



Special Session: Selected Applications, Civil Security

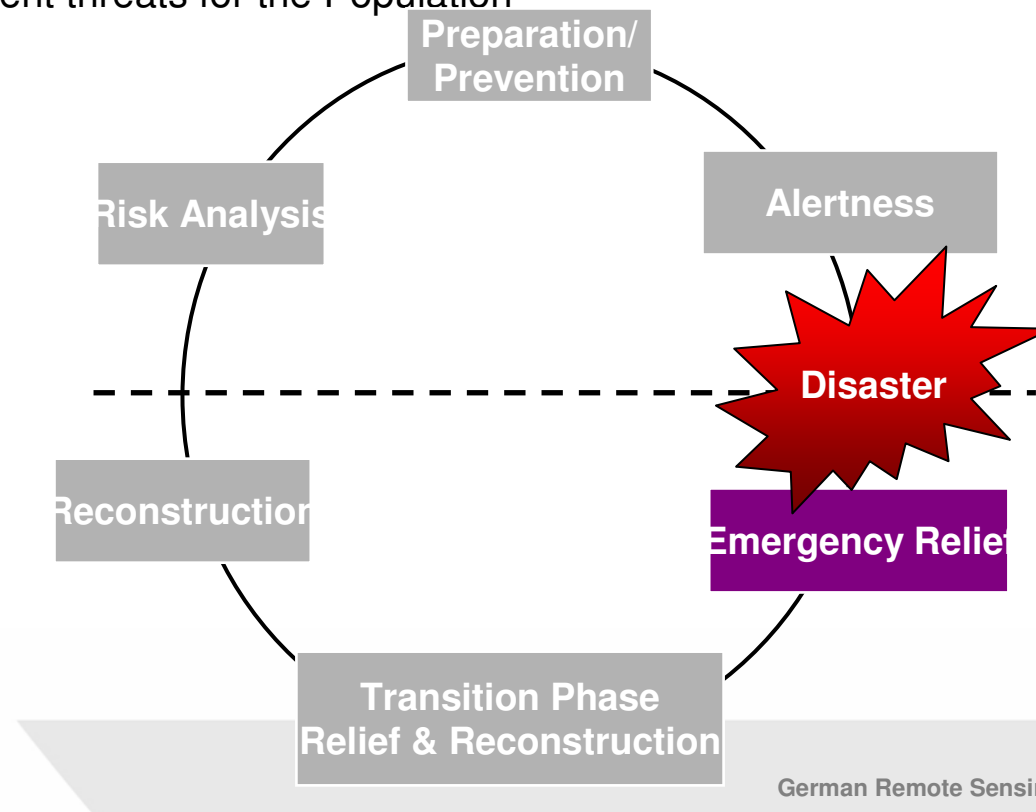
- *Rapid Mapping* -

Dr. Harald Mehl
23.04.2008, Mexico D.F.

Civil Security & Emergency Response

Rapid Mapping Demand for Information on

- Natural Disasters
- Humanitarian Relief Missions
- Immanent threats for the Population

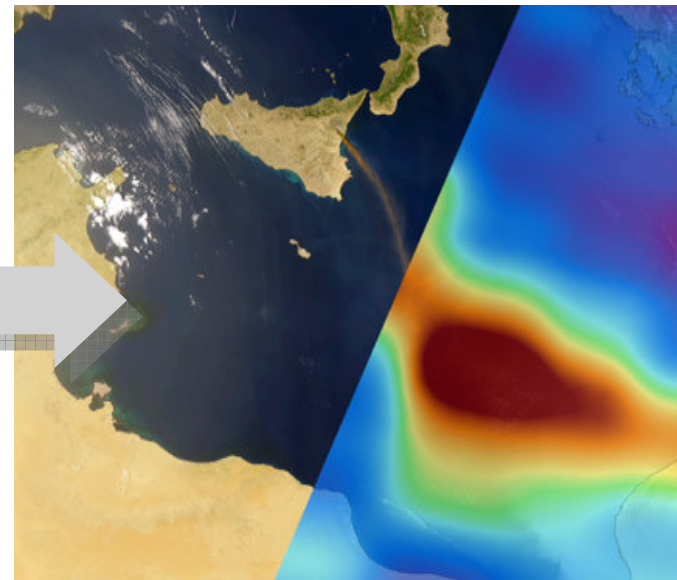




EO – Core Competences

➤ Ensure the access to earth observation data

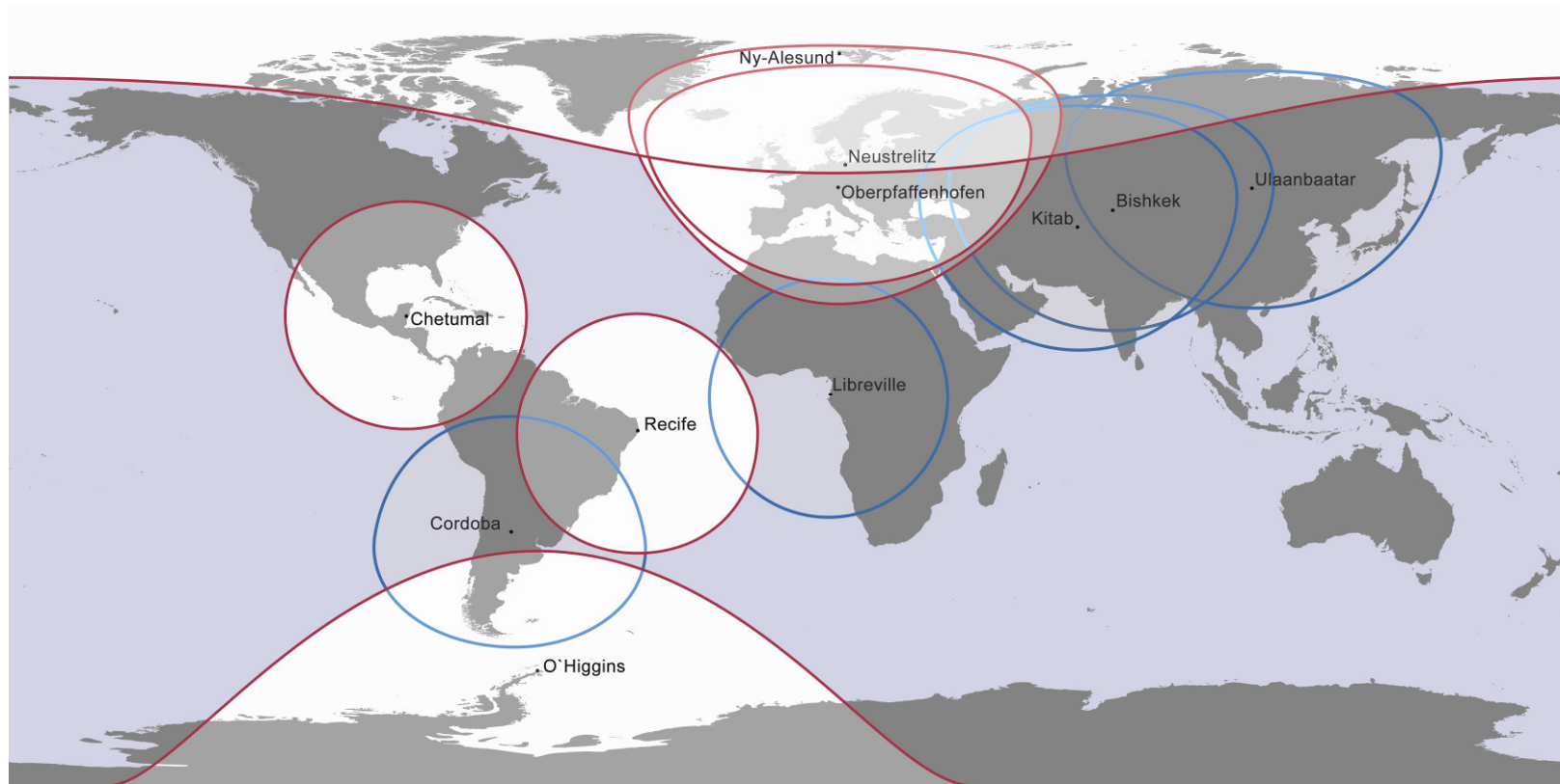
➤ Innovation in use of data thru development and operations of services



Payload Data Ground Segment

Applications and Services

DFD Payload Ground Segment: Station Network



Permanent

Neustrelitz (Germany)
Oberpfaffenhofen (Germany)

3 LSX-band 7.3 m, LS-band 4.0 m, VHF
 X-band 3.6 m, L-band 2.4 m, L-band 4.0 m
 X-band (5,6 m) on behalf of European Space Imaging
 LSX-band 9.0 m
 LSX-band 9.0 m
 X-band 4.0 m
 L-band 0.9 m

Transportable Mobile

O'Higgins (Antarctic)
Chetumal (Mexico)
Ny Álesund (with GFZ, Spitzbergen)
Recife (Brazil)

DFD Ground Segment Services

National contribution to GMES
Space Segment

➤ In Neustrelitz: services primarily for high data rate missions over Europe

- Champ, Grace, **BIRD**, *EnMAP* (national)
- ERS-1, ERS-2, Envisat (national)
- Koronas-F (national), Maroc/Tubsat (national)
- TerraSAR-X, *TanDEM-X* (national/Infoterra)
- **IRS-1C/IRS-1D** (Euromap), **IRS-P3** (Euromap, national)
- **IRS-P6** (ResourceSat), **IRS-P5** (CartoSat) (Euromap)
- Orbview-2 (Orbimage)
- *ALOS* (comm. ESA-Earthnet)
- Landsat-7 (ESA-Earthnet)

➤ In Oberpfaffenhofen: primarily for low data rate missions and PAF/PAC functions

- NOAA, *Metop* (national)
- Meteosat, MSG (national)
- Oceansat-1 (IRS-P4) (national)
- ERS, Envisat PAF/PAC (ESA)
- Terra, Aqua (national, ESA)
- IKONOS ROC (European Space Imaging)

➤ International stations network: for missions and commercial customers

- ERS-2, Landsat-5/7, **IRS-1C/D**, NOAA, Champ, BIRD, Terra, Aqua, Envisat



TerraSAR-X – First German SAR Satellite

Launch: June 15, 2007

First Image: June 19, 2007

Orbit: 514 km

Spat. Res.: down to 1 m

- Approved formation flight with TanDEM-X
- Mission control, data acquisition, processing and distribution from DLR institutes in Oberpfaffenhofen
- Scientific coordination and applications: DLR-DFD
- Commercial distribution: Astrium/InfoTerra
- Contribution to GMES

Linking Space Technology and Disaster Management



Technical Expertise

Data
Reception

Data
Archiving

Data
Management

Applications Competence

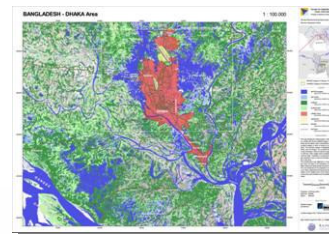
Environment &
Geoinformation

Crisis
Informationen



- **Political Decision Makers**
- **Situation Centres**

- **Relief Organisations**
- **Public**



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German Remote Sensing Data Center (DFD)

Responsibilities and Tasks of the ZKI

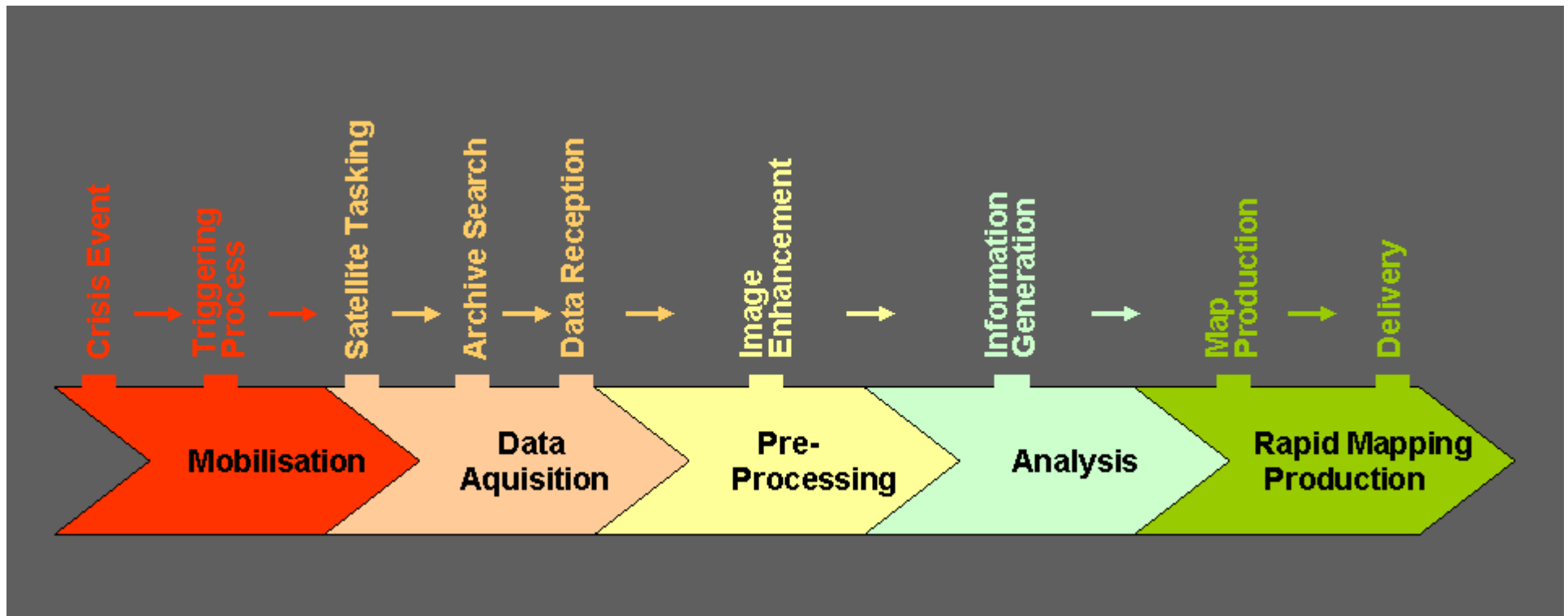
- **Provision and acquisition of satellite based crisis information**
 - **Basic maps and assessment maps (emergency mapping)**
 - **Rapid generation of customized information products in case of natural and environmental disasters**
- **24 hours/7days duty in case of disaster**
- **Established contact points in Germany and Europe as well as in international institutions**





Rapid Mapping...how it works ...

Rapid Mapping workflow I



Mission of ZKI-Team

Rapid Mapping workflow (1/2)



What happened?

Where did it occur?

**Who is user of needed
information?**

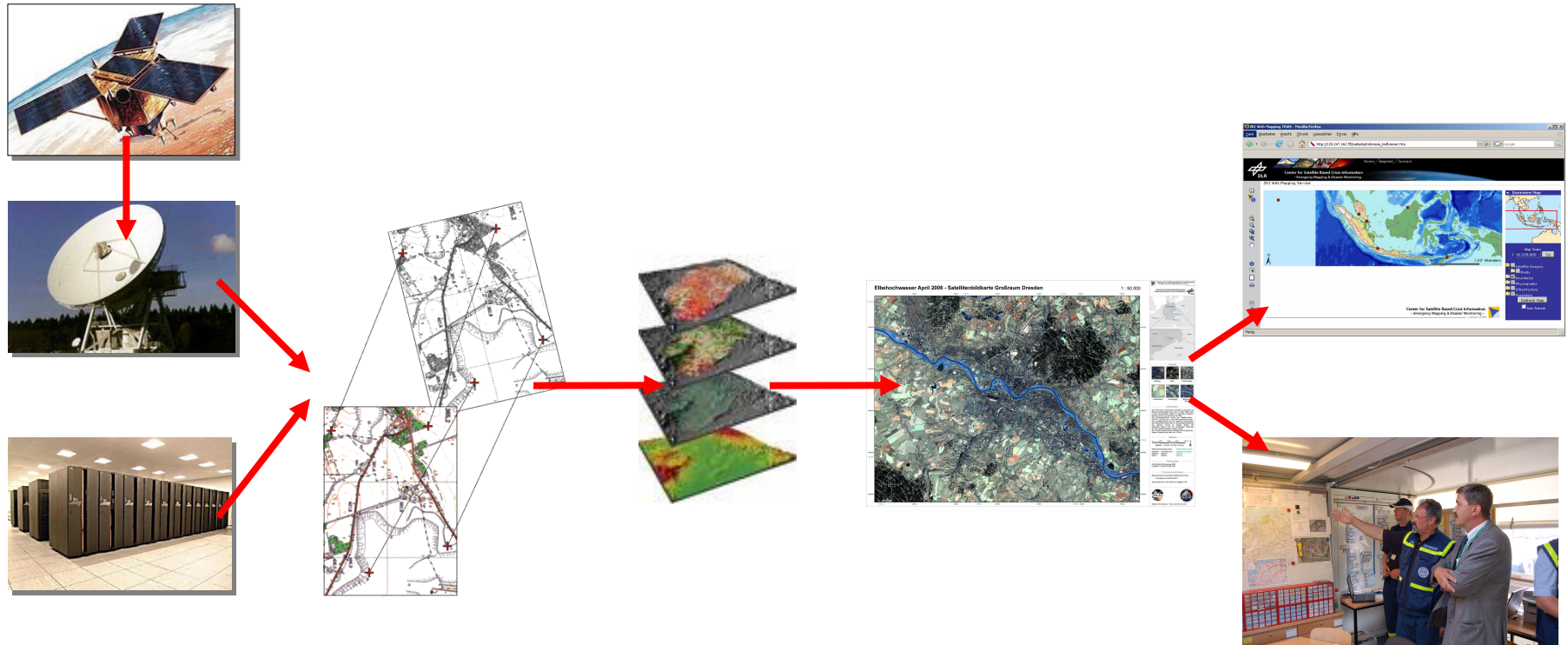
**Which satellite sensors
are qualified?**

**Who delivers the satellite
data?**

**Which analysis/crisis
information is needed?
[...]**

Mission of ZKI-Team

Rapid Mapping workflow (2/2)



**Data
acquisition**

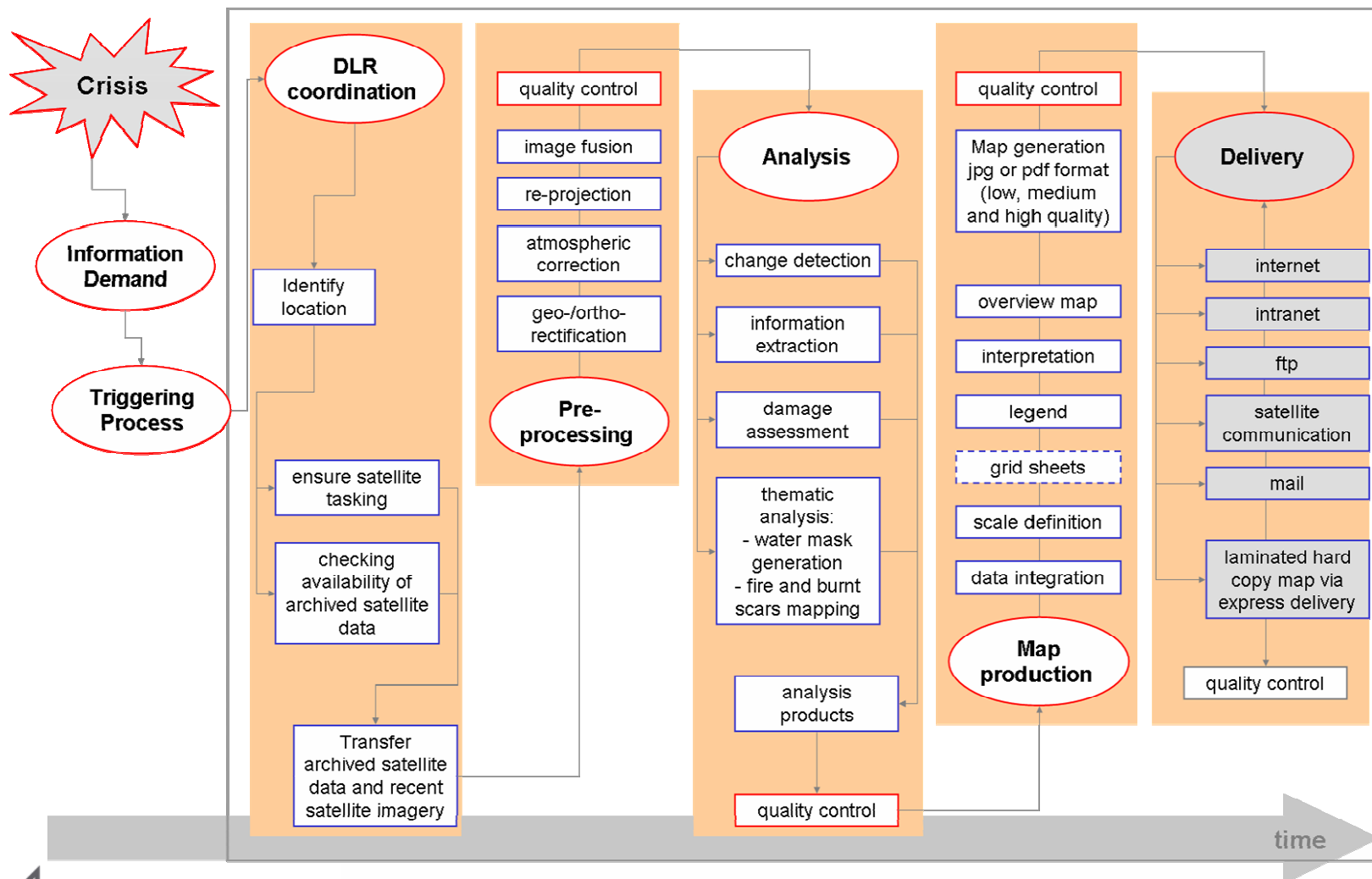
Data preprocessing

Data analysis

Map creation

Dissemination

Rapid Mapping workflow II





Rapid Mapping in the framework of the International Charter „Space & Major Disasters“



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International Charter “Space & Major Disasters”

Members:

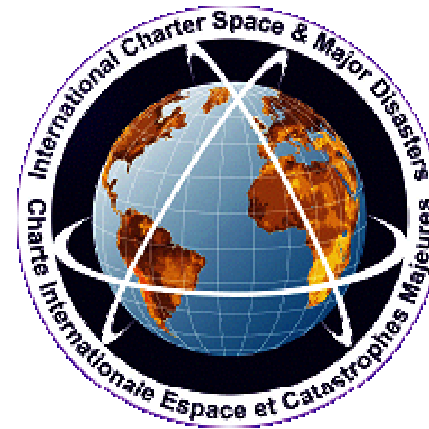
- Space Agencies
- Satellite Operators

Authorized User:

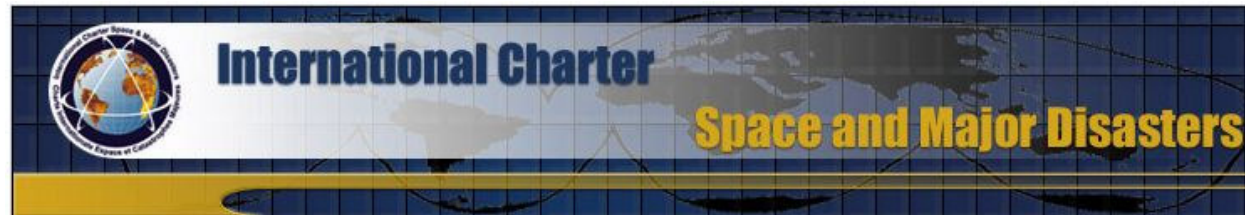
- Civil Protection & Relief Organisations
- Defence- & Security Institutions

Objectives:

- Provision of a unified system of space data acquisition and delivery to those affected by natural or man-made disasters through Authorized Users



Activations of the International Charter



www.disasterscharter.org

- Main
- Recent Activations
- The Charter
- Activating the Charter
- The Charter in Action
- Agencies - Resources
- News - Announcements
- The Charter for Schools
- Media Information
- Links
- Search
- English
- Français
- Español
- 日本語版

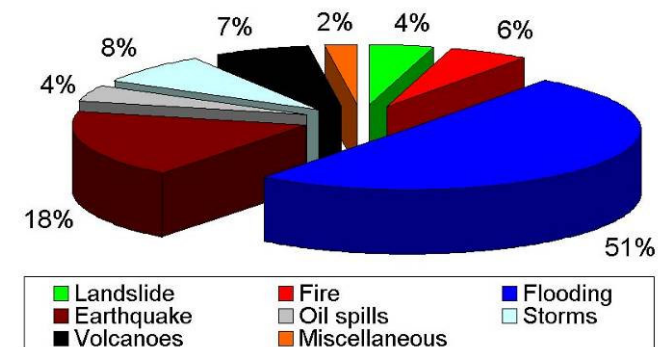
Recent Activations

[XML](#) [RSS](#)

20-03-2008	Flooding in the United States
14-03-2008	Flooding in Namibia and Angola
06-03-2008	Forest fires in Chile
26-02-2008	Flooding in Ecuador
08-02-2008	Tornadoes in the southeastern United States
05-02-2008	Earthquake in Rwanda
25-01-2008	Flooding in Bolivia
22-01-2008	Volcanic eruption in Ecuador
10-01-2008	Floods in southern Africa
12-12-2007	Oil spill in the North Sea
22-11-2007	Earthquake in Chile
16-11-2007	Floods and cyclone in Bangladesh
15-11-2007	Flooding in Vietnam
02-11-2007	Flooding in Mexico
30-10-2007	Flooding and hurricane in the Dominican Republic
24-10-2007	Fires in Southern California, USA
04-10-2007	Typhoon in Vietnam
21-09-2007	Floods and typhoon in North Korea
19-09-2007	Floods and landslides in Slovenia
14-09-2007	Flooding in West Africa

News and Announcements

Since 2000 the Charter has been **activated ?** about 200 times!



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Success only through Networks and Partnerships





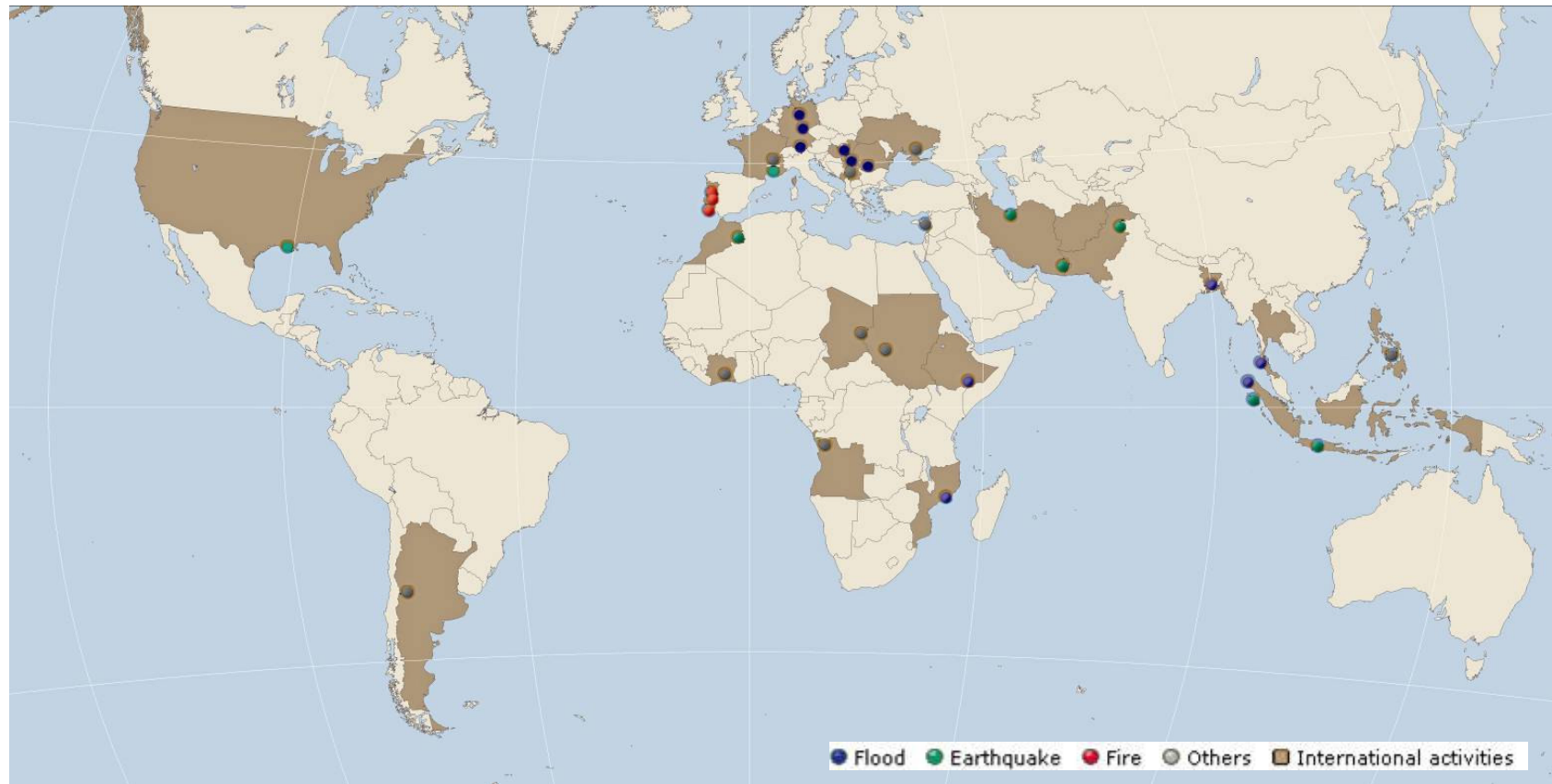
Examples for ZKI satellite-based Rapid Mapping



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ZKI - International Activities (more than 40 to date)





Floods

NAMIBIA - Omusati, Oshana, Oshana Region - Flood Extent March 22, 2008 - Sheet 3: Oshakati 1:50,000

Flood mask: TerraSAR-X ScanSAR Mode (Resolution: 16m)

Legend

- Flood Situation (March 22, 2008):**
 - Water surface (minimum area size 0.5 ha)
- Population:**
 - Town/Village
- Boundaries:**
 - Regions
- Infrastructure:**
 - Road

Interpretation

Heavy rain fall led to increased water levels and partially serious flooding situations in Northern Namibia and Angola's Southern province during February/March 2008. Many rivers and wetlands are deeply inundated with water, which caused serious damages to infrastructure and housing, and forced thousands of people to leave their homes. This map shows the flood situation in the Northern Omusati region on March 22, 2008. The water mask was generated from analysis of TerraSAR-X radar satellite imagery and shows only flooded areas with a minimum size of 0.5 ha. The results are superimposed on Landsat ETM satellite imagery from July 2000 and TerraSAR-X data from March 22, 2008.

Scale

Scale: 1:50,000 for DIN A1 printing

Reference coordinate system: UTM Zone 33 S
Projection: WGS 84
Spheroid: WGS 84
Datum: WGS 84

Data Sources

Vector data: © USGS
 LANDSAT-7 ETM © USGS 2000
 TerraSAR-X: © German Aerospace Center (DLR) 2008
 Commercial exploitation rights: www.dlr.de

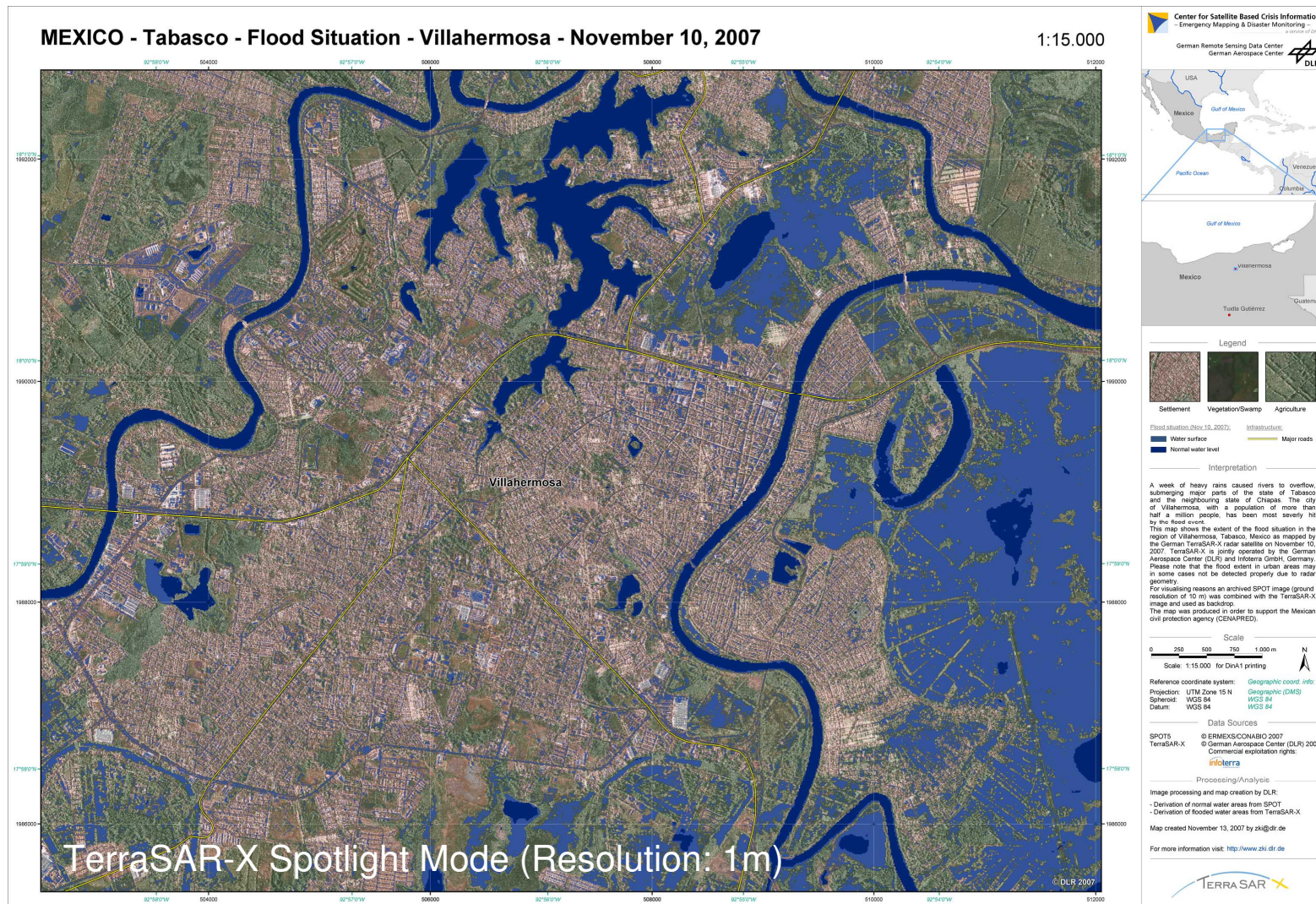
Processing/Analysis

Image processing and map creation by DLR
 - Derivation of flooded areas from TerraSAR-X
 - Roads digitized from LANDSAT-7 ETM imagery of 2000
 Map created: March 27, 2008 by ZH@DLR.DE
 For more information visit: <http://www.zku.de/de>

TERRA SAR X SAR-HQ

Glide No.: FL-2008-00004-NAM

Flood in Tabasco, Mexiko 2007





2 flood masks of the England flood, July 2007

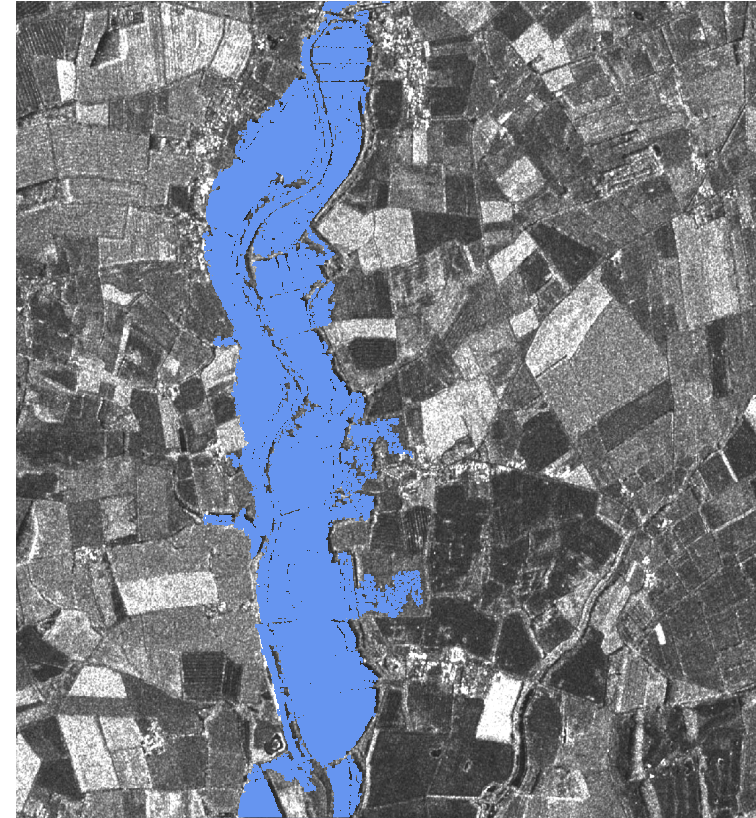
RADARSAT-1



12,5 m

spatial resolution

TerraSAR-X

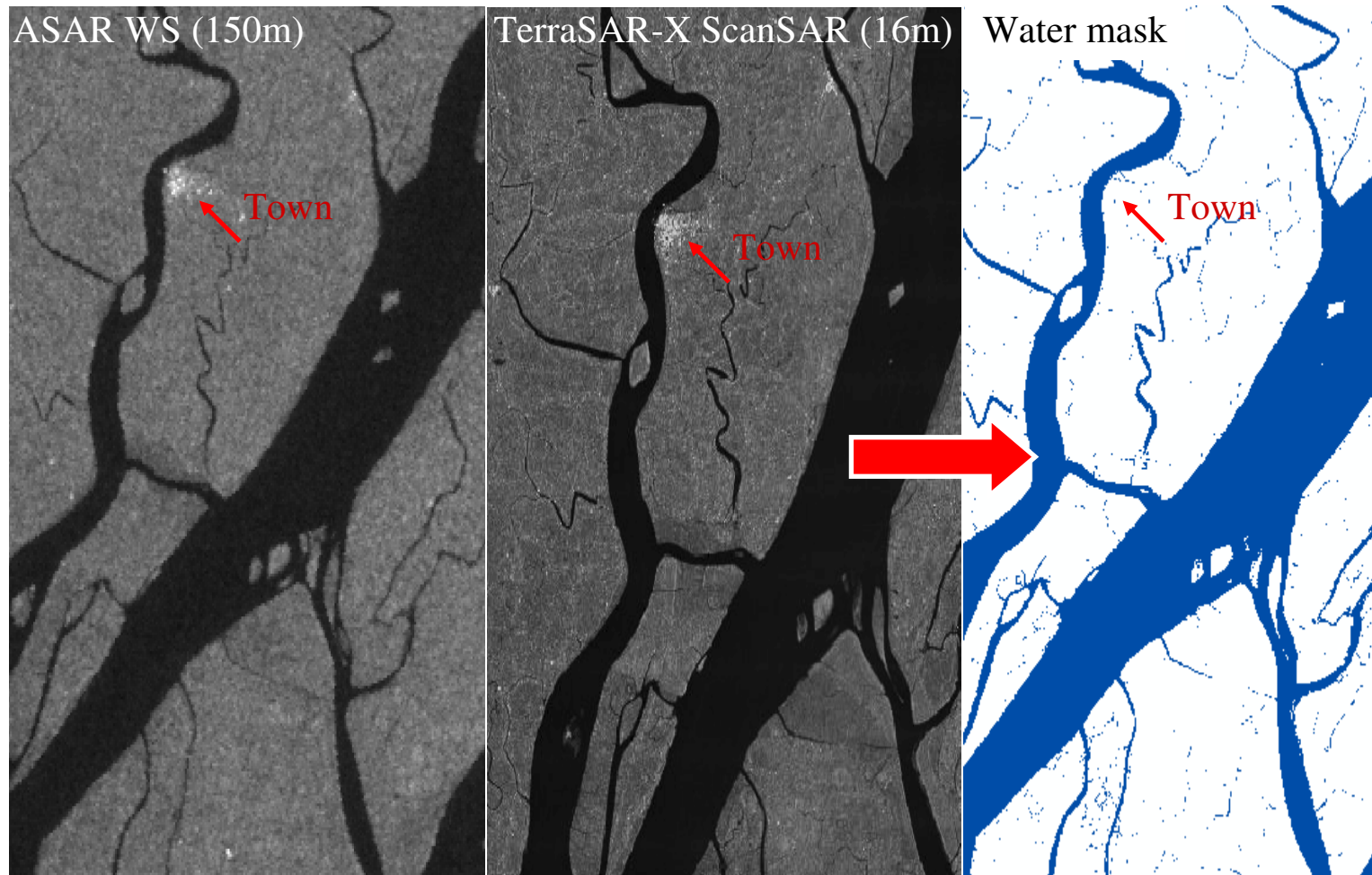


3m



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ASAR WS vs. TerraSAR-X (lowest resolution)



3 days after storm surge: hardly any flooding detectable as water has retreated



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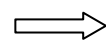


More detail, but still not enough information

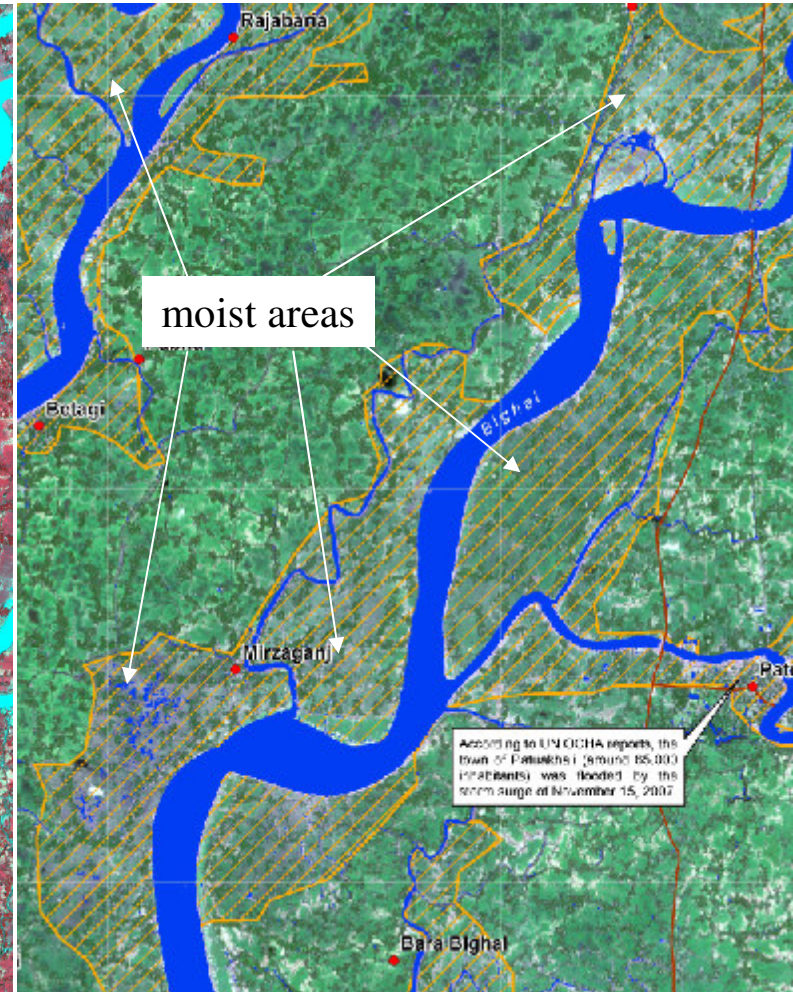
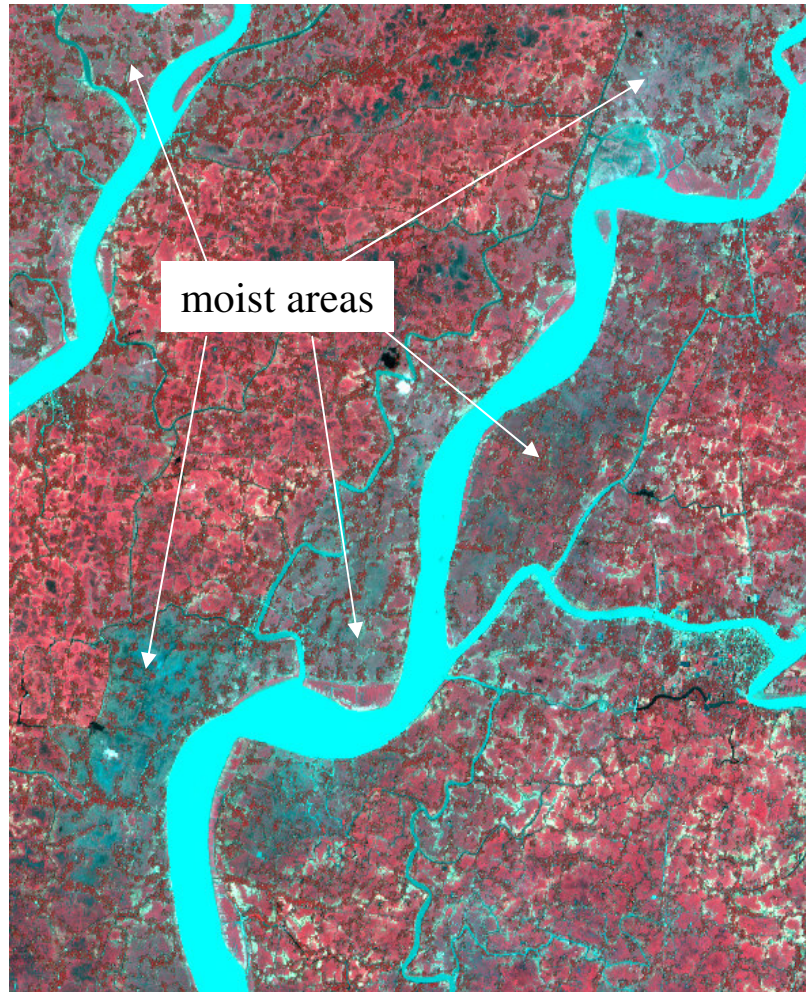
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Possible storm surge impact from optical MS data

SPOT4 (10m) NIR/SWIR



Map of possible storm surge impact



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Bangladesh 2007: Cyclone „Sidr“



Mapping with very high resolution data:

+ few damages caused by the storm surge are detectable (bridges, roads, pier)

- number of damages underestimated

- Spatial resolution is still not sufficient enough to detect condition of little (bamboo) huts.

- Limited coverage („Hotspots“ have to be known before data acquisition)

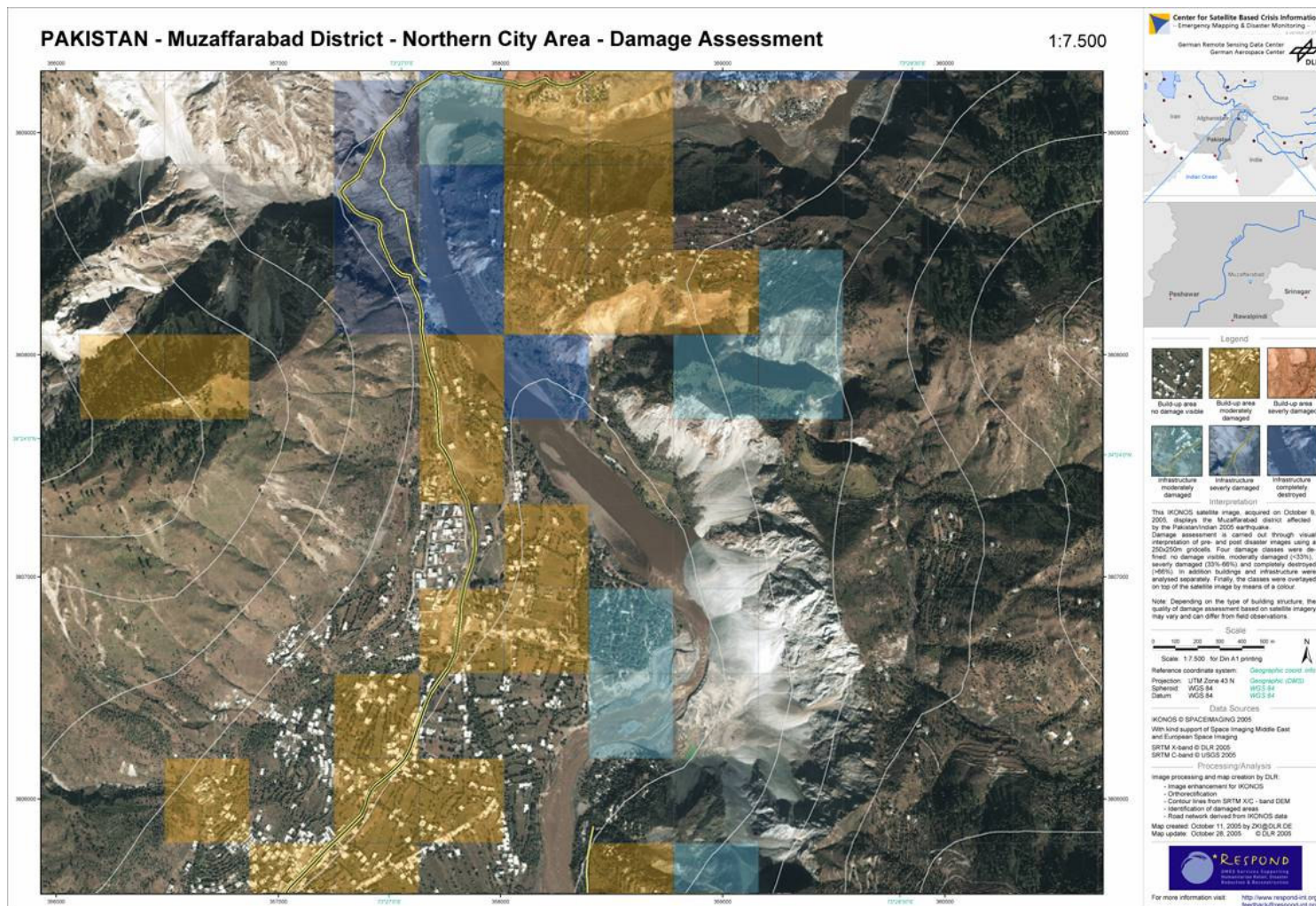


Earthquake



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Earthquake in Pakistan, 08th October 2005





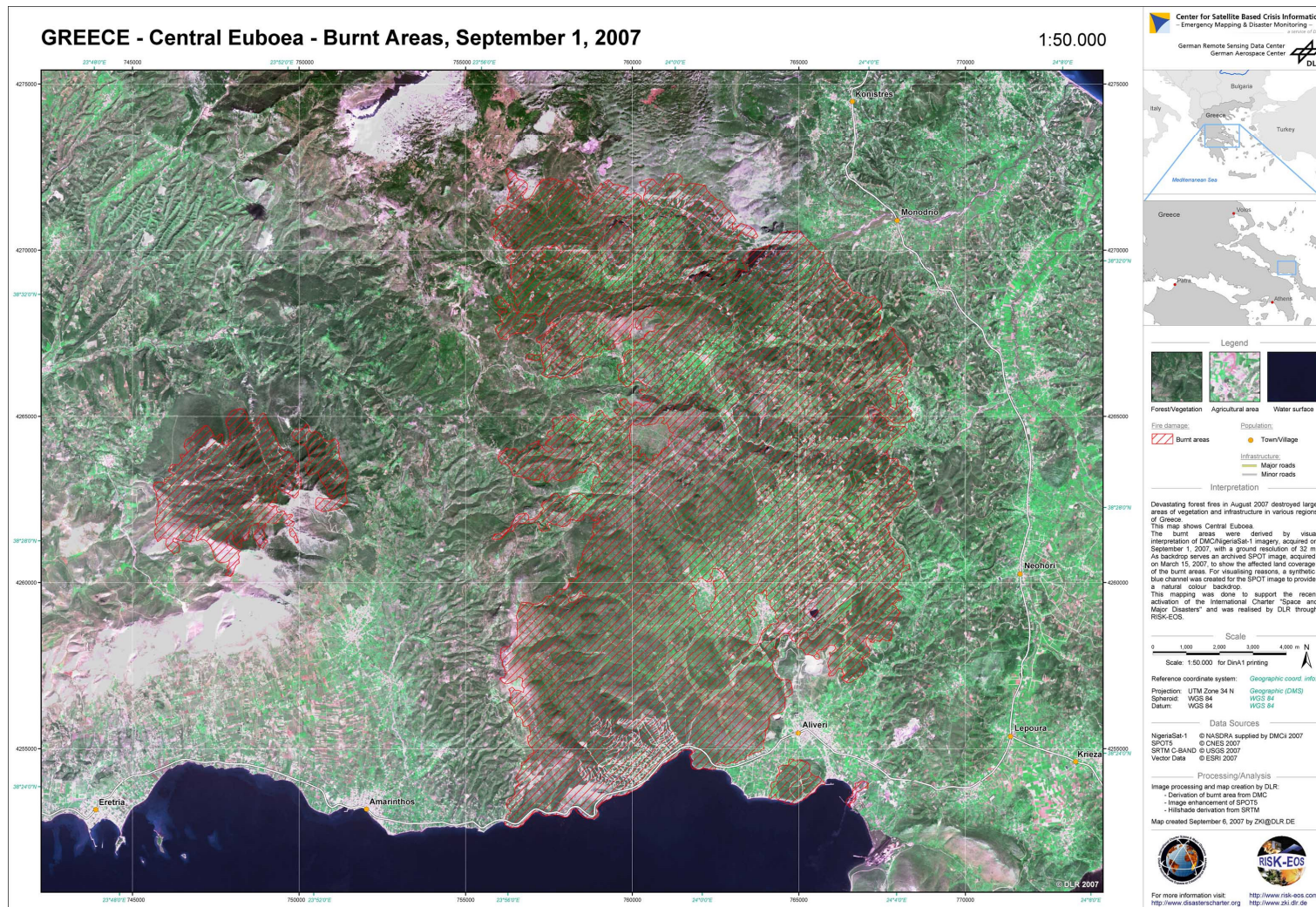


Fire

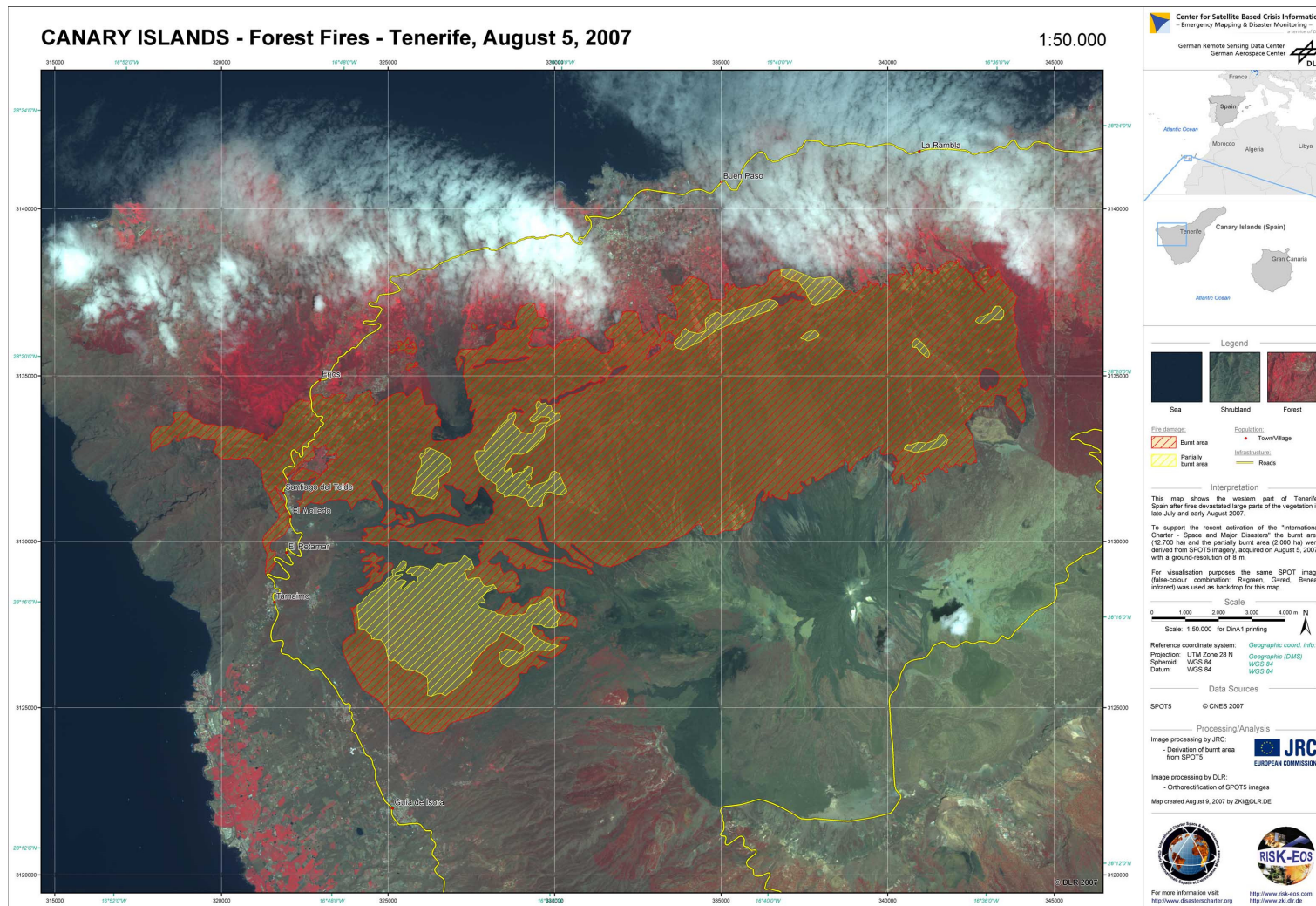


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Forest fires in Southern Europe, August 2007



Forest fires on the Canary Islands, August 2007



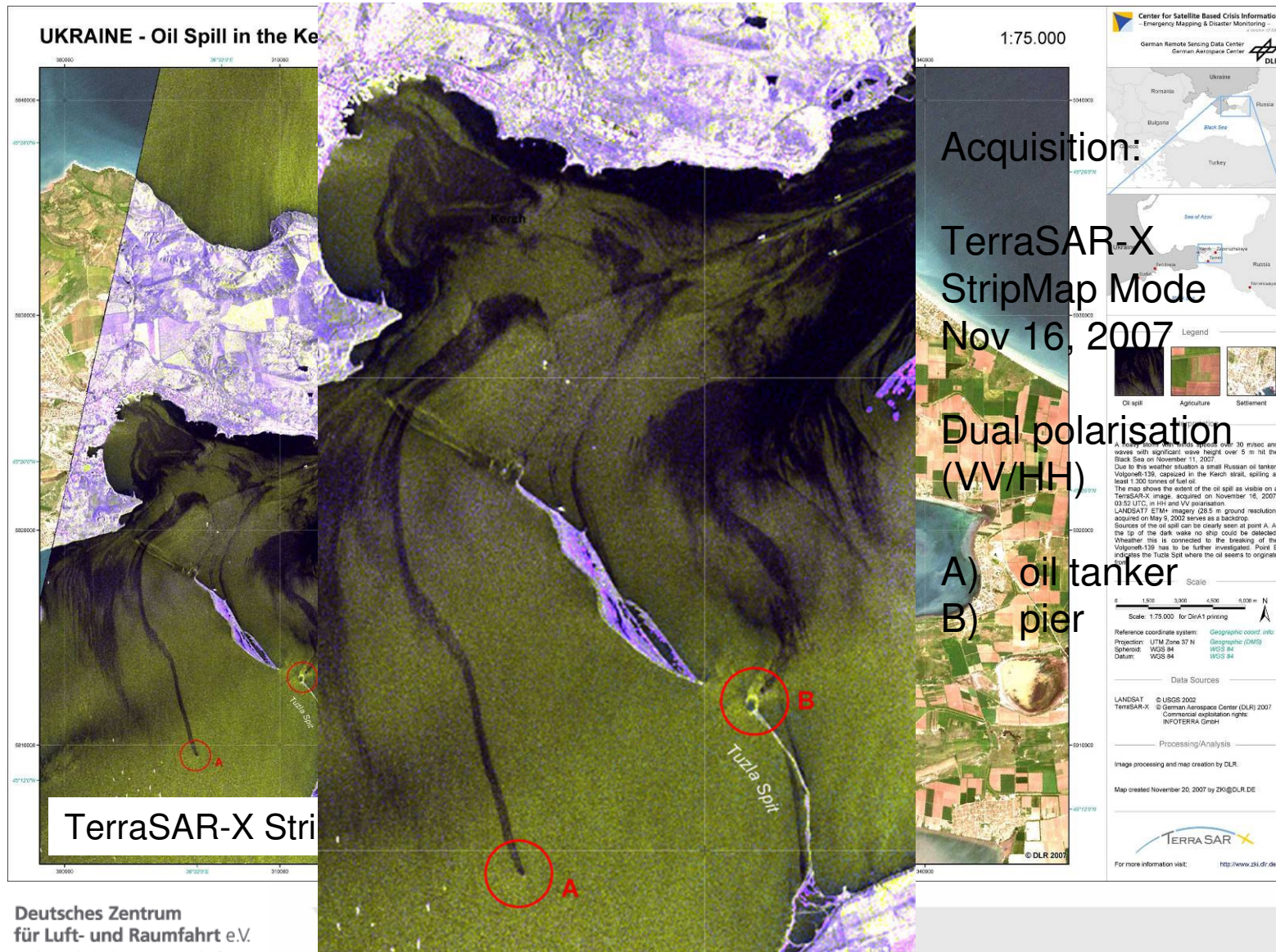


Other natural disasters or humanitarian crises

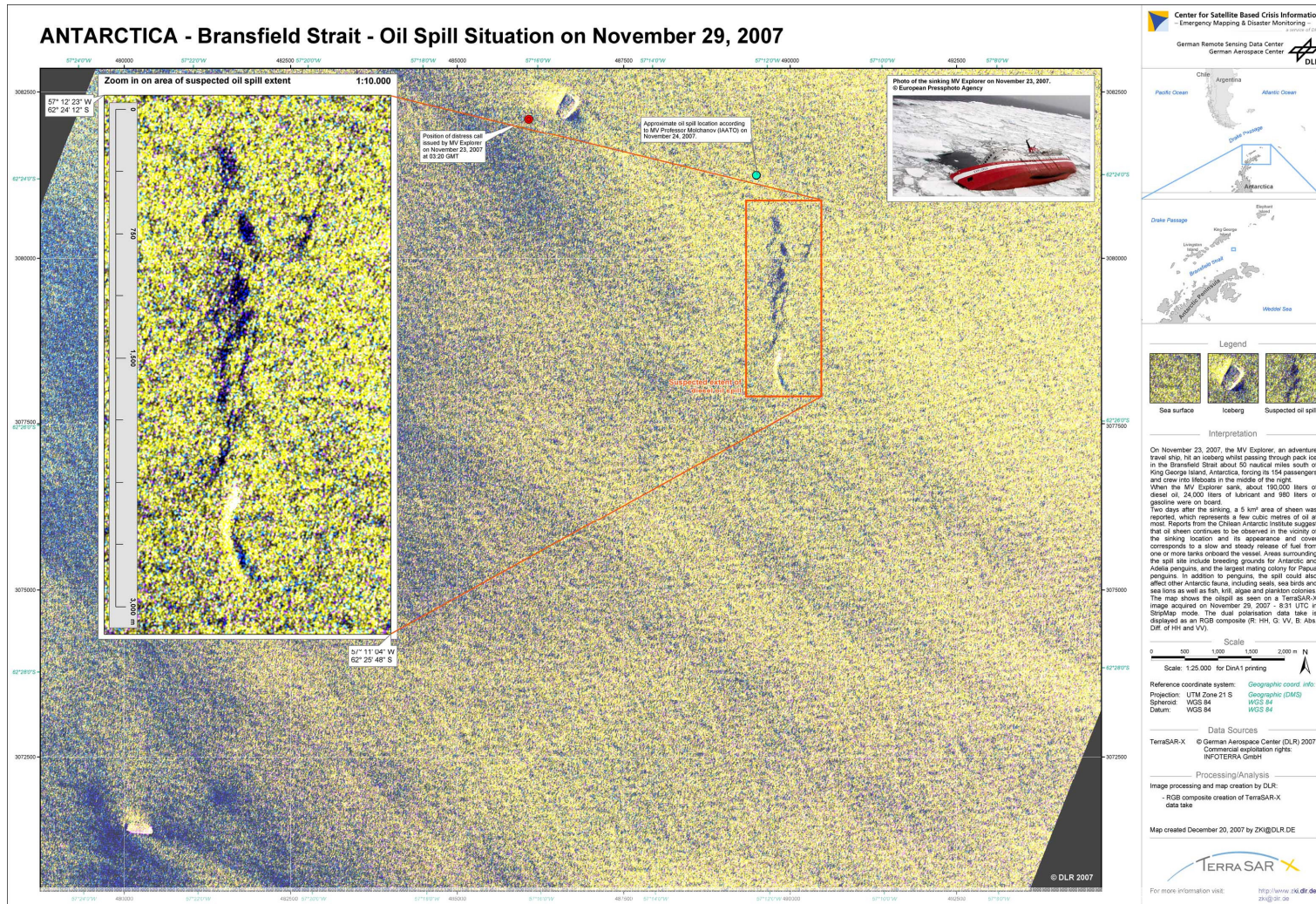


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Oil spill at the Kerch Strait between Ukraine and Russia



Oilspill Antarctica, November 2007



TerraSAR-X StripMap Mode (Resolution: 3m) in Dual Polarization (HH/VV)



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German Remote Sensing Data Center (DFD)



Train crash Ryongchon in North Korea, April 2004



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Summary & Outlook



Rapid Mapping Service of DLR ZKI

Summary

- Existing Service (24/7, world-wide)
- Freely available map products

Outlook

- Web-Mapping for individual mapping
- Development of a mobile crisis center
- Increasing the information content
- Better accuracy of the map products



Thank you for your attention !