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Genetic mechanism and tectonic significance of postglacial conglomerate accumulation at Diexi in the eastern Tibet

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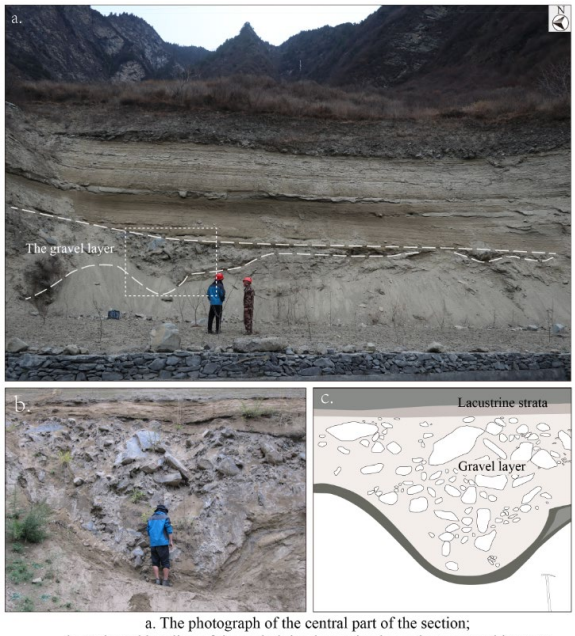
Tectonic or climatic significance of conglomerate accumulation in the tectonically active regions has raised a hornets' nest of controversy. This paper discusses the formation mechanism and geological significance of conglomerates in Diexi, eastern TP. This gravel layer is retained in the Diexi lacustrine section. By studying the chronology of the entire section, the gravel layer in the Diexi lacustrine section in the eastern Tibetan Plateau is dated to 16.79 ka BP. The bending of lacustrine layer caused by gravity collapse of massive rocks is clearly observed in the Diexi section. The lacustrine layer under the gravel layer was severely disturbed with a V-shape bending scale from 2 m to 3 m. From the north to the south of the section, the lacustrine layer kept continuous and showed no sign of erosion by the collapse debris. Under the severe effect of gravity, rocks fell or slid along a steep hillside and impacted the dammed lake floor in free fall and ploughed into the lacustrine beds. Consequently, the unconsolidated sediments were liquefied and fluidized and generated large-scale folds that may be accompanied by small interlayer glide structures. Furthermore, the gravel layer is covered directly by a lacustrine layer without up-fining gradation of particles or sedimentation bedding between lacustrine and gravel layers. These evidences suggest that the rock mass may collapse under a strong force and fall rapidly into the lake. Considering the frequency of earthquakes in this area, it is more likely that these gravel deposits were caused by an earthquake instead of a debris flow caused by torrential rain. Detailed analysis of satellite images and the sedimentary characteristics of gravel layer identified an ancient landslide at the west bank of Minjiang River near the Muer village, lying closely north of the Diexi section. Analysis of the intensity attenuation model in Southwest China implies that the lower limit of the minimum earthquake magnitude to trigger the landslide is M_S >5.7. This study is of great significance for our understanding of the genesis of gravel accumulation in areas with complex climatic and tectonic conditions.



a. The photograph of the central part of the section;
b. V-shaped bending of the underlying lacustrine layer due to gravel impact;
c. The sketch of the V-shaped bending

Lei et al., 2007:

The fitting formula of the elliptic model used is:

Long axis: $I_a = d_{a1} + d_{a2}M + d_{a3}\lg(R_a + R_{a0}) + \varepsilon_a$

Minor axis: $I_b = d_{b1} + d_{b2}M + d_{b3}\lg(R_b + R_{b0}) + \varepsilon_b$

Area	Axial direction	d_1	d_2	d_3	R_0	σ
Southwest of Sichuan basin	long axis	7.3568	1.2780	-5.0655	24	0.70
	short axis	3.9502	1.2780	-3.7567	9	0.70
	mean axis	5. 360 3	1.2963	-4.3666	15	0.51
	long axis	4.0293	1.3003	-3.6404	10	0.45
	short axis	2.3816	1.3003	-2.8573	5	0.45
	mean axis	3.3727	1.2755	-3.2858	7	0.42