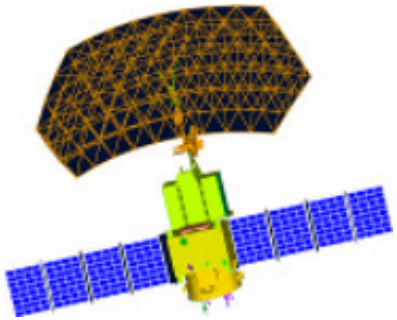
Space Technology Application for Wenchuan Earthquake Relief

Dr. Li Suju

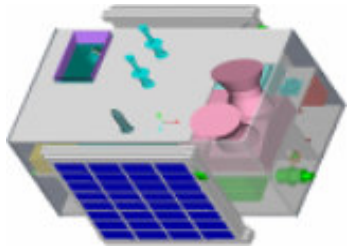
National Disaster Reduction Center of China

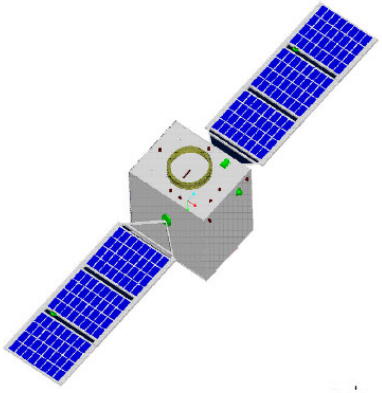
Feb 13, 2009 Vienna

Content



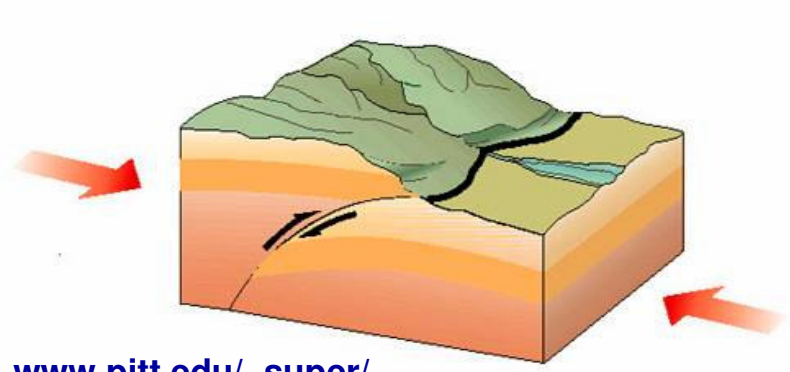
Disaster Information



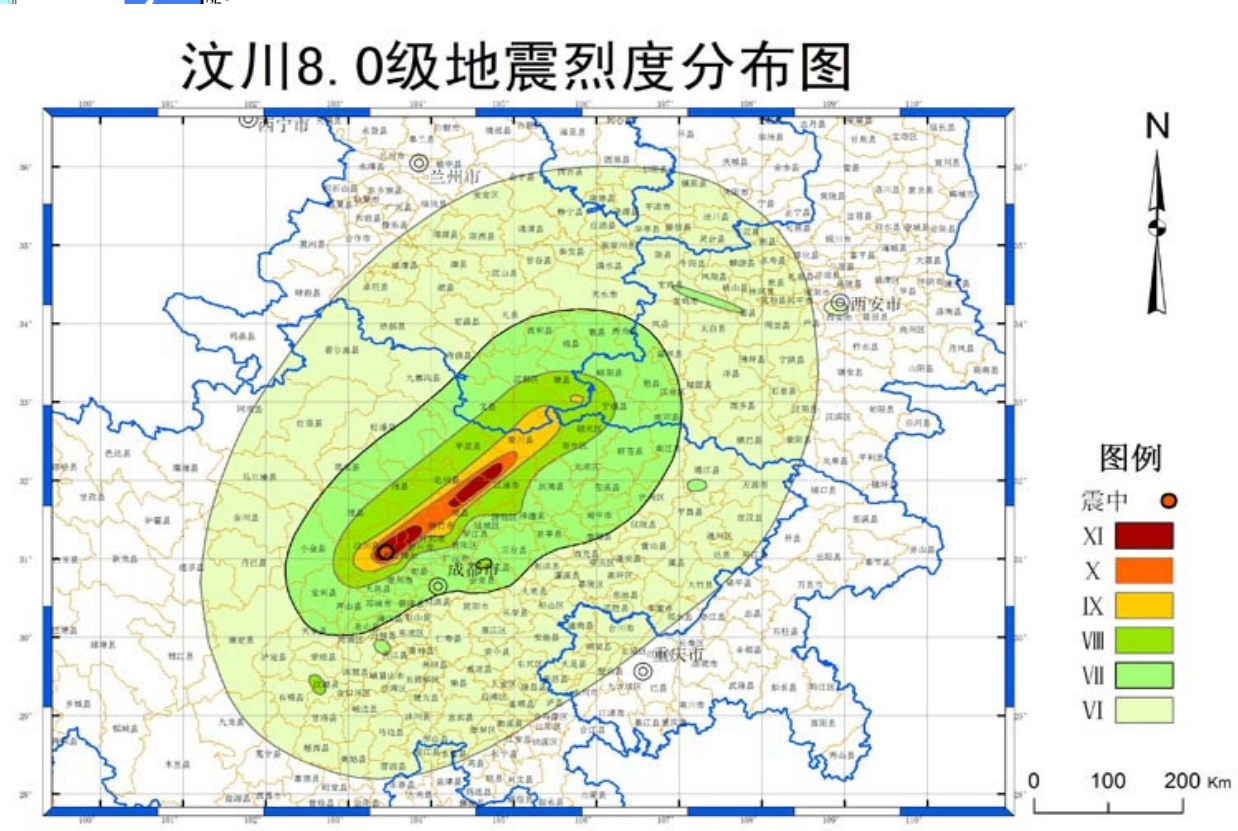


Disaster Information

- **Time: 14:28 Beijing Time**
- **Date: May 12, 2008**
- **Location: Wenchuan, Sichuan Province,China**
- **Epicenter: 31.021N, 103.367E**
- **Magnitude: 8.0M on Richter scale**



www.pitt.edu/~super/



Disaster Information

- **High intensity:** With a magnitude of 8, and the intensity of epicenter is 11；
- **Large area covered**： 10 provinces, autonomous regions and municipalities were affected. The affected area was more than 500,000 square km.
- **Frequent aftershock and secondary disasters**: More than 30,000 aftershocks occurred. Secondary disaster such as landslide and mudflow, quake lake occurred frequently;
- **Difficult for disaster relief**： Earthquake occurred in mountainous area where lots of life lines were destroyed by landslides or mudflows. It is difficult for disaster relief team, good and facility to access severe affected area ；
- **Massive disaster loss**： It left 69,227 dead with 17,923 still missing. About 15.1 million people were displaced. Direct losses exceeded 845.1 billion RMB.
- It was the most destructive earthquake since the People's Republic of China was founded in 1949

Decision Making Support Working Flow

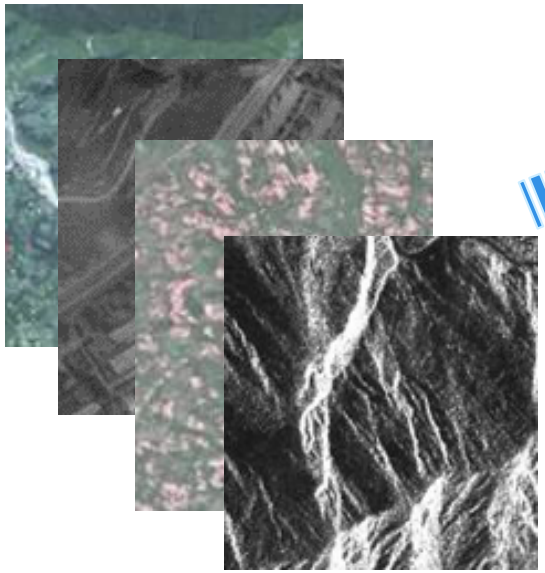


Image data acquisition

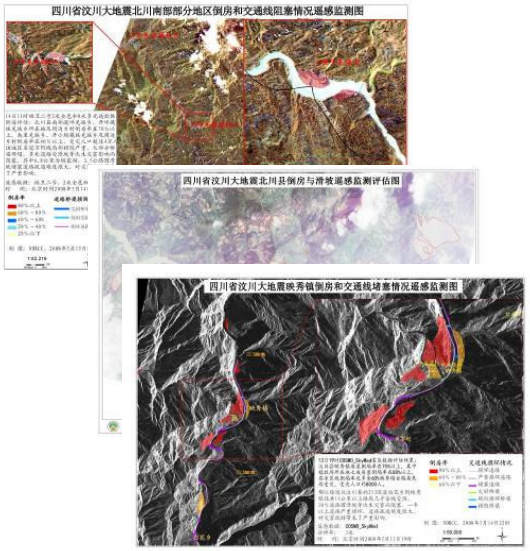


Image processing &Mapping

Product service

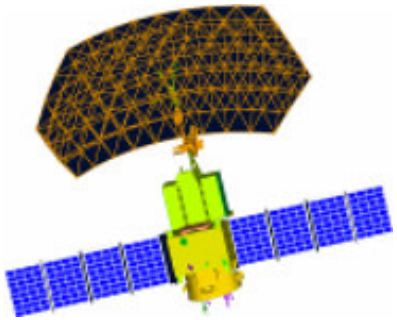
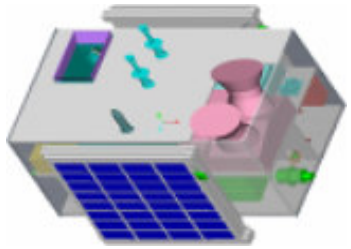


Image Data Acquisition



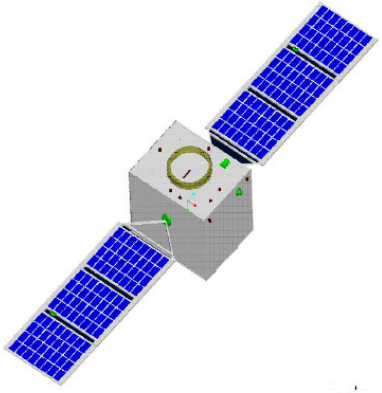


Image data acquisition

- By “International Charter Space and Major Disaster”

User Request Form
(Affected area information)

To be filled by ODO
Call ID 204

1. Date and time of the call 12/05/2008 at 09:15 UTC	DAY 12 MONTH (Spell) May YEAR 2008 TIME 16:00 LOCAL TIME ZONE +8 UTC TIME08:00
2. Name of the organization and caller	National Disaster Reduction Center of China
Phone	86-10-63531082 Ext.
Fax	86-10-83529990 Ext.
Cellular phone	(+86)13683306630
E-mail	wuwei@ndrcc.gov.cn
to be used for call back	
3. Type of disaster	☐ flood ☐ landslide ☐ volcano ☐ storm/hurricane ☐ fire ☐ ice ☒ earthquake ☐ oil spill ☐ other (specify)
4. Geographical location Region/Country name, approximate geographical location and surface extent. Region/country name:Wenchuan county, Dujiangyan city and Chengddu city,Sichuan Province Location From To Extent (km2)	5. Geographical Coordinates in Degrees, minutes, seconds a) Center Point Lat 31° ' " N Long 103° 24' " E Maximum radius of 30 Km b)Center Point Lat 30°59'43" Long 103°37'27" c)Center Point Lat 30°39'30" Long 104°4'13" b) Upper left Lat 31°56'38" N / S Long 102°28'23" E / W a. b c Lower right Lat 30°8'24" N / S Long 104°58'39" E / W
6. Approximate date/time of occurrence or predicted occurrence	May 12 2008 06:28 UTC
7. Additional information on the disaster	Magnitude 7.8 - EASTERN SICHUAN, CHINA The above three points (a,b,c) are the locations which need observing urgently.
8. Additional instructions (shipping instructions)	Quickbird, IKONOS, SPOT, IRS-P6, ALOS, DMC, ENVISAT ASAR will be better.

To be filled by ODO
Authorized User ☒ Cooperating Body ☐ Other ☐

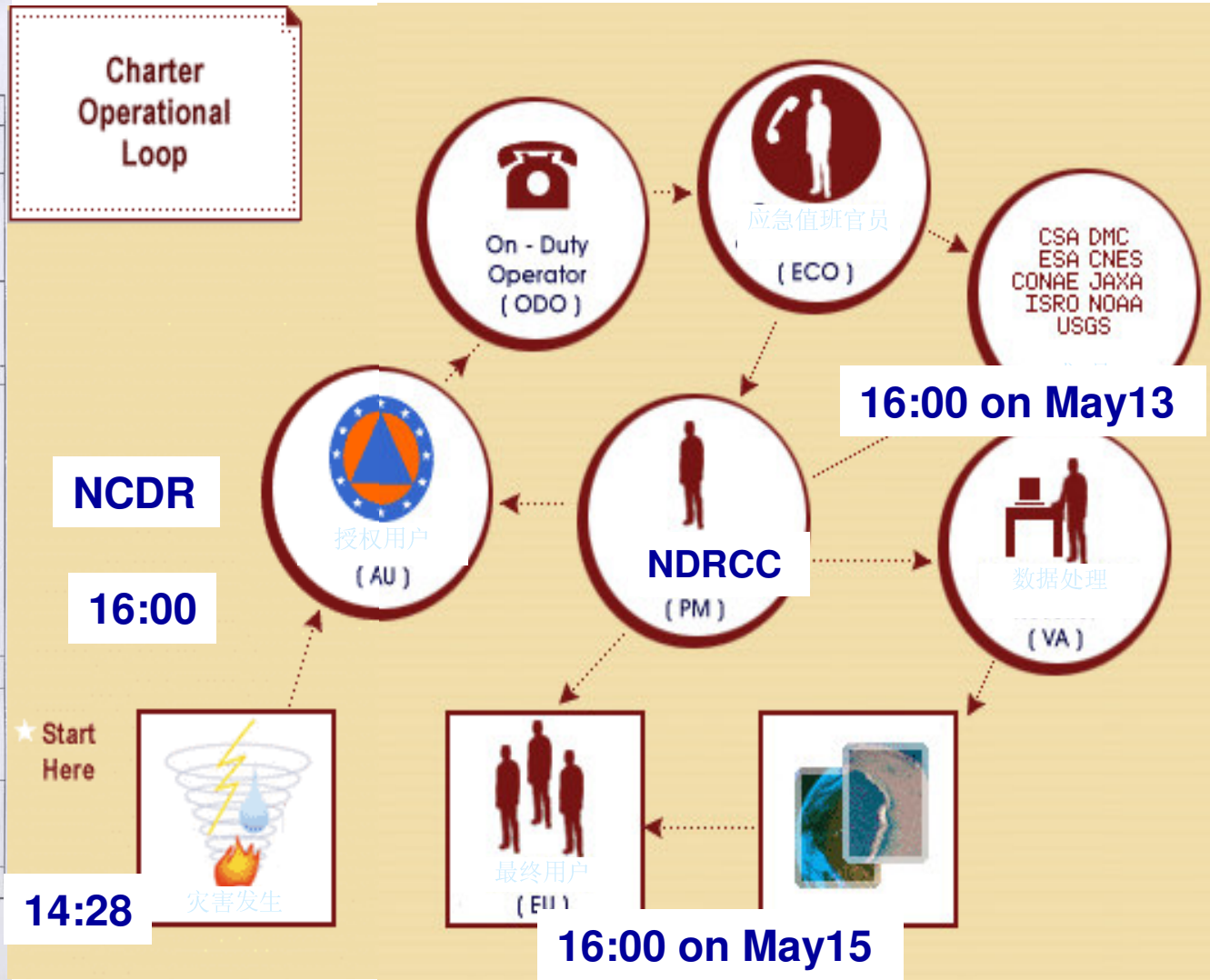


Image data acquisition_from international agencies)

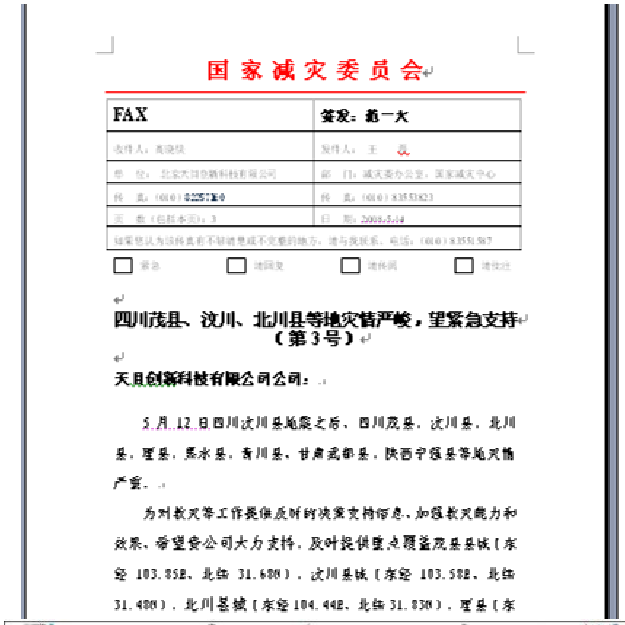
Name of the satellite	Radarsat-1	SPOT2	SPOT4	SPOT5	ALOS	Topsat**	UK-DMC	NigeriaSat-1	Terra/ASTER**	Landsat-7	ENVISAT	TerraSAR**	EROS-B***
Agency from	CSA ASC	cnes			JAXA	DMCII	dmc		USGS		esa	DLR	A
Was spacecraft tasked?	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes	No
How many frames were requested?													
What were the dates requested?	09/23/1998 04/10/2000 05/17/2008* 05/18/2007* 05/28/2008 06/04/2008 06/07/2008	05/17/2008 05/28/2008	05/22/2008 06/02/2008	08/15/2005	05/13/2008 05/14/2008 05/15/2008 05/16/2008 05/18/2008 05/19/2008 05/22/2008 05/23/2008	05/27/2008	05/16/2008 05/19/2008 05/22/2008 05/24/2008	05/15/2008 05/17/2008 05/18/2008 05/20/2008 05/23/2008 05/26/2008 05/28/2008	05/16/2008 05/23/2008 05/30/2008 06/01/2008 06/08/2008	05/16/2008 05/23/2008	05/14/2008 05/15/2008 05/17/2008 05/22/2008 05/25/2008 05/27/2008 05/28/2008 05/30/2008	05/15/2008 05/16/2008 05/17/2008 05/20/2008	05/15/2008 05/16/2008
How many frames were acquired? 1. Archive 2. New acquisition	2 11	0 2	0 3	2 0	19 21	0 2	0 4	0 7	0 14	10 4	0 16	0 11	10
What imaging modes were	STND FINE	PAN 10m	MS	PAN 2.5m MS	PRISM:OB; AVNIR:OBS	PAN MS	MS	MS	ASTER	MS	ASAR	Stripmap . Spotlight	

138 frames of images from 13 satellites, 9 agencies. 95 new acquisition images and 43 archive images

Image data acquisition_from domestic agencies

Image data &

Technical support



国家减灾委员会

FAX

签发：戴一大

四川茂县、汶川、北川县等地灾情严峻，望紧急支持（第3号）

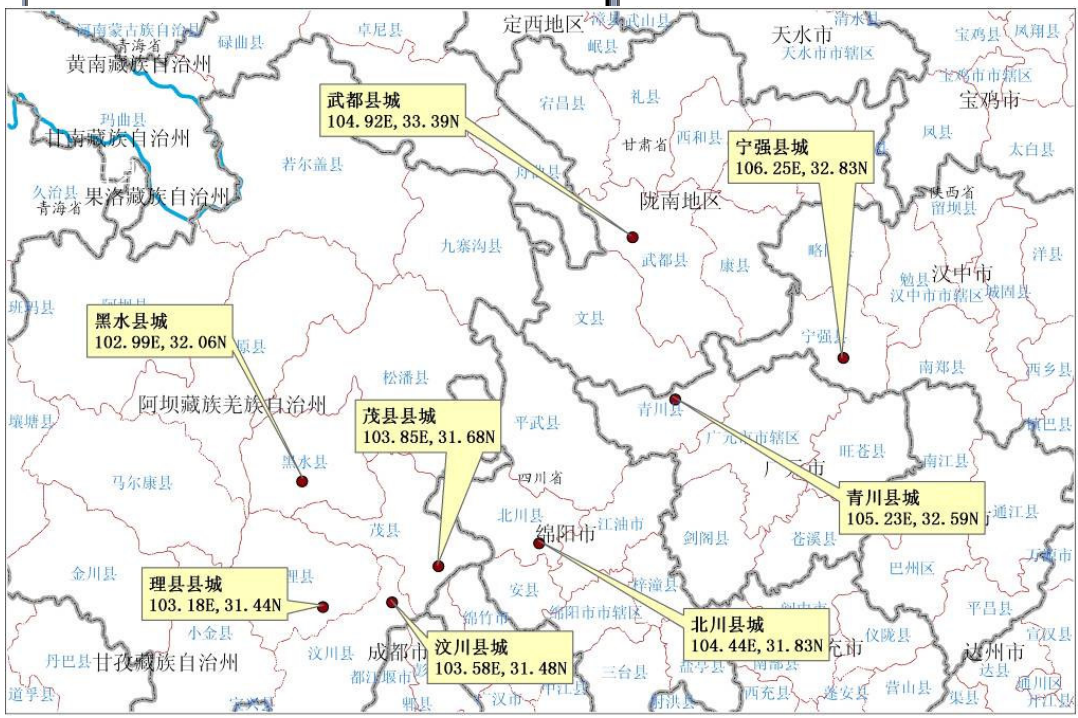
天目创新科技有限公司公司：

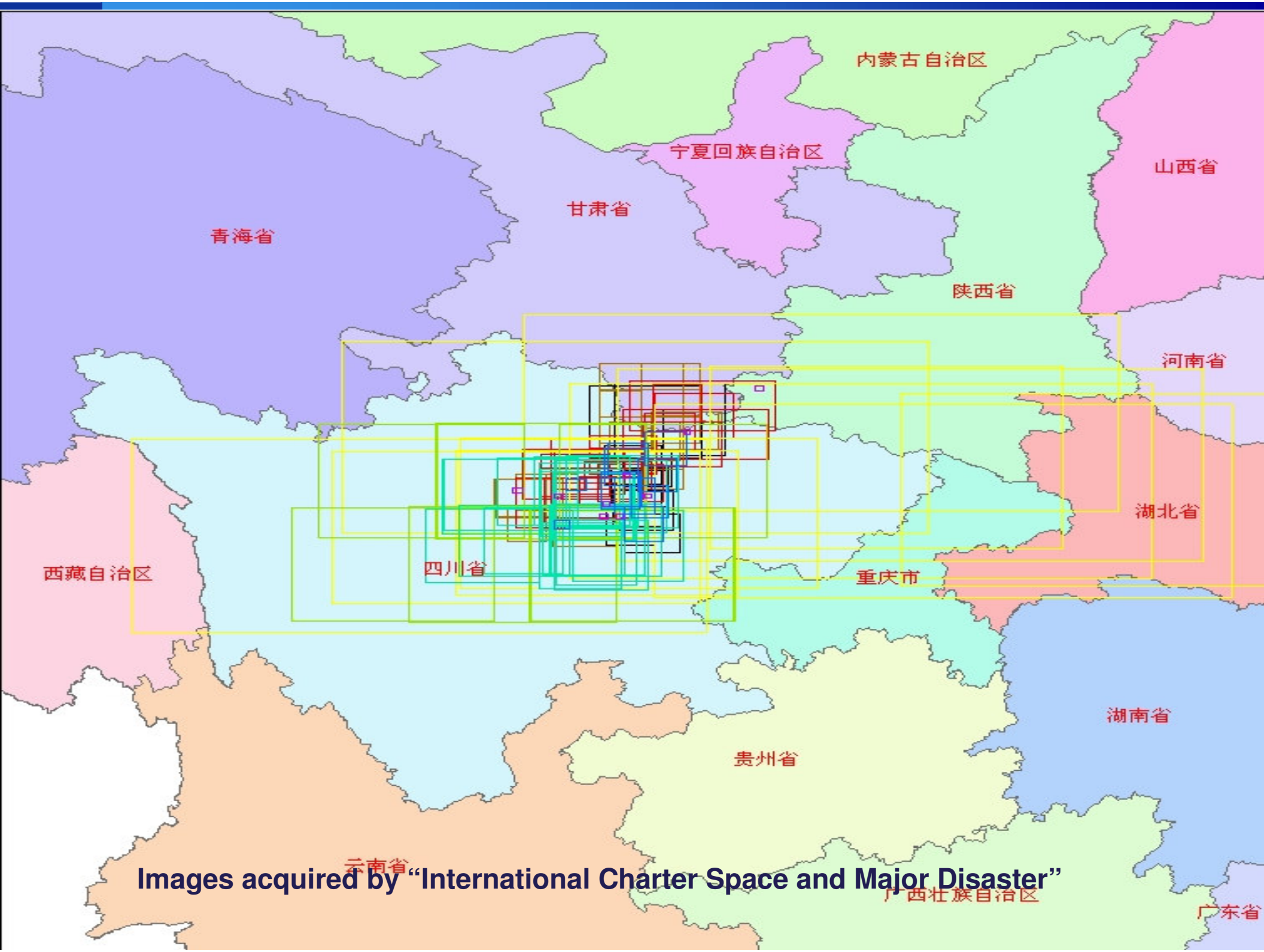
5月12日四川汶川县地震之后，四川茂县，汶川县，北川县，理县，黑水县，青川县，甘肃武都县，陕西宁强县等地灾情严重。

为对救灾等工作提供及时的决策支持信息，加强救灾能力和效果，希望贵公司大力支持，及时提供重点覆盖震区县城（东经 103.85E，北纬 31.68N），汶川县城（东经 103.58E，北纬 31.48N），北川县城（东经 104.44E，北纬 31.83N），理县（东

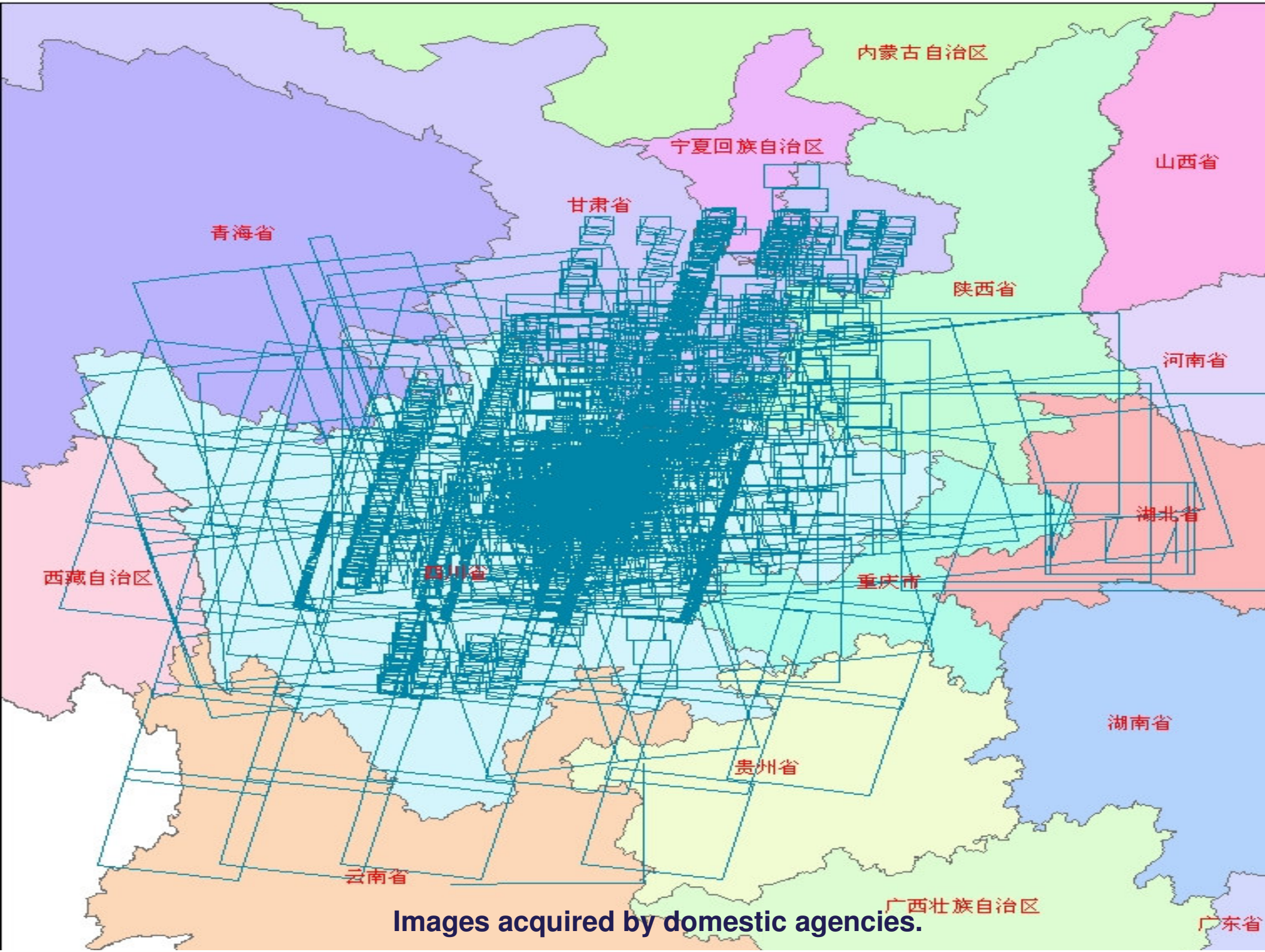
Request fax

Map of need observing area





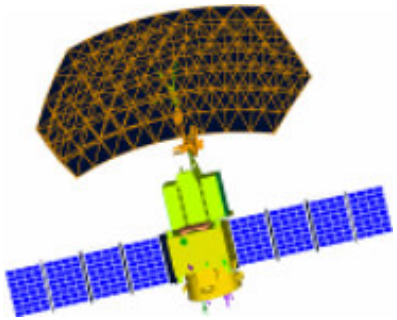
Images acquired by "International Charter Space and Major Disaster"



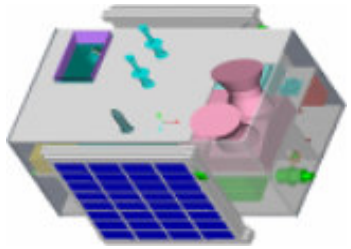
Images acquired by domestic agencies.

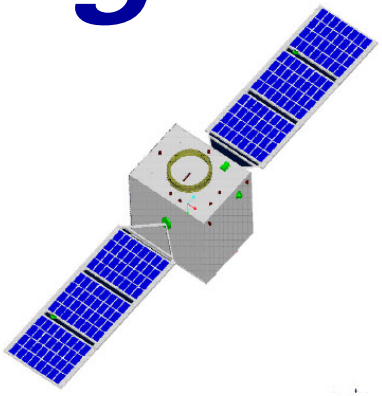
Image data acquisition

- Till June 23 16:00, more than 1300 frames of image from 23 satellites of 12 countries have been acquired for the earthquake affected area.
- Airborne remote sensing images from State Bureau of Surveying and Mapping (SBSM) and Chinese Academy of Sciences.
- Unmanned airborne remote sensing images from NDRCC;
- Statistic disaster data on county level from local government;
- Field investigation data and information are also acquired by field working team.

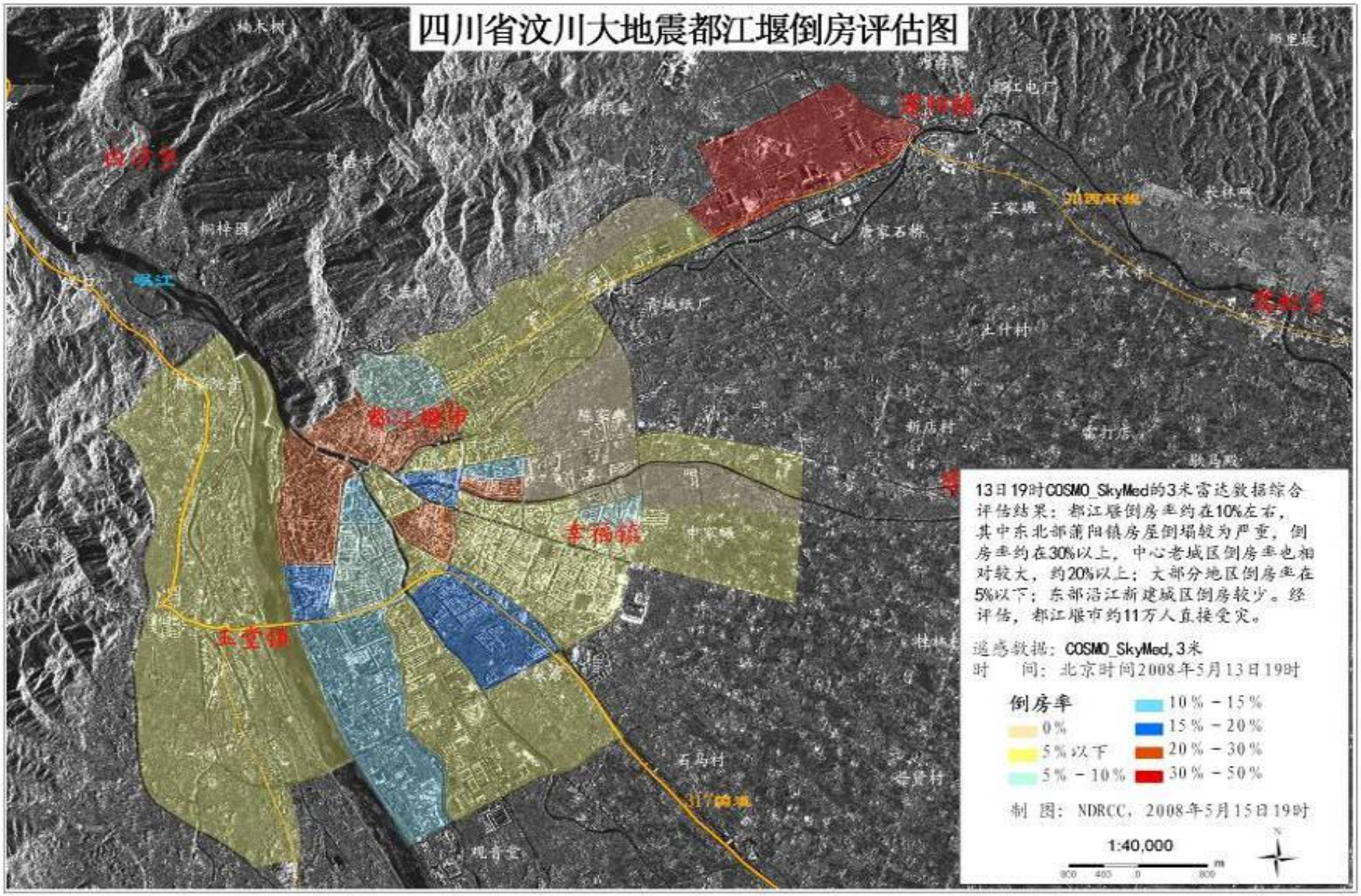


Map Making

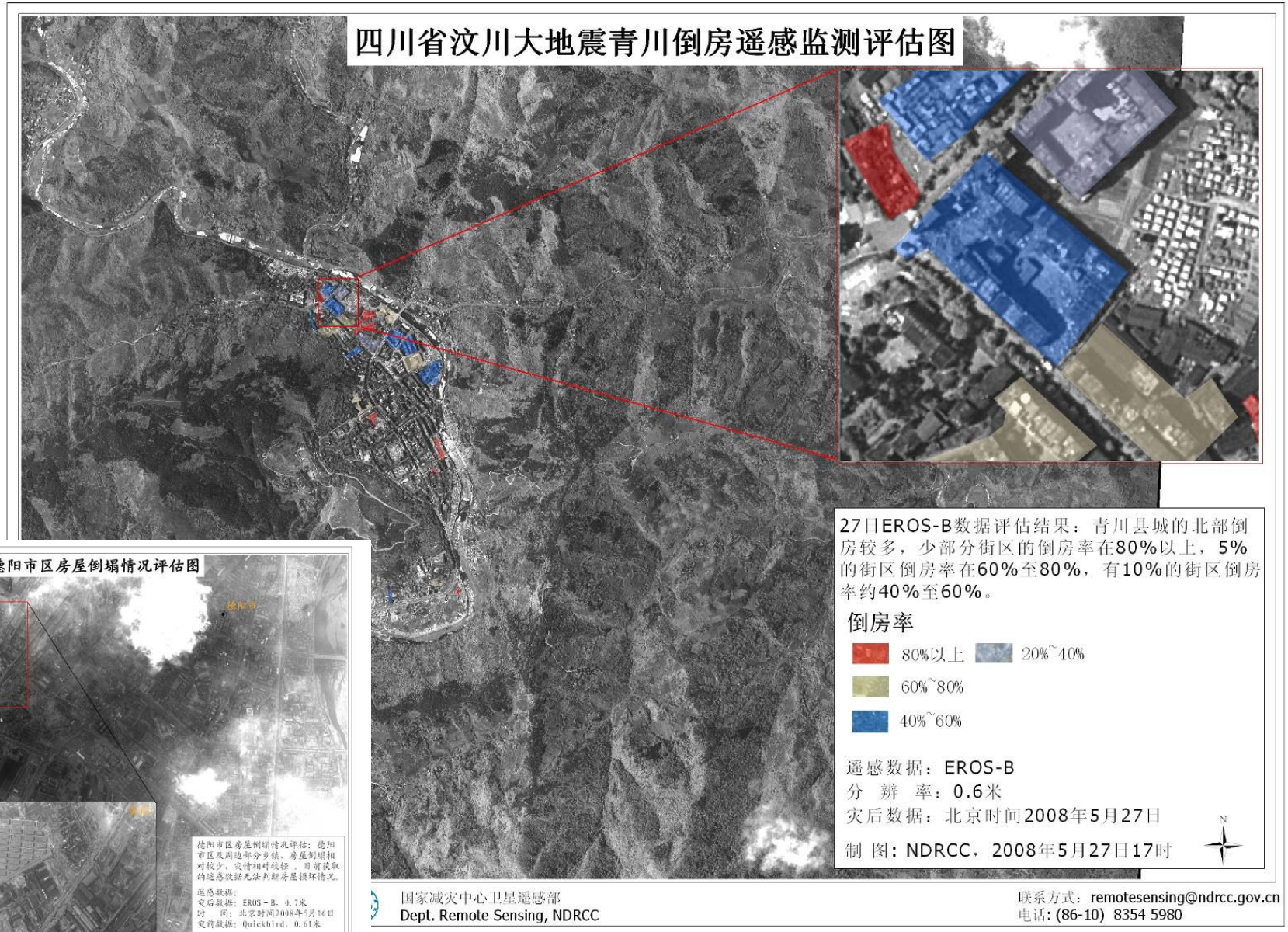




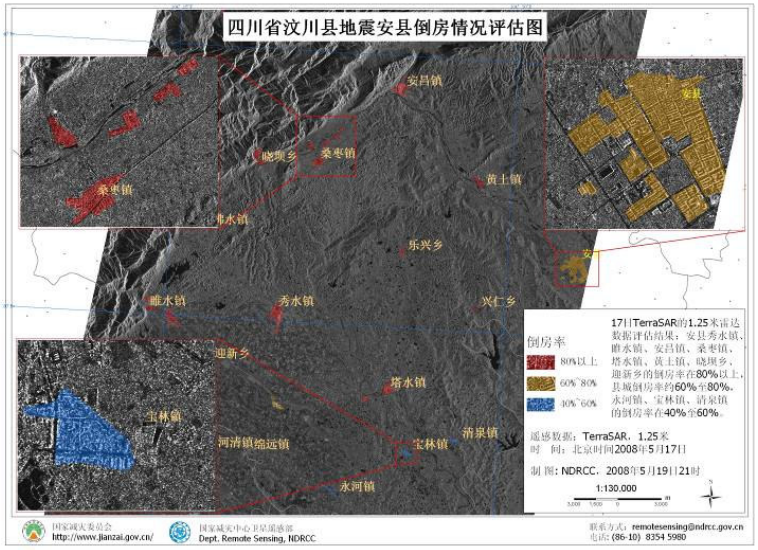
Collapsed Houses Assessment

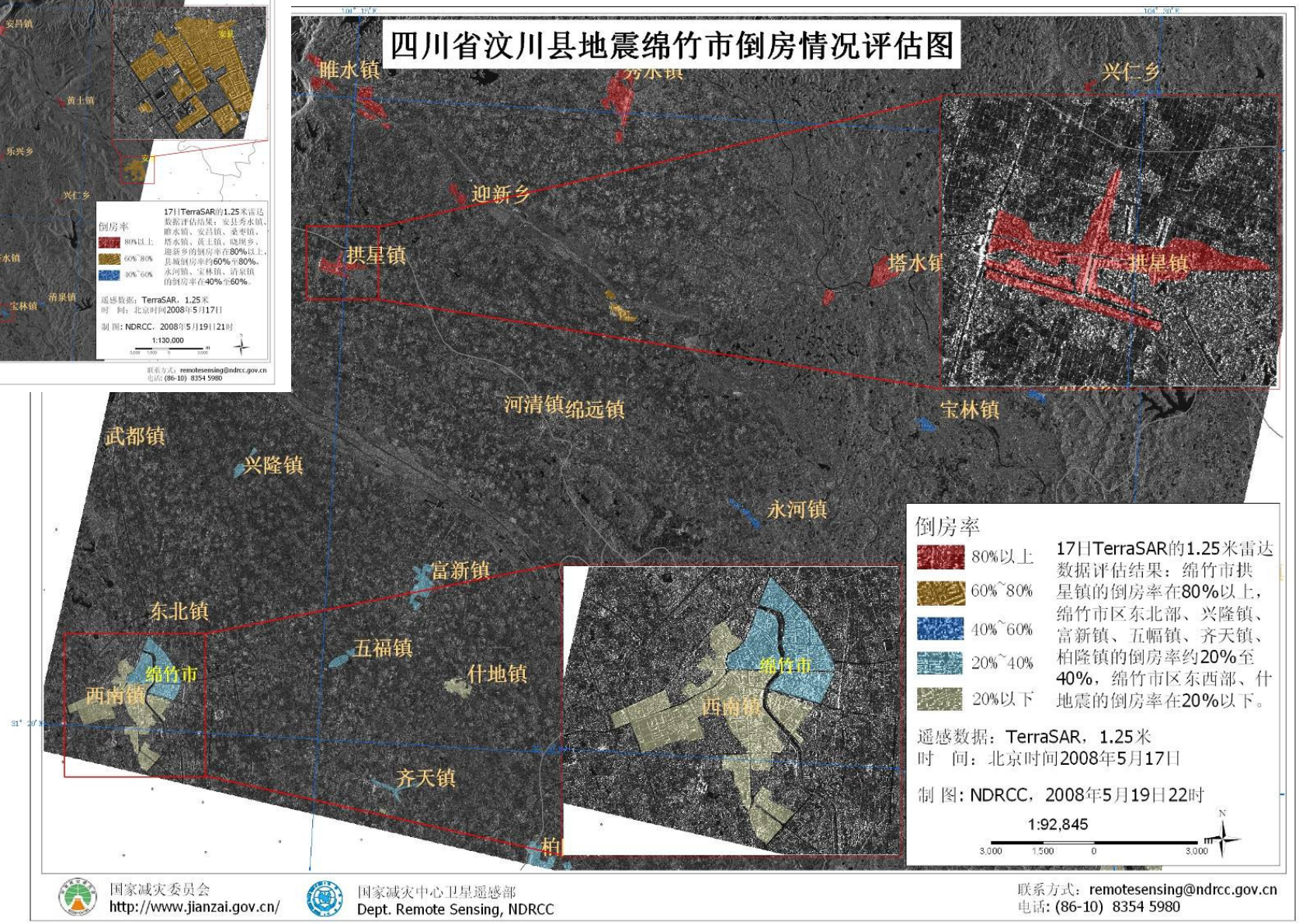


Collapsed Houses Assessment

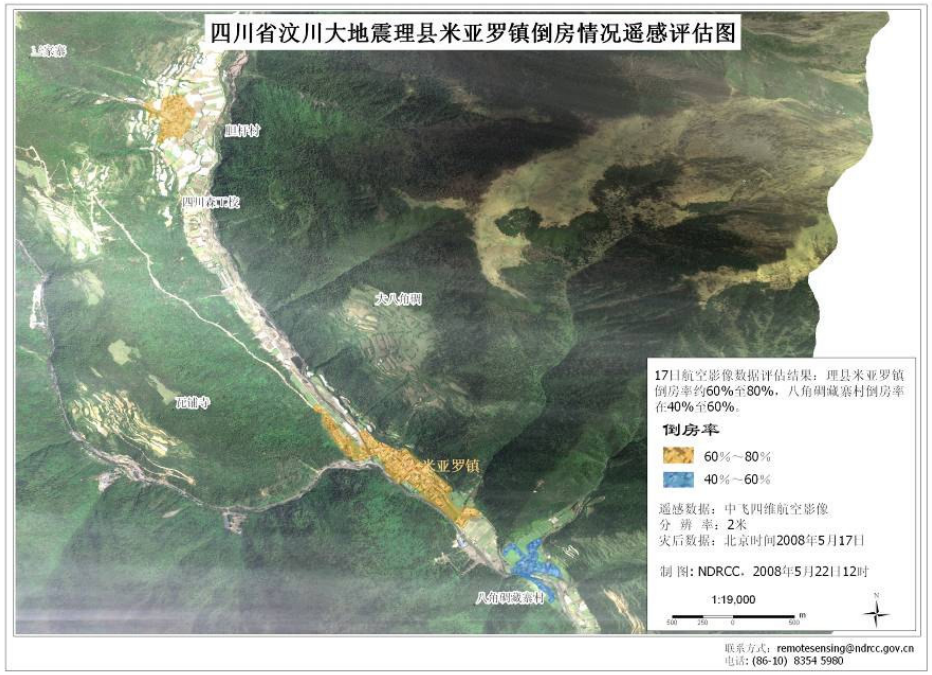


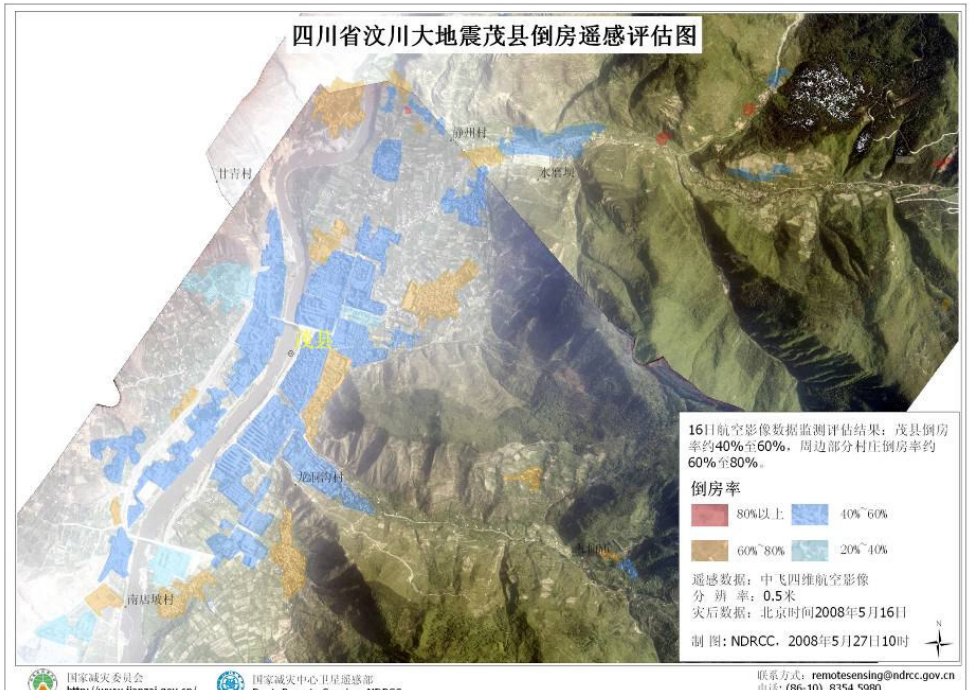
Collapses Houses Assessment

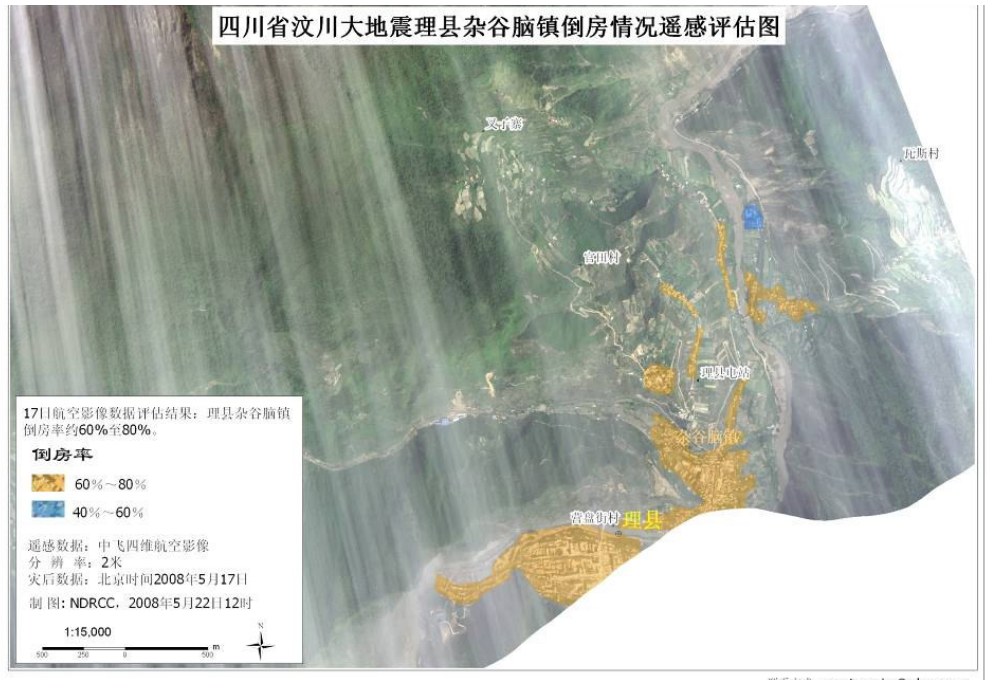




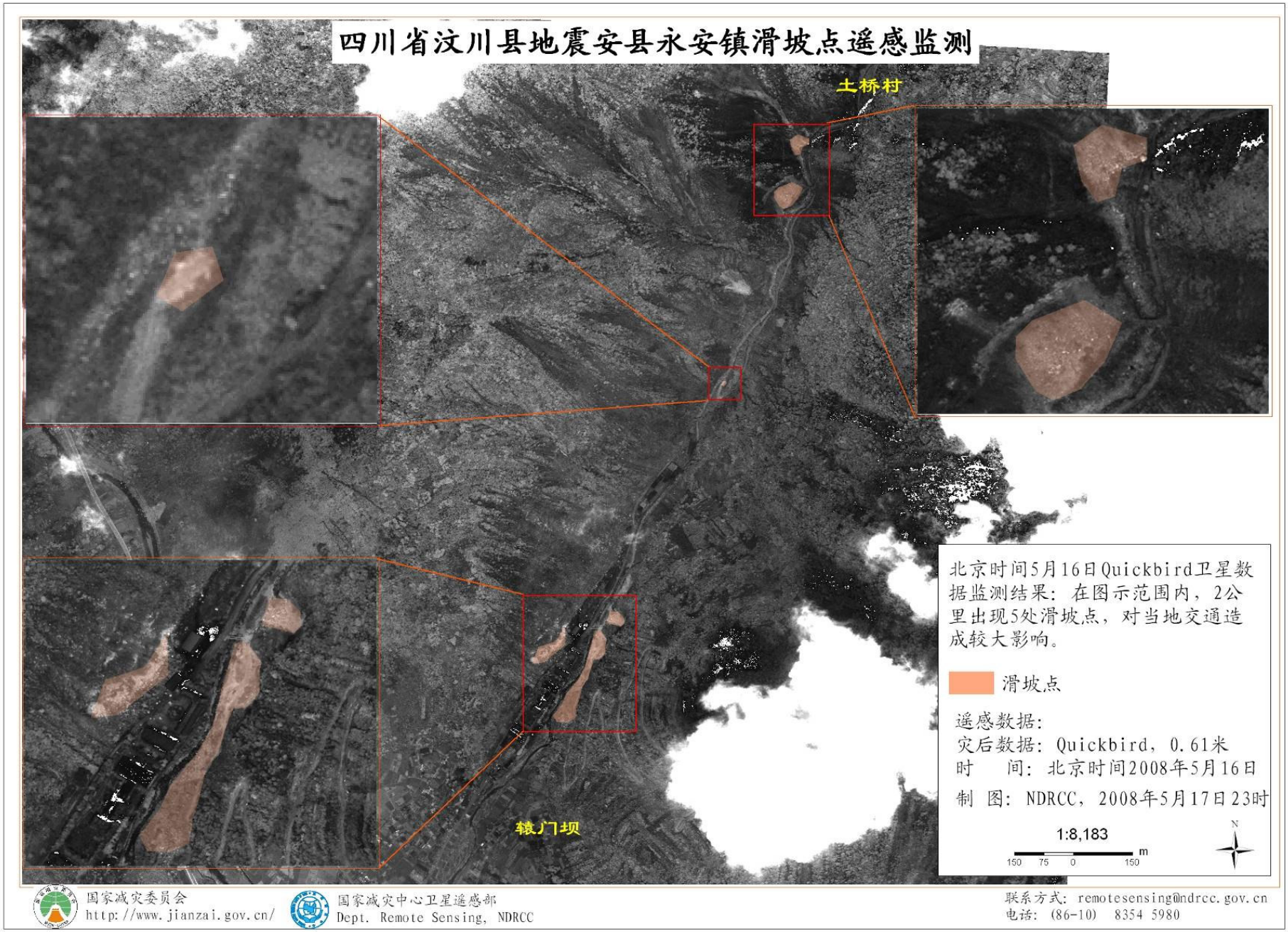
Collapses Houses Assessment





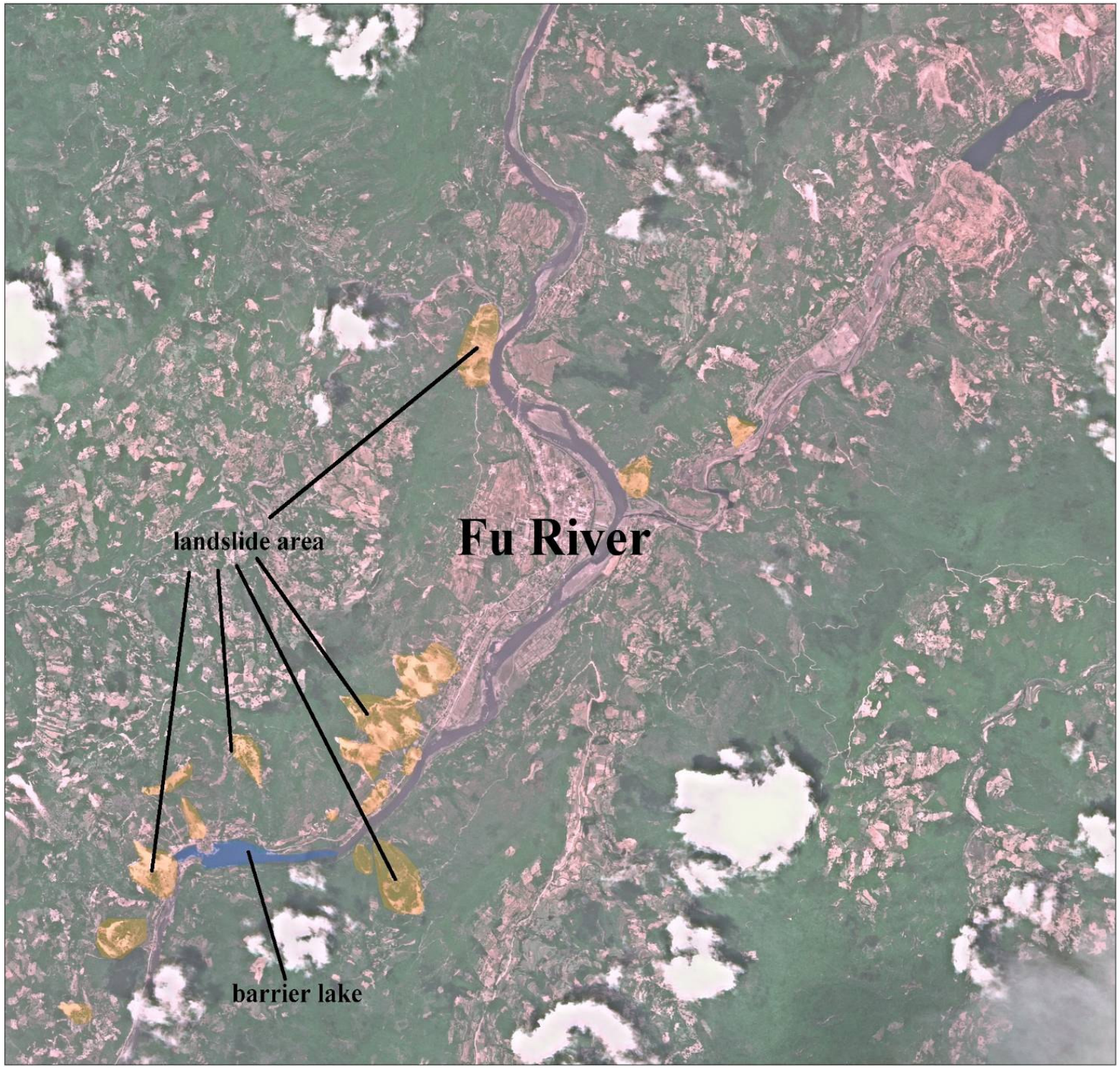


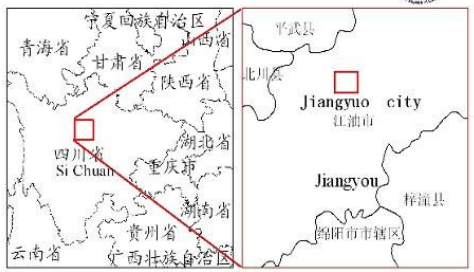
Landslide and destroyed traffic line monitoring



平武县南坝镇滑坡和堰塞湖监测图 Landslide and Barrier Lake Monitoring Map in Nanba Town, Pingwu County

Charter 204号订单 - 产品编号 09
Charter Call 204 - Product No. 09





2008年5月12日，四川省发生8.0级强烈地震，震中位于汶川县，此次地震给四川、甘肃、陕西等地造成巨大的人员和财产损失。

根据5月18日ALOS AVNIR-2数据评估结果：涪江南坝镇段，田洲村、磨湾、落河街、柏林里、沙湾、岩坝子等村的沿江地区出现十几处滑坡，同时滑坡体堵塞河道形成堰塞湖，加之近日降雨增多，滑坡体形成堤坝的决堤风险很大，当地出现泥石流次生灾害的风险增大。

The 2008 Wenchuan earthquake at a magnitude 8.0 Ms, occurred at 14:28:01.42 CST (06:28:01.42 UTC) on 12 May 2008 in Sichuan province of China, which has caused lots of landslides and barrier lake come into being. The map was based on ALOS AVNIR-2 image on May 18th in Pingwu County.

landslide area

barrier lake

灾害类型: 地震
Disaster Type: Earthquake

时间: 2008年5月12日
Date: 12 May 2008

灾害影像 Disaster Image:
ALOS AVNIR-2 分辨率10m, 获取时间2008年5月18日
ALOS AVNIR-2 10m acquired on 18 May 2008 © JAXA

灾害分析 Earthquake Analysis:
NDRCC，2008年5月20日21时 UTC12:00 20 May 2008©NDRCC
制 图 Map Production:
NDRCC，2008年5月20日23时 UTC15:00 20 May 2008©NDRCC

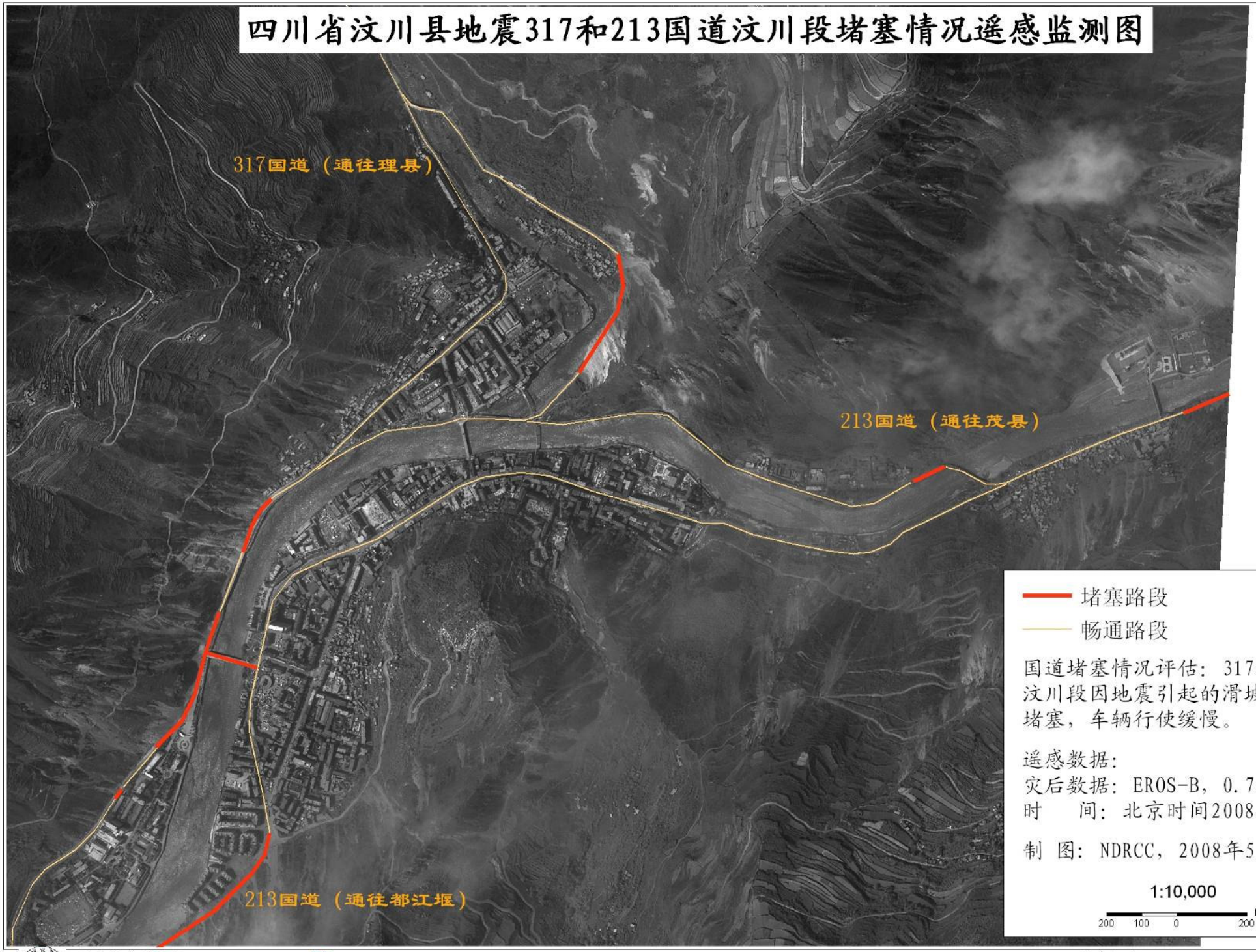
投影 Projection: UTM
椭球体 Spheroid: WGS84
地球模型 Datum: WGS84

0 250 500 1,000 Meters

国家减灾委员会
National Commitee for Disaster Reduction, P.R.C.
国家减灾中心
National Disaster Reduction Center of China

联系方式 Contact Information:
remotesensing@ndrcc.gov.cn
电话 Hotline: (86-10) 6353 1082
http://www.jianzai.gov.cn/rs/
http://www.ndrcc.gov.cn

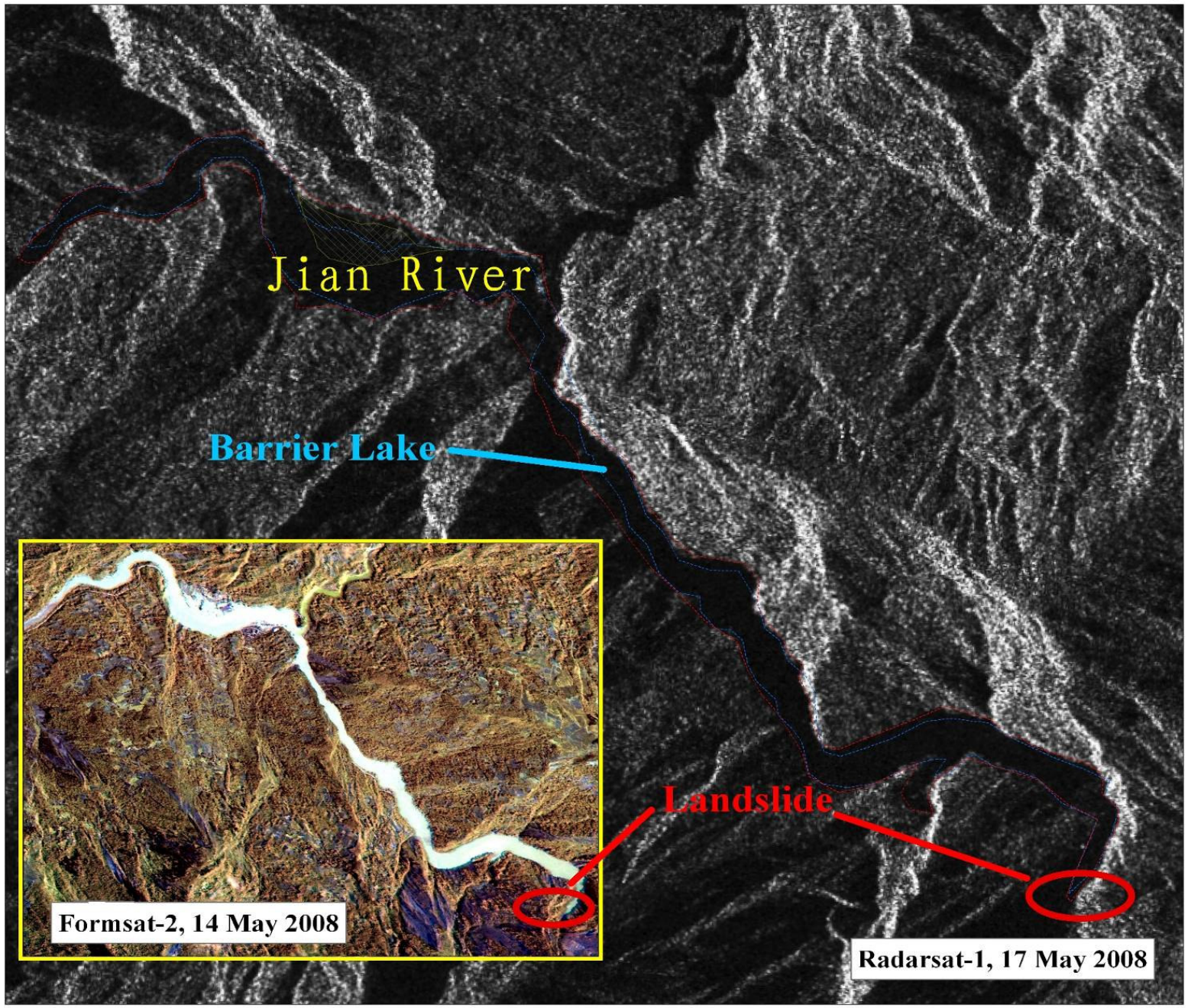
四川省汶川县地震317和213国道汶川段堵塞情况遥感监测图



国家减灾委员会
http://www.jianzai.gov.cn/
国家减灾中心卫星遥感部
Dept. Remote Sensing, NDRCC
联系方式：remotesensing@ndrcc.gov.cn
电话：(86-10) 8354 5980

Quake Lake Monitoring

北川县唐家山堰塞湖和滑坡监测图 **Barrier Lake and Landslide Monitoring Map in Beichuan County**



Charter 204号订单 - 产品编号 07
Charter Call 204 - Product No. 07

2008年5月12日，四川省发生8.0级强烈地震，震中位于汶川县，此次地震给四川、甘肃、陕西等地造成巨大的人员和财产损失。

根据5月14日福卫二号和5月17日Radarsat-1数据对堰塞湖监测结果的对比，可见堰塞湖水面面积增加了0.4平方公里。

The 2008 Wenchuan earthquake at a magnitude 8.0 Ms, occurred at 14:28:01.42 CST (06:28:01.42 UTC) on 12 May 2008 in Sichuan province of China, which has caused lots of landslides and barrier lake come into being. The barrier lake change map was based on Formsat-2 image (on 14th May) and Radarsat-1 image (on 17th May) in Beichuan County.

Barrier lake area based on Radarsat-1 (17 May)

Barrier lake area based on Formsat-2 (14 May)

Flooded village area

灾害类型: 地震 Disaster Type: Earthquake

时间: 2008年5月12日 Date: 12 May 2008

灾害影像 Disaster Image:
Radarsat-1 分辨率10m, 获取时间2008年5月17日
Radarsat-1 10m acquired on 17 May 2008 © CSA
Formsat-2 分辨率8m, 获取时间2008年5月14日
Formsat-2 8m acquired on 14 May 2008

灾害分析 Earthquake Analysis:
NDRCC，2008年5月19日21时 UTC13:00 19 May 2008©NDRCC

制 图 Map Production:
NDRCC，2008年5月19日23时 UTC16:00 19 May 2008©NDRCC

投影 Projection: UTM
椭球体 Spheroid: WGS84
地球模型 Datum: WGS84

0 125 250 500 Meters

国家减灾委员会
National Commitee for Disaster Reduction, P.R.C.
国家减灾中心
National Disaster Reduction Center of China

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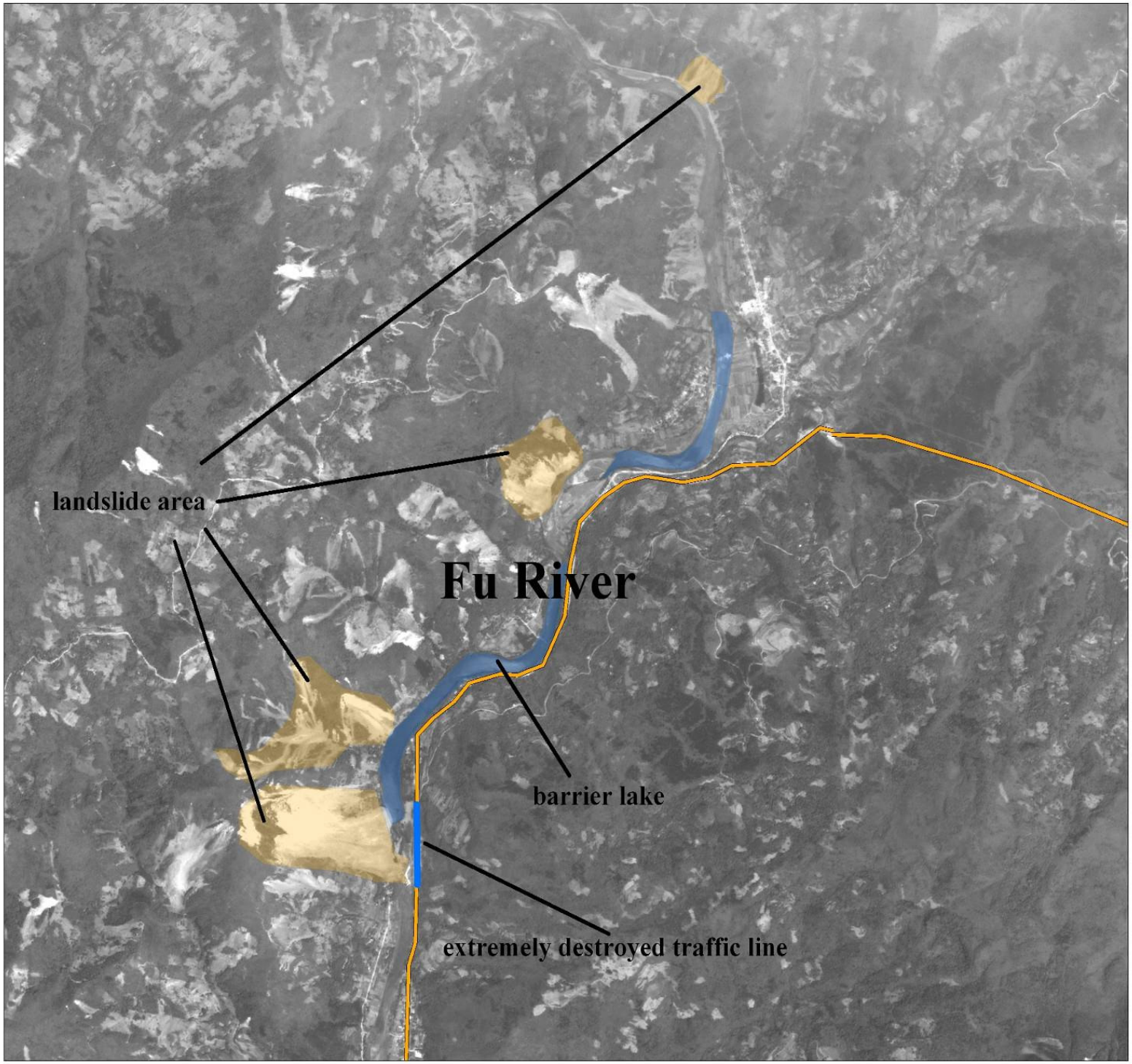
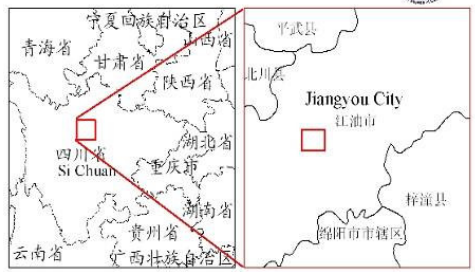
http://www.jianzai.gov.cn/rs/
http://www.ndrcc.gov.cn

平武县平通镇滑坡和堰塞湖监测图

Monitoring Map on Landslide, Barrier Lake and Destroyed Traffic Lines in Pingtong Town, Pingwu County

Charter 204号订单 - 产品编号 10
Charter Call 204 - Product No. 10





2008年5月12日，四川省发生8.0级强烈地震，震中位于汶川县，此次地震给四川、甘肃、陕西等地造成巨大的人员和财产损失。

根据18日ALOS PRISM数据评估结果：平通镇的太平坝、棺角村、船头河出现多处滑坡，造成省道南遂线部分路段严重损坏，给当地的交通和救援造成较大困难，同时滑坡体堵塞河道形成堰塞湖，加之近日降雨增多，滑坡体形成堤坝的决风险很大，当地出现泥石流次生灾害的风险增大。

The 2008 Wenchuan earthquake at a magnitude 8.0 Ms, occurred at 14:28:01.42 CST (06:28:01.42 UTC) on 12 May 2008 in Sichuan province of China, which has caused lots of landslide disasters, traffic line destroyed and a barrier lake came into being. The map is based on ALOS PRISM image on May 18th in Pingtong Town, Pingwu County.

Destroyed Traffic Lines

landslide area

Damaged

barrier lake

Extremely Destroyed

灾害类型: 地震
Disaster Type: Earthquake

时间: 2008年5月12日
Date: 12 May 2008

灾害影像 Disaster Image:
ALOS PRISM 分辨率2.5m 获取时间2008年5月18日
ALOS PRISM 2.5m acquired on 18 May 2008 © JAXA

灾害分析 Earthquake Analysis:
NDRCC，2008年5月20日21时 UTC12:00 20 May 2008©NDRCC
制 图 Map Production:
NDRCC，2008年5月20日23时 UTC15:00 20 May 2008©NDRCC

投影 Projection: UTM
椭球体 Spheroid: WGS84
地球模型 Datum: WGS84

Meters
0 125 250 500

国家减灾委员会
National Commitee for Disaster Reduction, P.R.C.
国家减灾中心
National Disaster Reduction Center of China

联系方式 Contact Information:
remotesensing@ndrcc.gov.cn
电话 Hotline: (86-10) 6353 1082
http://www.jianzai.gov.cn/rs/
http://www.ndrcc.gov.cn

Evacuated Tents Monitoring

Evacuated Tents Monitoring

Comprehensive Assessment Map

国家减灾委员会
National Committee for Disaster Reduction

国家减灾中心卫星遥感部
Dept. Remote Sensing, NDRCC

遥感数据：截止2008年6月1日
制　　图：NDRCC，2008年6月5日15时

http://www.jianzai.gov.cn/
联系方式：remotesensing@ndrcc.gov.cn


四川省汶川大地震部分地区道路损毁评估图
黑水县
万阿线:S30251
茂县
北川县
北川县
江油市
安县
汶川县
理县
绵阳市

ERROR: undefined
OFFENDING COMMAND: ETrB3SV_^IZ=;P‘eU

STACK: