

TC210 Embankment Dams



Welcome Message

TC210 Workshop on Embankment Dams Reykjavik, 1 September 2019

Limin Zhang

Chair, ISSMGE TC210

Chair Professor, Hong Kong Univ. of Science and Technology

Workshop on Embankment Dams

Harpa Conference and Concert halls

Reykjavik, 1 September 2019|

Chair : Daniele Cazzuffi (CESI SpA, Milano)

- 13.00-13.15: **Introduction**
Limin Zhang (University of Science & Technology, Hong Kong and Chair of TC 210)
- 13.15-13.35: **3D Stress State and the slope stability of embankment dams in narrow valleys**
Nicolas Moura & Gilson Gitirana (University Goiania, Brazil) and Murray Fredlund (SoilVision Systems, Canada)
- 13.35-13.55: **Embankment construction by means of a membrane foundation**
Oliver Detert (Huesker, Germany), Dimiter Alexiew (Gescher, Germany) and D. Konig (University of Bochum, Germany)
- 13.55-14.15: **Dynamic properties of earth-core Italian dams from field and laboratory tests**
Giuseppe Lanzo (Sapienza University of Roma, Italy), A. Pagliaroli (University of Chieti-Pescara, Italy) and G. Scasserra (Ground Engineering, Roma, Italy)
- 14.15-14.35: **Effects on earth dams of drawdown scenarios imposed after a strong earthquake**
S. Sica & F. Rotili (University of Sannio, Benevento, Italy) & Luca Pagano (University Federico II, Napoli, Italy)
- 14.35-14.55: **Numerical simulation of seismic response of earth dams**
E. Banti, S. Stacul & D. Lo Presti (University of Pisa, Italy)
- 14.55-15.25: **Discussion**
- 15.25-15.40: **Summary and Closure**
Daniele Cazzuffi (CESI SpA, Milano)
Limin Zhang (University of Science & Technology, Hong Kong and Chair of TC 210)
- 15.40-15.55: **Break**
- 15.55-16.55: **ISSMGE TC210 Committee Meeting**

TC210 on Embankment Dams

- Restructured in June 2018
- 42 nominated members and 7 corresponding members

Limin Zhang (Chair)
Rui Wang (Secretary)
Zuyu Chen
Jean-Pierre Tournier
Kaare Hoeg
Malcolm Eddleston
Nihal Vitharana
Paolo Pitasi
Luca Pagano
Angelo Amorosi
EDUARDO OSCAR CAPDEVILA
S.R. Gandhi
George Dounias
Nikolaos Klimis
Hongxin Chen
Hendra Jitno
Meysam Safavian
Behrooz Ghahremannejad
Fernando Delgado
James Burr
Suttisak Soralump
Duruo Huang
Mahendra Singh

Hong Kong SAR
China
China
Canada
Norway
United Kingdom
Australia
United Kingdom
Italy
Italy
Argentina
India
Greece
Greece
China
Indonesia
Australia
Australia
Spain
New Zealand
Thailand
China
India

Daniele Cazzuffi
Krzysztof Parylak
Baris Trak
Deniz Ulgen
Laura Caldeira
João Marcelino
Octávio Pereira
Chin Kok Toh
GILSON GITIRANA Jr.
Duruo Huang
Daniel Pradel
Zheng-yi Feng
Yoshikazu Yamaguchi
Jörg Klomp maker
Bernhard Odenwald
ALBERTO SAYÃO
Feyza Cinicioglu
Didiek Djarwadi
Shijin Feng
Koen Haelterman
Jean-François Vanden Berghe
Siavash Litkoohi
Sven Knutsson
Zdzisław Skutnik
José María Villarroel
Jean-Jacques Fry

Italy
Poland
Turkey
Turkey
Portugal
Portugal
Portugal
Malaysia
Brazil
Hong Kong SAR
United States
Chinese Taipei
Japan
Germany
Germany
Brazil
Turkey
Indonesia
China
Belgium
Belgium
Iran
Sweden
Poland
Spain
France

TC210 Terms of Reference

■ Dissemination

- To promote co-operation and exchange of information concerning research and developments in geotechnical issues of dam construction among TC members and ISSMGE member societies

■ Guidelines and recommendations

- To develop guidelines and bulletins for the design, construction and safe operation of embankment dams

■ Conference assistance

- To assist with technical programs of international and regional conferences organized by the ISSMGE:

■ Industry links

- Interact with industry and overlapping organizations working in areas related to TC210's specialist areas

Key Targets

- Launch the ISSMGE TC210 conference series: **International Conference on Embankment Dams (ICED)**.
- Launch an **ISSMGE lecture** in honour of a distinguished researcher in embankment dam engineering.
- Launch a **Developing Country Training Program**, which supports delegates from developing countries to attend conferences and training programs organised by TC210.
- Develop guidelines and bulletins for the design, construction and safe operation of embankment dams.

Significant Past/ongoing Activities

2nd International Workshop on Machine Learning and Big Data in Geoscience
第二届岩土科学机器学习与大数据国际研讨会

Hosted by
 ISSMGE Machine Learning and Big Data Technical Committee (TC309)
 Risk and Insurance Research Branch of China Civil Engineering Society

Organized by
 Tongji University

Supported by
 ISSMGE TC304 / TC 210
 FedIGS JTC2
 Norwegian Geotechnical Institute

Shanghai, China, July 28-30, 2019
 中国, 上海, 2019.7.28-30



7th International Symposium on Geotechnical Safety and Risk
 ISGSR 2019 | Taipei, Taiwan | December 11-13 2019

State-of-the-Practice in Geotechnical Safety and Risk

Home Important Dates Sessions Keynote Lectures Short Courses Program at a glance Registration Venue



News & Updates

- Online registration is now open
- Short courses at ISGSR2019

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Conference Proceedings

The conference proceedings will be published by Taylor & Francis.

Important Deadlines

Deadline for submission of abstracts	31 Aug. 2019
Notification of acceptance of abstracts	15 Sept. 2019
Deadline for submission of full papers	30 Nov. 2019
Notification of acceptance/revision of papers	31 Dec. 2019
Notification of final acceptance of papers	31 Jan. 2020



Enquiries

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Under the auspices of
International Society of Soil Mechanics and
Geotechnical Engineering (ISSMGE)
TC210 Committee Embankment Dams

First Bulletin

FIRST INTERNATIONAL CONFERENCE ON EMBANKMENT DAMS (ICED'2020): DAM BREACH MODELLING AND RISK DISPOSAL

5-7 June 2020, Beijing International Convention Center
Beijing, China

<http://iced-2020.host30.voosite.com/>



Chinese Institution of Soil Mechanics and Geotechnical
Engineering – China Civil Engineering Society



水电水利规划设计总院
China Research Institute of Water Resources and Hydropower Research



香港科技大学
THE HONG KONG UNIVERSITY OF
SCIENCE AND TECHNOLOGY



清华大学
Tsinghua University



中国水利水电科学研究院
China Institute of Water Resources and Hydropower Research

- Submit abstracts at iced2020@163.com
- Proceedings published as a monograph in Springer Geomechanics Series, “Dam Breach Modelling and Risk Disposal”
- All TC210 members as Technical Committee members
- Subcommittee on Keynote Lectures
- ISSMGE Bright Spark Lectures

Why on Dam Breach Modelling and Risk Disposal?



Gongo Soco tailing dam failure on 25 January 2019 in Brazil that claimed nearly 300 people



Mount Polley open pit mine dam failure in British Columbia, Canada on 4 August 2014

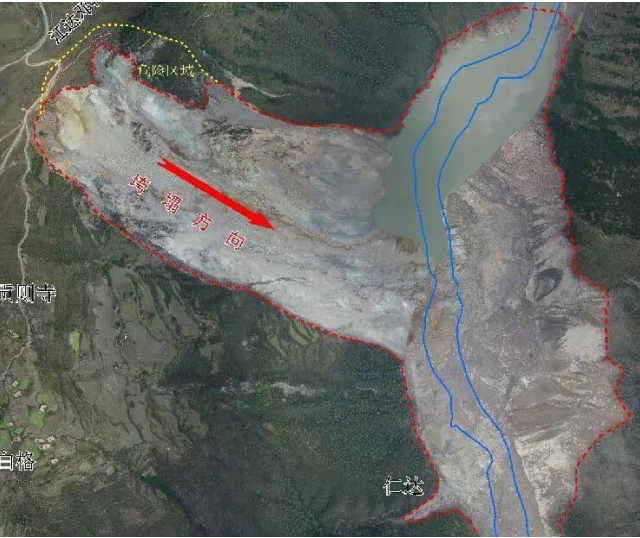


Laos dam collapse on 23 July 2018 that hit both Laos and Cambodia and killed 39 people



Sheyuegou dam failure, Xingjiang, China on 31 July 2018. 20 fatalities.

Landslide dams on Yangtze River and Yalung Tsangpo, Oct-Nov 2018



Baige, 11 Oct 2018
金沙江白格堰塞湖(1)



Baige, 3 Nov 2018
金沙江白格堰塞湖(2)



Yalung Tsangpo, 17 Oct 2018
雅鲁藏布堰塞

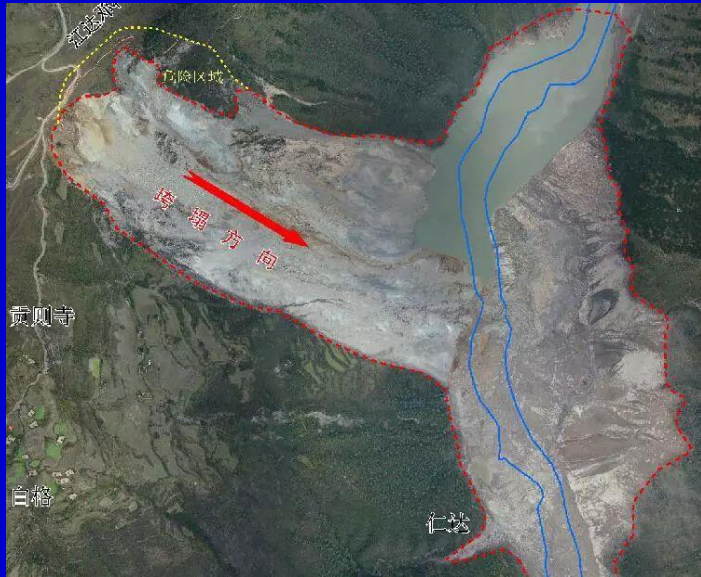
Formation: 7:10 am, 11 Oct
Water depth: 46 m
Lake capacity: $2.7 \times 10^8 \text{ m}^3$
Breaching: 18:00, 12 Oct.
-14:00, 13 Oct.
 Q_{\max} : 10000 m^3/s
Lifespan: 2.5 days

17:15, 3 Nov
86 m
 $8.2 \times 10^8 \text{ m}^3$
4:45, 12 Nov
-2:00 14 Nov
33900 m^3/s
10.5 days

5:00 am, 17 Oct
79 m
 $5.9 \times 10^8 \text{ m}^3$
13:30, 19 Oct
-7:00, 20 Oct
32000 m^3/s
3 days



First Landslide Damming



Formation: 7:10 am, 11 Oct 2018

Water depth: 46 m

Lake volume: $2.7 \times 10^8 \text{ m}^3$

Breaching: 18:00, 12 Oct. 2018

-14:00 13 Oct. 2018

Q_{max} : $\sim 10000 \text{ m}^3/\text{s}$

Lifespan: 2.5 days

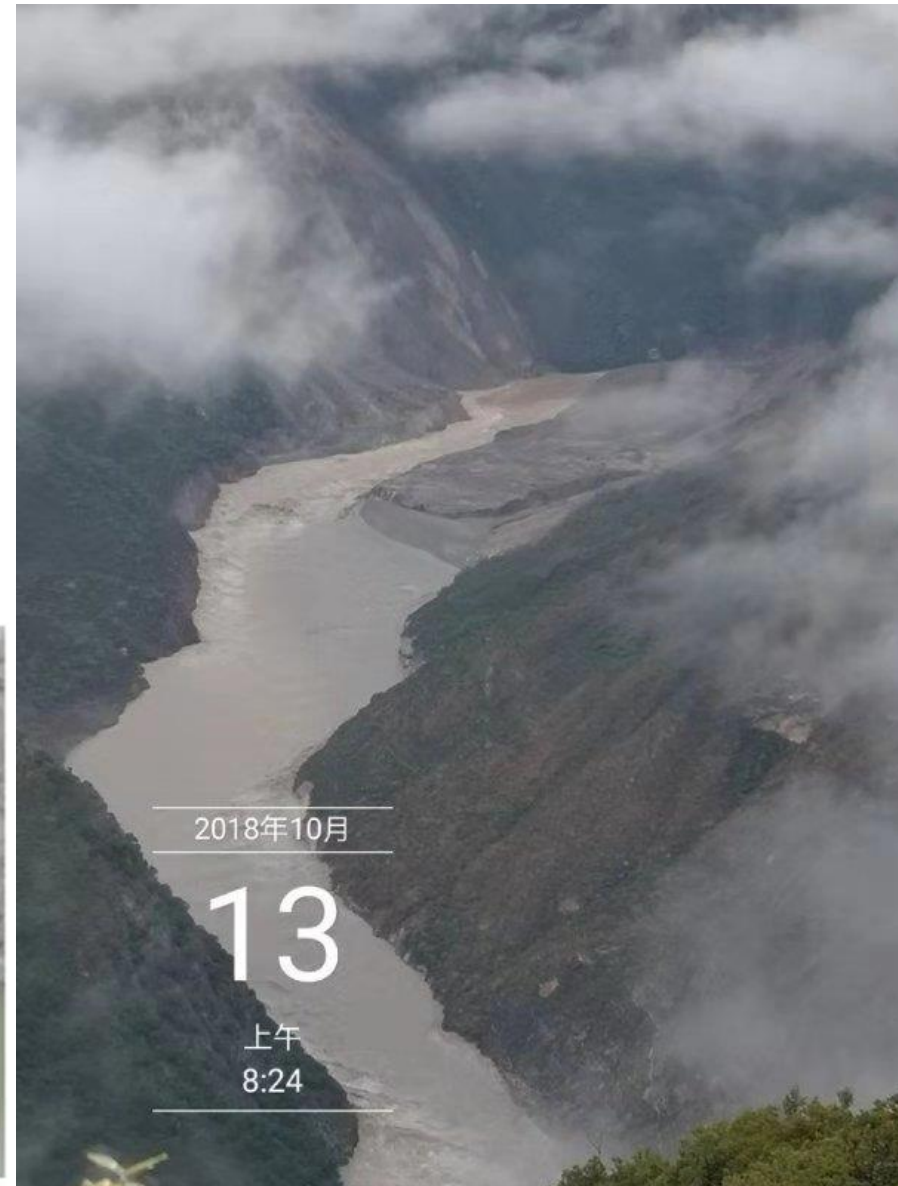


Scar length = 1350 m, average width = 600 m, top elevation = 3680 m, bottom elevation = 2980 m, elevation difference = 700m (ALOS-1DEM)

Dam length: 1600 m along river, 490 m across river, max height 150 m, average thickness 40 m, **volume** = $3400 \times 10^4 \text{ m}^3$. (质灾害InSAR技术研究中心)



Overtopped at 18:00, 12 Oct 2018;
Breached: early morning 13 Oct 2018



Second Landslide Damming

17:15 pm, 3 Nov. 2018
New dam volume:
 $3 \times 10^6 \text{ m}^3$



The second lake:

Formation: 17:15, 3 Nov 2018

Water depth: 86 m

Volume: $8.2 \times 10^8 \text{ m}^3$

Breaching: 4:45 12 Nov 2018
-2:00 14 Nov 2018

Q_{\max} : $33900 \text{ m}^3/\text{s}$

Lifespan: 10.5 days





Diversion channel: $h_{\max} = 15$ m (Elev 2966-2951 m), top width = 42m, bottom width = 3m, $L = 220$ m, $V=135,000$ m³.

Overflow: 4:45, 12 Nov; $V_{\max} = 5.78 \times 10^8$ m³

$Q_{\max} = 33,900$ m³/s at 6:20 pm on 13 Nov 2018

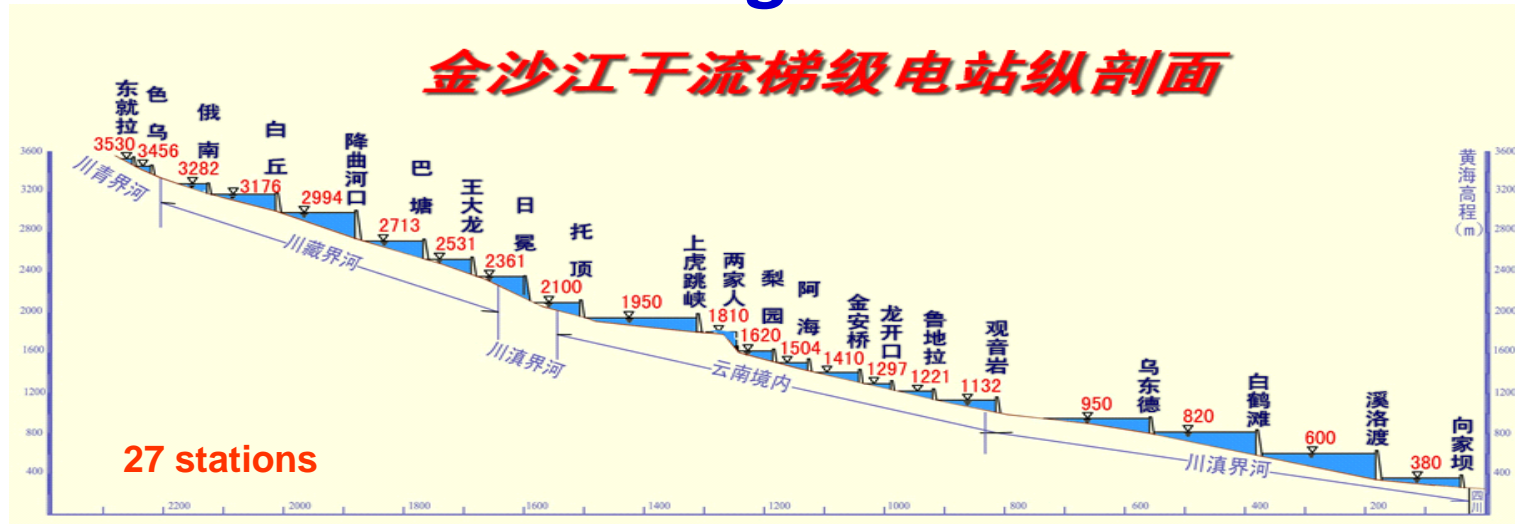




plagioclase gneiss



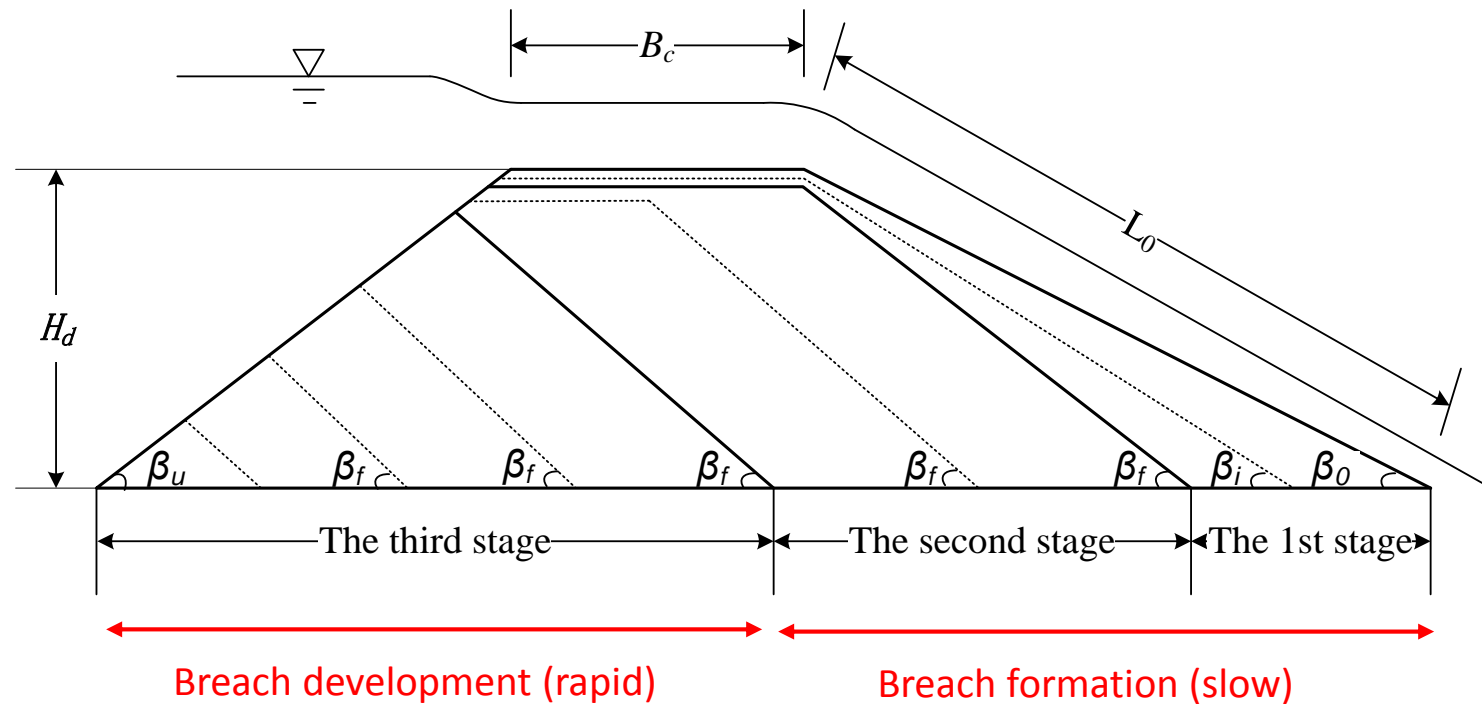
Safety of cascading hydropower systems in China under extreme loading conditions



Xiluodu Concrete Gravity Arch Dam, 13860 MW, H = 285.5 m, V = 128x10⁸ m³

- When would the dam break?
- What would be the peak flood?
- What would be the consequences?
- Safety of the cascading reservoirs?
- How many people downstream the dam could be flooded?
- How many people should be evacuated?
- When they should be evacuated?

Physically based dam breaching model



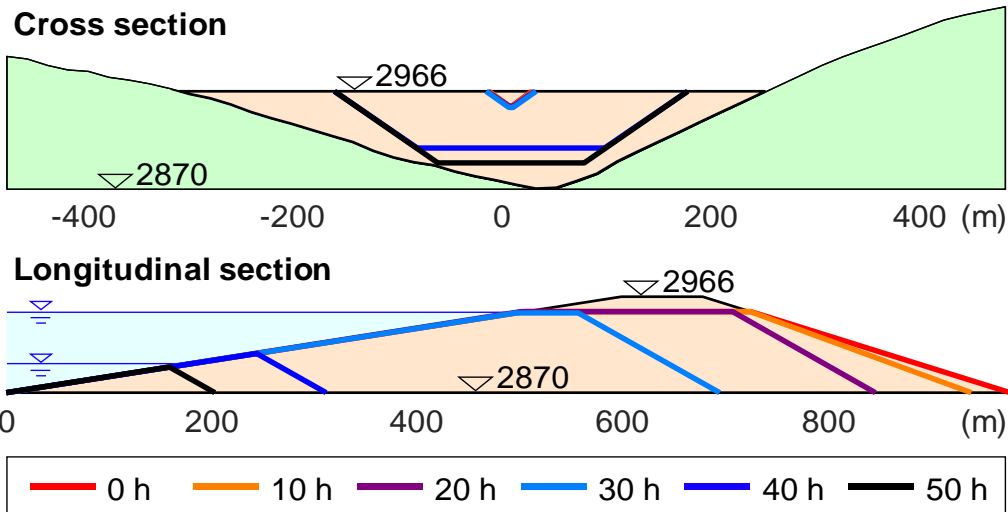
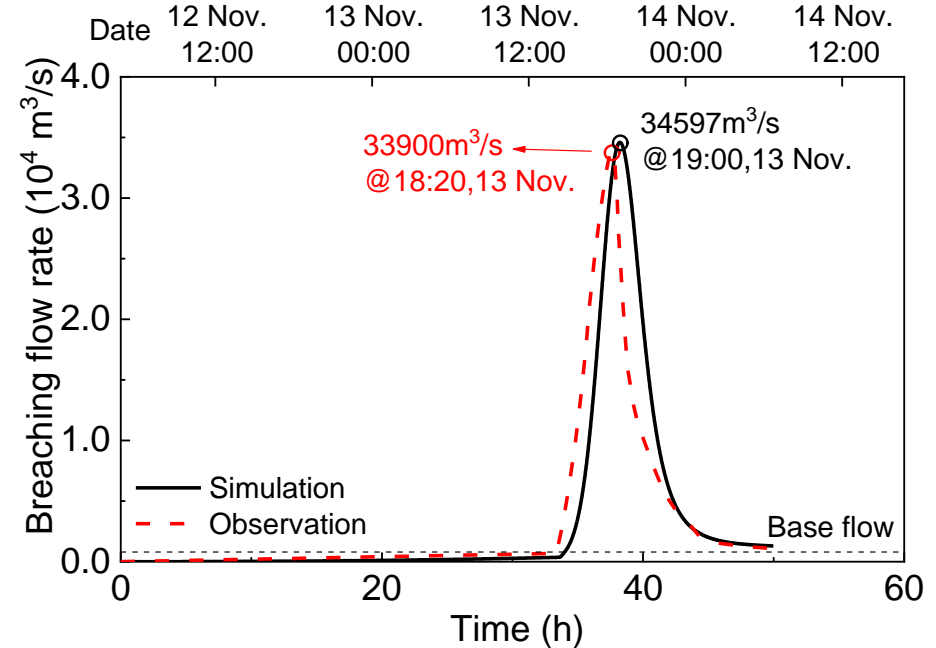
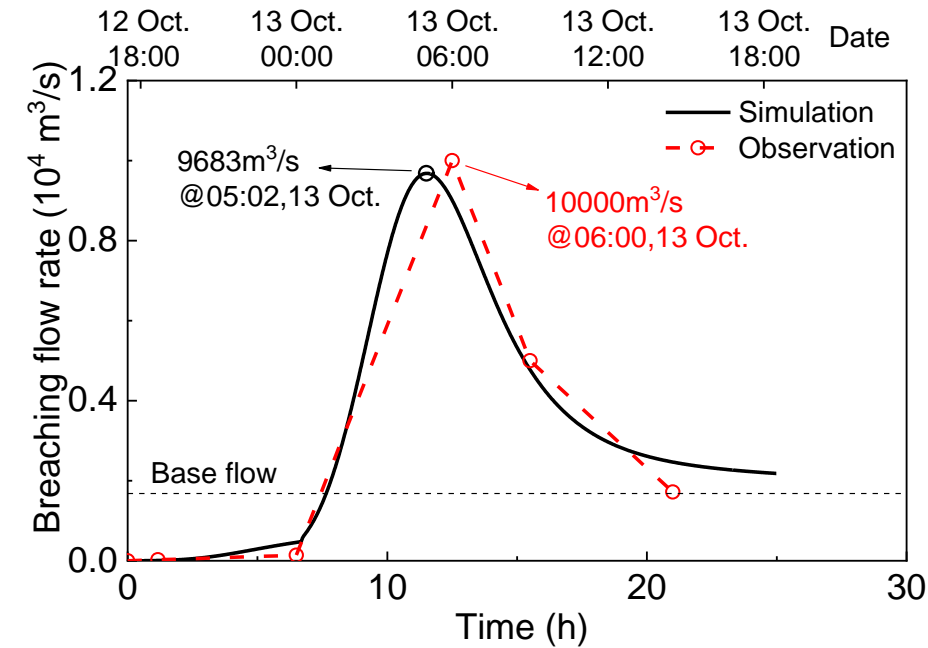
(Chang and Zhang, 2010)

$$E = K_d(\tau - \tau_c) \quad K_d = 20075e^{4.77}C_u^{-0.76}$$

$$\tau = \gamma_w R_h S \quad \tau_c = 6.8(PI)^{1.68}P^{-1.73}e^{-0.97}$$



Numerical simulation of Jinsha River breaches





Cofferdam for the Suwalong asphalt core wall dam. 20-y return period flow rate = $6180 \text{ m}^3/\text{s}$, actual flow rate = $7800 \text{ m}^3/\text{s}$ on 13 Oct. 2018



Cofferdam partially removed before the arrival of the second flood.



The cofferdam completely breached, $Q_{\text{max}} = 19800 \text{ m}^3/\text{s}$ on 14 Nov. 2018

**Removal of 2.75 million
m³ of barrier, July 2019**



**Relief of crown of
landslide, July 2019**



Thank you very much !

