We are grateful to **Reviewer 2** for giving us comments to improve our manuscript. The responses to the comments from Reviewer 2 are addressed point by point as follows.

Comments

The manuscript conducted a series of grain-size analysis for modern fluvial sediments from the upper Min River, Eastern Tibet and then tried to indicate the control of tectonic activity on fluvial sediments. Although the authors provided some data of grain-size distribution of the modern fluvial sediments along the upper Min River channel, the relationship between sedimentary grain size and tectonic activity is far away to be reach. In fact, as stated by the manuscript itself, there are many factors to determine the grain-size distribution of fluvial sediments, including climate, vegetation, hydrology, geomorphology, lithology, and fault slip rate etc. Thus, it is lack solid evidence for their implication.

First of all, thank you very much for your review.

Fluvial sediments are important materials for studying tectonic activity and climate change. Because fluvial sediments can reflect provenance and transport power. Grain-size distribution is an important parameter to characterize sediment. In this study, we selected fluvial sediments in the upper Min River, eastern Tibet, and discussed the main controlling mechanism of fluvial sediment provenance through detailed grain-size analyses. This paper innovatively uses grain-size of fluvial sediments to study the tectonic activity in eastern Tibet, and confirms the previous research results.

Although there are many factors to determine the grain-size distribution of fluvial sediments, including climate, vegetation, hydrology, geomorphology, lithology, and tectonic activity etc. But we believe that the dominant role of the grain-size distribution of fluvial sediments is unique. Based on the comprehensive consideration of various factors (vegetation, hydrology, geomorphology, lithology, and tectonic activity), this paper attempts to establish the ideal relationship between grain-size distribution and tectonic activity and/or climate along upper Min River in the eastern Tibetan Plateau, rather than discussing the relationship between fluvial sediments and tectonic activity in isolation.

Based on grain size parameters (grain–size fractions, EMs, and mode values, C-M, F-M, Y value) and existing knowledge of regional sediments (P346-405), we discussed the possible origin and indicative significance of EMs, and obtained the following insights: EM1 (fine–grained fractions, <63 μm) probably have an aeolian provenance (P347-366); EM2 mainly reflect typical fluvial sediments (P374-385); EM3 represents the local sedimentary component that was locally transported over short distances (P386-405).

According to the piecewise characteristic of grain-size components, combined with climate, vegetation, hydrology, geomorphology, lithology, and fault slip rate, we discussed the controlling mechanism for piecewise changes in grain size distribution along the upper Min River. Among them,

1) The windy and semi–arid climate in the study area is responsible for more fine particle components (EM1) in segment I, and Segment I developed along the Minjiang Fault (Fig. 1a), which has a low slip rate (0.30–0.53 mm/a) and therefore a weak influence on local provenance supply (P407-419).

2) Fluvial sediments coarsen at the transition between segments I and II, highlighting an increase in EM2 and EM3 content, and a higher M value (Figs. 3, 7). This locality occurs at intersection of the Minjiang Fault and the Songpinggou Fault (Fig. 1a), which was the epicenter of the 1933 Ms 7.5 Diexi earthquake. In addition, the longitudinal slope of the riverbed (12.6‰, Fig. 7c) and the hillslope angle (41.4°, Fig. 7d) are highest in the entire study area, which imply higher regional denudation rates forced by active tectonics (P426-445).

3) EM3 content rapidly reaches its maximum in segment III (Fig. 5), likely due to the maximum transport force (C value) in the area (Fig. 7). The continuous occurrence of the coarsest grain–size in the segment III responds to the high slip rate of the faults when the catchments cross the faults (P446-472).

4) Segment IV is located in the Sichuan Basin and is completely unaffected by alpine valleys in the eastern TP. In fact, the flurosion was the main factor controlling sediment transport (EM2) in segment IV (P420-424).

Based on multiple analyses, this paper establishes the ideal relationship between grain-size distribution and tectonic activity and/or climate along upper Min River in the eastern Tibetan Plateau,

Comments

1. No question was raised for solving in the Introduction, so I cannot catch the significance of the study. In fact, nearly all discussion or implications are common knowledge, without solid contribution.

It is a scientific issue expounded in the Introduction to obtain the regional tectonic activity through the comprehensive study of topography, vegetation, hydrology, deposition and regional geology.

The solid contribution of this study is to obtain regional tectonic activity through modern fluvial sediments combined with geomorphology, hydrology, vegetation and regional geology, which is distinctly different from the traditional low-temperature thermochronological dating, GPS and seismic methods as we often see.

2. There are coarse sediments and gravels along the Min River, but no data for these depositions.

Yes, the phenomenon you mentioned is ubiquitous along the Min River.

For example, the 2008 Mw 7.9 Wenchuan earthquake triggered the largest number of coseismic landslides on record (~200,000) and large quantities of debris (coarse sediments and gravels) over vast areas (>44,000 km^2) (Dai et al., 2011; Xu et al., 2014). From 2008 to 2020, these deposits can be remobilised by four rainstorms (13 Aug 2013, 10 Jul 2013, 20 Aug 2019 and 10 Aug 2020), while more than 70% of the debris is stabilised on the hillslopes (Dai et al., 2021) and will take more than 370 years to move out (Wang et al., 2017). The above results are sufficient to show that the extensive existence of gravel in Min River can reveal tectonic activity for a long time, and we can make use of it. But these studies cannot explain the regional fluvial and wind transport characteristics. Therefore, the modern river sediment samples were collected along the upper Min River (~340 km) to study the transport information of various forces, such as hydrology, wind force and tectonics. And then, we report a new approach that can reveal the style of regional tectonic activity by analyzing fluvial sediments collected from tectonically active regions. That is the new innovation of this paper.

Reference

Dai, F.C., Xu, C., Yao, X., Xu, L., Tu, X.B., Gong, Q.M.: Spatial distribution of landslides triggered by the 2008 Ms 8.0 Wenchuan earthquake, China. J. Asian Earth Sci., 40, 883-895, https://doi.org/10.1016/j.jseaes.2010.04.010, 2011.

Dai, L.X., Scaringi, G., Fan, X.M., Yunus, A.P., Liu, Z.J., Xu, Q., Huang, R.Q.: Coseismic debris remains in the orogen despite a decade of enhanced landsliding. Geophys. Res. Lett., https://doi.org/10.1029/2021GL095850, 2021.

Xu, C., Xu, X.W., Yao, X., Dai, F.C.: Three (nearly) complete inventories of landslides triggered by the May 12, 2008 Wenchuan Mw 7.9 earthquake of China and their spatial distribution statistical analysis. Landslides, 11(3), 441-461, https://doi.org/10.1007/s10346-013-0404-6, 2014.

Wang, W., Godard, V., Liu-Zeng, J., Scherler, D., Xu, C., Zhang, J.Y., Xie, K.J., Bellier, O., Ansberque, C., Sigoyer, J., Team, A.: Perturbation of fluvial sediment fluxes following the 2008 Wenchuan earthquake. Earth Surf. Process Land., 42(15), 2611-2622, https://doi.org/10.1002/esp.4210, 2017.

3. There is no rule to divide the river into four segments in the main text, but it was divided into three segments in Abstract and conclusion.

We don't support your statement.

In "2.2 Segmented Characteristics of the Min River", the rule to divide the river into four segments (P178-180) and the characteristics of each segment are described in detail (P184-209).

In abstract and conclusion sections, we introduce and summarize the four segments of the upper Min River. Based on the analysis of grain size parameters, hydrological, vegetation, and topographic and geomorphic data, it is not "it was divided into three segments" that we identified **three segments of tectonic activity** along the upper Min River (P19-22, 541-542). Among them, we conclude that tectonic processes play a dominant role in the segments II and III, indicating the gradual increase in tectonic activity from segment II to segment III. Therefore, segments II and III are classified as the most tectonically active section (P27-32) in abstract and conclusion sections.

The three segments of tectonic activity along the upper Min River show that the Minjiang Fault, situated in the Minjiangyuan–Diexi segment (segment I), generally shows **weak tectonic activity**; two segments of the fault from Diexi to Wenchuan (segments II) and from Wenchuan to Dujiangyan (segment III) show **enhanced phase of regional tectonic activity**, although the segment from Dujiangyan to the Sichuan basin segment (IV) records **almost no evidence of tectonic activity** (P542-546).

4. For the sections of "Climate controlled finer grained fluvial sediments" and "Coarser grained deposits controlled by tectonism", there is no solid evidence for either.

We don't support your statement.

The discussion in the sections "5.2 Climate controlled finer grained fluvial sediments" and "5.3 Coarser grained deposits controlled by tectonism" is based on the conclusions of section "5.1 Dynamic and provenance implications of fluvial sediments".

In section 5.1 (P346-405), we discussed the possible origin and indicative significance of EMs based on grain size indicators (grain–size fractions, EMs, and mode values, C-M, F-M, Y value), physical geographic conditions (wind, hydrology, vegetation, topography), and existing knowledge of regional sediments, and obtained the following insights:

(1) **EM1 (fine–grained fractions, <63 μm) probably have an aeolian provenance**. This inference is supported by five separate lines of evidence: (P347-366)

1) Md varies within the narrow range 13.9–89.8 μm (Fig. 3), although the C values fluctuate widely between 54.8 μm and 964.3 μm (Fig. 7);

2) the distribution of samples in an RS section in a C–M diagram (Fig. 6) reflects uniform suspension, which likely requires transportation by ubiquitous and strong wind (Fig. S1, Passega, 1957);

3) nearly half of the samples (i.e., 22 out of 55) have Y values of less than –2.74, which is indicative of an aeolian origin (Sahu, 1964);

4) loess deposits are widely distributed in the study area, especially from Diexi upstream (Fig. S3) (Liu et al., 2013; Shen et al., 2017) and may represent a voluminous source of dust particles;

5) the study area has a high mean altitude of 2840 m, and the monthly maximum wind speed can reach 15.4 m/s, which would allow for strong aeolian transport.

(2) **EM2 mainly reflect typical fluvial sediments**. (**P374-385**)

1) The EM2 in segment IV reaches the highest value (185.8 μm: 67.4%) recorded in the whole sequence and corresponds to the 63–250 μm fraction (59.5%), which is consistent with previous studies having shown that fluvial deposits are composed mainly of a medium–sand component (modal size: 200–400 μm) (Middleton, 1976; Tsoar and Pye, 1987; Bennett and Best, 1995; Dietze et al., 2014).

2) In the C–M diagram, sample data that lie close to the C = M line reflect the suspension transport of riverbed sediments (Fig. 6a) (Singh et al., 2007; Passega, 1957).

3) the single peak mode (Fig. S2d) of segment IV represents a single river transport process and sedimentary environment (McKinney and Sanders, 1978).

4) The small size range of the grain–size frequency distribution also reflects a well–sorted product that was deposited by fluvial action (Sun et al., 2002). In addition, well-rounded pebbles (Fig. 2d) on the riverbed prove this point.

(3) **EM3 represents the local sedimentary component** that was locally transported over short distances, which is consistent with earlier research (Dietze et al., 2014; Jiang et al., 2014, 2017). (P386-405)

1) The maximum values of C and M (Figs. 7a, b) in segment III indicate that it had the highest transport capacity (Passega, 1957; Singh et al., 2007; Bravard et al., 2014).

2) The distribution characteristics of samples from segment III in the PQ section (Fig. 6a) indicate that rolling and jumping transportation processes dominated (Passega, 1957).

3) The mean grain size in segment III (170.2 μm) increases before the Zagunao River (mean of 83.1 μm, Fig. S4) joins the Min River (Fig. 1b. 3) and contribution from the Zagunao River can be precluded.

5) The abnormally high grain size and SUS values in segment III are likely caused

by a local provenance change. **(P393-398)**

Based on the indicative significance of EMs, combined with the regional climatic and tectonic background, we support that the understanding of sections "Climate controlled finer grained fluvial sediments" and "Coarser grained deposits controlled by tectonism" are reliable.

Reference

Bennett, S.J., Best, J.L.: Mean flow and turbulence structure over fixed, two-dimensional dunes: implications for sediment transport and bedform stability. Sedimentology, 42(3), 491-513, https://doi.org/10.1111/j.1365-3091.1995.tb00386.x, 1995.

Bravard, J.P., Goichot, M., Tronchère, H.: An assessment of sediment-transport processes in the Lower Mekong River based on deposit grain sizes, the CM technique and flow-energy data. Geomorphology, 207, 174-189, https://doi.org/10.1016/j.geomorph.2013.11.004, 2014.

Dietze, E., Maussion, F., Ahlborn, M., Diekmann, B., Hartmann, K., Henkel, K., Kasper, T., Lockot, G., Opitz, S., Haberzettl, T.: Sediment transport processes across the Tibetan Plateau inferred from robust grain-size end members in lake sediments. Clim. Past, 10, 91-106, https://doi.org/10.5194/cp-10-91-2014, 2014.

Jiang, H.C., Mao, X., Xu, H.Y., Yang, H.L., Ma, X.L., Zhong, N., Li, Y.H.: Provenance and earthquake signature of the last deglacial Xinmocun lacustrine sediments at Diexi, East Tibet. Geomorphology, 204, 518-531, https://doi.org/10.1016/j.geomorph.2013.08.032, 2014.

Jiang, H.C., Zhong, N., Li, Y.H., Ma, X.L., Xu, H.Y., Shi, W., Zhang, S.Q., Nie, G.Z.: A continuous 13.3-ka record of seismogenic dust events in lacustrine sediments in the eastern Tibetan Plateau. Sci. Rep., 7:15686, https://doi.org/10.1038/s41598-017-16027-8, 2017.

Liu, W.M., Yang, S.L., Fang, X.M.: Loess recorded climatic change during the last glaciation on the eastern Tibetan Plateau, western Sichuan. J. Jilin Univ. Earth Sci. Edi., 43(3), 974-982, http://ir.itpcas.ac.cn/handle/131C11/2852, 2013 (in Chinese).

Middleton, G.V.: Hydraulic interpretation of sand size distributions. J. Geol., 84(4), 405-426, https://doi.org/10.1086/628208, 1976.

Passega, R.: Texture as characteristic of clastic deposition. Bull. Amer. Assoc. Petrol. Geol., 41, 1952-1984, https://doi.org/10.1306/0BDA594E-16BD-11D7-8645000102C1865D, 1957.

Sahu, B. K.: Depositional mechanisms from the size analysis of clastic sediments. J. Sediment. Res., 34, 73-83, https://doi.org/10.1306/74D70FCE-2B21-11D7-8648000102C1865D, 1964.

Shen, Y.Q., Guo, C.B., Wu, R.A., Ren, S.S., Su, F.R., Zhang, T.: Analysis on the development characteristics and engineering geomechanical properties of the Songpan loess, western Sichuan province, China. J. Geomech., 23(5), 131-142, https://doi.org/10.3969/j.issn.1006-6616.2017.05.013, 2017 (in Chinese).

Singh, M., Singh, I.B., Müller, G.: Sediment characteristics and transportation dynamics of the Ganga River. Geomorphology, 86(1/2), 144-175, https://doi.org/10.1016/j.geomorph.2006.08.011, 2007.

Tsoar, H., Pye, K.: Dust transport and the question of desert loess formation. Sedimentology, 34(1), 139-153, https://doi.org/10.1111/j.1365-3091.1987.tb00566.x, 1987.

5. There is no new implication in the conclusion section, just for weak or enhanced tectonic activity, nothing with grain-size distribution of fluvial sediments.

Previous studies on the tectonic activity of the Minjiangyuan - Dujiangyan segments did not find the results of tectonic subsections. The piecewise characteristic of tectonic activity in upper Min River given in this study is the new implication.

Grain-size distribution of fluvial sediments, geomorphology (local relief and hillslope) and geology (fault and lithology) data are auxiliary data and means, and our aim is to reveal the tectonic activity of the region.

6. There are lots of grammar and type mistakes.

We have thoroughly revised grammar and type mistakes.

The manuscript was retouched twice before submission.