Table List

Table 1. Study cases of ancient landslide-dammed lakes in the Upper Yangtze River at the eastern Tibetan Plateau.

Drainage basin	Name	Dating method	Sampling site	Age (ka)	Reference
Jinsha River	Benzilan ancient landslide-dammed lake	U-series dating	Upper part of the lacustrine clay bed on the right bank	55.4 ± 3.5	Zhang et al., 2011
			Lower part of the lacustrine clay bed on the right bank	82.1 ± 6.6	
			Lacustrine clay bed on the left bank	122.0 ± 12.4	
	Wangdalong paleo-dammed lake	OSL	Top of lacustrine sediments	1.2 ± 0.1 ~ 1.3 ± 0.2	Chen et al., 2013
		^{14}C	Landslide debris	1.9 ± 0.06	
	Suwalong paleo-dammed lake	^{14}C	Downstream relict landslide dams	1.175 ± 0.025 ~ 1.37 ± 0.095	Wang et al., 2014
		OSL	Lacustrine sediments	1.3 ± 0.14 ~ 1.8 ± 0.1	
	Xuelongnang paleolandslide-dammed lake	^{14}C	Bottom of the relict landslide dam	2.1 ± 0.025	Chen et al., 2018
		OSL	Lacustrine sediments	0.4 ± 0.1 ~ 2.1 ± 0.3	
Upper Minjiang River	Maoxian paleolake	^{14}C	Bottom of the lacustrine sediments	22.5 ± 0.55	Wang et al., 2007
	Wenzhen paleolake, Maoxian	^{14}C	Middle part of the lacustrine sediments	20.76 ± 0.225	
	Gu'ergou paleolake	^{14}C	Lower-center part of the lacustrine sediments	18.84 ± 0.34	
	Lixian paleolake	^{14}C	Lower-center part of the lacustrine sediments	18.94 ± 0.12	
Dadu River	Jiajun paleolake	^{14}C	Bottom of the lacustrine sediments	19.36 ± 0.42	Wu et al., 2018

Table 2. Summary of conventional methods and equations developed to determine peak discharge (Q_p) for outburst floods.

Method categories		Equation	Number of case studies	Coefficient of determination (R^2)	Accuracy	Reference
Regression equations	Water height (depth)	$Q_p=1.268(H_w+0.3)^{2.5}$	38	0.790	Best fit	Kirkpatrick, 1977
		$Q_p=13.4(H_d)^{1.89}$	38	0.488	Best fit	Singh and Snorrason, 1982
		$Q_p=0.784(H_d)^{2.668}$	72	0.633	Best fit	Pierce et al., 2010 (linear)
		$Q_p=2.325\ln(H_d)^{6.405}$	72	0.640	Best fit	Pierce et al., 2010 (nonlinear)
		$Q_p=24(d)^{1.73}$	19	0.530	Best fit	[a]Cenderelli, 2000
	Water storage (volume)	$Q_p=1.776(S_w)^{0.47}$	35	0.918	Best fit	Singh and Snorrason, 1984
		$Q_p=0.72(V_w)^{0.53}$	39	0.836	Best fit	[a]Evans, 1986
		$Q_p=60.3(V_w)^{0.84}$	22	0.890	Best fit	Walder and O'Connor, 1997
		$Q_p=0.00919(V)^{0.745}$	87	0.805	Best fit	Pierce et al., 2010
		$Q_p=3.4(V)^{0.46}$	19	0.730	Best fit	[a]Cenderelli, 2000
		$Q_p=1.122(S_w)^{0.57}$	35	—	Best fit	Costa, 1985
	Water height and storage	$Q_p=0.54\left(S_w \cdot H_d\right)^{0.5}$	31	—	Envelope	Hagen, 1982
		$Q_p=1.154(V_w \cdot H_w)^{0.412}$	37	0.788	Best fit	MacDonald and Langridge-Monopolis, 1984
		$Q_p=0.0176(V \cdot H)^{0.606}$	87	0.844	Best fit	Pierce et al., 2010
		$Q_p=0.038\left(V^{0.475} \cdot H^{1.09}\right)$	87	0.850	Best fit	
		$Q_p=0.607\left(V_w^{0.295} \cdot H_w^{1.24}\right)$	32	0.934	Best fit	Froehlich, 1995
		$Q_p=0.19(V_w \cdot H_w)^{0.47}$	22	0.490	Best fit	Walder and O'Connor, 1997
		$Q_p=1.9(V \cdot d)^{0.4}$	19	0.760	Best fit	[a]Cenderelli, 2000
		$Q_p=0.0158PE^{0.41}$	12	0.810	Best fit	[a]Costa and Schuster, 1988
Parametric equations		$Q_p=g^{0.5}(2/3)^{1.5}W_t d^{1.5}$	2[e]	—	Envelope	[b]O'Connor and Beebee, 2009
		$Q_p=8/27[(0.4W_b)+(0.6W_t)]g^{0.5}H_b^{1.5}$	2[e]	—	Envelope	[c]Manville, 2001
		$Q_p=0.591C_d \cdot H_b^{1.5}(5W_b+4z \cdot H_b)$	2[e]	—	Envelope	
		$Q_p=2V/t_w$	5[e]	—	Envelope	[d]Haeberli, 1983 (nontunnel events)
		$Q_p=1.51\left(g^{0.5}d^{2.5}\right)^{0.06}(kV/d)^{0.94}$, if $kV(gd)^{-0.5}d^{-3}<0.6$; $Q_p=1.94g^{0.5}d^{2.5}(D_c/d)^{0.75}$, if $kV(gd)^{-0.5}d^{-3}\gg 1$	28[e]	—	Best fit	[a]Walder and O'Connor, 1997
Boulder competence methods		$Q=vA$	139[e]	—	Best fit	O'Connor, 1993; [a]Costa, 1983

Note:

[a]This example has been derived entirely from case studies of landslide-dam failure.

[b]This equation is applied to broad-crested weir: rectangular breach.

[c]This equation is applied to broad-crested weir: trapezoidal breach. Breach development time: 0.76 h; breach erosion rate 100 m h^{-1}.

[d]The relation is applied to events termed 'sudden break'. t_w is a time constant with an approximate range between 1000 and 2000 s.

[e]These case studies are from the statistics of present literature in this paper.

Table 3. Calculating parameters and results of the Diexi ancient LLOFs by the boulder competence methods.

Subjects		Cross-sectional sites				
		C.S. 1	C.S. 2	C.S. 3	C.S. 4	C.S. 5
Distance from the relict landslide dam (km)		0.45	0.90	1.95	2.80	5.00
Statistics of the largest bourders' geometry	Amount of bounders (piece)	36	30	30	40	38
	Average long axis / $\overline{d_L}$ (m)	4.3	3.6	2.9	1.9	1.7
	Average intermediate axis / $\overline{d_I}$ (m)	3.3	2.3	1.7	1.3	1.1
	Average short axis / $\overline{d_S}$ (m)	2.5	1.7	1.1	0.9	0.7
Channel parameters	γ_s (g/cm^3)	2.85				
	γ_f (g/cm^3)	1.0				
	G (m/s^2)	9.8				
	C_L	0.178				
	f	0.7				
	n	0.04				
	S	0.005				
	θ (°)	35	30	40	30	37
Average velocity / $\overline{v}$ (m/s)	Helley's method	23.97	17.80	17.95	13.15	10.07
	F_D+F_L=F_R method	10.50	8.11	6.51	6.00	5.61
	Average value (m/s)	17.23	12.96	12.23	9.58	7.84
Average depth / $\overline{D}$ (m)	Manning's formula	30.43	19.85	18.20	12.62	8.96
Channel cross-sectional area / A (m^2)		4192.26	3683.32	2763.01	1498.93	1073.33
Peak discharge / Q_p (m^3/s)		72232.66	47735.83	33791.61	14359.75	8414.91

Table 4. Geomorphological characteristics of the outburst deposits sections.

Section number	Distance from the relict landslide dam (km)	Exposed length (m)	Maximum thickness (m)	Top elevation (m)	Location	
					Latitude (N)	Longitude (E)
I	0.45	120	9.3	2024.7	32°01'24.86"	103°41'08.84"
II	0.8	150	25	2032.9	32°01'20.81"	103°40'57.71"
III	1.2	78	18	2027.2	32°01'11.38"	103°40'58.11"
IV	1.6	25	4.2	1972.8	32°00'57.56"	103°40'45.00"
V	2.0	110	8.5	1964.3	32°00'48.91"	103°40'40.22"
VI	2.6	60	3.4	1949.4	32°00'30.36"	103°40'37.12"
VII	3.2	30	2.2	1929.2	32°00'11.77"	103°40'33.35"
VIII	5.0	62	4.9	1893.5	31°59'23.22"	103°40'25.27"

Note: Sections of II, III and V ~ VII were from Ma et al. (2018).