

Interactive comment on “Survival of the Qaidam Mega-Lake System under Mid-Pliocene Climates and its Restoration under Future Climates” by Dieter Scherer

Anonymous Referee #1

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This paper assessed the water balance in Qaidam basin, where the mega-lake existed in mid-Pliocene, using High Asia Refined analysis data during 2001-2014. The results showed almost zero annual balance with positive during warmer and negative during dry years. Also the altitudinal tendencies of climate parameters with their contribution to the water balances are diagnosed by simple regression (scattering) analysis. Assessments of annual water balance in the semi-dry and endorheric basin behind TP, using comprehensive data based on satellite estimates and numerical model, are challenging. If the trend shown in Fig.2 could be verified by independent data or evidences in the social activities, the budget assessments would be reliable and useful in the present climate condition. Also, in the scattering diagram in Fig. 4, years with

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far from linear regression should be diagnosed intensively as Fig. 3 to know the factors in HAR data that caused positive or negative budget (e.g. as mentioned in P6L175). Besides, there are many fundamental unintelligible and not logical parts as following comments.

1) Mountain water (including from glaciers) are accumulated in the underground, and foster the society and ecosystem (used by human or biosphere/agriculture) in the semi-arid basins by pumping up especially during non-rainy season. This part is ignored in (1) and flowing analysis. Lake is the ground water level over the surface, but it is very strange that author neglected the groundwater matter (P2L34) and discusses about the lake existence in the past. 2) There is a huge time scale gap between the 10 years time slice for present climate (2001-2014) and a time slice of Mid-Pliocene (3.3-3.0 Ma=30,000,000 years). Author also recognized this issue in P8L234. I can not understand the logic of such comparison. It is very nonsense to compare 10 years/annual average to the paleo climate time scale. If your focus is the mechanism of mega-lake formation and maintenance for several millions of years, water budget simulation during the mid-Pliocene is necessary with boundary condition that fits proxy data. Also, the evaporation over the lake water is quite different from the desert surface that is not considered in your study. Dry soil/sand at the skin surface blocks soil moisture movement from the underground. 3) I could not understand that what and how the author estimates in P7L193. I speculated that statistical relations between altitude and meteorological parameters derived in Fig. 3 was performed as functions of future or passed expected temperature differences. If so, the methods are wrong. Relations in Fig. 3 was derived from the dynamical downscaling in the present climate condition, and does not work in the passed or future climate condition without simulating the similar dynamical downscaling under Mid-Pliocene global climate condition (see PlioMIP2 project etc.). 4) Paper structure is very strange. Results (figures) are only limited in the statistical relations and data aggregation using the 10 years HAR data, without clear figures to explain that why the mega-lake could form/sustain during the mid-Pliocene. Conclusion do not contain the main results but his own theory (idea) was extended,

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and abstract mentioned that analogue of Mars could fit to the study results without any analysis in the main contents.

Minor comments P2L42“Which is the “high mountain range in the Qaidam basin”? Is this for Mid-Pliocene? P2L47-50 Is this objective parts? Can not understand the discussion. P3L74 How many GSOD stations in the target area ? Quite few? Or many? Black point in Fig. 1? P3L85 Fig. 3 comes before Fig. 2 ? P4L91 climate driver -> variables/elements ? P6L164-175 Is this review ? Then better to move in Chapter 1. P7L199“comparative with,” L205“almost identical”, very vague terms and I can not understand. P7L210 Some papers show that climate in Mid-Pliocene is warm and wet (e.g. by Zhang). Celements et al. (1996) shows that nonstationary phase of Asian monsoon during Plio-Pleistocene, so is it sure that mega-lake was stable for several Ma years? P7L220 “blocking humidity” Thermal effect of TP causes subsidence around the northeast Asian area to form dry climate including around Qaidam basin. See Sato and Kimura, 2005, GRL for instance. Uplift of northwestern Tibet in the target era may also effect to this effect and also changes intensity/route of westerly disturbances.

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