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Terrace formation linked to outburst floods at the Diexi palaeo-landslide dam, upper Minjiang River, eastern Tibetan Plateau

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Supplementary tables:

Table S1. The quartz single-aliquot regenerative-dose (SAR) optically stimulated luminescence (OSL) dating protocol used for equivalent dose (D_e) determination (Murray and Wintle, 2000; Wintle and Murray, 2006).

Step	Treatment	Observed
1	Give dose, D_i	-
2	Preheat to 260 ºC for 10 s	-
3	OSL for 60 s at 125 ºC	L_i
4	Give test dose, D_t	-
5	Preheat to 220 ºC for 10 s	-
6	OSL for 60 s at 125 ºC	T_i

Table S2. 124 chronological data and 30 incision rate data from previous studies of the upper Minjiang River.

No.	Area	Reach	Site	Elev. (m)	Depth (m)	Height above the river (m)	Terrace level	Material	Dating method	Ages (ka)	Error	Incision rate (m/×10^4a)	Refers
1	Up-stream	Gonggaling - Gamisi	Doujitai	-	-	246	T4	-	ESR	376.3	-	6.5	Yang et al. (2003)
2		Gonggaling - Gamisi	North of Xiaoxitian	-	-	40	T3	-	TL	31.2	-	12.8	Zhao et al. (1994)
3		Gonggaling - Gamisi	Kakagou	-	-	124	above T3	cave	ESR	322.67	-	3.8	Yang et al. (2003)
4		Gamisi - Zhangla	Chuanpan	-	-	25	T2	-	ESR	287.27	-	0.9	
5		Gamisi - Zhangla	Chuanpan	-	-	25	T2	-	TL	30.2	-	8.3	Zhou et al. (2000)
6		Gamisi - Zhangla	Chuanpan	-	-	25	T2	-	TL	46.4	-	5.4	
7		Gamisi - Zhangla	Chuanpan	-	-	28	T2	-	ESR	642.7	-	0.4	Yang et al. (2003)
8		Gamisi - Zhangla	Shanbaxiang	-	-	150	T4	-	TL	134.8	-	11.1	Zhou et al. (2000)
9		Gonggaling - Gamisi	Qiming	-	-	120	T2	-	TL	27	-	44.4	Zhou et al. (2000)
10		Gamisi - Zhangla	Zhangla	-	-	45	top of T3	loess	14C	10.116	-	-	
11		Gamisi - Zhangla	Zhangla	-	-	90	top of T3	loess	14C	6.693	-	-	Zhu (2014)
12		Gamisi - Zhangla	Zhangla	-	-	35	T3	-	14C	35.16	-	-	

13		Gamisi - Zhangla	Zhangla	-	-	20	T3	-	14C	22.555	-	-	
14		Gamisi - Zhangla	North of Zhangla	-	-	60	T2	-	14C	7.75	-	77.4	Kirby et al. (2002)
15		Gamisi - Zhangla	North of Zhangla	-	-	35	T2	-	14C	6.12	-	57.2	
16		Gamisi - Zhangla	Zhangla	-	-	15	T2	-	14C	18.565	-	-	Zhu (2014)
17		Gamisi - Zhangla	Zhangla	-	-	15	T2	-	OSL	19.2	-	-	
18		Gamisi - Zhangla	Zhangla	-	-	40	T2	-	TL	15.3	-	26.1	Zhao et al. (1994)
19		Gamisi - Zhangla	Zhangla	-	-	80	T2	-	TL	23.6	-	33.9	
20		Gamisi - Zhangla	Zhangla	-	-	-	T2	-	TL	31.2	-	-	Gao and Li (2006)
21		Gamisi - Zhangla	Zhangla	-	-	-	T2	-	14C	22.78	-	-	Kirby et al. (2002)
22		Gamisi - Zhangla	Zhangla	-	-	-	T1	-	TL	15.3	-	-	Gao and Li (2006)
23		Gamisi - Zhangla	Zhangla	-	-	-	T1	-	14C	9.231	6.49	-	Kirby et al. (2000)
24		Gamisi - Zhangla	Zhangla	-	-	10	T1	-	14C	2.81	-	35.6	
25		Gamisi - Zhangla	Zhangla Chuanzhusi	-	-	35	T2	-	14C	12.94	-	27	Kirby et al. (2002)
26		Gamisi - Zhangla	Linpo-chuanzigou	-	-	200	T2	-	14C	23.46	-	85.3	
27		Gamisi - Zhangla	Chuanzigou	-	-	80	upper T4	-	IRSL	157	28	5.1	Kirby et al. (2000)
28		Gamisi - Zhangla	Chuanzigou	-	-	300	lower T4	-	IRSL	254	35	11.8	
29		Gamisi - Zhangla	Chuanzigou	-	-	160	T4	-	TL	157.6	-	10.2	Zhao et al. (1994)
30		Gamisi - Zhangla	Chuanzigou	-	-	250	upper T4	-	TL	830	-	3	
31		Gamisi - Zhangla	East of Songpan	-	-	80	top of T3	-	ESR	107	-	-	Yang (2005)
32		Gamisi - Zhangla	East of Songpan	-	-	20	bottom of T2	-	ESR	25	-	-	
33	From	Diexi	Taiping	-	1	-	-	Lacustrine	OSL	9.5	0.5	-	Zhong
34	downstre	Diexi	Taiping	-	2.1	-	-	Lacustrine	14C	13.395	0.209	-	(2017)
35	am to	Diexi	Taiping	-	4.1	-	-	Lacustrine	14C	14.327	0.192	-	
36	upstream	Diexi	Taiping	-	4.2	-	-	Lacustrine	OSL	10.3	0.5	-	

37	or Study	Diexi	Taiping	-	5.3	-	-	Lacustrine	OSL	8.9	0.6	-	
38	area	Diexi	Taiping	-	7.5	-	-	Lacustrine	OSL	11.1	0.5	-	
39		Diexi	Taiping	-	8.6	-	-	Lacustrine	OSL	10.2	0.7	-	
40		Diexi	Taiping	-	8.7	-	-	Lacustrine	14C	14.688	0.23	-	
41		Diexi	Taiping	-	8.9	-	-	Lacustrine	OSL	18.9	3.5	-	
42		Diexi	Taiping	-	9.6	-	-	Lacustrine	OSL	10.1	0.7	-	
43		Diexi	Taiping	-	10.1	-	-	Lacustrine	14C	14.173	0.153	-	
44		Diexi	Taiping	-	11.3	-	-	Lacustrine	OSL	8.4	0.8	-	
45		Diexi	Taiping	2239.5	1.1	-	-	Lacustrine	OSL	25	3.2	-	Guo (2018)
46		Diexi	Taiping	2239.3	1.3	-	-	Lacustrine	OSL	19.6	2.7	-	
47		Diexi	Taiping	2232	8.6	-	-	Lacustrine	OSL	20.7	2.4	-	
48		Diexi	Taiping	2231.6	9	-	-	Lacustrine	OSL	22.8	3.6	-	
49		Maoxian - Zhangla	North of Jiaochang	-	-	56	T2	Lacustrine	IRSL	14.2	1.7	39.4	Kirby et al. (2000)
50		Maoxian – Zhangla	Jiaochang	-	-	162	T5	Lacustrine	14C	9.483	0.21	-	Wang et al. (2007)
51		Maoxian – Zhangla	Jiaochang	-	-	180	T2	Lacustrine	14C	10	-	198	Duan et al. (2002)
52		Maoxian – Zhangla	Jiaochang	-	-	90	T2	Lacustrine	14C	14	-	64.3	
53		Maoxian – Zhangla	Jiaochang	-	-	35	T2	Lacustrine	14C	6.3395	0.16	-	Wang et al. (2007)
54		Maoxian – Zhangla	Jiaochang	-	-	30	T2	Lacustrine	14C	22	-	13.6	Duan et al. (2002)
55		Maoxian – Zhangla	Jiaochang	-	-	196	T2	Lacustrine	ESR	390	-	5	Yang et al. (2003)
56		Maoxian - Zhangla	Jiaochang	-	-	180	T2	Lacustrine	ESR	504.74	-	3.6	
57		Diexi	Tuanjie	2254.97	-	-	T5	Lacustrine	14C	8.3755	0.12	-	Wang et al. (2020)
58		Diexi	Tuanjie	2213.84	-	-	T4	Lacustrine	14C	4.8105	0.07	-	
59		Diexi	Tuanjie	2185.68	-	-	T3	Lacustrine	14C	3.7015	0.27	-	
60		Diexi	Tuanjie	-	-	-	-	Lacustrine	AMS 14C	24.445	0.653	-	Wang et al. (2007)
61		Diexi	Tuanjie	-	-	-	-	Lacustrine	AMS 14C	27.35	0.977	-	
62		Diexi	Tuanjie	-	-	-	-	Lacustrine	AMS 14C	24.447	0.519	-	
63		Diexi	Tuanjie	-	-	-	-	Lacustrine	AMS 14C	9.735	0.712	-	
64		Diexi	Tuanjie	-	-	-	-	Lacustrine	AMS 14C	13.602	0.128	-	

65	Diexi	Tuanjie	-	-	-	-	Lacustrine	AMS 14C	15.08	0.065	-	Wang (2009)
66	Diexi	Tuanjie	-	0	-	T2	Lacustrine	OSL	10.63	1.27	-	Jiang et al. (2014)
67	Diexi	Tuanjie	-	0.05	-	T2	Lacustrine	OSL	15.9	1.1	-	Mao (2011)
68	Diexi	Tuanjie	-	0.95	-	T2	Lacustrine	OSL	18.17	2.66	-	Jiang et al. (2014)
69	Diexi	Tuanjie	-	1.05	-	T2	Lacustrine	OSL	18	1.1	-	Mao (2011)
70	Diexi	Tuanjie	-	1.95	-	T2	Lacustrine	OSL	21.88	4.58	-	Jiang et al. (2014)
71	Diexi	Tuanjie	-	3.05	-	T2	Lacustrine	OSL	13.7	1.9	-	Mao (2011)
72	Diexi	Tuanjie	-	3.85	-	T2	Lacustrine	OSL	13.88	1.39	-	Jiang et al. (2014)
73	Diexi	Tuanjie	-	4.05	-	T2	Lacustrine	OSL	17.3	3.4	-	Mao
74	Diexi	Tuanjie	-	5.05	-	T2	Lacustrine	OSL	14.4	1.5	-	(2011)
75	Diexi	Tuanjie	-	6.05	-	T2	Lacustrine	OSL	14.19	1.91	-	Jiang et al. (2014)
76	Diexi	Tuanjie	-	6.05	-	T2	Lacustrine	OSL	16.5	2.1	-	Mao (2011)
77	Diexi	Tuanjie	-	6.9	-	T2	plant	14C	14.6295	0.32	-	Shi et al. (2020)
78	Diexi	Tuanjie	-	7.05	-	T2	Lacustrine	OSL	14.91	3.77	-	Jiang et al. (2014)
79	Diexi	Tuanjie	-	8.05	-	T2	Lacustrine	OSL	15.9	2	-	Mao (2011)
80	Diexi	Tuanjie	-	8.3	-	T2	plant	14C	16.48	0.18	-	Shi et al. (2020)
81	Diexi	Tuanjie	-	8.95	-	T2	Lacustrine	OSL	16.6	2.67	-	Jiang et al. (2014)
82	Diexi	Tuanjie	-	9.05	-	T2	Lacustrine	OSL	19	1.7	-	Mao
83	Diexi	Tuanjie	-	10.05	-	T2	Lacustrine	OSL	18.8	1.7	-	(2011)
84	Diexi	Tuanjie	-	10.95	-	T2	Lacustrine	OSL	18.6	2.86	-	Jiang et al. (2014)
85	Diexi	Tuanjie I	-	0.5	-	-	Lacustrine	OSL	10.9	0.6	-	Zhong
86	Diexi	Tuanjie I	-	1.5	-	-	Lacustrine	OSL	17.7	0.8	-	(2017)
87	Diexi	Tuanjie I	-	2.5	-	-	Lacustrine	OSL	12	0.7	-	
88	Diexi	Tuanjie I	-	3.5	-	-	Lacustrine	OSL	9.8	0.7	-	
89	Diexi	Tuanjie I	-	4.5	-	-	Lacustrine	OSL	17.8	0.9	-	
90	Diexi	Tuanjie I	-	5	-	-	Lacustrine	OSL	11.1	0.9	-	
91	Diexi	Tuanjie I	-	6.1	-	-	Lacustrine	OSL	10	0.8	-	
92	Diexi	Tuanjie I	-	8.15	-	-	Charcoal	AMS 14C	13.837	0.173	-	
93	Diexi	Tuanjie I	-	8.5	-	-	Lacustrine	OSL	16.1	0.7	-	
94	Diexi	Tuanjie I	-	9	-	-	Lacustrine	OSL	12.7	0.6	-	

95		Diexi	Tuanjie I	-	10	-	-	Lacustrine	OSL	19.2	3.4	-	
96		Diexi	Tuanjie I	-	10.5	-	-	Lacustrine	OSL	19.5	1	-	
97		Diexi	Tuanjie I	-	11.1	-	-	Charcoal	AMS 14C	14.23	0.15	-	
98		Diexi	Tuanjie II	-	0.1	-	-	Lacustrine	OSL	20.3	1.4	-	
99		Diexi	Tuanjie II	-	0.6	-	-	Lacustrine	OSL	12.1	0.7	-	
100		Diexi	Tuanjie II	-	0.7	-	-	Lacustrine	OSL	20.4	0.8	-	
101		Diexi	Tuanjie II	-	2.1	-	-	Lacustrine	OSL	14.2	1.2	-	
102		Diexi	Tuanjie II	-	2.4	-	-	Lacustrine	AMS 14C	14.67	0.23	-	
103		Diexi	Tuanjie II	-	2.9	-	-	Lacustrine	AMS 14C	14.439	0.176	-	
104		Diexi	Tuanjie II	-	3.7	-	-	Lacustrine	OSL	20.9	1	-	
105		Diexi	Tuanjie II	-	5.6	-	-	Lacustrine	OSL	15.5	1	-	
106		Diexi	Tuanjie	-	2.30 (thickness)	-	-	Lacustrine	14C	35.7815	0.37	-	Zhang et al. (2009)
107		Diexi	Tuanjie	-	4.55 (thickness)	-	-	Lacustrine	14C	31.1315	0.1	-	
108		Diexi	Tuanjie	-	7.70 (thickness)	-	-	Lacustrine	14C	30.655	0.03	-	
109		Diexi	TuanjieII I	2158.9	4	-	T3	Lacustrine	OSL	19	1.9	-	Guo (2018)
110		Diexi	TuanjieII	2161.8	3	-	T2	Lacustrine	OSL	22.9	2.7	-	
111		Diexi	TuanjieI	2165.6	7.5	-	T1	Lacustrine	OSL	23.7	3.2	-	
112		Diexi	valley	-	-	-	T5	Sand	TL	90.446	3	-	Gao and Li (2006)
113		Diexi	valley	-	-	-	T3	Sand	TL	50.8	3.9	-	
114		Diexi	valley	-	-	-	T2	Sand	TL	12.7	1	-	
115		Diexi	valley	-	-	-	bottom of lacustrine sediments	Lacustrine	14C	22.675	2.44	-	Luo et al. (2019)
116	Down-stream	Wenchuan - Maoxiao	East of Yaogou, Maoxian	-	-	140	upper T3	-	ESR	110.25	-	12.7	Yang et al. (2003)
117		Wenchuan - Maoxiao	North of Maoxian	-	-	120	T2	-	TL	20.7	-	58	Zhao et al. (1994)

118	Wenchuan - Maoxiao	Maoxian	-	-	100	upper of T3	loess	ESR	62	-	-	Yang (2005)
119	Wenchuan – Maoxiao	Maoxian	-	-	90	upper of T3	loess	ESR	100.5	-	-	
120	Wenchuan - Maoxiao	Maoxian	-	-	80	bottom of T3	-	OSL	39.9	-	-	Zhu (2014)
121	Wenchuan - Maoxiao	Maoxian	-	-	35	T2	-	14C	27.84	-	-	
122	Wenchuan - Maoxiao	Maoxian	-	-	20	T2	-	14C	24.68	-	-	
123	Wenchuan - Maoxiao	Yantouzhai, Maoxian	-	-	160	lower T3	-	ESR	279.99	-	5.7	Yang et al. (2003)
124	Wenchuan - Maoxiao	North of Wenchuan	-	-	160	T4	cave	ESR	370.5	-	4.3	

Supplementary figures:

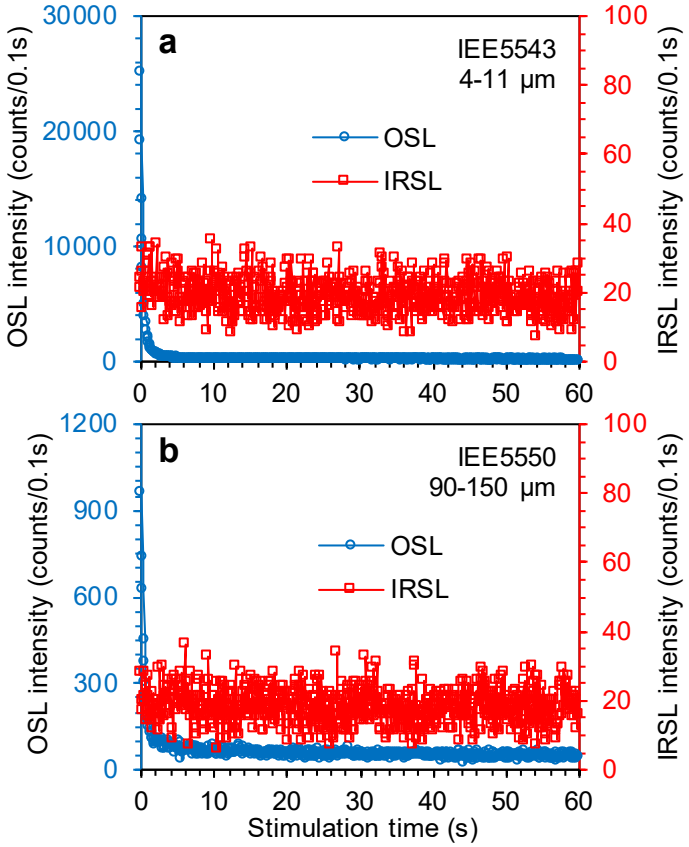

Fig. S1. Regeneration dose (15.5 Gy) optically stimulated luminescence (OSL) and infrared stimulated luminescence (IRSL) decay curves of samples IEE5543 (**a**) and IEE5550 (**b**).

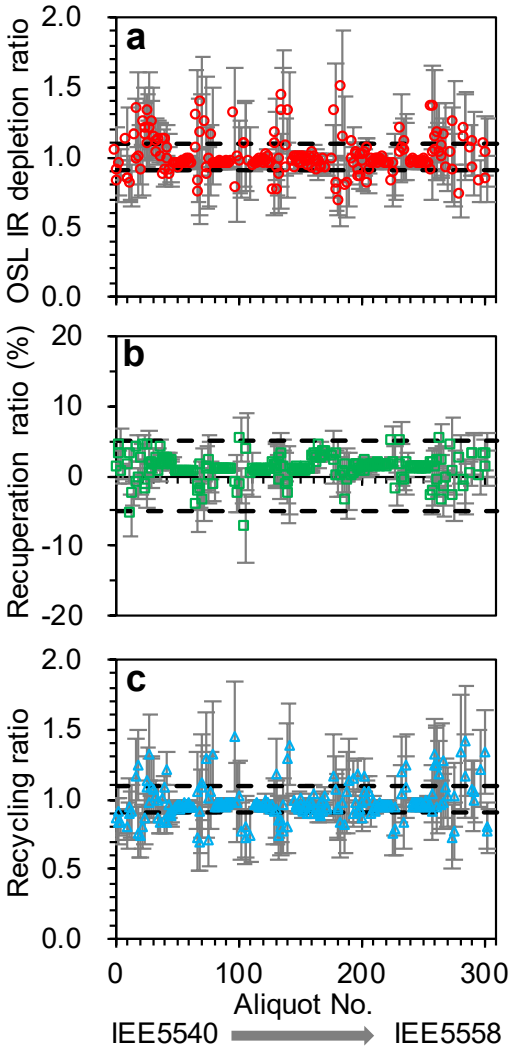

Fig. S2. Quartz OSL IR depletion ratio (with IR/without IR **a**), recuperation ratio (recuperated/natural, **b**), and recycling ratio (repeated/regenerated, **c**) for all the 222 aliquots (used for D_e determination) of the 19 luminescence samples.

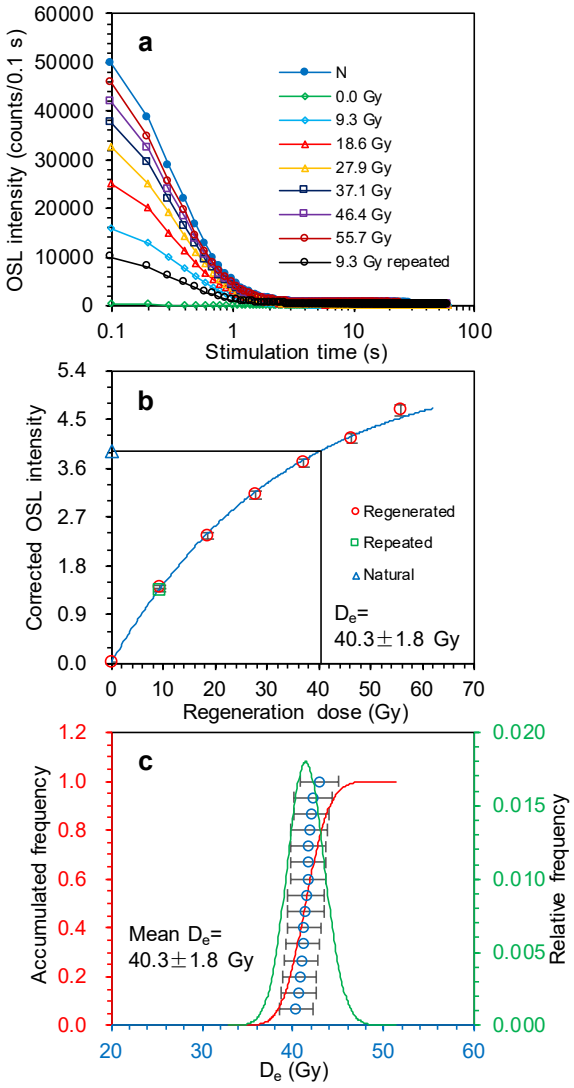

Fig. S3. Quartz OSL D_e determination for sample IEE5543. (**a**) Natural and regenerative-dose OSL decay curves from one of the 15 aliquots used for D_e determination. (**b**) Dose-response curve and D_e determination for the aliquot in (**a**). (c) Probability density distribution of D_e and mean D_e.

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