comment on "Atmospheric significance of aeolian salts in the sandy deserts of northwestern China" by B.-Q. Zhu' by Anonymous Referee #1 (Solid Earth Discuss., 7, C1555-C1556, 2015)

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The interactive comment by an anonymous Referee #1 (Solid Earth Discuss., 7, C1555-C1556, 2015) on my paper "Atmospheric significance of aeolian salts in the sandy deserts of northwestern China" (in Solid Earth Discuss, 7, 3409-3440, 2015)

proposed some specific comments. I accepted these instructive suggestions and revised my paper accordingly. The detailed revisions are shown as below: (1) In page 3412 line 11, the word "iimplications" has been corrected into "implications" (seen the revised manuscript attached). (2) In page 3412 line 15, the word "Alashan Plateau" has been changed into "Alex Plateau" (seen the revised manuscript attached). (3) In page 3412 line 18, the word "Badanjilin Desert" has been changed into "Badain Jaran Desert". Besides, all the words "Badanjilin Desert" in the whole text have been changed accordingly, such as page 3412 lines 15, 21, 23, page 3413 lines 2, 21, page 3414 lines 6, 19, 27, and so on (seen the revised manuscript attached). (4) Figure 5 has been enlarged for the label and size. (5) Page 3415 lines 26 – page 3416 lines 19, the results show that the date hold great uncertainty. I accept the suggestion and have added the discussion about the uncertainty in different locations in the revised manuscript (seen the revised manuscript attached). The detailed words are copied here as below: The above chronological data show that the OSL data hold great uncertainty. It may be necessary to discuss the uncertainty in different locations in this study. As previously reported, textures such as grain size and shape are important parameters influencing the OSL dating of sediment (Aitken, 1985; Fain et al., 1999; Brennan, 2003; Guerin et al., 2012; Duval et al., 2015), since they have a direct impact on several correction factors that are used for evaluating the dose rate. The aeolian sand layers for OSL dating in the Tazhong-XIII section have a mean particle sizes of 3.3-3.5 phi (sieving result), which is much coarser than the interbedded lacustrine deposits (mean particle size 5.8-6.7 phi). The aeolian sand layers in the Yaogan-VIII section have a mean grain size of 3.8 phi, also coarser than the intercalated lacustrine deposits (mean particle size 4.6-6.2 phi). Aeolian silt or sandy loess deposits in the Tumiya-II section have a mean grain size of 3.6-4.0 phi. These data show a large variability in term of size of grains between the samples for OSL dating in the Taklamakan Desert. Because there is a distinction between the sieve aperture size, or sieve opening, and the diameter of a particle, consequently, the main dimension controlling the sorting of the grains for non-spherical particles is the

so-called intermediate diameter. For example, for standard mesh of 50, 100, 200 and 300 mm, grains passing through may have an intermediate dimension in the range of from 50 to 71 mm, 100-141 mm, 200-283 mm, 300-424 mm, respectively (Duval et al., 2015). Besides, the grain size distribution of the raw sediment may have also an impact on the dating results, like in the case of a bimodal distribution (Duval et al., 2015). So the principal sources of uncertainty in OSL dating data of this study may potentially be derived from the grain size of aeolian sediments. On the other hand, the difference in 14C ages between the uppermost and lowermost organic carbon layers of a sediment profile usually underestimates the time of sediment deposition, and the difference in OSL ages taken from sediment units overlying and underlying a buried soil most likely overestimates it (Miao et al., 2016). For example, the comparison of OSL and 14C ages suggests that the radiocarbon dating technique may significantly underestimate the age of sediments for samples older than 30 cal ka BP (corresponding to $\sim$25 14CkaBP) (Long et al., 2015). This factor could also lead to a certain uncertainty in the chronological data of this study. The related references added are listed as below: Aitken, M.J. Thermoluminescence Dating. Academic Press, London, 1985. Brennan, B. J.: Beta doses to spherical grains. Radiation Measurements 37, 299-303, 2003. Duval, M., Campana, I., Guilarte, V., Miguens, L., Iglesias, J., and Sierra, S.G.: Assessing the uncertainty on particle size and shape: Implications for ESR and OSL dating of quartz and feldspar grains. Radiat. Meas., 81, 116-122, 2015. Fain, J., Soumana, S., Montret, M., Miallier, D., Pilleyre, T., and Sanzelle, S.: Luminescence and ESR dating beta-dose attenuation for various grain shapes calculated by a Monte-Carlo method. Quat. Sci. Rev., 18, 231-234, 1999. Guerin, G., Mercier, N., Nathan, R., Adamiec, G., and Lefrais, Y.: On the use of the infinite matrix assumption and associated concepts: a critical review. Radiat. Meas., 47, 778-785, 2012. Long, H., Shen, J., Wang, Y., Gao, L., and Frechen, M.: High-resolution OSL dating of a late Quaternary sequence from Xingkai Lake (NE Asia): chronological challenge of the “MIS3a Mega-paleolake” hypothesis in China, Earth and Planetary Science Letters, 428, 281-292, 2015. Miao, X., Wang, H., Hanson, P. R., Mason, J. A., and Liu, X.:

A new method to constrain soil development time using both OSL and radiocarbon dating, Geoderma, 261, 93-100, 2016.

Please also note the supplement to this comment:
http://www.solid-earth-discuss.net/7/C1596/2015/sed-7-C1596-2015-supplement.pdf

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Interactive comment on Solid Earth Discuss., 7, 3409, 2015.

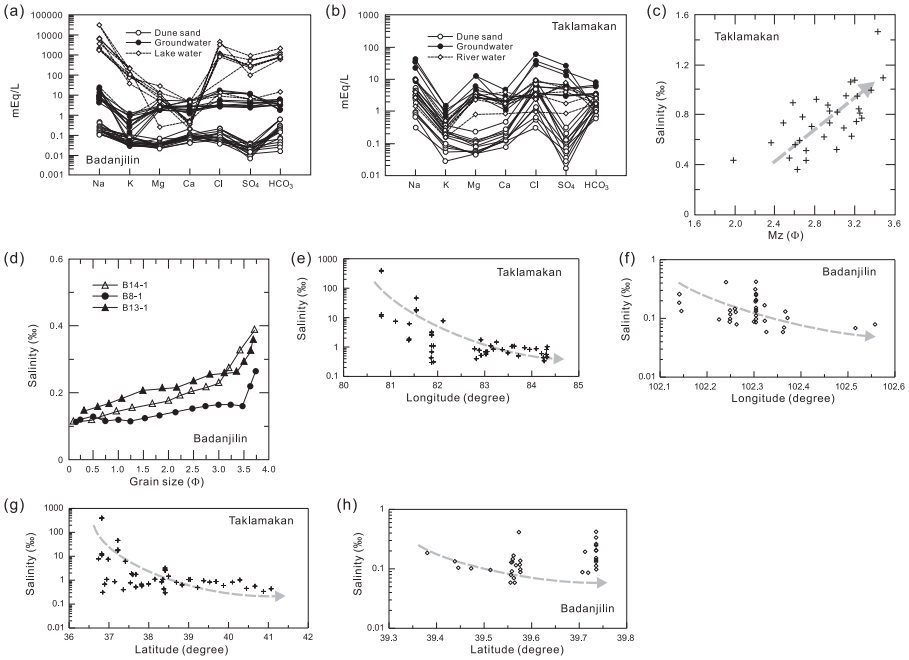

Fig. 1. Figure 5 Distribution patterns of the major ions of aeolian salts, groundwaters and lake waters in (a) the Badain Jaran Desert and (b) the Taklamakan Desert. The data of local lake water and groundwat