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Chengdu Forum on
United Nations Global Geospatial Information Management
联合国全球空间信息管理成都论坛

Application of Emergency Safeguard of Surveying and Mapping in Disaster Prevention and Mitigation
应急测绘保障技术在防灾减灾中的应用

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Chengdu, China 中国成都
16 October, 2013 2013年10月16日

Outline 汇报提纲

1. Introduction 前言
2. Substantial Problems and Solutions
   存在的问题及开展的工作
3. Successful Case 应用案例
4. Conclusion 结论

Introduction 前言

Building collapsed in earthquakes
地震房屋倒塌

Drought
旱灾

landslide and mud-rock flow
滑坡泥石流

flood
洪涝

Introduction 前言

In recent years, serious natural disaster and public emergencies have increased our concern on emergency safeguard

近年来，随着一些大的自然灾害和公共突发事件的发生，国家越来越重视应急保障

Emergency safeguard of surveying and mapping has been given unprecedented priority

尤其是应急测绘保障工作提升到前所未有的高度

When major disaster happens, emergency safeguard of surveying and mapping can play significant roles in disaster condition detection, decision-making and deployment, disaster evaluation, and post-disaster recovery

在重大灾害发生以后，应急测绘保障工作在灾情侦查、决策部署、灾情评估、灾后重建过程中发挥重要作用

Introduction 前言

Seismically active area
地震活跃区

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Substantial Problems
存在的问题

- Absence of scientific judgement and evaluation of disaster situation
  缺乏对灾情科学的判断与评估

Substantial Problems
存在的问题

- The superior instruction: recover the roads within 24 hours. But the traffic is still interrupted after 24 hours

  5·12汶川地震后，得到的指令是24小时内打通道路，但是24小时过去之后，道路并没有打通

- According to the images, it is impossible to fully repair roads within 24 hours

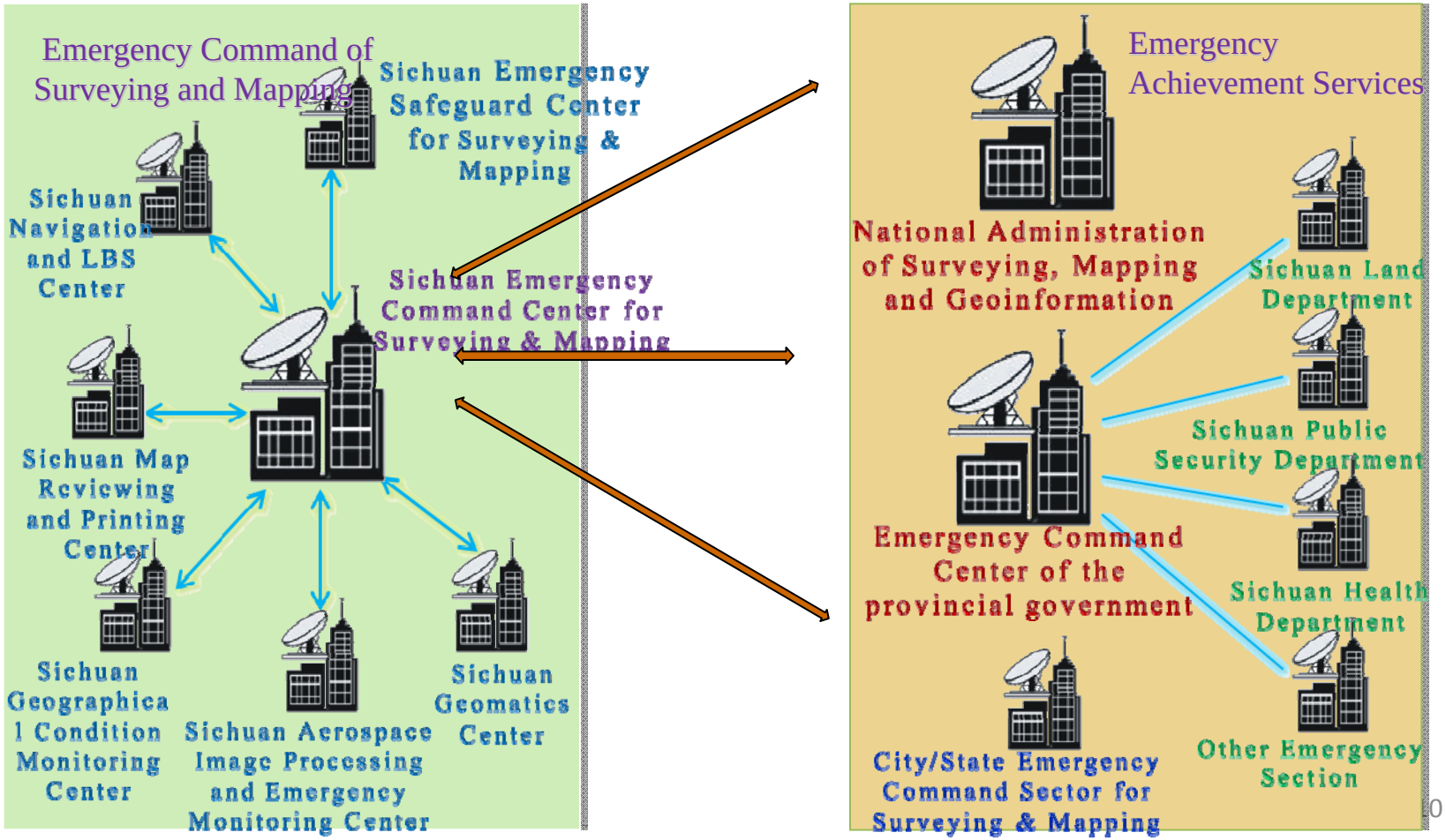
  根据影像可以判断，24小时内打通灾区道路不现实

Substantial Problems
存在的问题

- Lack of precise geographic coordinates makes the dropping of aid very difficult
  没有精准的地理坐标数据，救援物资无法准确投送

Solutions
开展的工作

- Establishing a comprehensive emergency surveying and mapping mechanism
  建立了一套应急测绘体制机制



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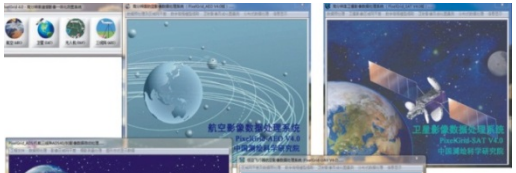
Solutions
开展的工作

- Equipping with professional technological installations
  沉淀了一套技术装备

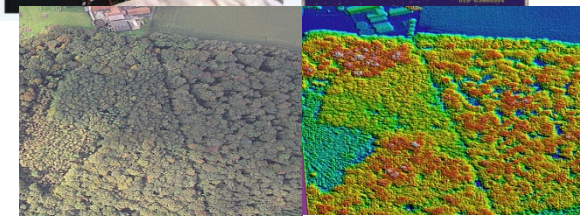


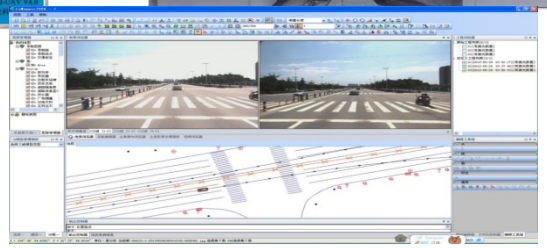
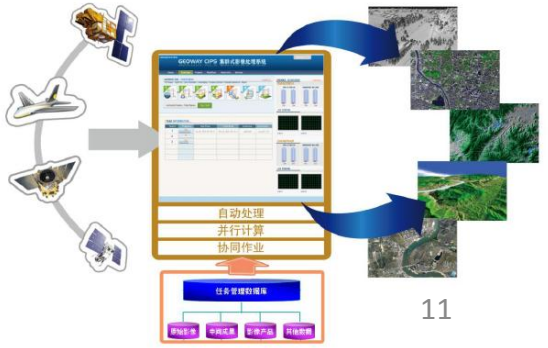








Solutions
开展的工作

- Establishing an effective emergency response team
  建立了一支应急队伍

Solutions
开展的工作

- Organizing an actual maneuver
  策划了一次实战演练

Decision-making and deployment
决策部署，下达测绘应急工作指令

Rushing to emergency spot
奔赴应急现场

Gathering emergency team
集结应急队伍

Opening up easy access
开辟绿色通道

Acquisition of emergency data
获取应急数据

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7.0 Earthquake in Lushan County, Sichuan Province
芦山7.0级强烈地震

Running Contingency Plan
启动预案

8:07	• The emergency surveying and mapping system is triggered when the 1st emergency command is received 第一条应急指令通过短信发出，测绘应急指挥体系开始运转
8:25	• Gathering the emergency teams, and the UAV team flying toward disaster area from Cheng wen qiong 应急分队集结，无人机分队由成温邛高速奔赴灾区
8:30	• Provincial map center begin to compile thematic maps for "4.20" earthquake relief works 省地图审查与制印中心开始编制“4•20”芦山地震抗震救灾专用图
8:40	• Provincial navigation and location service center starts to check the operation condition of the navigation and location service platform 省导航与位置服务中心开始检测导航与位置服务平台运行情况
9:00	• Provincial aerospace remote sensing monitoring center starts to compile images that captured before the earthquake 省航空航天遥感应急监测中心开始编制震前影像图
10:00	• Provincial basic geographic information center deploys special technical team to support the headquarters of earthquake relief work 省基础地理信息中心派出技术支撑小组前往省抗震救灾指挥部
10:50	• Provincial geographical conditions monitoring center deploys mobile surveying team to disaster area 省地理国情监测中心移动测量分队开赴灾区
11:50	• Aerial photography aircraft ready in Mianyang airport 航摄飞机运-12完成准备工作，在绵阳机场待命
14:15	• The UAV takes off from Jiaguan town in Qionglai city to acquire high-resolution images 无人机从邛崃市夹关镇起飞，获取灾区高分辨影像

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Acquisition of High-Resolution Images
高分辨率影像获取

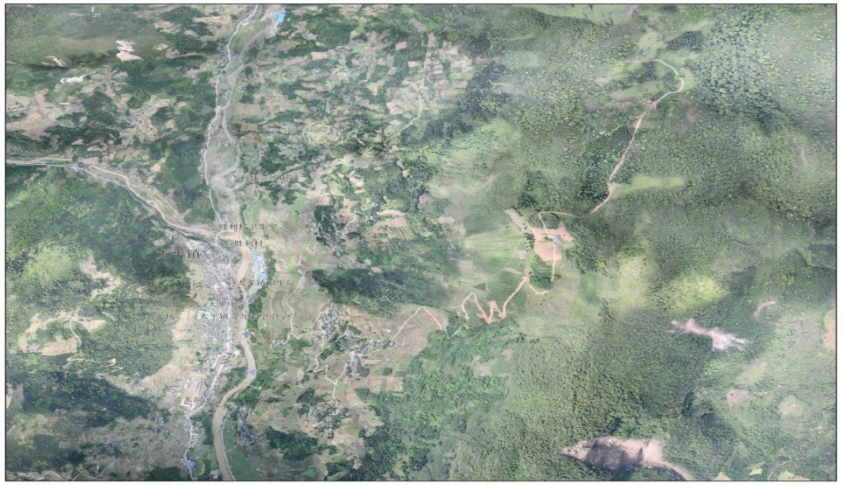
High-resolution images were obtained 7 hours after the earthquake. Compiled thematic maps were provided to headquarters of earthquake relief work and related departments for disaster evaluation, decision making and resource deployment

芦山县宝盛乡灾后影像图

芦山县太平镇灾后影像图

四川省测绘地理信息局

2013年4月20日16时无人机航摄影像，地面分辨率0.16米。



四川省测绘地理信息局

2013年4月20日16时无人机航摄影像，地面分辨率0.16米。

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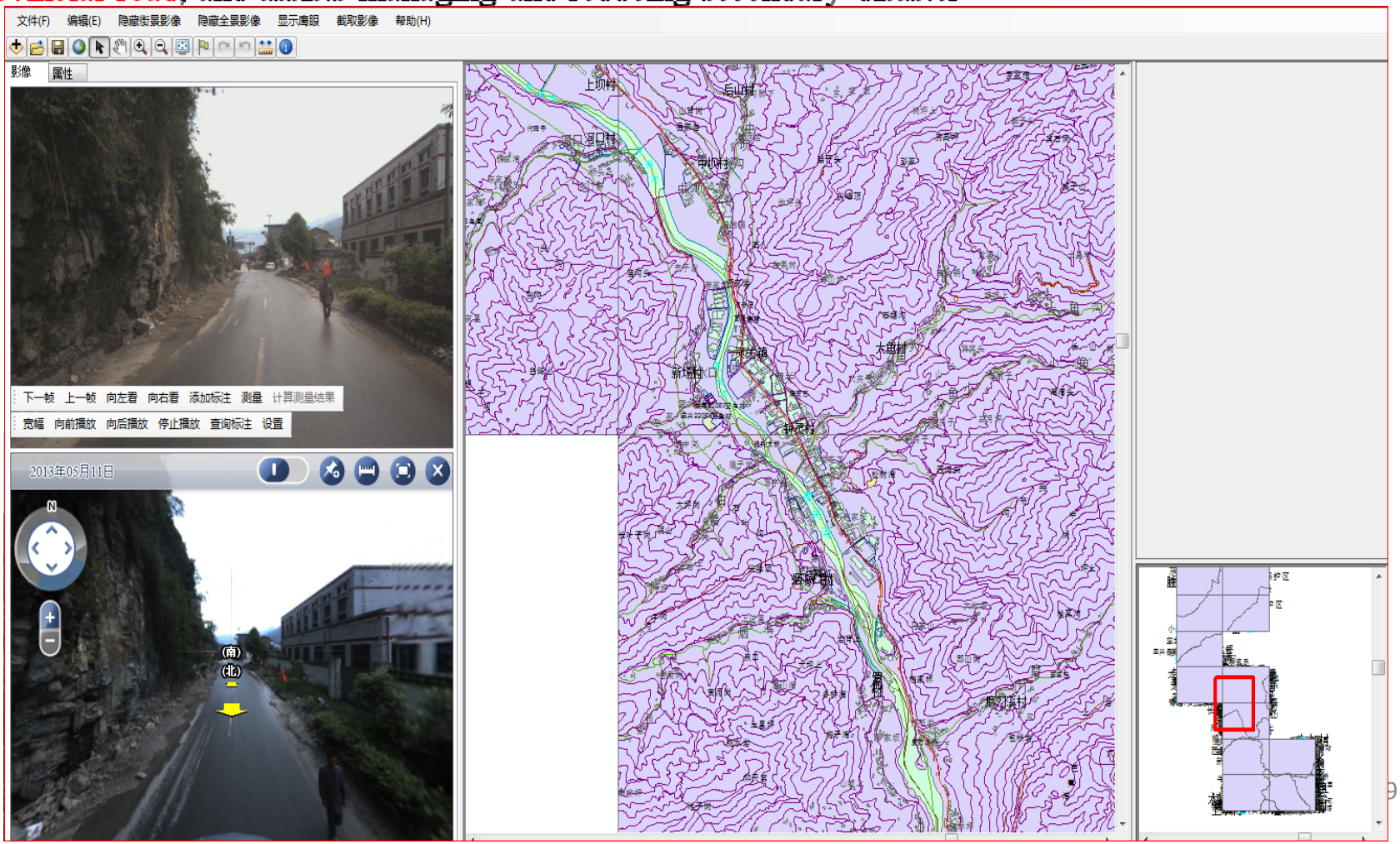
Acquisition of High-Resolution Images

高分辨率影像获取

The zonal images of 210 provincial road were acquired by the UAV, this can greatly assist further work such as making plans of road repairing, managing secondary damages along the roads

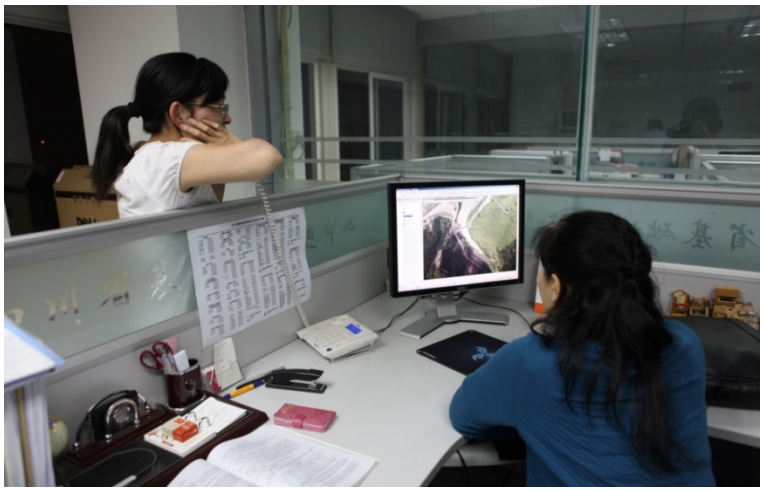
Measurable panoramic image acquisition system
可量测全景影像采集

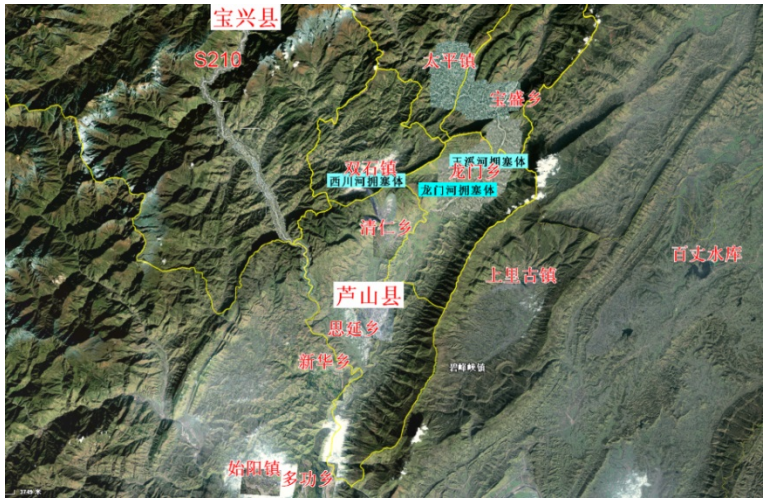
Mobile surveying platform provides measurable panoramic images of major dangerous rocks zones in 210 provincial road, and assists managing and reducing secondary disaster



Interpretation of geological hazard
地质灾害解译

Based on the acquired images, professionals conducted geological hazard interpretation and early warning. Approximately 3,200 km^2 area in images were interpreted, and 1,901 potential hazard sites were found





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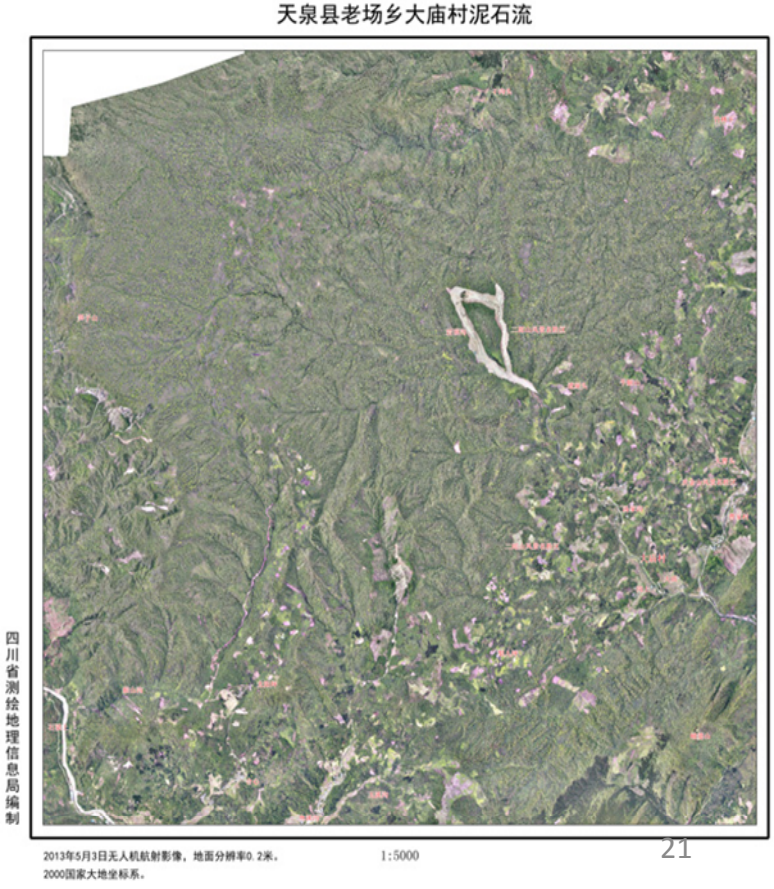
Acquisition of High-Resolution Images
高分辨率影像获取

The UAV captured high-resolution images for potential geological hazard areas in Chenglingmugou in Baoxing county, Gangoutou in Damiaotou village in Tianquan county, Baizhanghu reservoir, etc., which provides surveying and mapping support for the work of disaster detection, evaluation, monitoring, early warning, and management

宝兴县教场沟与冷木沟灾后影像图

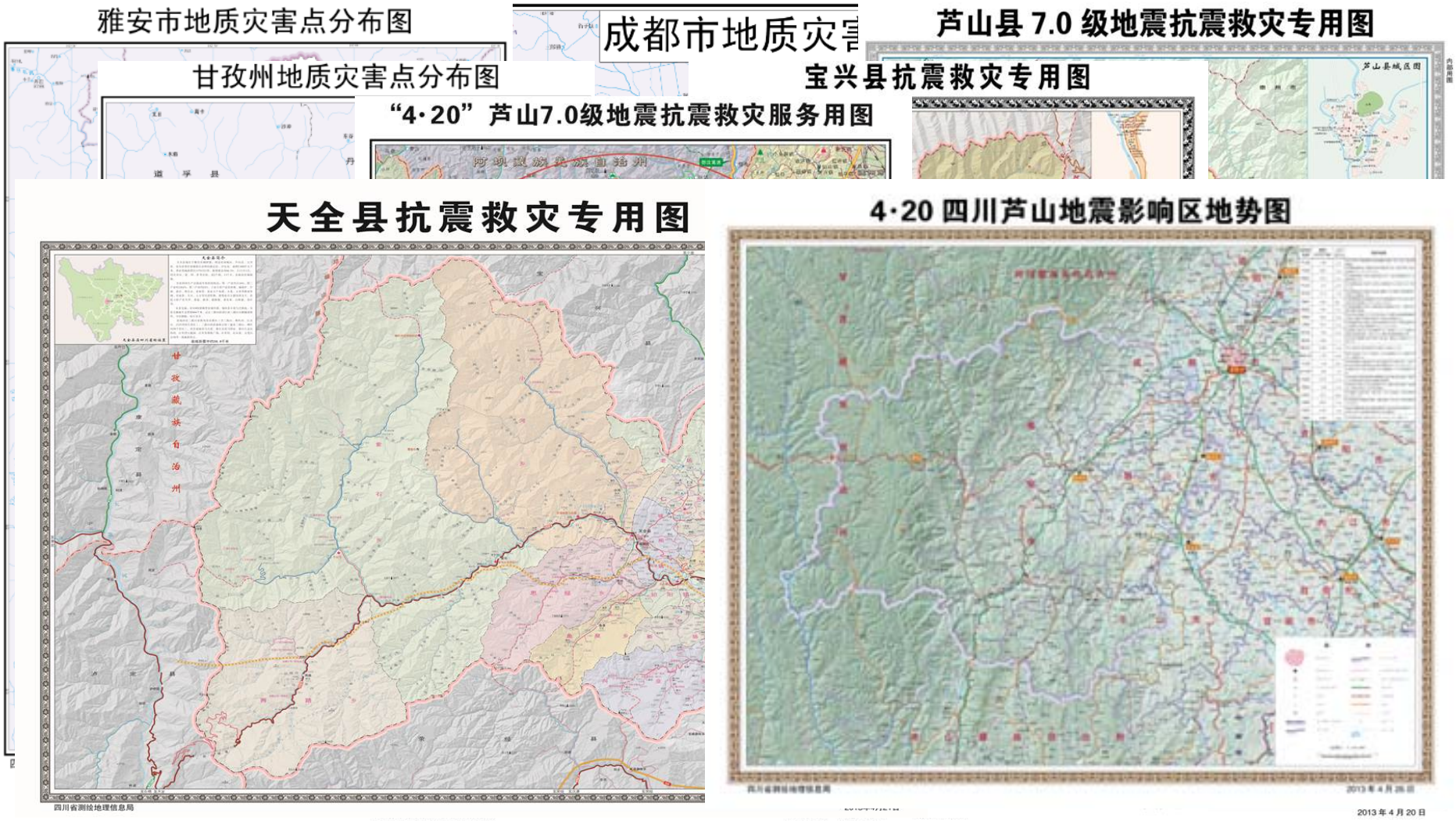
四川省芦山县 420 地震抗震救灾影像图（百丈水库）

天泉县老场乡大庙村泥石流



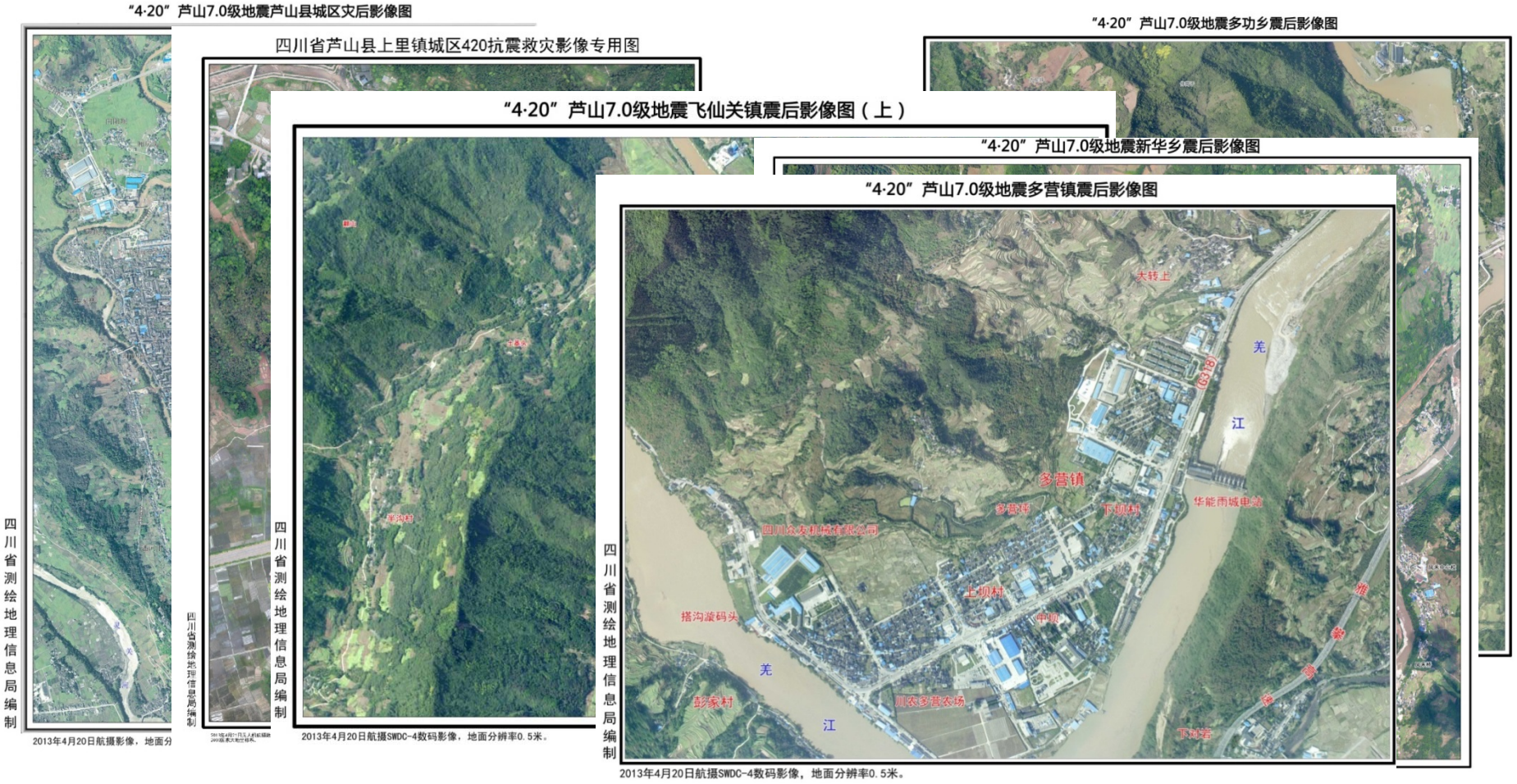
Compiling Thematic Maps for Earthquake Relief Work
抗震救灾专题图编制

We developed over 50 thematic maps for earthquake relief work, which greatly benefited earthquake relief commanding and reasonable resource deployment



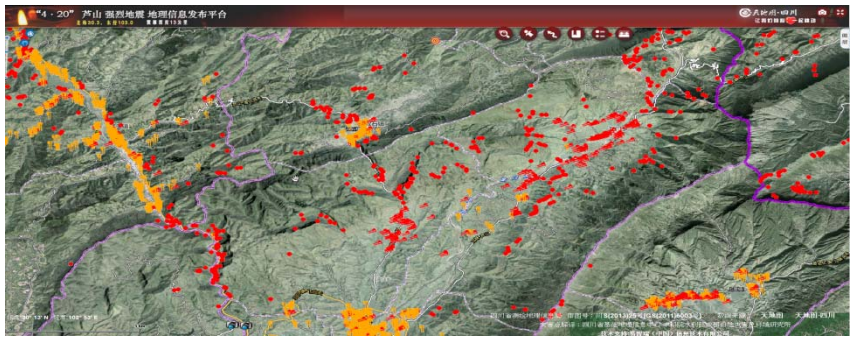
Compiling thematic Images
影像专题图编制

We developed over 50 thematic images for earthquake relief headquarter and relevant functional departments conducting hazard and disaster evaluation, resource deployment, loss evaluation, and secondary disaster assessment



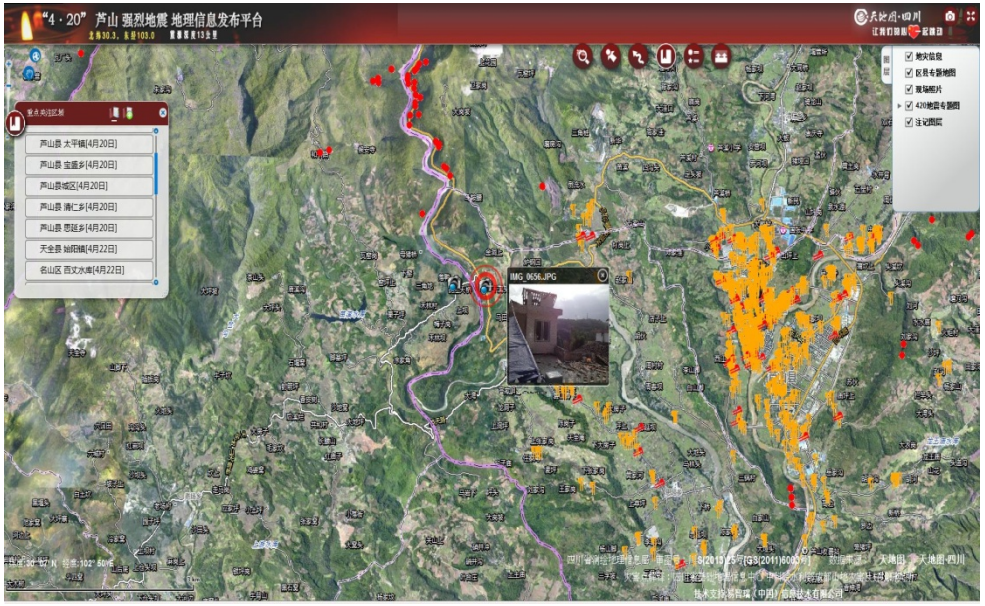
Geographic Information Portal of Lushan Earthquake
芦山地震地理信息公众平台

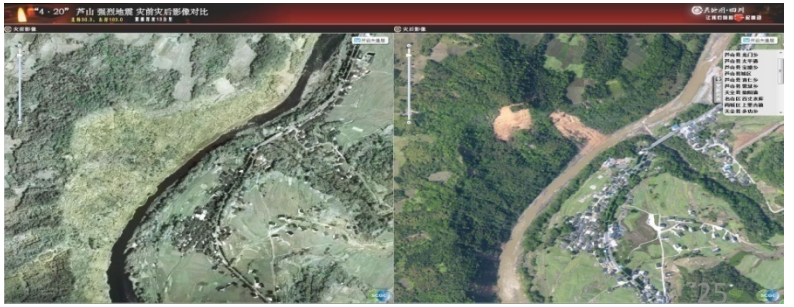
In the first 24 hours after earthquake, we developed a geographic information portal of Lushan earthquake to timely publish the disaster images, interpreted results of potential secondary disasters, thematic maps for earthquake relief work, real-time traffic condition in disaster areas, etc



Geographic Information Portal of Lushan Earthquake
芦山地震地理信息公众平台

The portal provides high resolution images (0.6 m) of approximately 5,000 km2 disaster area (covers Lushan, Baoxing and Qionglai), and reports totally 2,935 disaster sites, including 9 interpreted congestion bodies, 1,183 collapse landslides, 1,312 damaged buildings, and 431 collapsed buildings





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Outcomes of Emergency Safeguard of Surveying and Mapping
应急测绘保障成果

Compiled 107 thematic maps and images, and printed and distributed almost 26,000 maps

应急测绘保障成果

Captured high resolution aerial images of over 3,000 km^2, and created digital orthogonal maps

获取灾区高分辨率航空影像3000余平方千米，并制作数字正射影像

Interpreted almost 3,200 km^2 disaster area, and 3,000 disaster sites

判读震后影像近3200平方千米，解译各类灾害点3000余处

Processed 4,050 km^2 satellite images that captured before the earthquake

制作震前卫星遥感影像4050平方千米

Captured 100 km 3D street view images for severely afflicted area

采集重灾区三维实景影像100余千米

Produced 1,007 paper topographic maps of various types

提供各类纸质地形图1007张

Produced 1.27 TB geographic data of various types

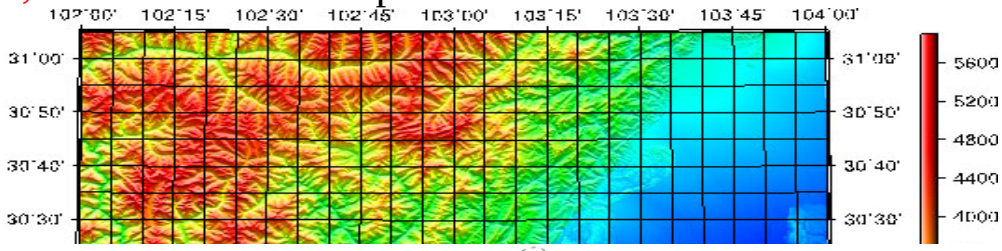
各类地理信息数据1.27TB

Post-disaster construction of surveying and mapping
灾后测绘基准建设

✓Constructed 6 continuous running base station of global navigation satellite system in Lushan, Baoxing, Tianquan, etc.

✓Reconstructed the independent coordinate system for Ya'an, Lushan, Tianquan, Baoxing and Xingjing

✓Efficiently built a new quasi-geoid model of 10,000 km^2 and with a precision of 5 cm



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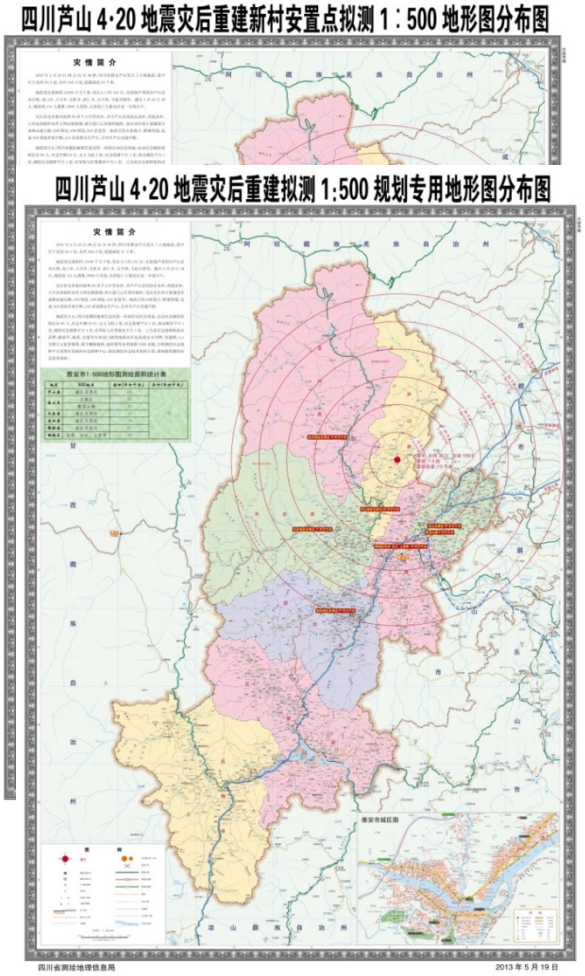
Surveying and mapping special topographic map for reconstruction planning
重建规划专用地形图测绘

Surveying and mapping special topographic map of 2 scales for reconstruction planning: 1:500 scale topographic map covering 130 km^2 area. 1:2000 scale topographic map covering 650 km^2



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Conclusion 结论

1

Be quick
要快

Disaster information required to be quickly obtained and understood right after the disaster

2

Be effective
要有效分析与判断

By studying and evaluating disaster condition, and made reasonable plan of rescue solution, the effective suggestions have to be made and provided for further decision making

3

Be accurate
要准确

Multi-resolution images acquired using emergency surveying system have to be accurately utilized according to different purpose of disaster relief and post-disaster recovery

Conclusion 结论

Satellite
卫星

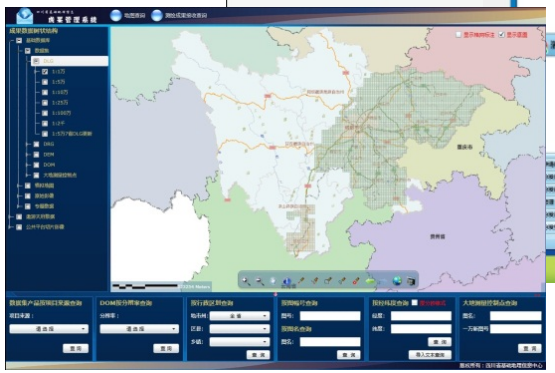
UAV
无人机

Cluster-Tpye Image Processing System
集群式影像处理系统

应急数据查询分发系统

Mobile Measurement Platform
移动测量平台

Effective Printing System
快速打印图件



Emergency Data Query and Distributing System

Demo 视频演示

Demo: Emergency safeguard of Surveying and Mapping for 4.20 Lushan Earthquake

Concluding Remarks
结束语

With the demand of surveying and mapping for major incidents and disasters, and considering the historical disaster relief experiences, we investigated the technical structure of emergency safeguard, developed corresponding software and portal, provided emergency geographic information services for the government and public, and further explore the potential of emergency safeguard of surveying and mapping

针对自然灾害等重大突发事件应急测绘需求，结合四川省历史抗震救灾经验，研究应急测绘保障技术体系，开发应用软件系统，提供面向政府部门和公众用户应急测绘地理信息服务，挖掘应急测绘保障潜力

Emergency Safeguard of Surveying and Mapping is a Long and Arduous Task！

应急测绘保障　使命任重道远！

Thank You for Attention！

谢

谢！