



中国科学院
水利部

成都山地灾害与环境研究所

Institute of Mountain Hazards and Environment, CAS



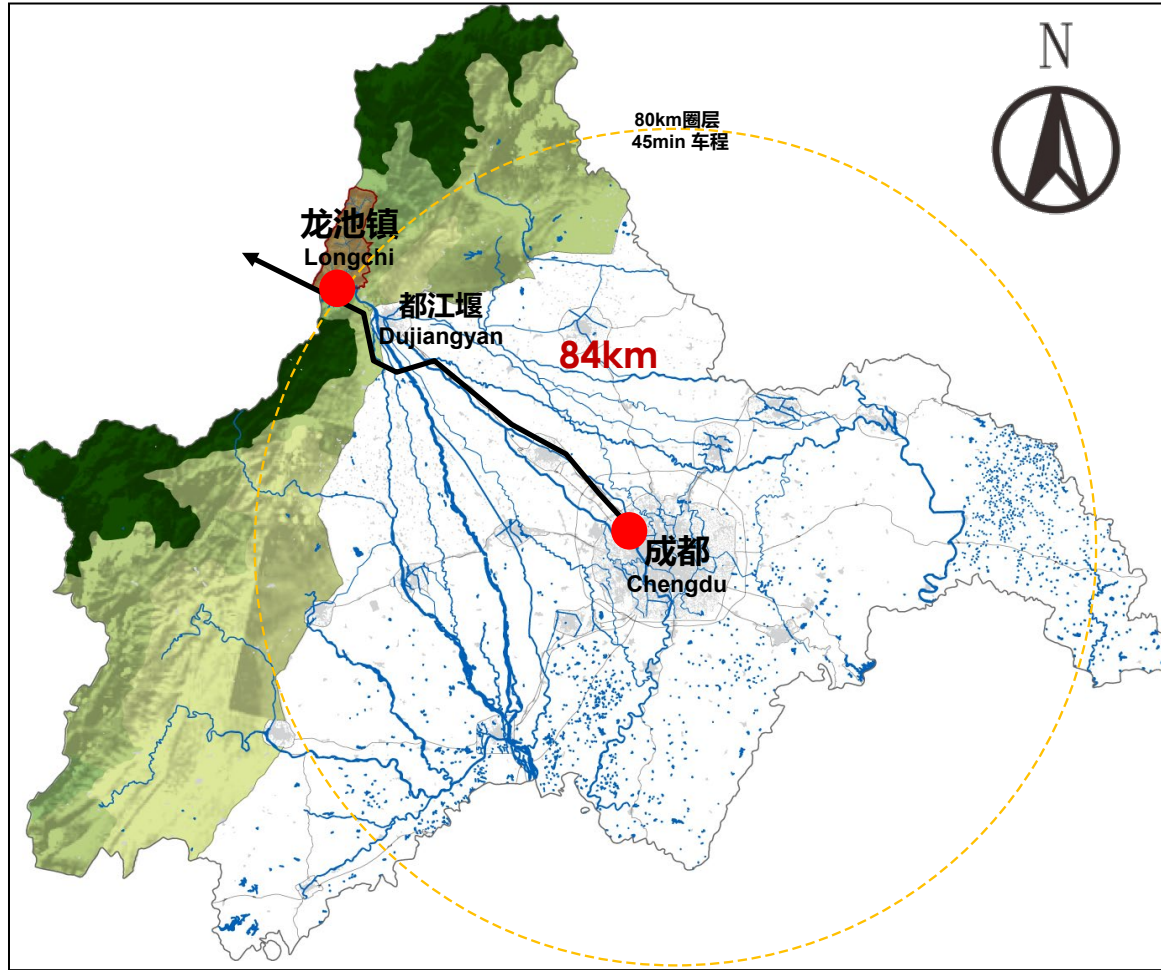
Introduction of the field trip to Longxi River

**Yu Lei,
Guotao Zhang,
Shengnan Wu,**

**Chengdu,
2025. 10. 16**

1. Overview of Longxi river catchment
2. Disasters Situations
3. Monitoring and early warning system

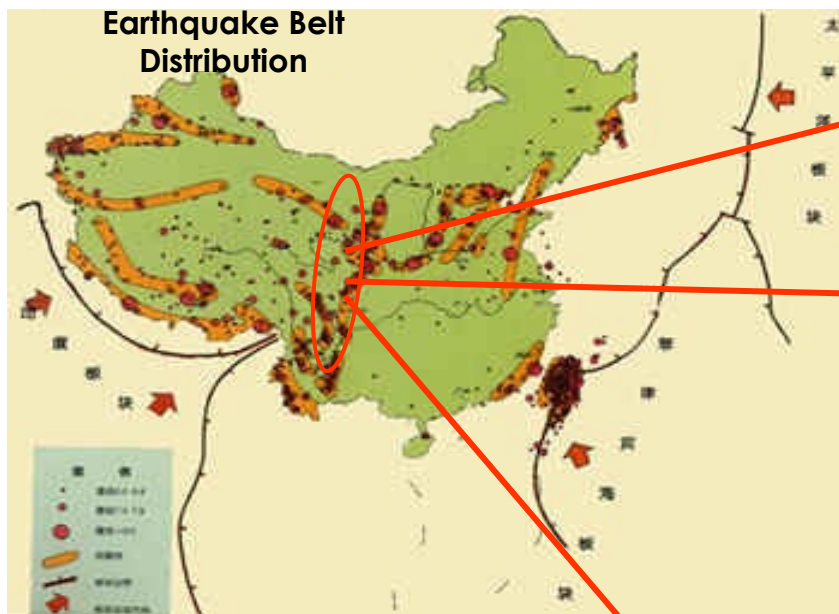
1. Overview of Longxi river catchment



- **Longxi river catchment:** located in Longchi national forest park
- **Distance :** 84km, **Travel time:** 1h40min.
- **Animal paradise:** Famous for its panda



Earthquake Belt Distribution



South-North Earthquake Zone of China along longitude E104

Within 70-150 km of Longmen Range, the height difference reaches 4000m

Active Fault

+

Steep Terrain

→

High Risk

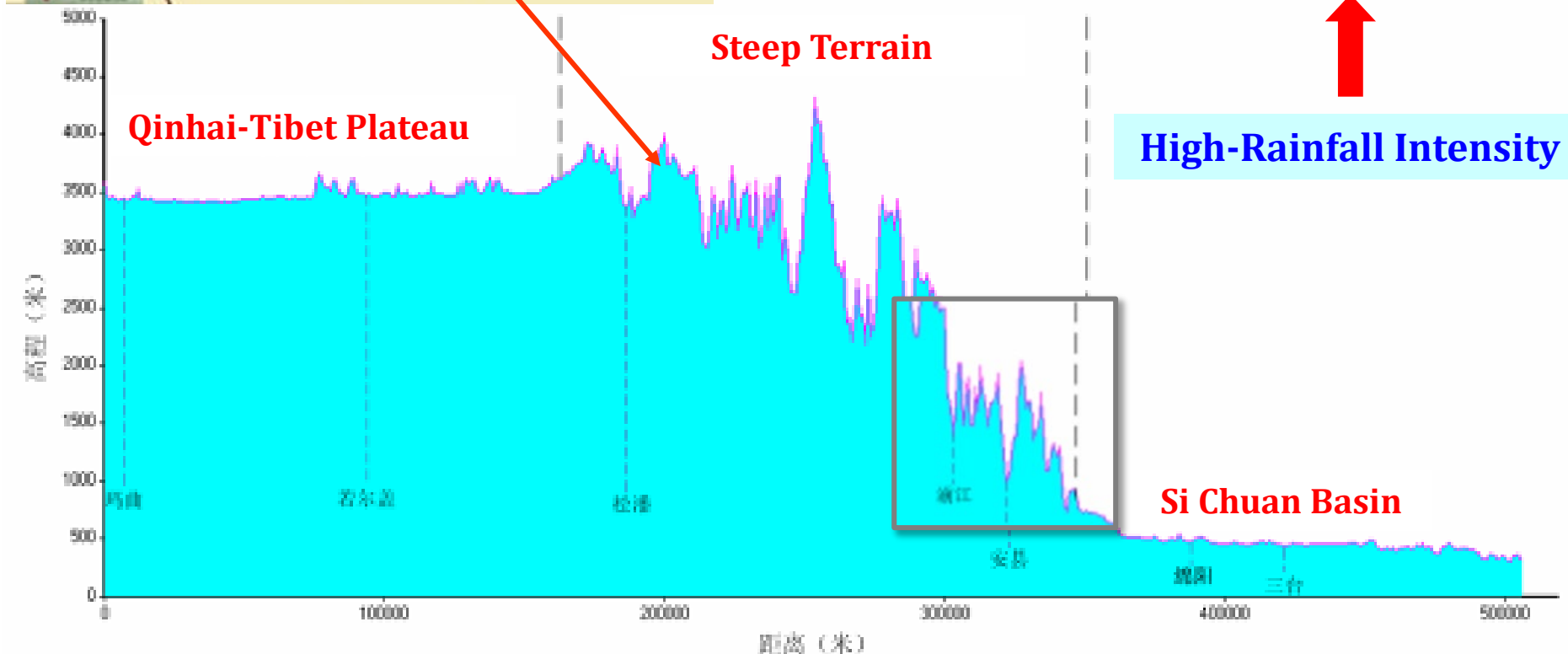


High-Rainfall Intensity

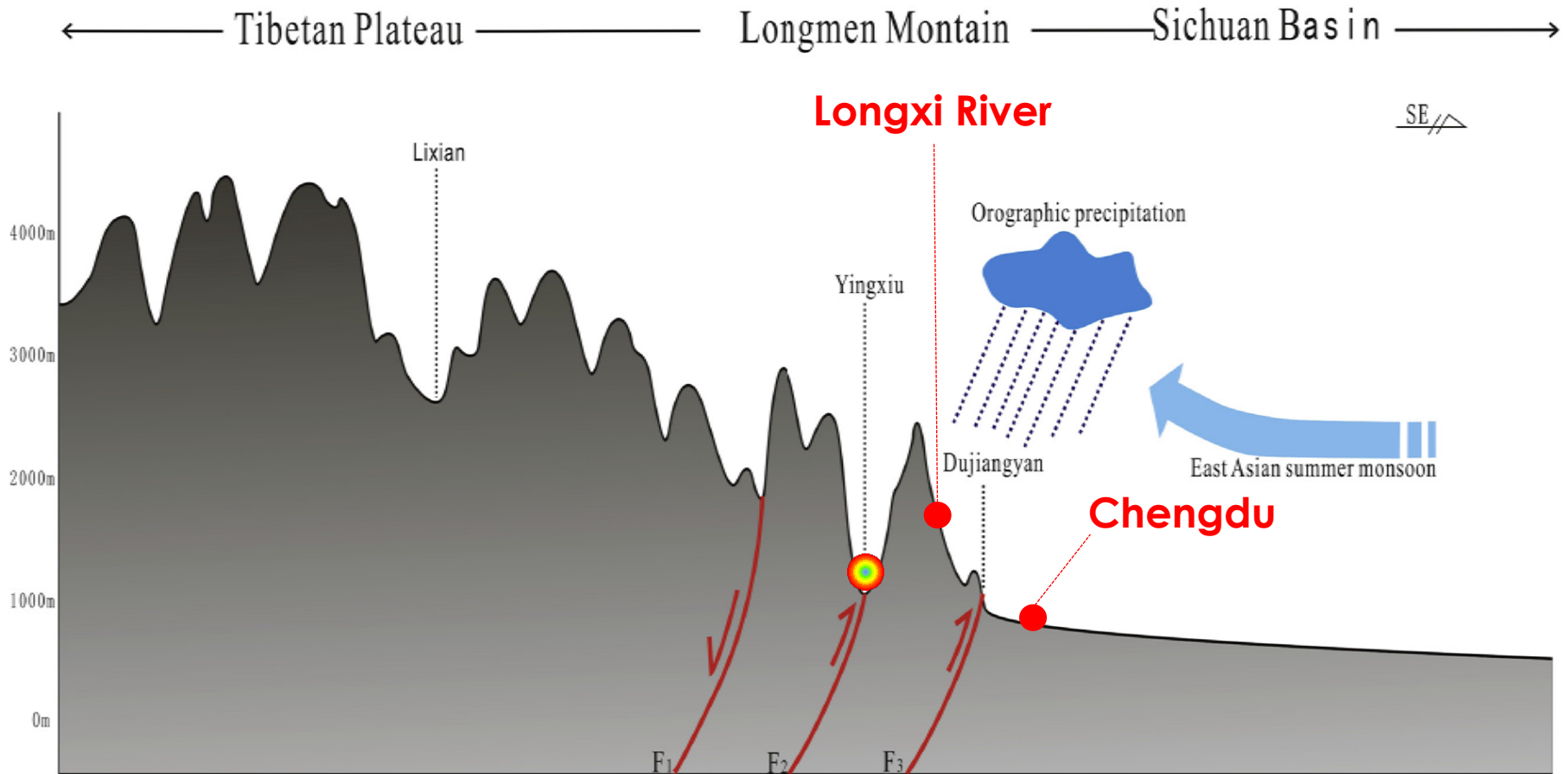
Steep Terrain

Qinhai-Tibet Plateau

Si Chuan Basin

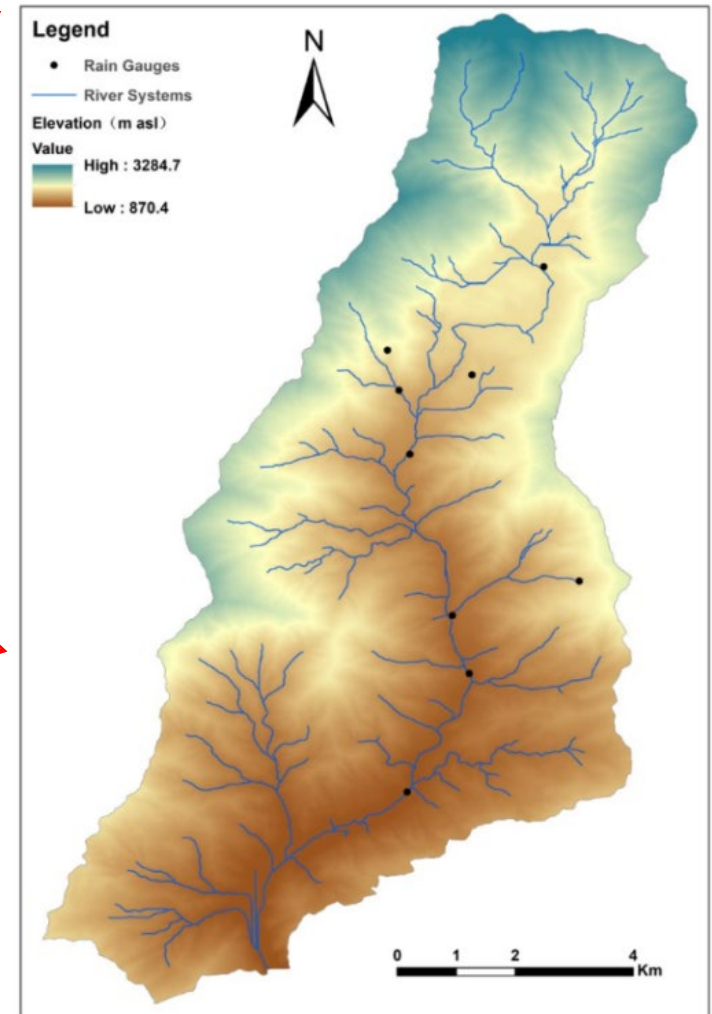
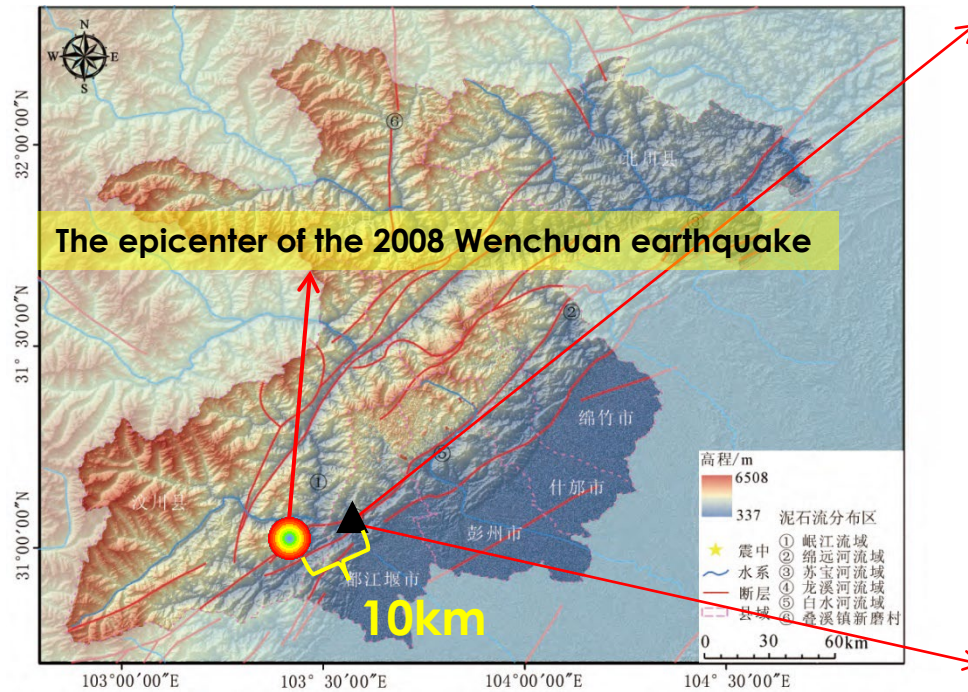


1. Overview of Longxi river catchment



- High-relief topography
- Complex geological conditions
- Abundant loose solid materials in the hillslopes
- East Asian summer monsoon

1. Overview of Longxi river catchment



Longxi river catchment

- **The area:** 78.3 km²
- **Total length:** 18.2 km
- **Climate:** subtropical and monsoon climate
- **Annual rainfall:** 1135mm
- **Mean annual discharge:** 6m³/s
- **Maximum peak discharge:** 865m³/s

1. Overview of Longxi river catchment

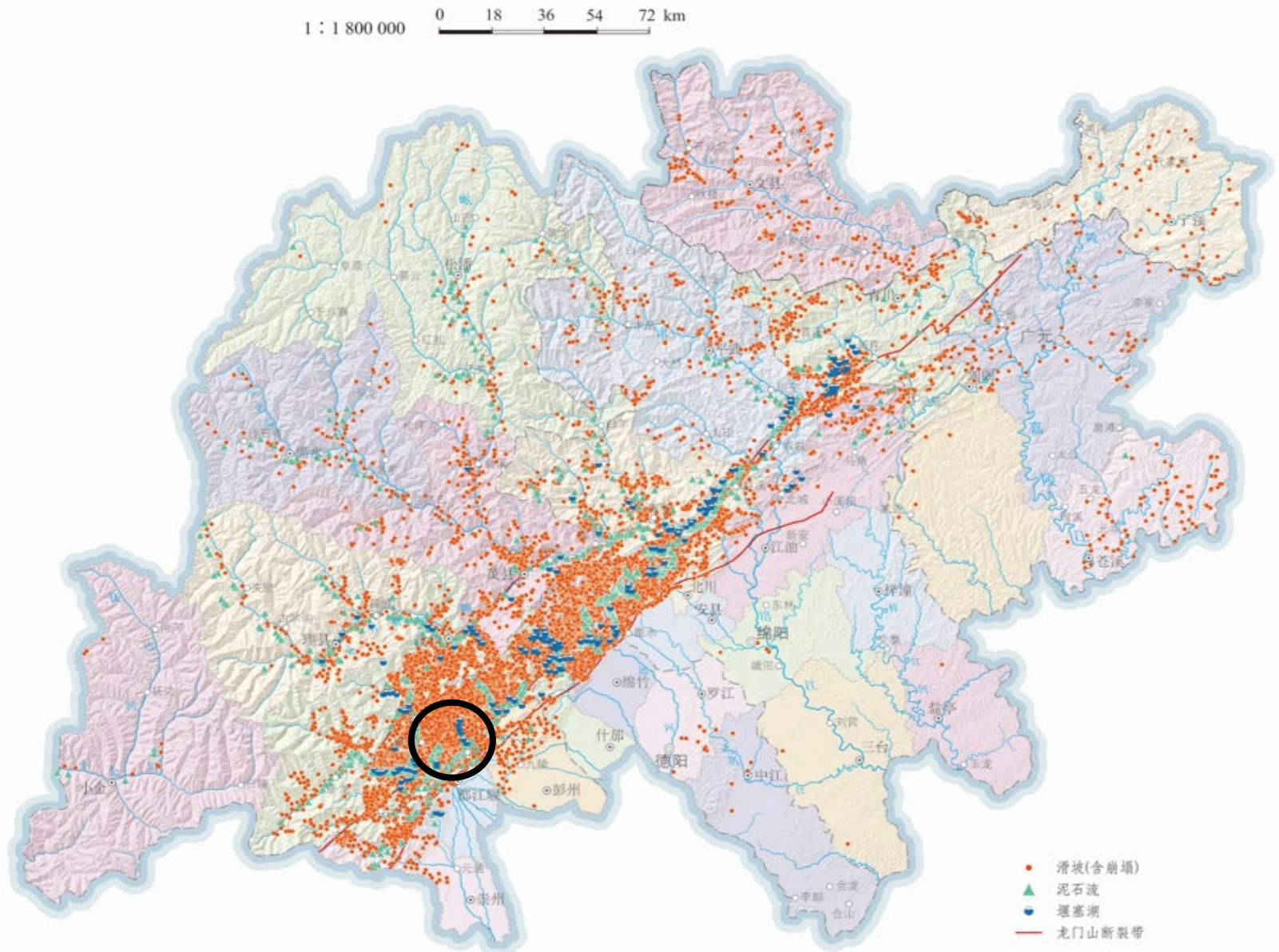
❑ 2008 Wenchuan Earthquake

About 70,000 fatalities, 18,000 missing, total affected about 47 million people

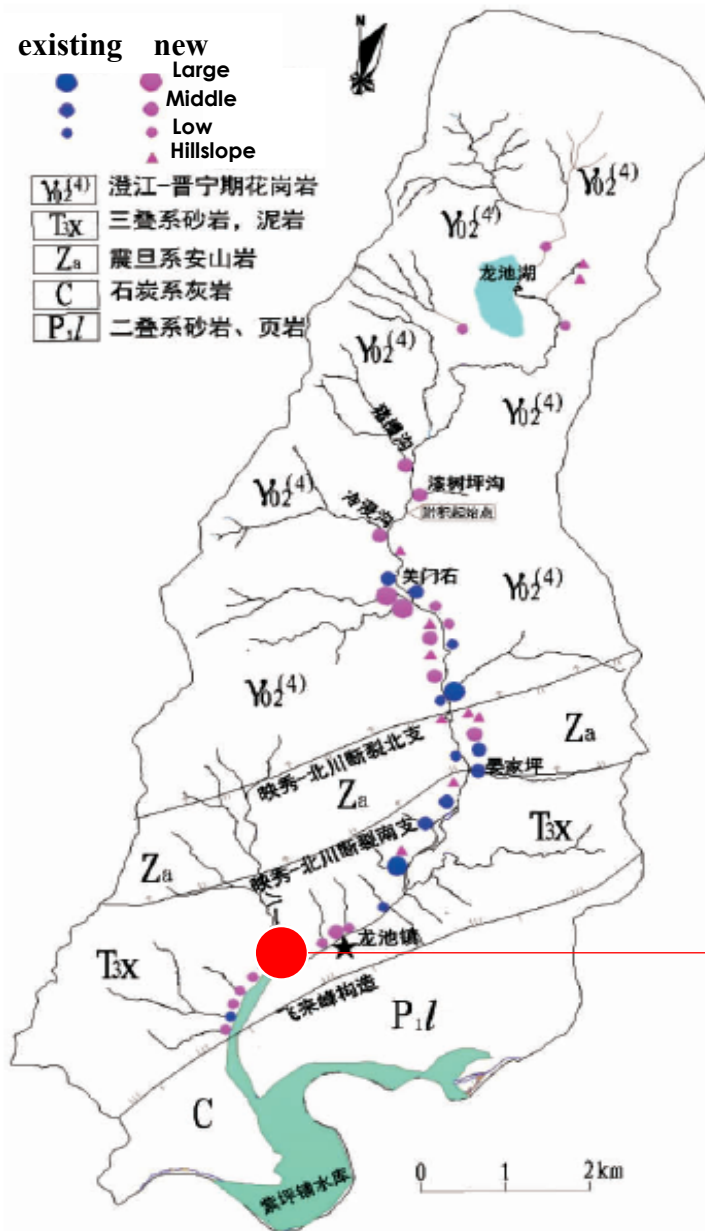


1. Overview of Longxi river catchment

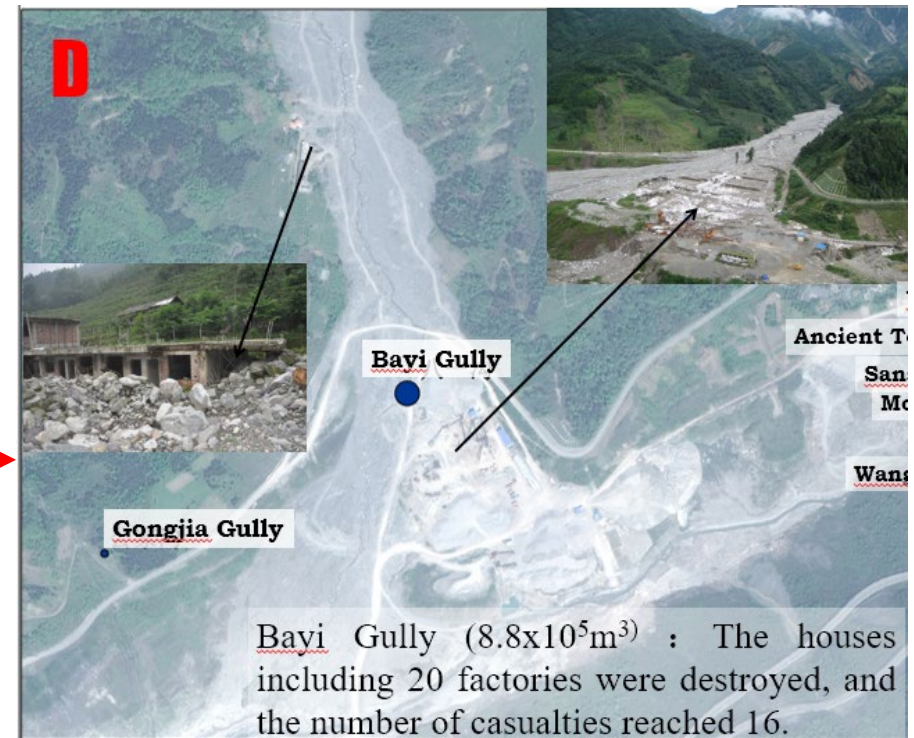
□ EQ induced secondary disaster- landslide, debris flow, dammed lake



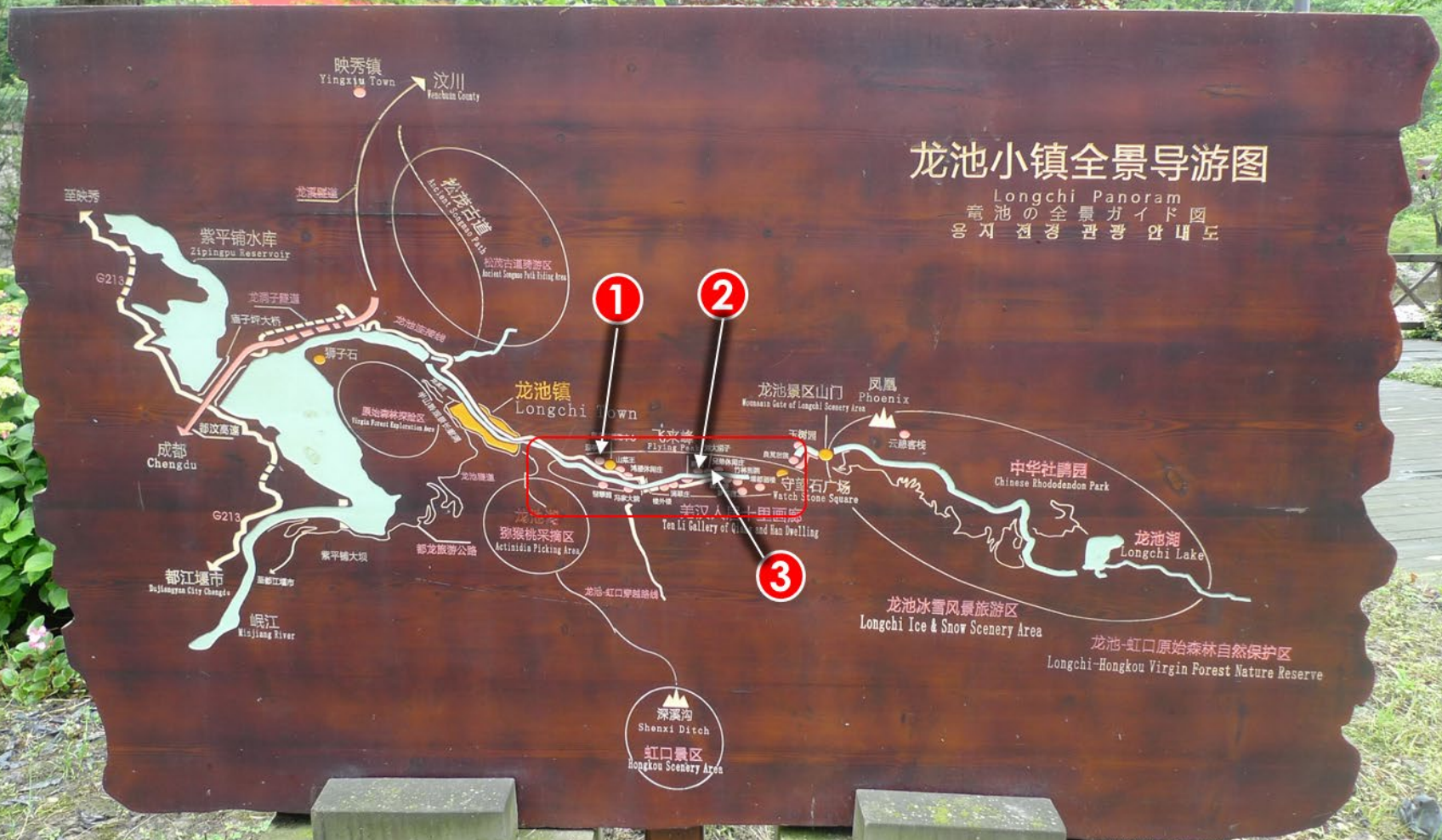
2. Disasters Situation



- The 120 geological hazard sites, there are 45 landslides (medium 16, small 29), 25 collapses (medium 10, small 15), and 50 debris flows (large 6, medium 24, small 20).
- After 2008, emerged 63 new disasters, including 22 landslides, 4 collapses, and 37 debris flows.

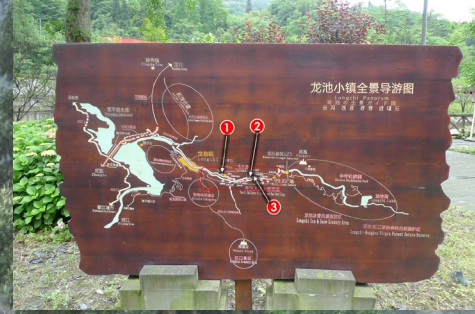


The Post 2008 Reconstruction, done in 2010



1

13 Aug 2010...



2

13 Aug 2010...



3

13 Aug 2010...



2. Disasters Situation



■ 2008.05.12 Wenchuan EW

■ 2012.08. 17/2013.07.08-12,

Disasters such as flash floods, landslides, mudslides and so on were successively mass-produced, causing major property losses.

2010



2012



2013



■ 2010.08.13,

After encountering largest rainfall in 20 years, the debris flows in 33 gullies were blocked in many places, and the riverbed was lifted by 3 to 8 m, with an average silt height of 5 m. The economic losses was about 550 million yuan;



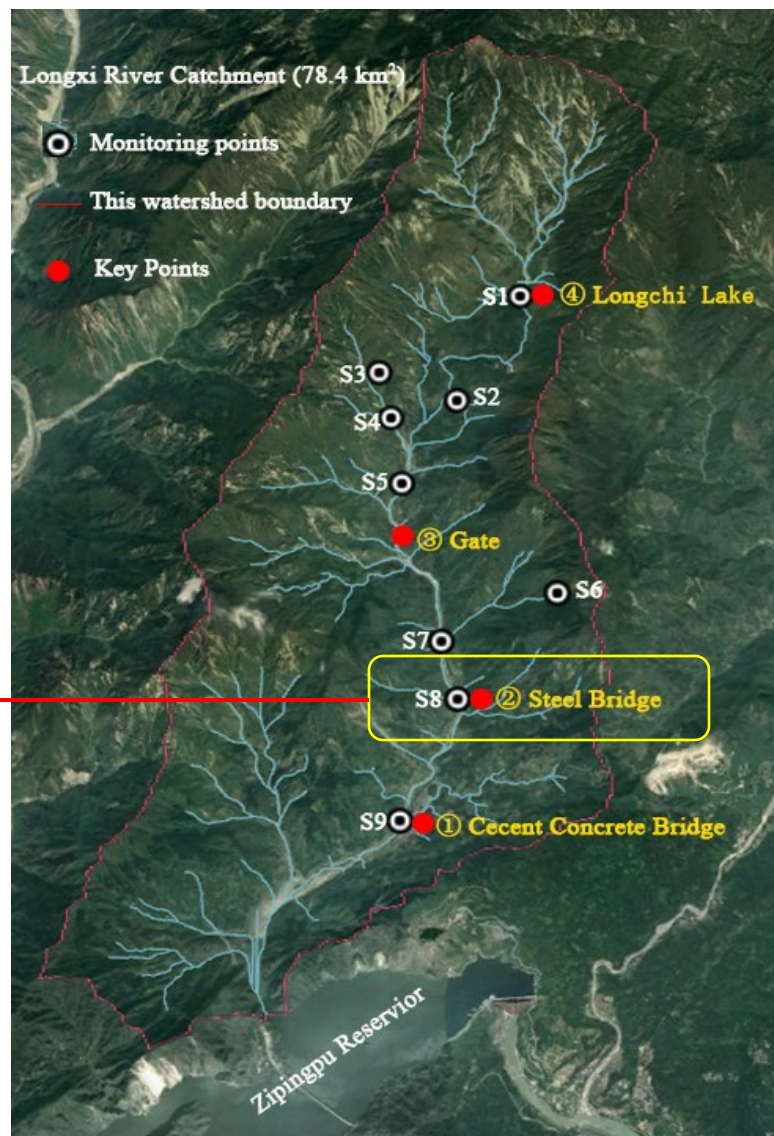
2010



2012



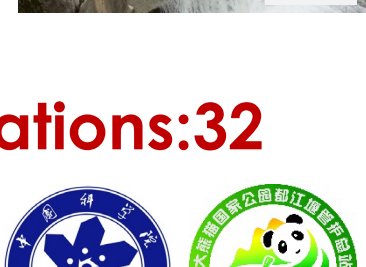
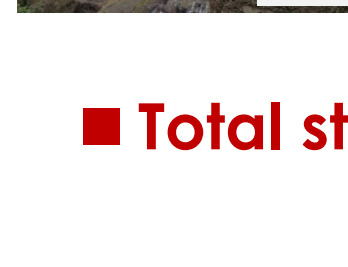
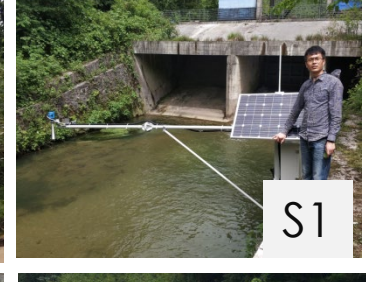
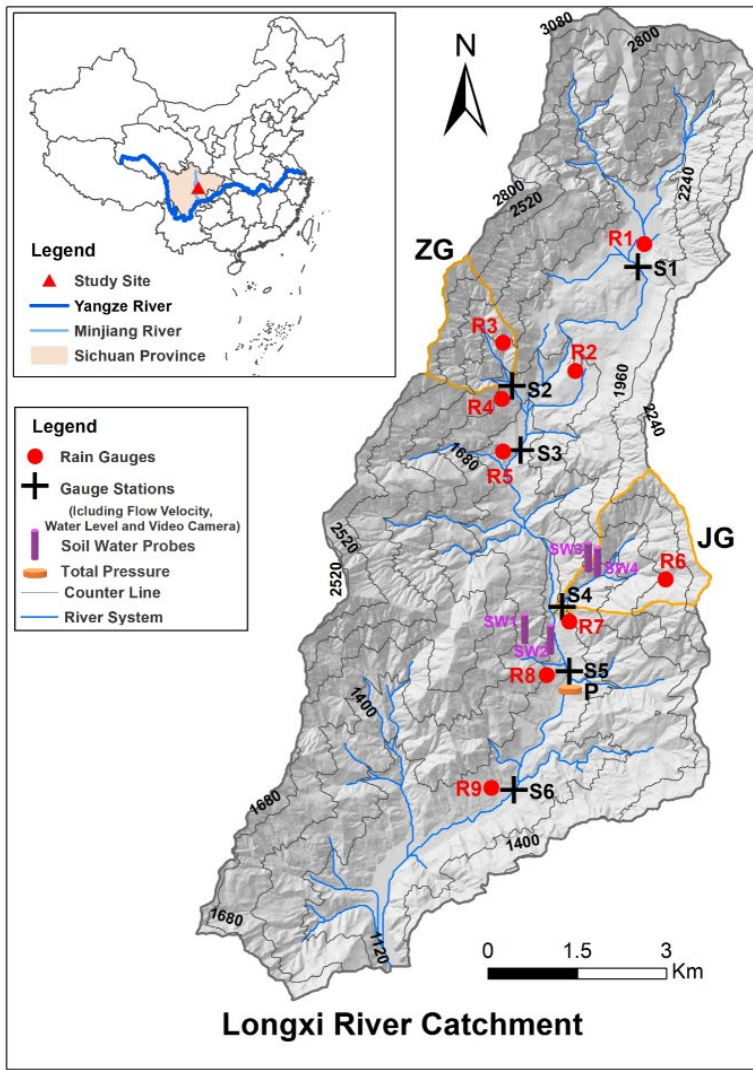
2013



Jiang Jia Debris flow gully



3. Monitoring and early warning in Longxi river catchment



■ Total stations:32



■ 9 Precipitation stations

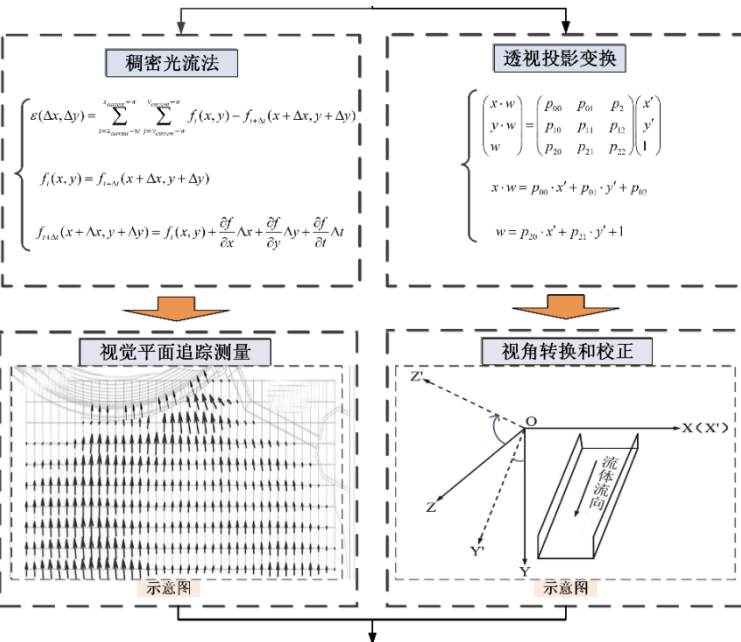
■ 4 Soil water stations;

■ 1 Total pressure station;

■ 6 Hydrological stations (6 Water table; 6 Velocity; 6 Video)

3. Monitoring and early warning in Longxi river catchment

Video

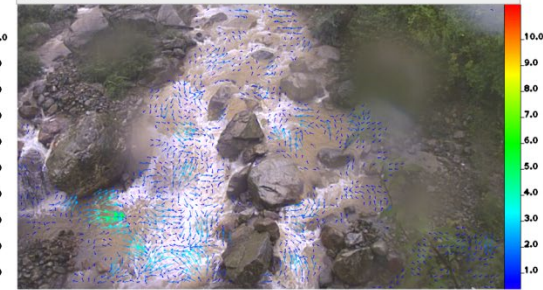


Velocity field

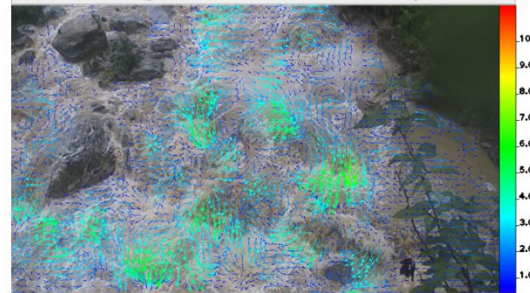
(a) Base flow, Max. surface velocity=1.59m/s



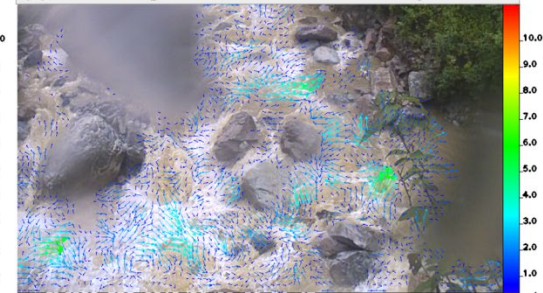
(b) The rising flood; Max. surface velocity=2.45m/s



(c) The falling flood, Max. surface velocity=4.75m/s

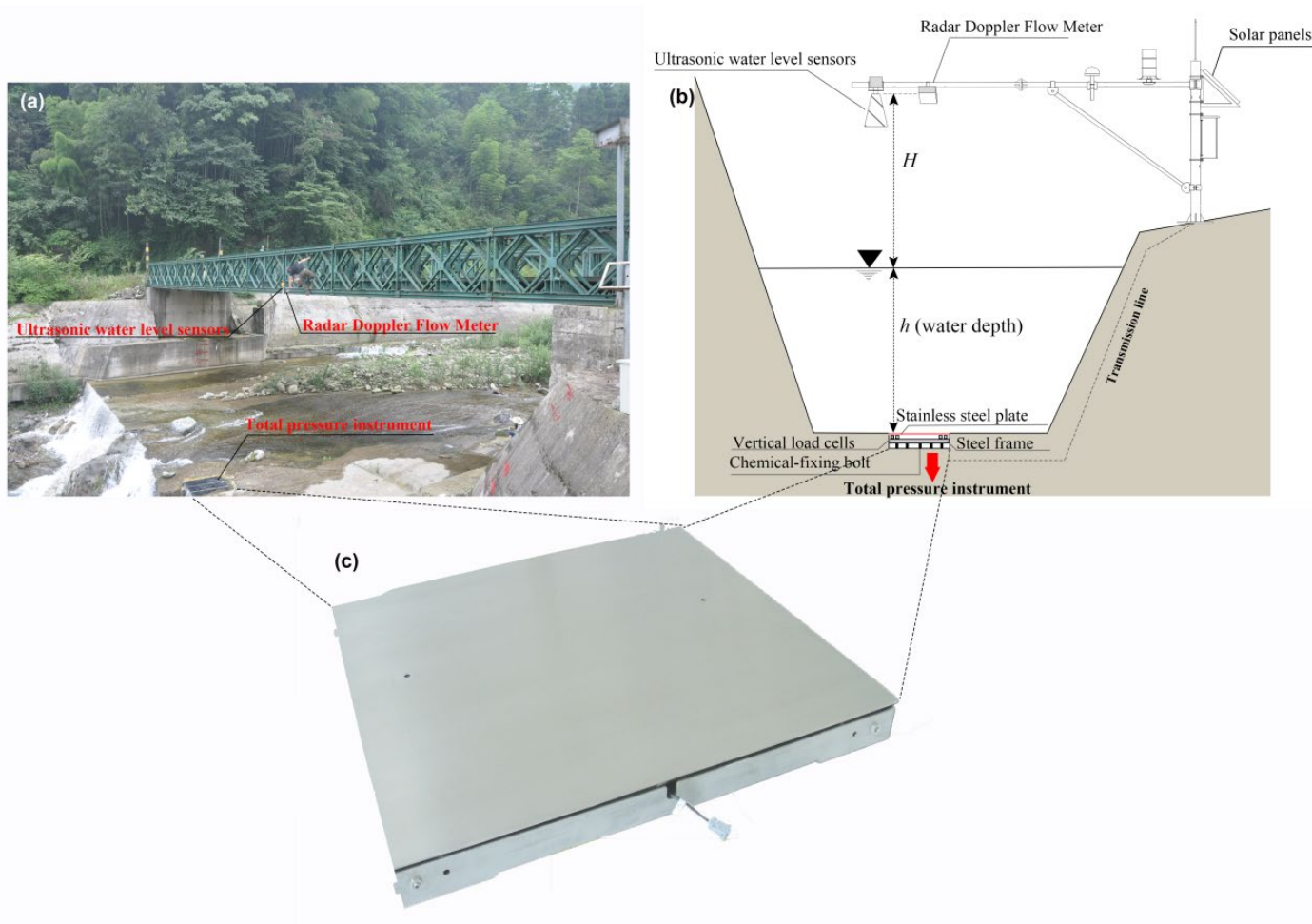


(d) The falling flood, Max. surface velocity=3.68m/s



- **Trace projection and transformation method:** A refined measurement method for the **surface velocity field** of the debris flow is proposed based on the monitoring video image.

3. Monitoring and early warning in Longxi river catchment



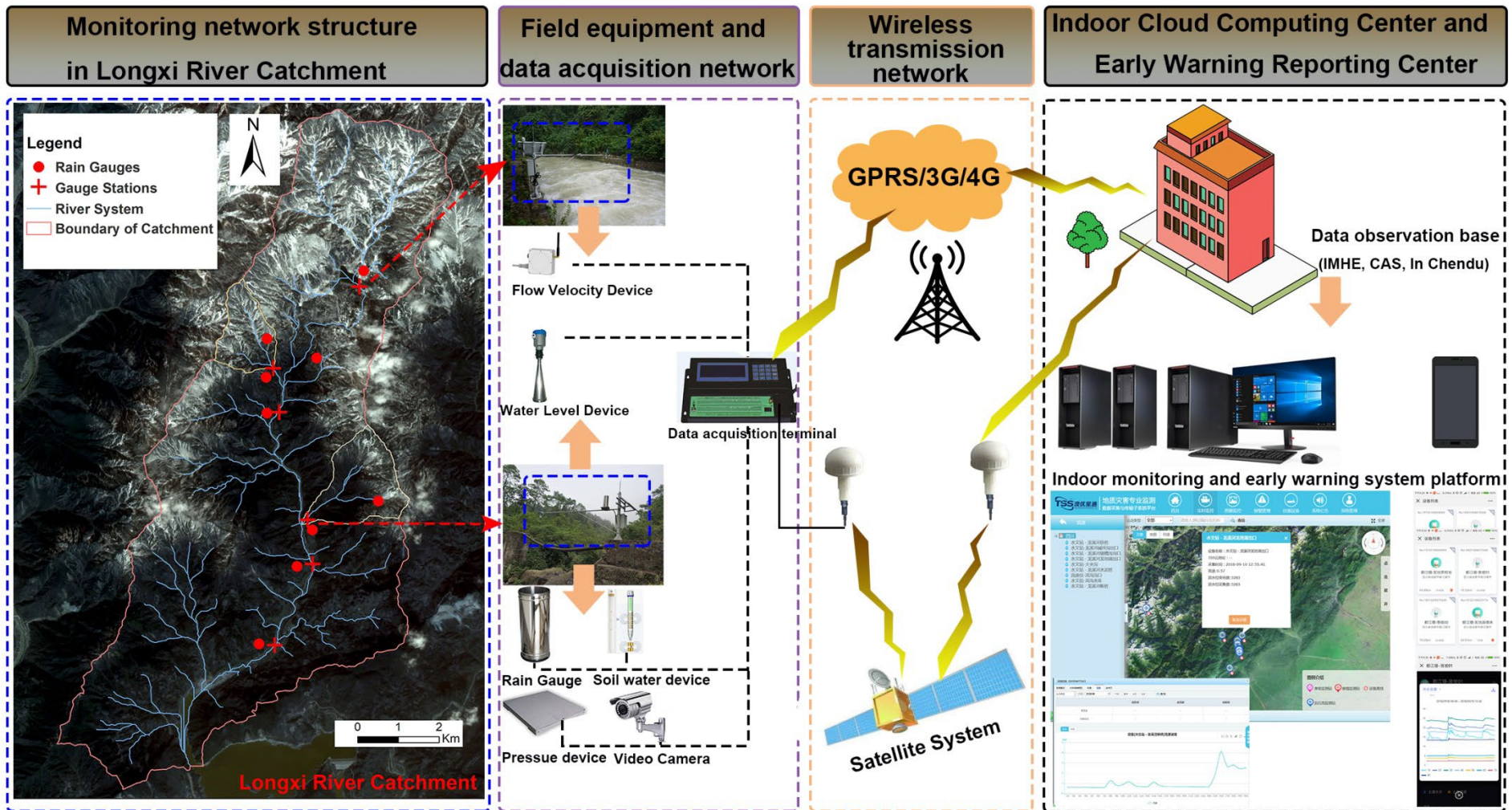
- The estimation of dynamic fluid density during a flood hydrograph.
- The establishment of the relationship between the fluid density and discharge.

From debris flow to flash flood

Aug 2019



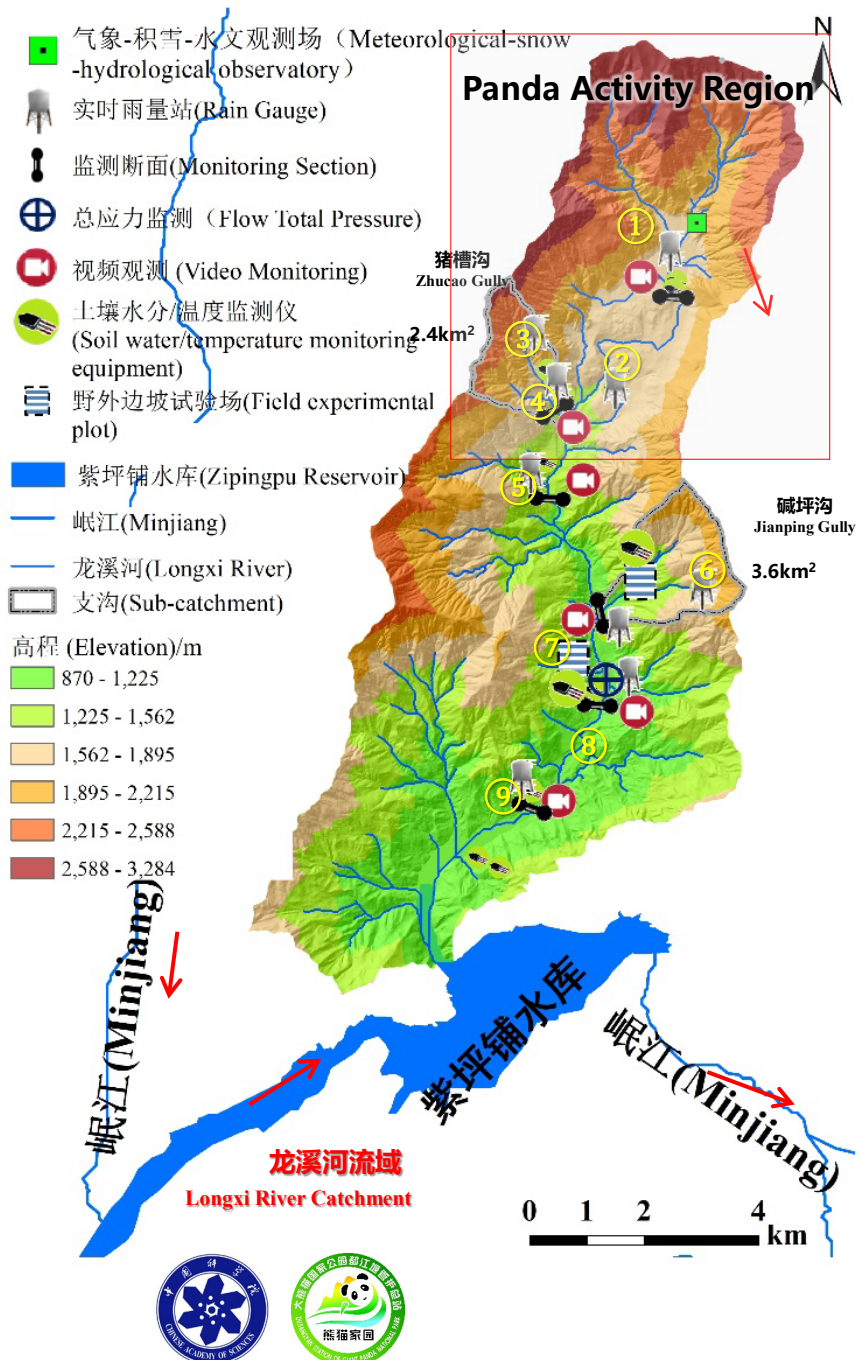
3. Monitoring and early warning in Longxi river catchment



Schematic of the monitoring and early warning system for flash flood hazards in the LXR catchment.

Thank You

1. Impact of EQ induced secondary disaster
2. Lesson learnt for post EQ reconstruction
3. Science involvement for long term safety
4. Local resilience against the uncertainty of disaster



Longxi River Catchment (78.4 km²)



Monitoring points

— This watershed boundary



Key Points

S1 ● ④ Longchi Lake

S3 ●

S2 ●

S4 ●

S5 ●

● ③ Gate

S6 ●

S7 ●

S8 ● ② Steel Bridge

S9 ● ① Cecent Concrete Bridge

Zipingpu Reservior