



Remote Sensing Applications in Support of Sustainable Development and Disaster Management by DLR – Current Activities

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in der Helmholtz-Gemeinschaft

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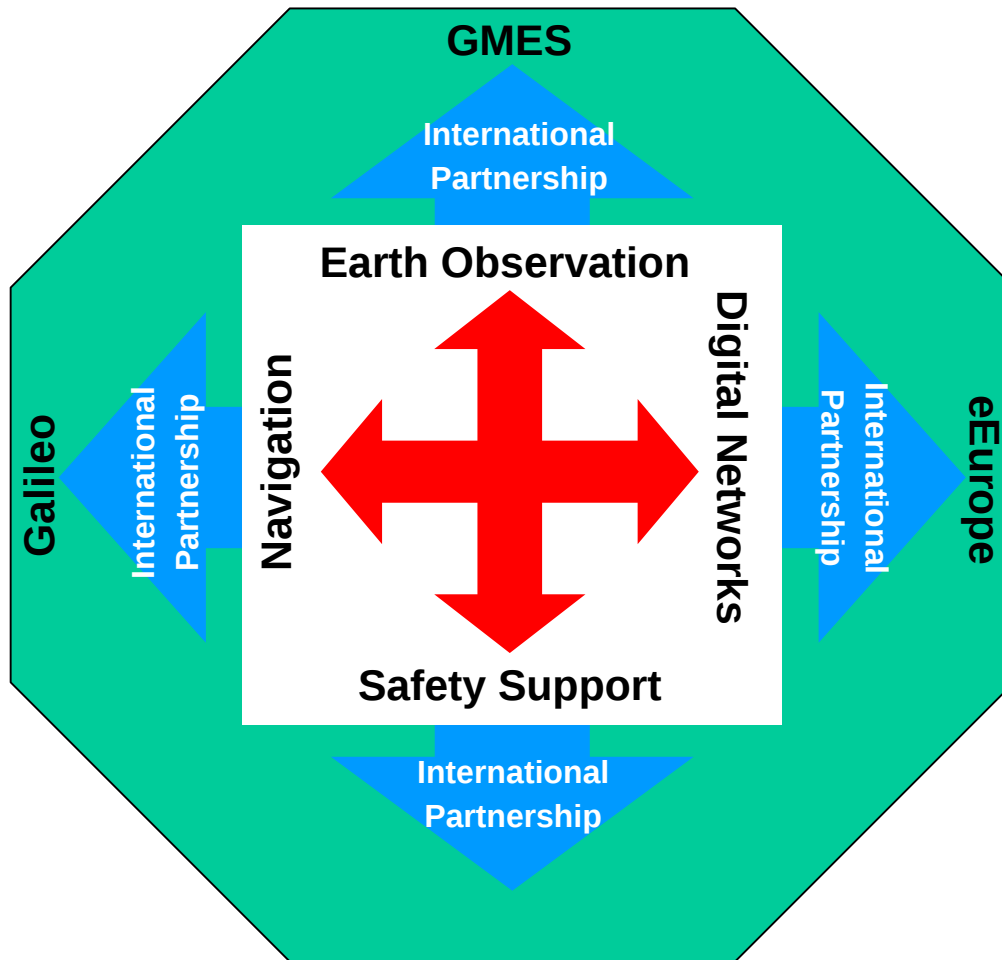
The European Perspective: GMES



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The EU Space Strategy



➤ **EU White Paper on Space:**
*“Space Actions in Support
of an Enlarged Union”*

- **Satellite Navigation**
- **Earth Monitoring**
- **Bridging the “digital divide”**
- **Crisis Monitoring and Safety Support**

Global Monitoring for Environment and Security



Stakeholders



EUMETSAT

GMES Components



Applications & Services



Space Segment



In Situ Systems



Ground Segment & Data Management

Implementation

- ESA GMES Service Elements
- EU Integrated Projects
- EU Fast track Services

- GMES Sentinels 1 - 5
- National Missions
- „3rd-Party“ Missions

- Terrestrial, Marine & Atmospheric Networks
- Airborne Sensors
- Socio-economic data

- Data Acquisitions
- Flight Operations
- Processing, Archiving & Distribution



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The German Remote Sensing Data Center



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DLR's Remote Sensing Data Center in Germany

- Founded in 1980
- 2 locations in Germany
- 150 staff
- Complete earth observation chain
 - Data acquisition
 - Processing
 - Archive
 - Distribution
 - Information extraction
 - Applications
- User oriented Services

... in Neustrelitz



... in Oberpfaffenhofen

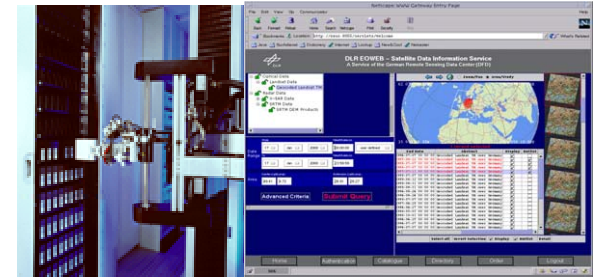
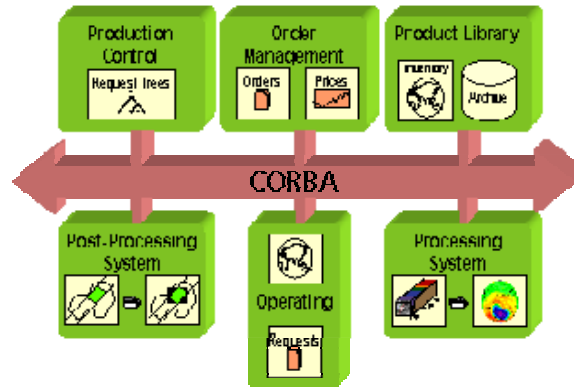


DFD Mission and Competence



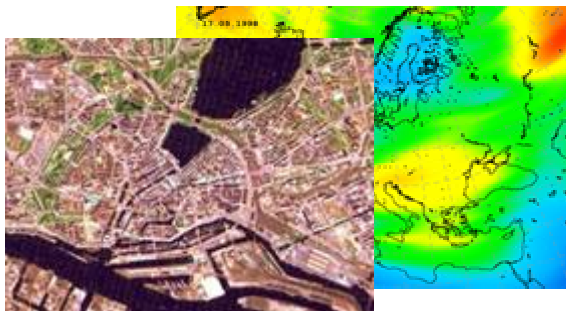
Data Acquisition

- National receiving center
- Mobile ground stations



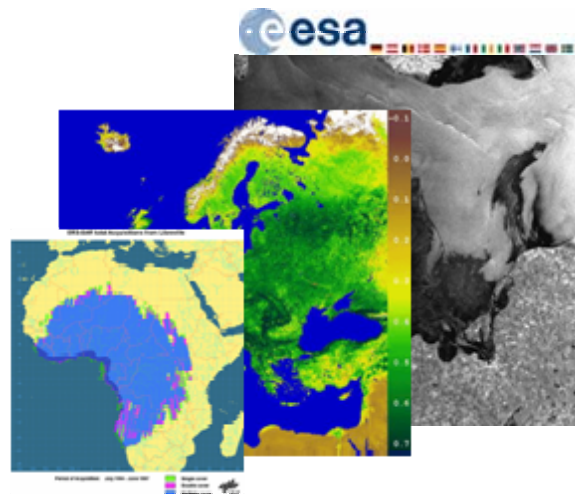
Information Technology

- National EO data library
- Online access via EOWEB



Applications and Services

- Pilot projects
- User services



Processing Facility

- Operational products
- Mission ground segment



Marketing and Media

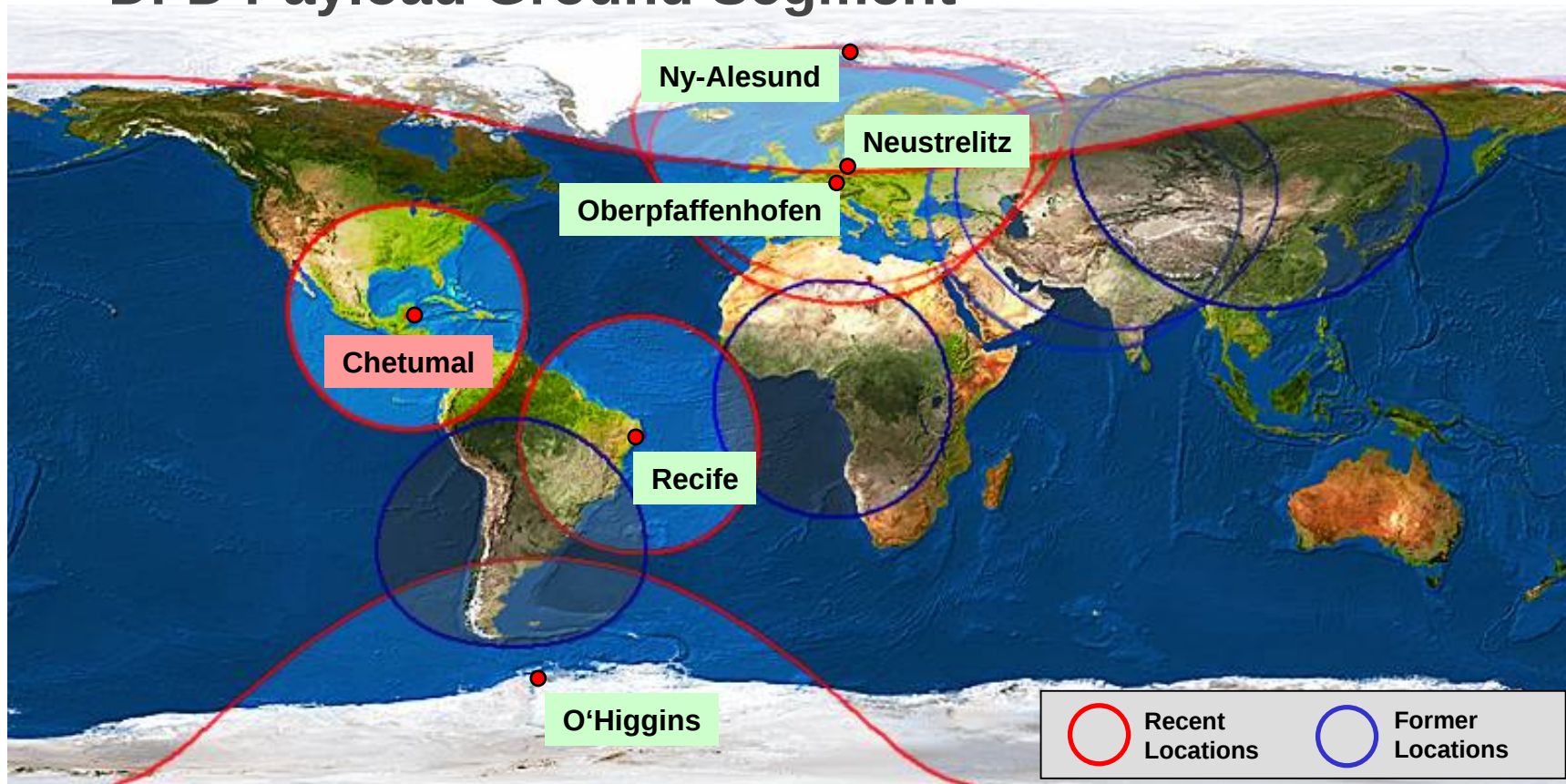
- Public outreach
- Computer animation



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DFD Payload Ground Segment



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

Transportable

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

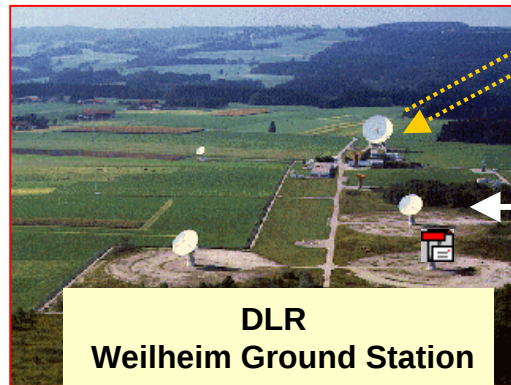
LSX-band 9.0 m
 LSX-band 9.0 m (in preparation, planned for 2006)
 X-band 4.0 m
 L-band 0.9 m



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EO Technologies, Infrastructure and Services in one Hand



**DLR Satellite Control and
Data Processing Center
in Oberpfaffenhofen**





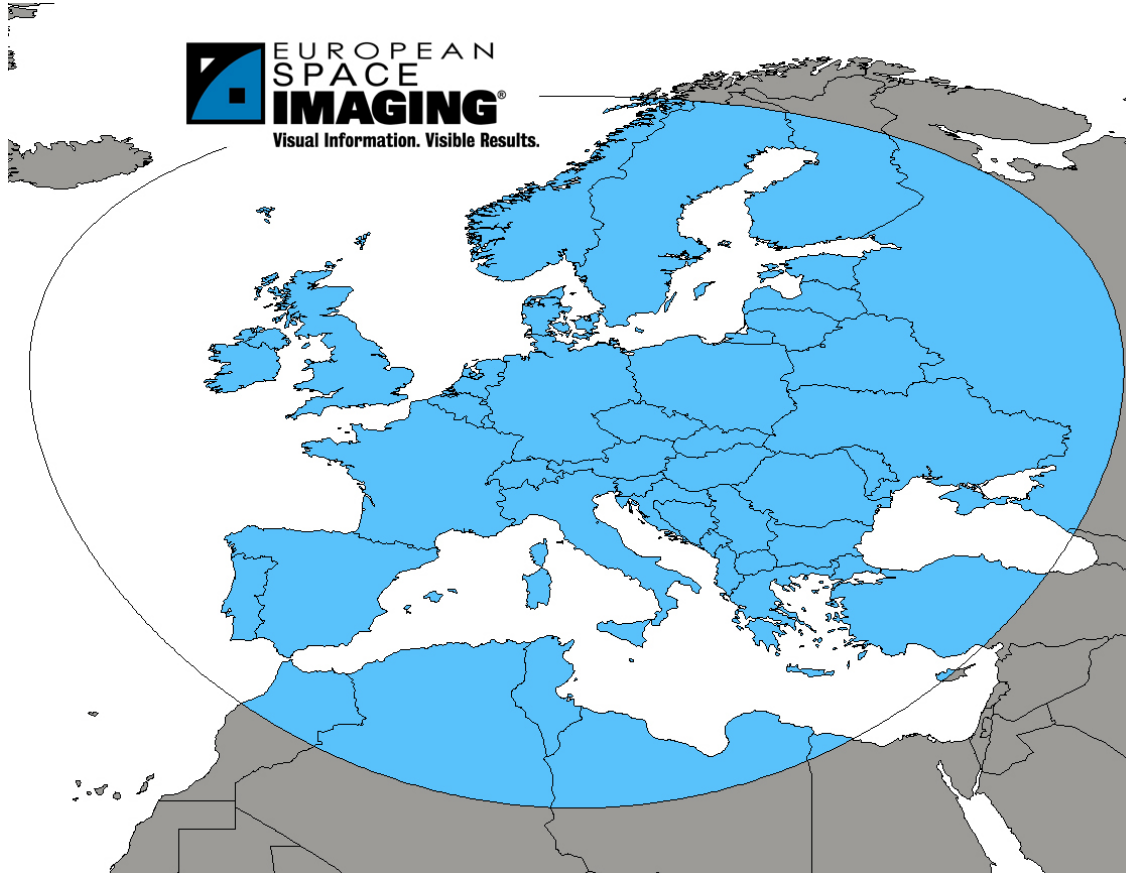
Contributions to Earth Observation Missions



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European Space Imaging



- Cooperation between DLR and European Space Imaging:
- Ground Station operated by DLR since 2003
- Data distribution by European Space Imaging



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TerraSAR-X: SAR Continuity in Germany



➤ Realization

- DLR / Astrium
- Public Private Partnership

➤ Prime Payload

- X-Band SAR
- Single and Dual Polarization

➤ Launch

- June 2006 by Dnepr-1

➤ Scientific Data Coordination

- DLR-DFD
- AO Programs, e.g. with ESA/Jaxa ALOS PalSAR

➤ International Ground Segment

- Licensing of Scientific and Commercial Direct Access Stations

➤ Exclusive Commercial Exploitation

- Infoterra GmbH, Friedrichshafen
- Value Added Data Products



RapidEye



R A P I D E Y E

➤ Owner

- Rapid Eye AG, Germany
- Public Private Partnership
(Private and public investors)

➤ Constellation

- Five microsattellites in constellation
- 3 orbital planes

➤ Launch date

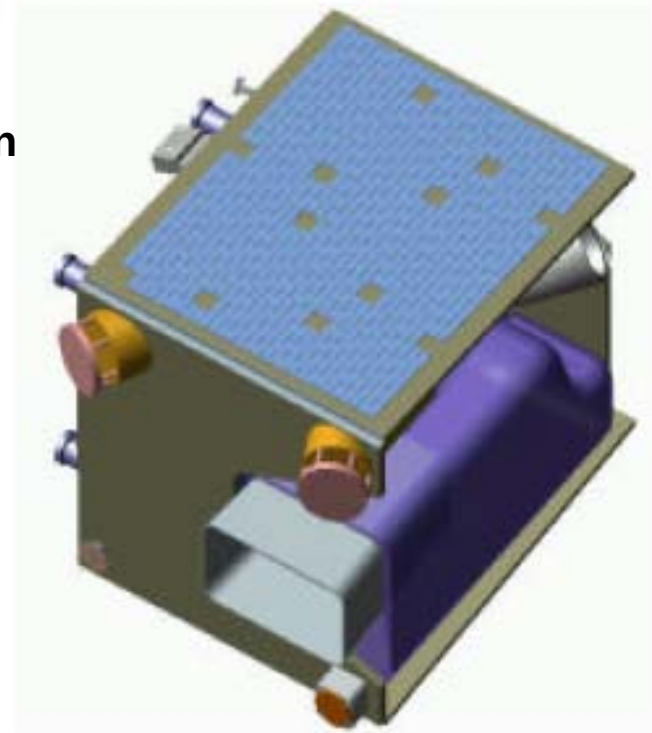
- 2007

➤ Prime instrument

- Optical 5 bands

➤ Resolution/swath

- 6,5 m / 80km





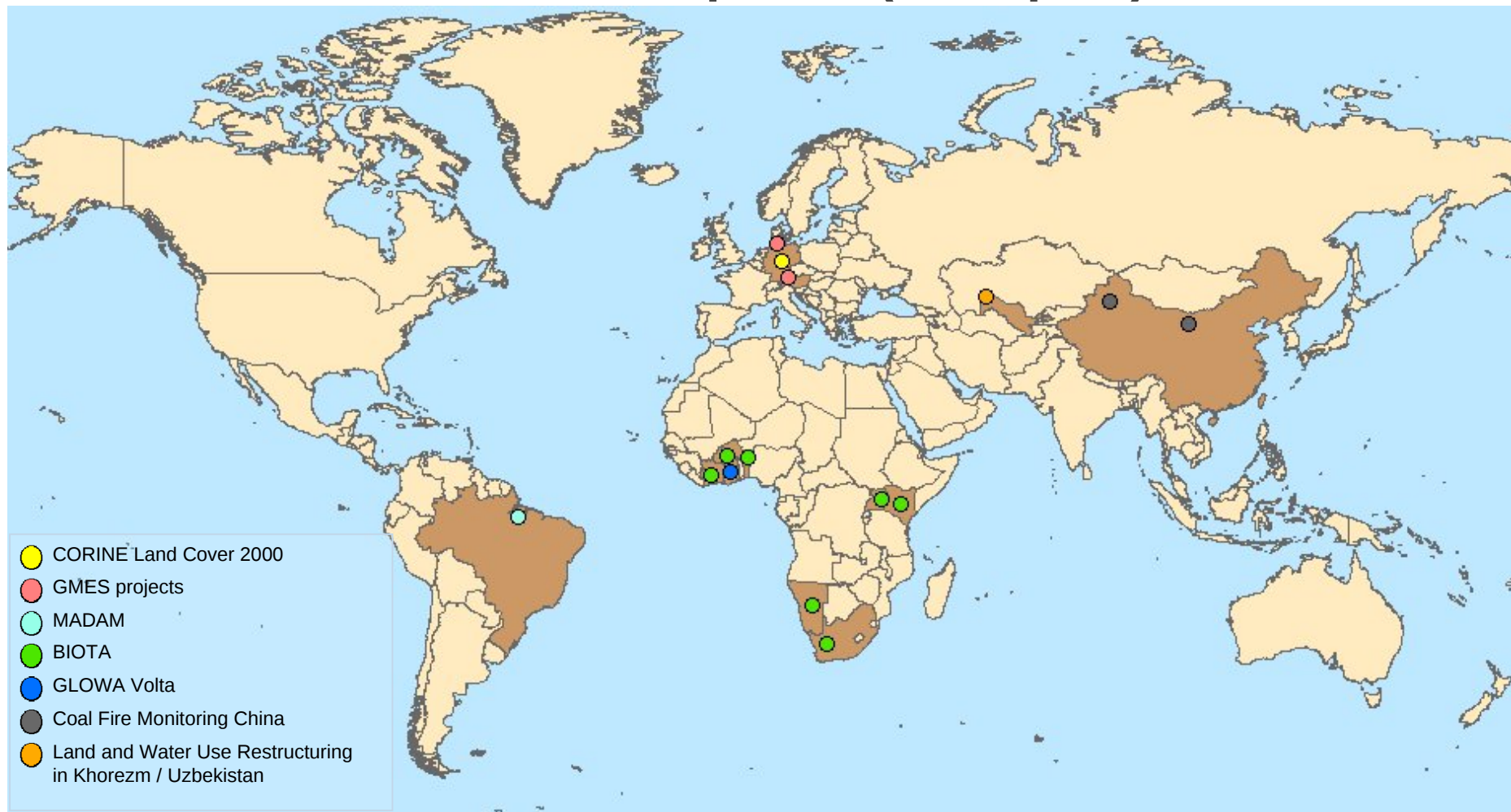
Earth Observation Applications for Sustainable Development



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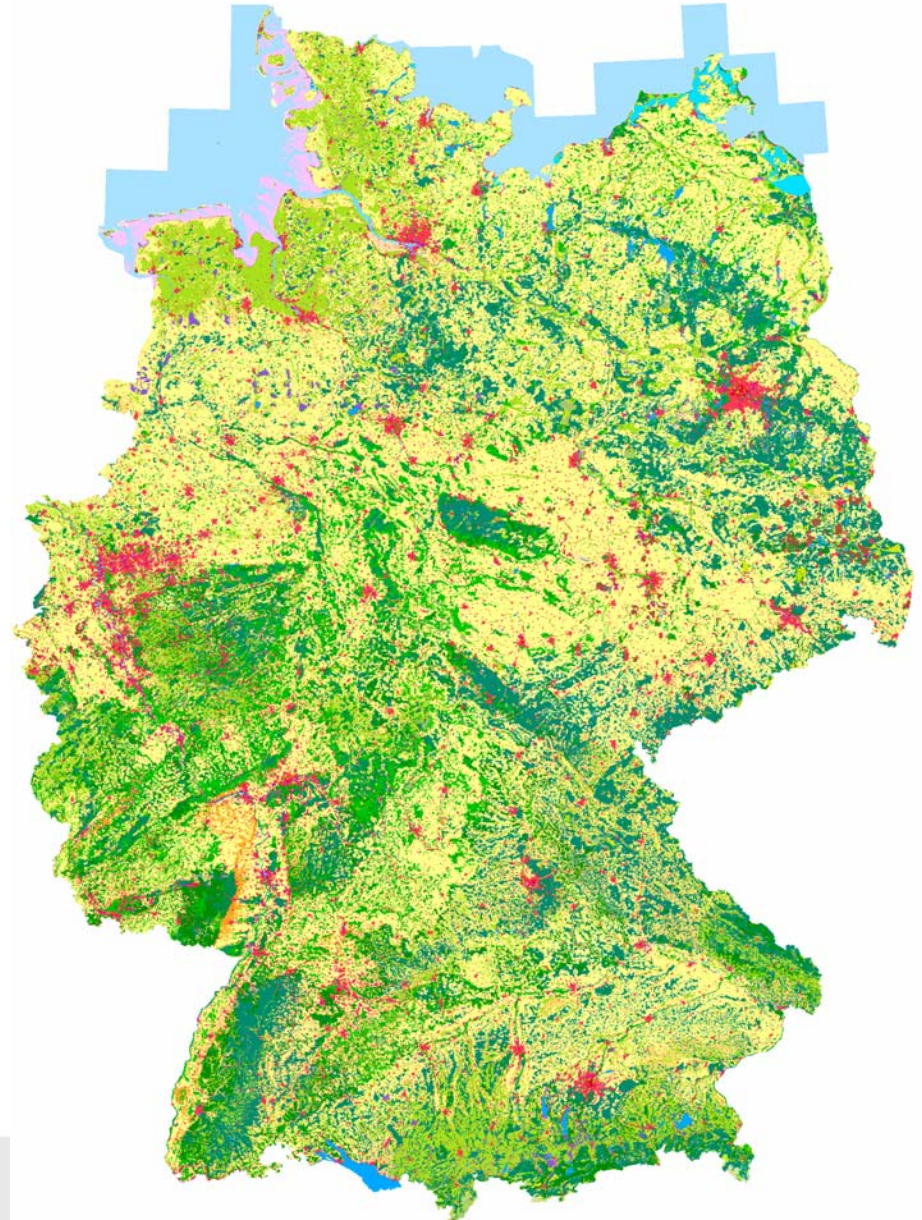
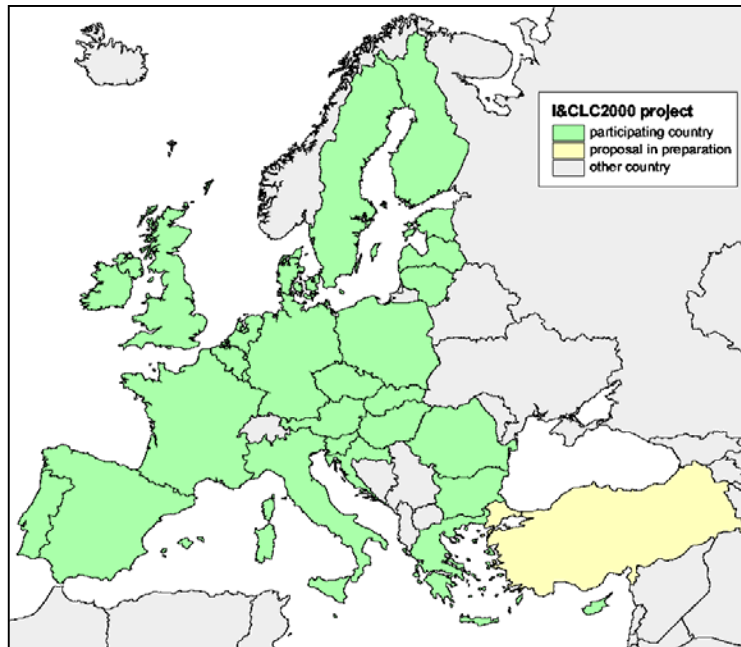
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Activities in support of environmental monitoring and sustainable development (examples)

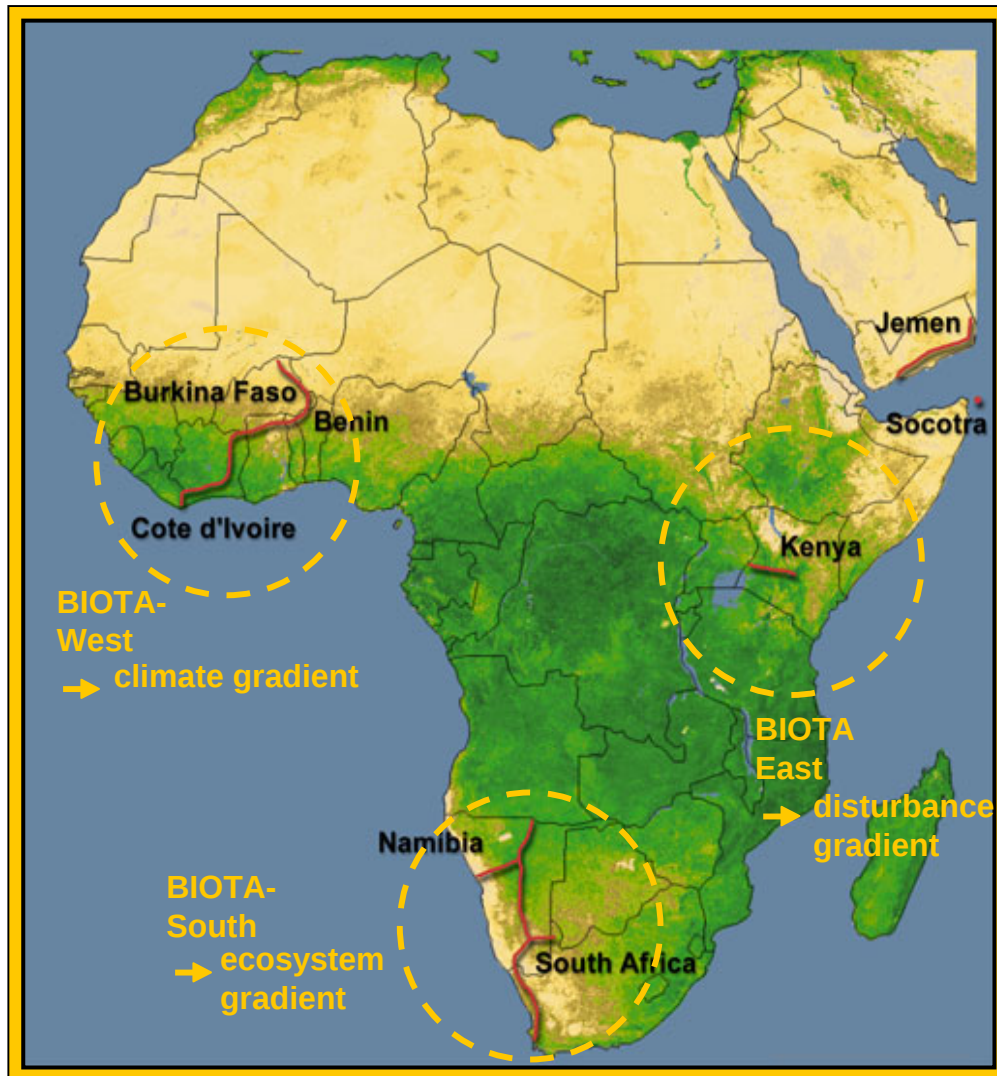


Land Use Mapping - CORINE Land Cover

- Creation of an updated data base on land cover (year 2000) and its changes (1990) based on a European wide harmonized method and nomenclature

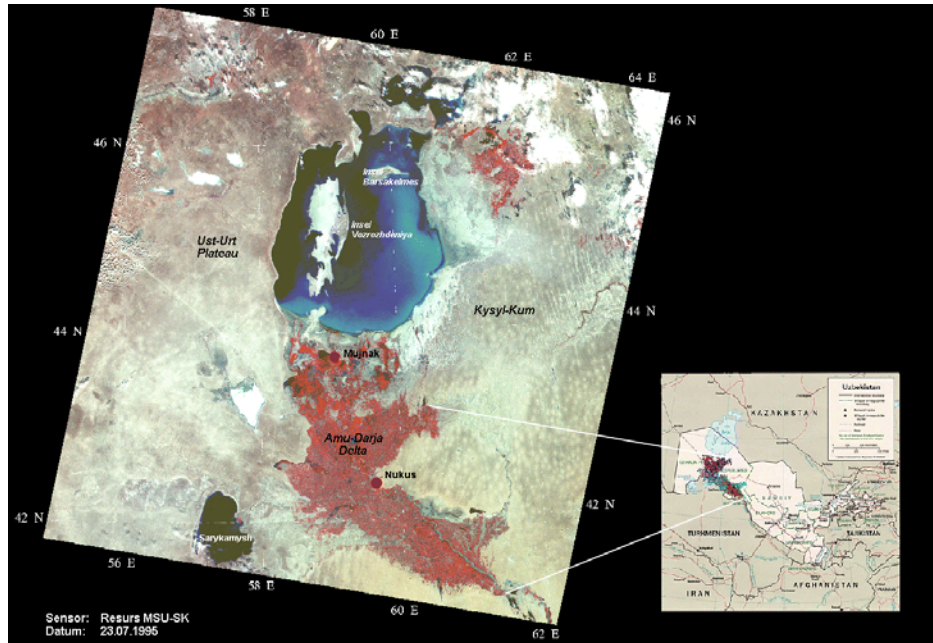


Biodiversity Research in Africa – Project BIOTA



- Analysis of Biodiversity Changes in Africa
- Integrated Research Project
- Funding: German Ministry for Education and Research (BMBF)
- German contribution to UN Convention on Biological Diversity (UNCBD)

Economic and ecological restructuring of Land- and Water Use in Khorezm (Uzbekistan)



Integrated research approach:

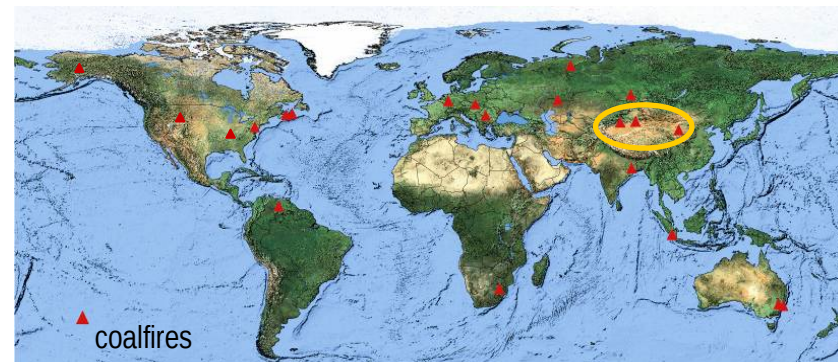
- Natural Resources Management
- Agricultural Production
- Economy
- Society and Institutions

Joint project:

- Center for Development Research, Bonn
- German Aerospace Center (DLR)
- Partner organizations in Uzbekistan
- UNESCO

Monitoring of underground Coal Fires in China

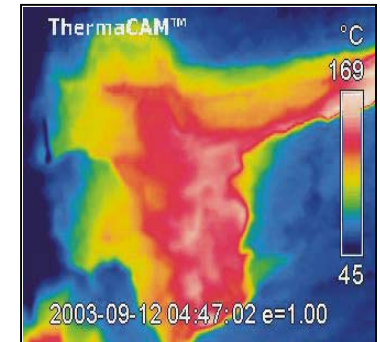
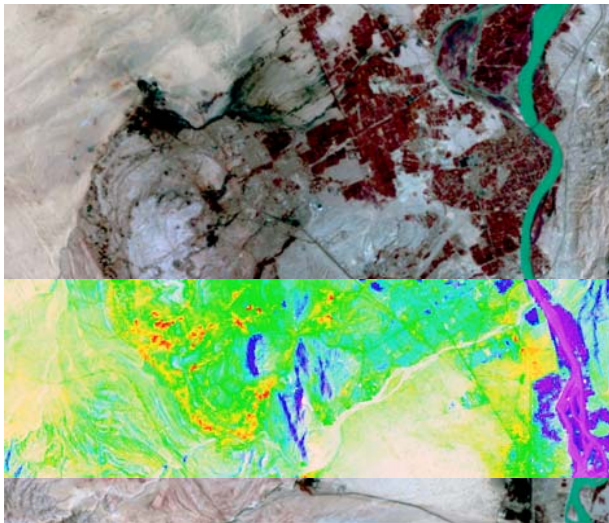
- Environmental Problems
 - Gas Emissions (CO₂, CO, CH₄)
 - Land subsidence and cracks
 - Threat to human health
 - Regional land degradation
- Economic Problems
 - In China: ~20 million t burn / year
 - Huge impact on mining activity
- Joint Chinese & German project



Monitoring of underground Coal Fires in China

Fire detection

Thermal IR



Validation in the field

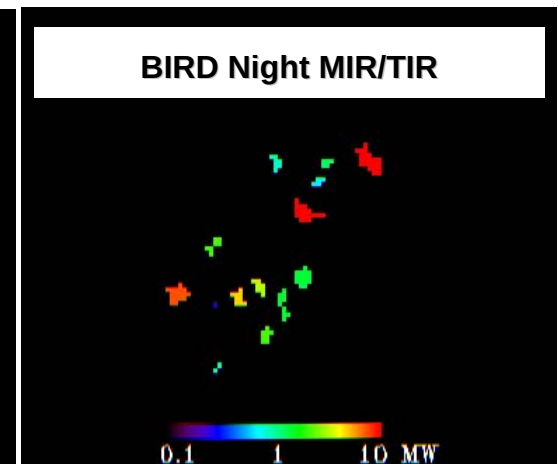
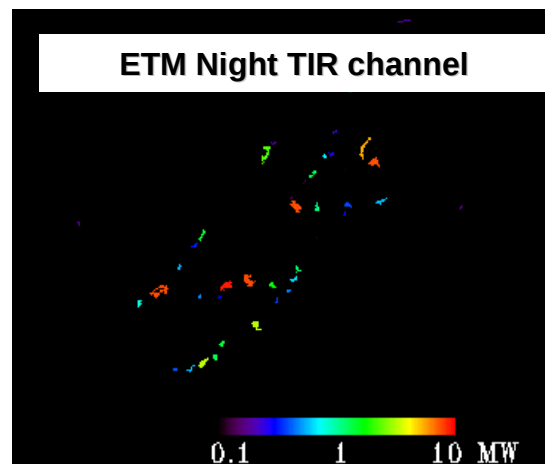
Thermal camera measurements of cracks
Coal fire mapping

Automated quantification

Coal fire temperature

Energy release in MW

115 MW / year for Ruqigou





Earth Observation Applications for Disaster Management and Humanitarian Relief



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“New Challenge” Civil Security

- **Increasing demand for timely information on the status of**
 - Natural disasters
 - Humanitarian relief
 - Immanent threats to populations
 - **Satellites providing information for**
 - Natural hazard prevention, early warning, mitigation
 - Vulnerability and risk analyses
 - Rapidly mapping & assessing the local emergency situation
 - Reconstruction activities
 - **Center for Satellite Based Crisis Information**
 - Emergency Mapping & Disaster Monitoring –
- a service of DFD*



Linking Space Technology and Disaster Management



Technical Expertise

Data
Reception

Data
Archiving

Data
Management

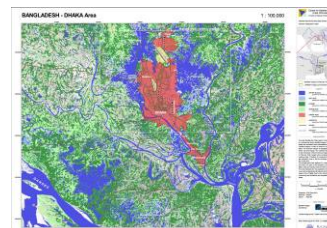
Applications Competence

Environment &
Geoinformation

Crisis
Information

- Political Decision Makers
 - Situation centres of national & internat. Authorities

- Relief Organisations
 - Public

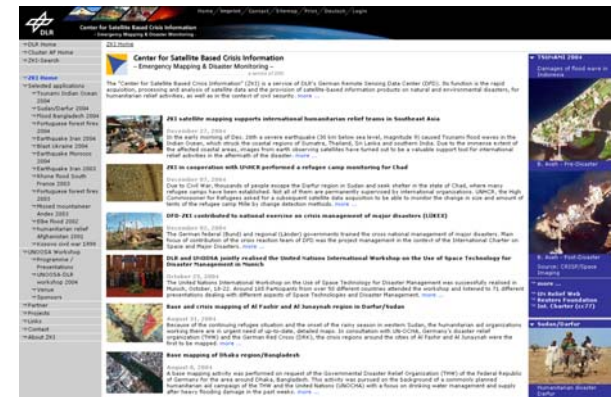




DLR Center for Satellite Based Crisis Information (ZKI)

➤ ZKI Activities in 2005-2006:

- Tsunami SO-Asia (Dec 2004 - 2005)
- Earthquake Nias/Indonesia (March 2005)
- Marburg-Virus Angola WHO (April 2005)
- Flooding in Ethiopia (May 2005)
- Flooding in Rumania (May 2005)
- Forest Fires in Portugal (Aug. 2005)
- Flooding in Southern Germany (Aug. 2005)
- Hurricane Katrina (Aug. 2005)
- Earthquake in Pakistan (Oct. 2005)
- Land slides in Philippines (Feb. 2006)
- **Generation of about 90 map products in 2005 („rapid mapping“)**

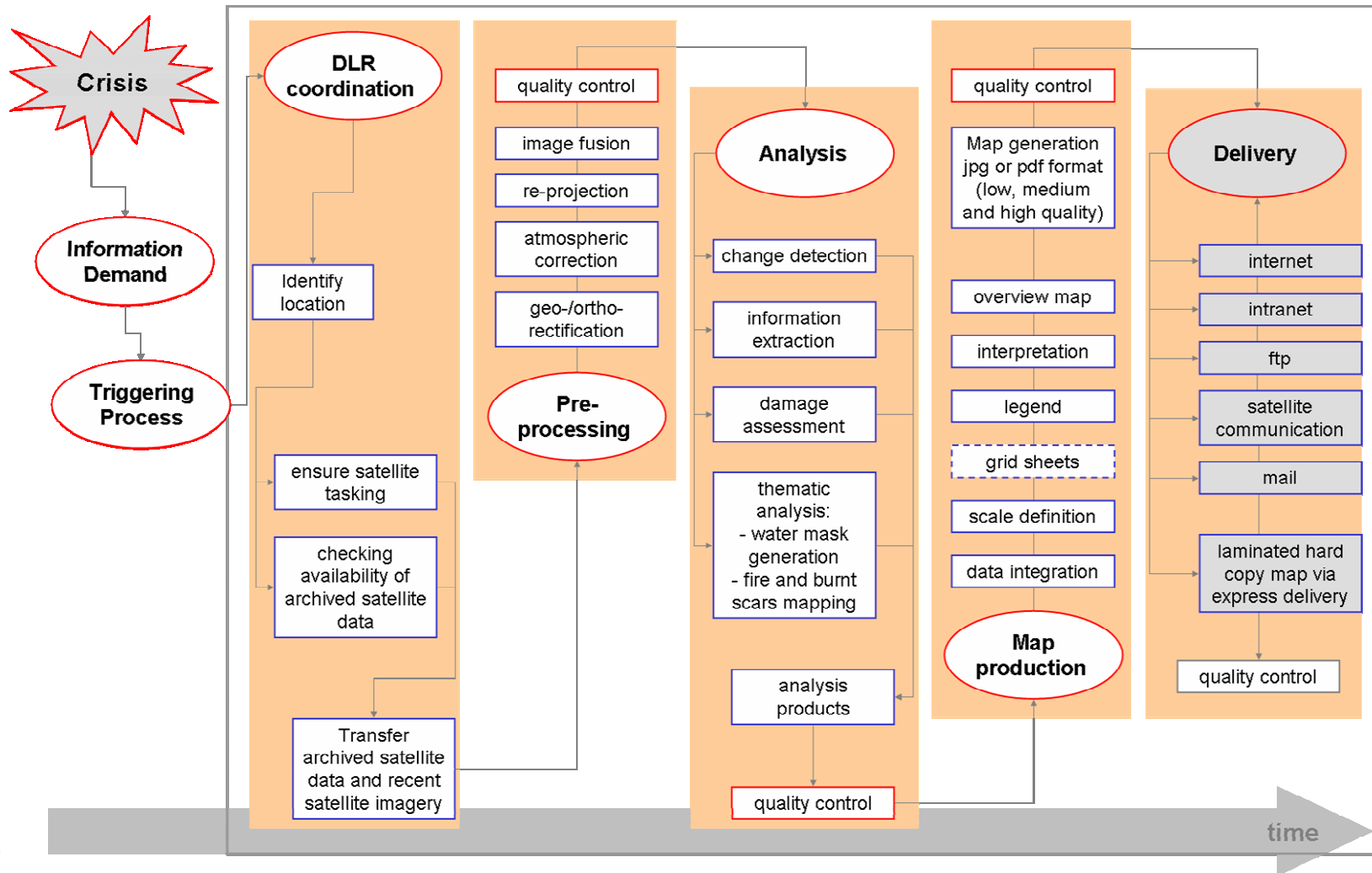


➤ Website Access:

- Data Download: ca. 750 GB per year (~ 2 GB per day)



RAPID MAPPING workflow



Tsunami 2004 – Northern Khao Lak Bay, Thailand



Tsunami 2004: ZKI's Immediate Response

➤ 26 Dec. 2004

- Alarm by automatic SMS
- Initial coordination

➤ 27 Dec. 2004

- First basic maps on-line
- Selection of priority crisis regions
- Specification of target coordinates

➤ Starting 28 Dec. 2004

- Analysis of satellite images
- Map production and delivery

➤ Regional focus

- Thailand (*Khao Lak*)
- Sumatra, Indonesia (*Banda Aceh*)

Over 40 Analysis Products and Maps in Two Weeks



Tsunami Early Warning and Mitigation System – German Contribution to IOTEWS



GFZ
POTSDAM



AWIO

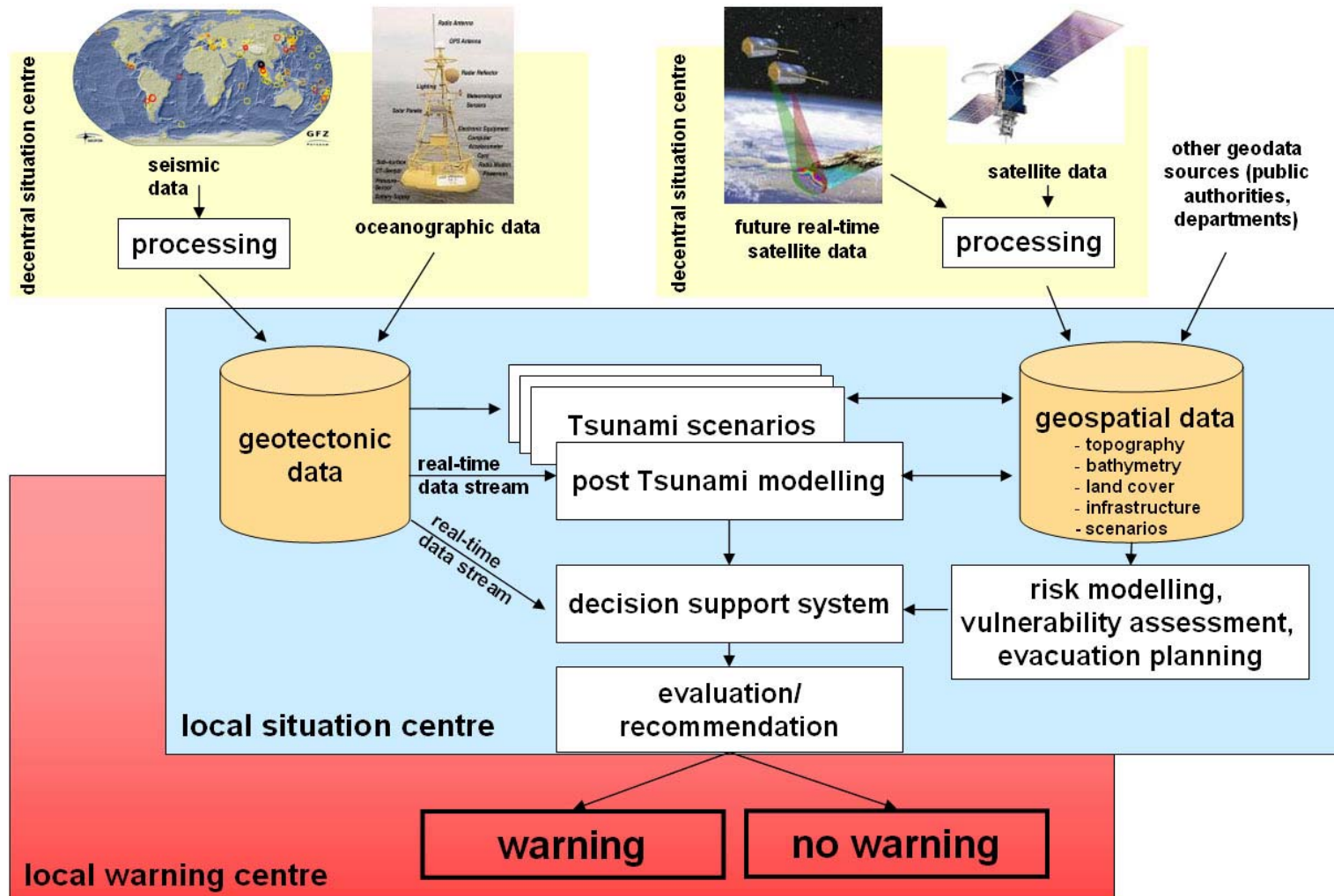
GKSS
FORSCHUNGSZENTRUM



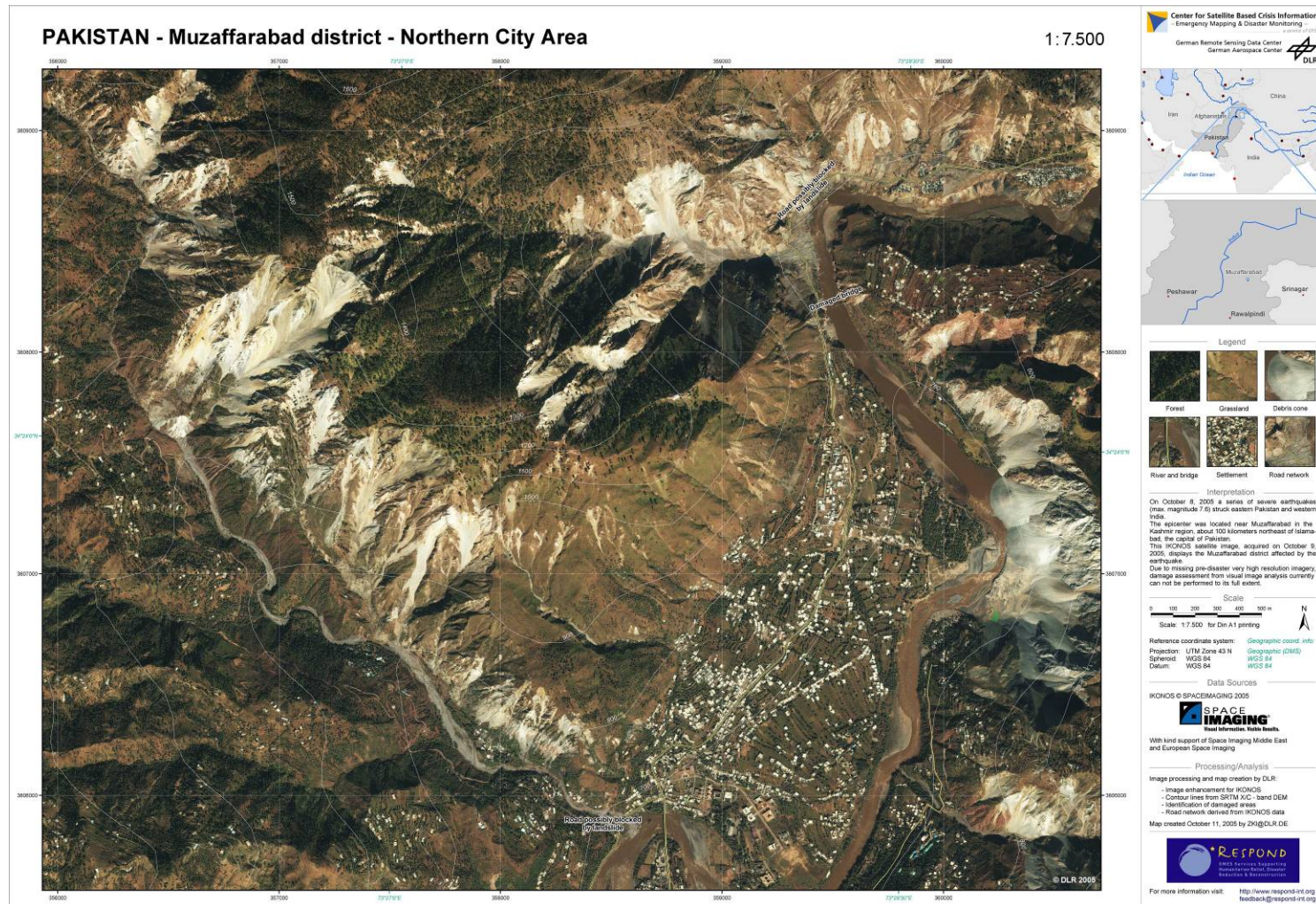
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Tsunami Early Warning and Mitigation System



Earthquake in Pakistan – October 2005





Success only through Networks and Partnerships



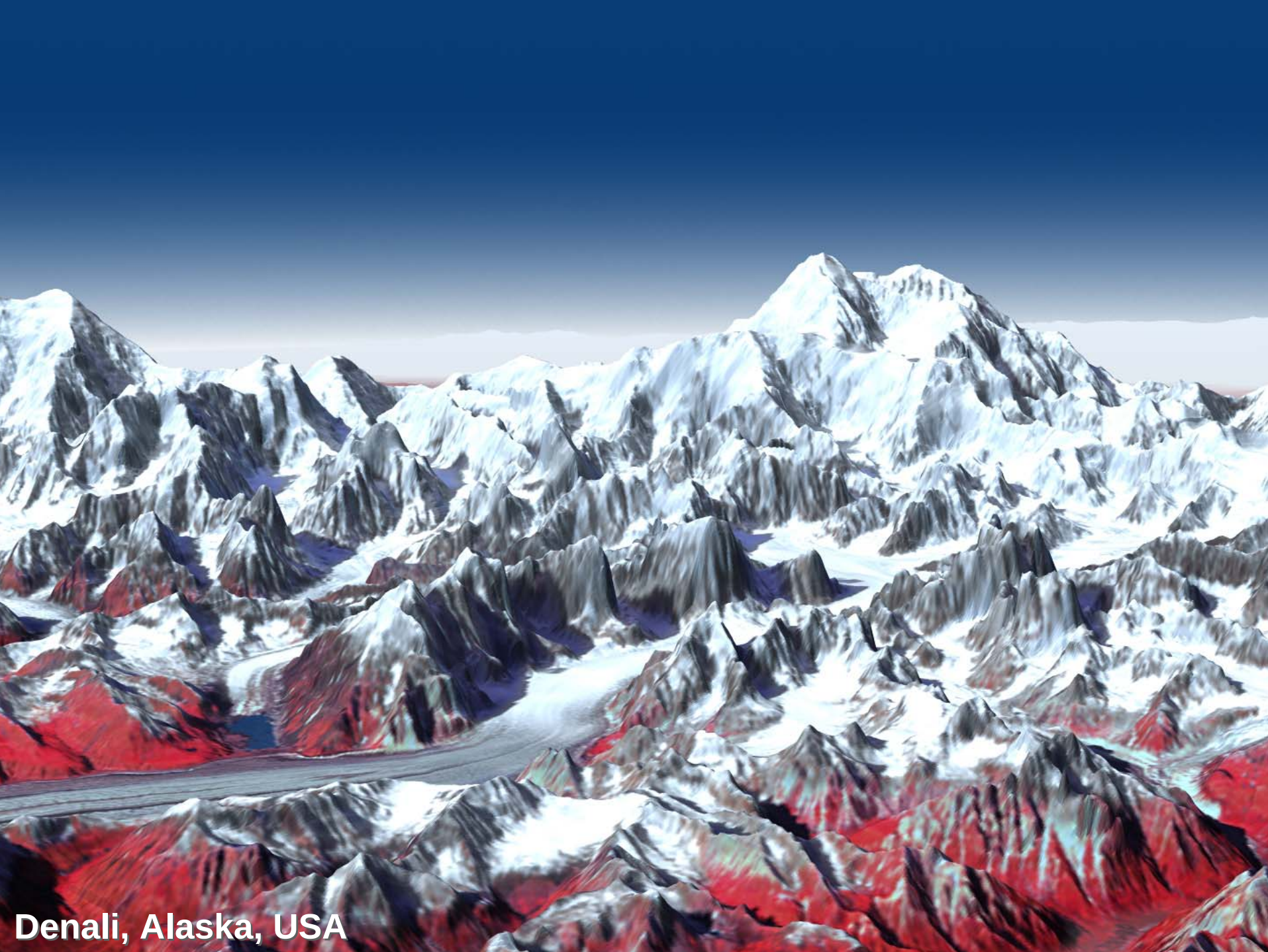


Public Outreach (Example: “Mountains from Space”)

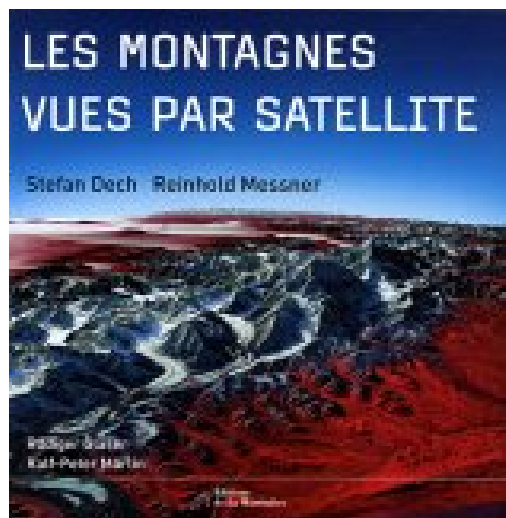
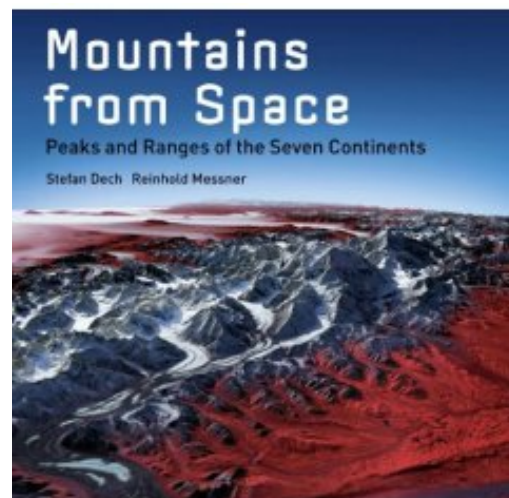


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Denali, Alaska, USA



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Final remarks

- DLR is actively involved in research projects in support of environmental monitoring and sustainable development worldwide
- DLR provides through ZKI the German contribution for European and international civil protection and humanitarian relief using earth observation
- DLR will integrate future German EO missions (TerraSAR-X, Rapid Eye)
- DLR to apply for membership in the International Charter “Space and Major Disasters” with begin of TerraSAR-X operations
- DLR is ready to provide facilities, substantial services and capacity building to European and international initiatives and networks for space-system-based disaster management support



Thank you for your attention!



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