We are very grateful for the constructive comments, suggestion and questions from the reviewer #2. According these, we have done careful revision to our manuscript. The following text gives our point-by-point replies and explanations (in black) to the issues listed (in blue and italics).

*To investigate evolution and forcing mechanism of the dry climate in central Asia is important to understand the climate system in Asia and the beyond; it is also helpful to understand the eolian dust changes in northern Hemisphere. Many unconsolidated sediments in and around Tarim Basin provide such an opportunity to reconstruct the dry climate changes during late Cenozoic, and several papers on this topic were published recently, this paper is one of the such contributions.*

Reply: Partly agree.

Explanation: This is the first high-resolution, multi-proxy record of the late Cenozoic paleo-environment change with robust time constraints from central Taklimakan Desert. With respect to the basin margins, paleo-environmental records from the central part of the basin have more broadly implications, and should be more reliable to be interpreted, as the influence of dramatic changes in depositional environments is minimum. Thus, we believe this paper can provide a unique contribution for the reader to understand the late Cenozoic climate changes in the Tarim Basin. In addition, the correlations between climate records in the dust sources and downwind areas is new and is important for understanding the tempo-spatial history of the semi-arid to arid environment over northwestern China.

*I have two considerations on this paper:*

*1) the proxy indicators such as magnetic susceptibility, grain-size distribution and the color reflectance of these sediments may not necessarily indicate the climatic changes, because local landform process may also change the physical features of these*

*sediments. Thus, I am worry about whether interpretations in this paper are right? I suggest the authors provide more evidences to support their paleoclimatic interpretations of these proxy indicators, in particular, the sediments such as eolian, fluvial and even lacustrine should be different to response to the climatic changes, therefore, the curves such as the magnetic susceptibility should be cautiously interpreted.*

Reply: Partly agree.

Explanation: Through the HBS section, each proxy studied has systematic variations among different sediments, suggesting the used proxies are sensitive to paleo-environmental change. The long-term variations of the given proxy (e.g. magnetic susceptibility) in fluvial, lacustrine, aeolian sand, and loess have similar trends from the bottom to top of the section, implying a unique factor, rather than abrupt depositional environmental change, contributed to the long-term trend of each proxy. Based on the systematic variations, the fundamental property of the proxy, and the inter-proxy comparisons, we believe the proxy indices used in this work are adequate (see comments of reviewer 1) and reliably reflects the paleo-environmental changes.

We argued it should encourage publication of such attempt to use the conventional proxy indices in the sedimentary sequences with diverse depositional facies, as most of the Cenozoic nomarine sequences are complex, and the long-term paleo-environmental records from the nonmarine sedimentary sequences are of special important for understanding the past climate change and its forcing mechanism.

*2) Which one, the tectonic uplift or the global cooling, is the dominator that has driven the dry climate evolution during the late Cenozoic has been controversial; I am surprised that the authors do not cite the papers conflict to the conclusion of this*

*paper. I suggest the authors to add these references such as Miao et al., Earth-Science Reviews 2012 and thereafter at least, and expand the discussion part to tell the authors what is the certainty and uncertainty.*

Reply: Agree.

Explanation: Section 4 was improved following the suggestion. More references wer cited and the discussion has been expanded. We noted both the uplift of the Tibet Plateau and global cooling played an important role in driving the late Cenozoic Asian aridification. We emphasized that the uplift of the Tibet plateau is the main contributor to the desertification in the Tarim Basin around 3.4 Ma, due to the synchronous accumulations of in-situ aeolian dune sand in the central Tarim Basin and tectonic coarse-grained conglomerates in the north margin of the Kunlun Mountain, as well as the anti-correlation between temperature and aridity trends. We argued that global cooling around 2.8 Ma played more important role in driving the remarkable cooling, enhanced aridity, and intensified wind intensity at 2.8 Ma, due to the similar first-order trends between the history of the major Northern Hemisphere glaciations and the climatic records derived from the Tarim Basin, the Chinese Loess Plateau, and the North Pacific Ocean. See revised discussion. P: 10, Line:18- P: 12, Line:16.

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