DATA AVAILABILITY

Evaluation of barrier lake breach floodS: insights from recent case studies in China

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Breach of the Baige barrier lake on November 12, 2018 on Jinsha River, China. *Photo by Shuaifeng Wu.*

Abstract

China has seen frequent barrier lake breach hazards since 2000. Several cases have monitored with complete breach flood hydrographs that enabled the improvement to the existing dam breach analysis methods by merging hydraulics and soil mechanics expertise. Some novel improvements to the analytical methods have been published. This paper focuses on the authors' improved hyperbolic soil erosion and lateral enlargement models, and a numerical algorithm that allows easy calculation of the breach flood hydrograph. The calculated peak flows using this improved method are in general agreement with field measurements and are less sensitive to input parameters. The research outcomes have been incorporated into a spreadsheet DB-IWHR coded in Microsoft Excel and available for downloading from the web. It is self-explanatory and almost self-tutorial. This software is particularly useful in emergencies when a quick and easy evaluation of the breach flood is required. Four well-documented large-scale barrier lake breach cases have been analyzed against the measured data. Among them, the historical Yigong barrier lake breach, with its 94,013 m^3/s peak flow has shed light on our knowledge of combatting disastrous natural hazards. The latest Baige barrier lake beach, happened on November 12, 2018 in the upper reach of the Jinsha river with a documented peak flow of 31,000 m^3/s, offers another significant case reviewed in this paper.

1. INTRODUCTION

Breaches of barrier lakes are common natural disasters worldwide (Schuster & Costa, 1986; Liu et al.,

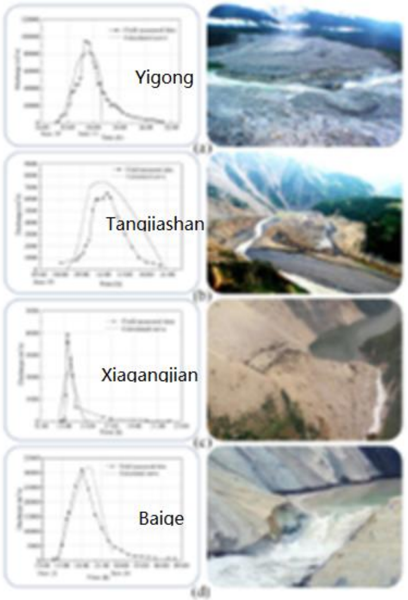

TABLE 5 Summary of the sensitivity studies

Case	Physics of the parameters	Sub-case	Parameters: Sensitivity studies	Parameters: Target case	Peak flow, Q_p, m^3/s	η %
A	Hydraulic parameters	A-1	m=0.6, C=1.35	m=0.8, C=1.43	7,829.65	2.89
		A-2	m=0.5, C=1.35		7,858.80	3.27
		A-3	m=0.5, C=1.69		8,300.19	9.07
B	Hyperbolic erosion model	B-1	a=1.0,b=0.0005	a=1.1,b=0.0007	9,475.62	24.52
		B-2	a=0.9,b=0.0003		13,524.99	77.73
C	Power erosion model	C-1	a_l=8,b_l=1.2		7,512.91	-1.28
		C-2	a_l=10,b_1=1.2		10,357.93	36.11
		C-3	a_1=8,b_1=1.3		15,192.20	99.63
D	Linear erosion model	D-1	a_L=0.3		20,619.35	170.95
		D-2	a_L=0.2		13,707.17	80.12
		D-3	a_L=0.1		4,769.04	-37.33
E	Shear strength parameters	E-1	c=50, φ=35°	c=25, φ=22°	6,954.75	-8.61
		E-2	c=10, φ=15°		7,413.23	-2.59

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