

Providing satellite based geo-information for emergency response activities in Romania

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Romanian specific emergency situations

- **Landslides**
- **Fires**
- **Earthquakes**
- **Storms**
- **Flash floods**
- **Plain floods**





Floods

- Floods are the major disaster affecting many countries in the world year after year. From Romania perspective, floods are among the most hazardous natural disasters in terms of human suffering and economic losses. Major floods occurred in 2000, 2005, 2006 and 2008, the worst ones in more than 40 years, have affected large regions of Romania: in the Timis county (April 2005) over 1 300 homes have been damaged or destroyed, 3 800 people have been evacuated and about 30 000 hectares of agricultural land flooded; in five counties situated in eastern Romania (July 2005) 11 000 homes were inundated, 8 600 people have been evacuated, 20 people were killed, 53 000 hectares farmland flooded, 379 bridges damaged or destroyed; in 12 counties along the Danube (April 2006) 3 077 homes were affected (1 049 completely destroyed), 16 000 people evacuated, 5 people killed, 144 000 hectares of land flooded; in six counties from the North-East part of Romania (July 2008) 3 985 houses were affected (over 300 totally destroyed), 15 834 people evacuated and 35 084 hectares of agricultural land inundated.



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Floods

ROMANIA - FLOOD HAZARD MAP (TIME PERIOD 2000 - 2008)





Framework

Projects:

- 2003 – 2006: NATO SfP 978016, Monitoring of extreme flood events in Romania and Hungary using EO data
- 2007 – 2010: PNCDI2 SIGUR, Satellite Based Emergency Response Service
- 2007 – 2010: PNCDI2 RISCASAT, Development of New Satellite-Derived Products Adapted to Users Requirements for Hydro-Meteorological Risk Management
- 2009 – 2012: FP7 SAFER, Services and Applications For Emergency Response

Partners:

- Romanian Space Agency
- National Meteorological Administration
- National Institute of Hydrology & Water Management
- Romanian Center for the Remote Sensing Use in Agriculture
- University Politehnica Bucharest
- Advanced Studies and Research Center

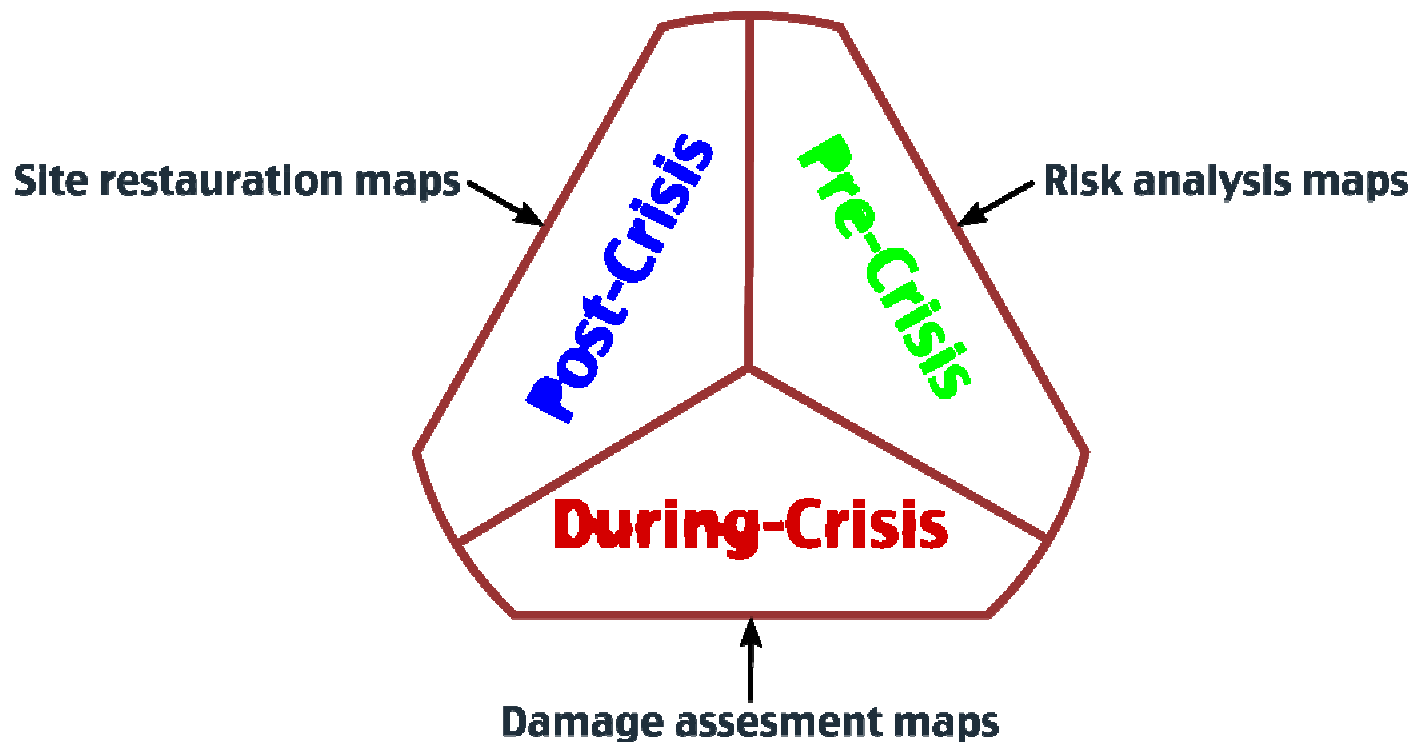
Beneficiaries:

- General Inspectorate for Emergency Situations
- Ministry of Environment and Sustainable Development
- Local county councils, prefectures, etc.



Service concept

- Various processing techniques (classification, geo-referencing, filtering, and photo-interpretation) are used to combine the optical and radar images and **map** the flooded areas.



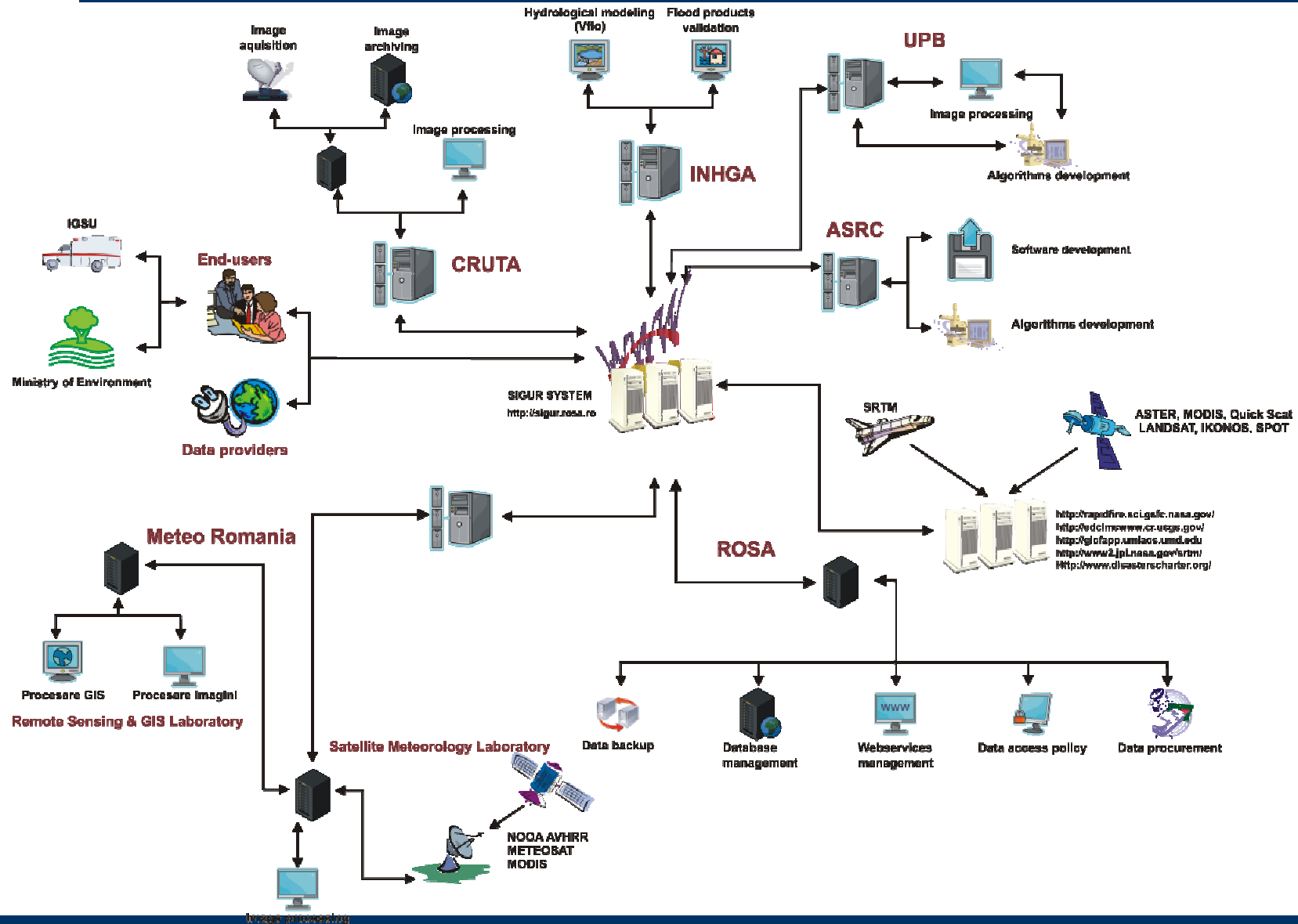


Service history

- Version 1: started in 2005
- Version 2: started in early 2007
- Version 3: started in early 2010

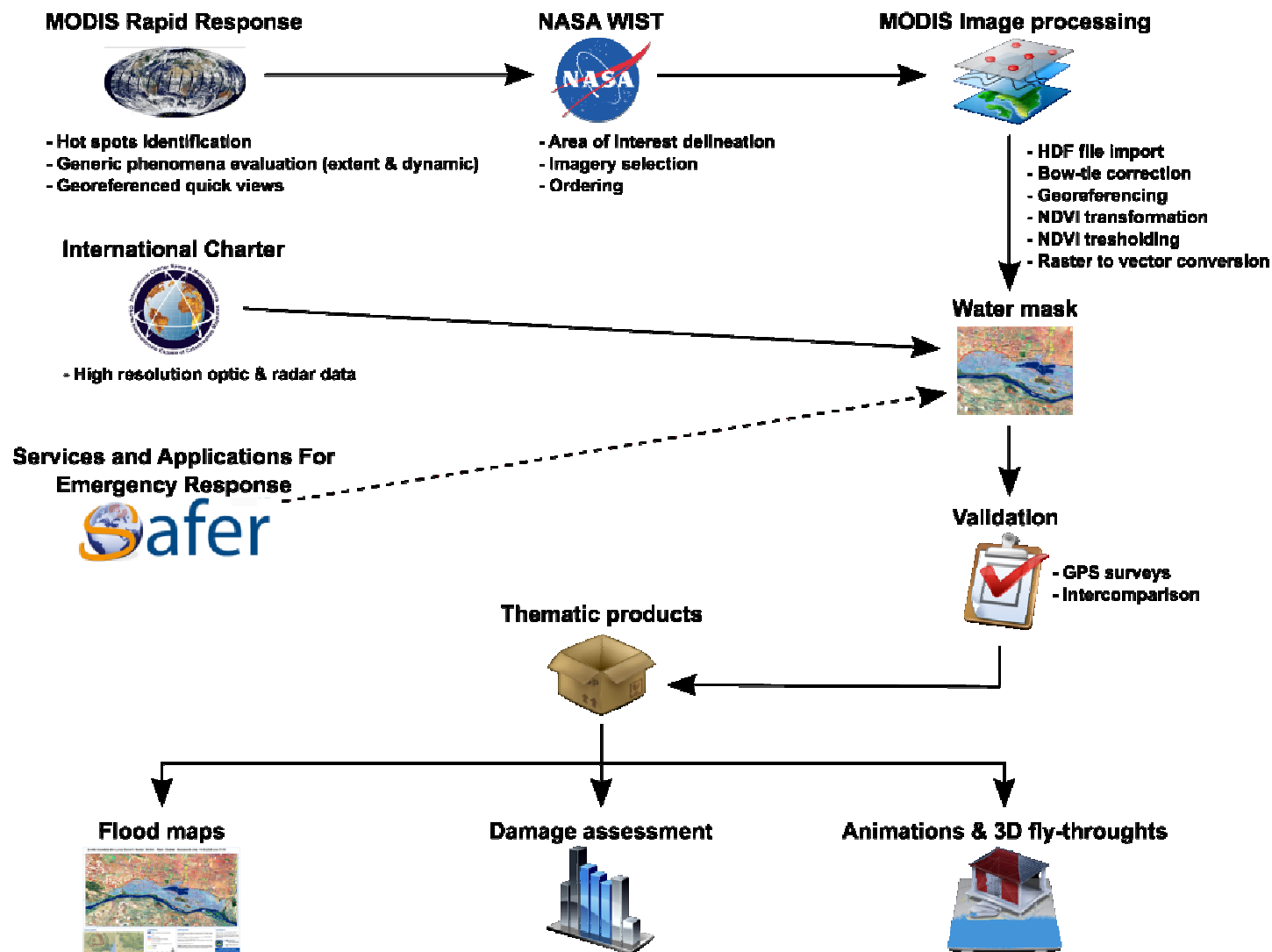


Workflow



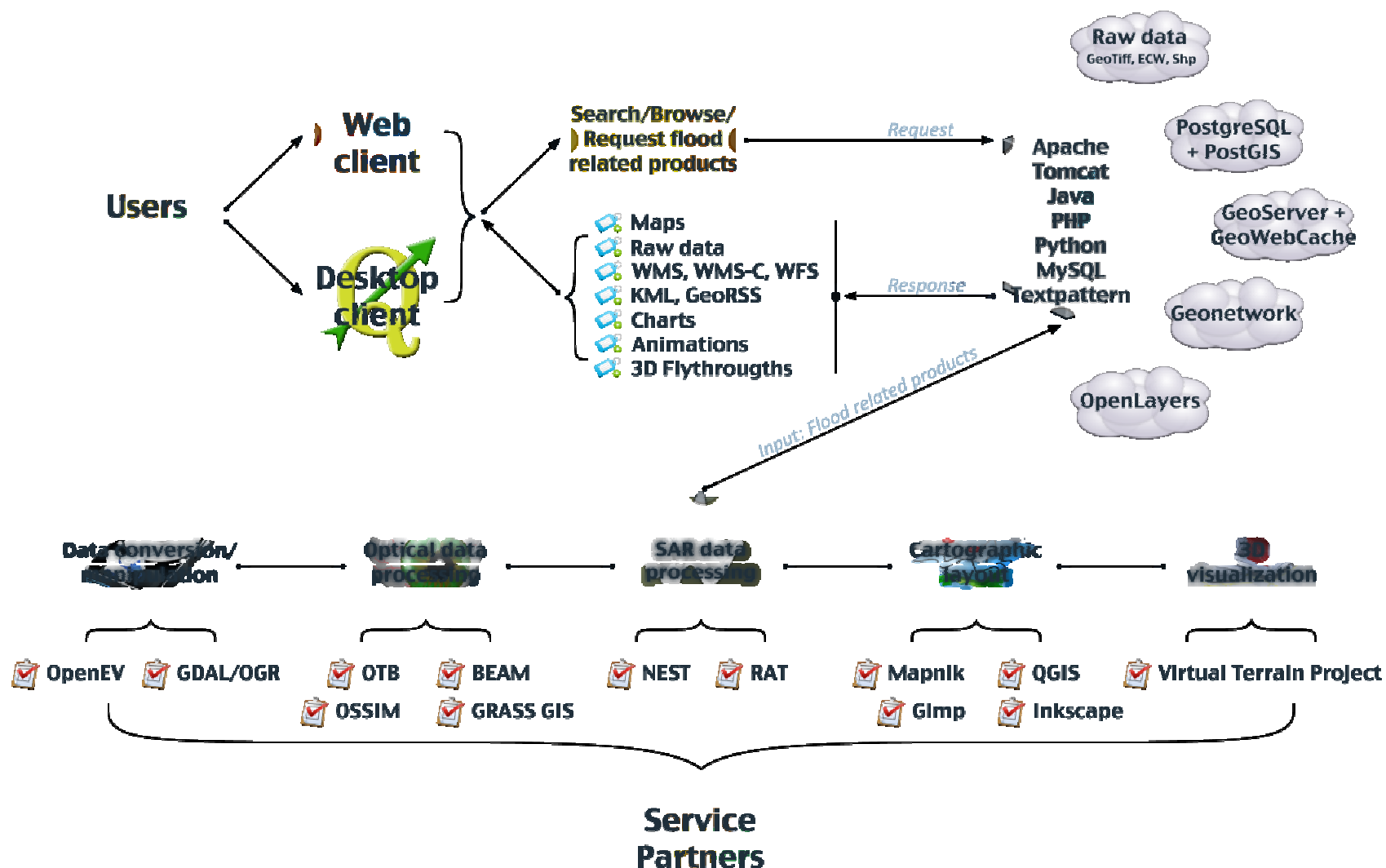


Flood image processing chain





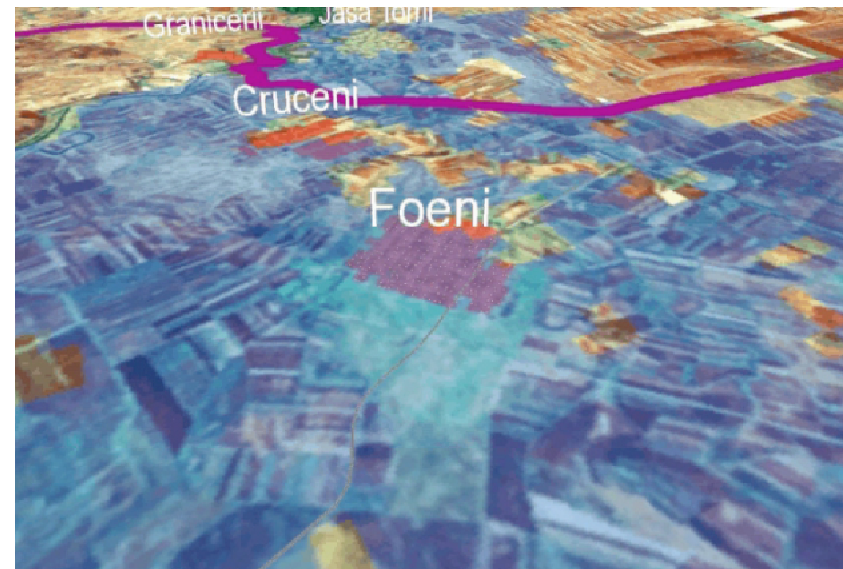
Software architecture





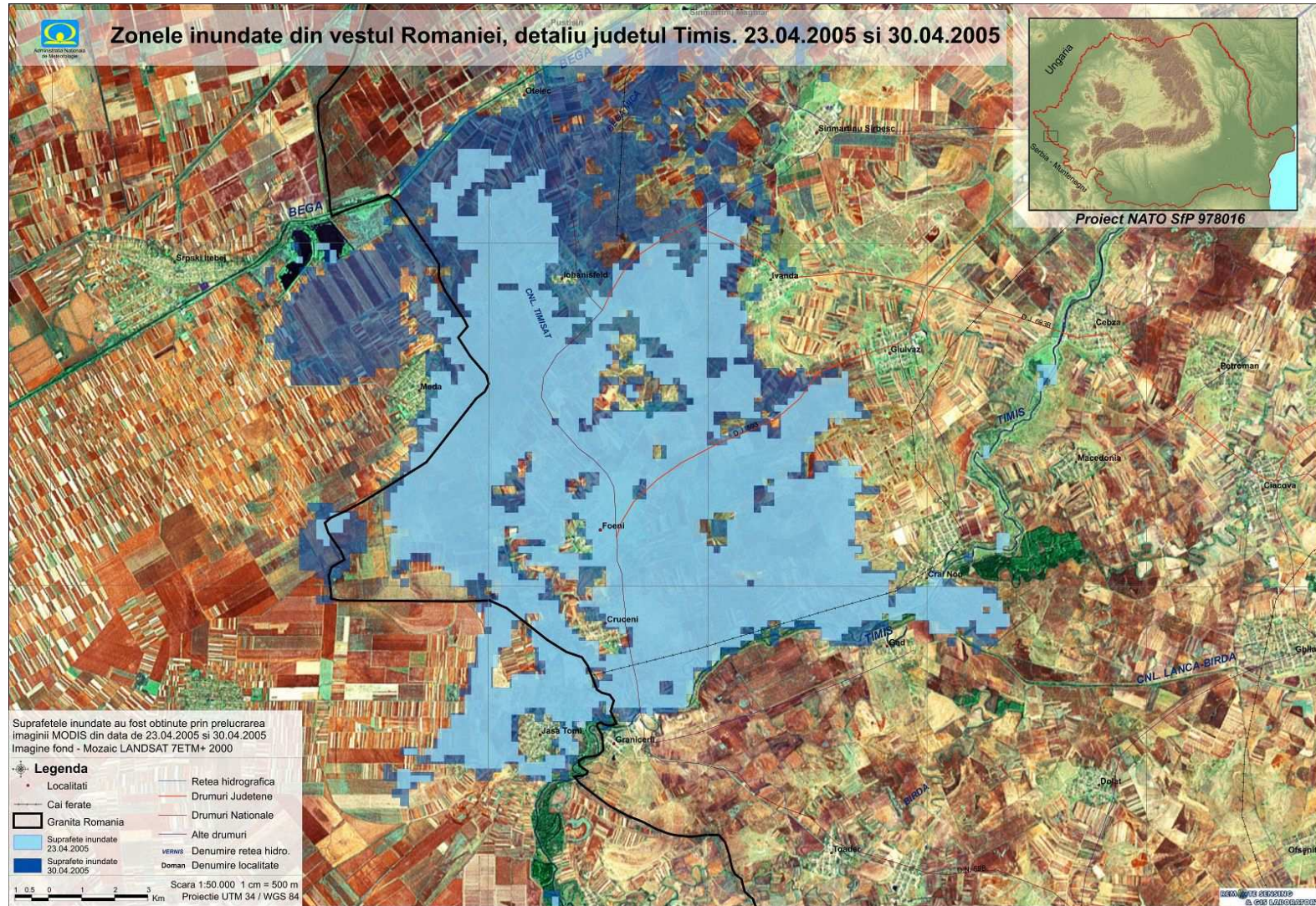
Flood related products

- Near real-time flood mapping
- Non real-time flood mapping
- Maximum flood extend mapping
- Flooded area classification
- Flood evolution mapping
- Damage assessment maps & reports
- 2D Animations
- 3D Flythrough



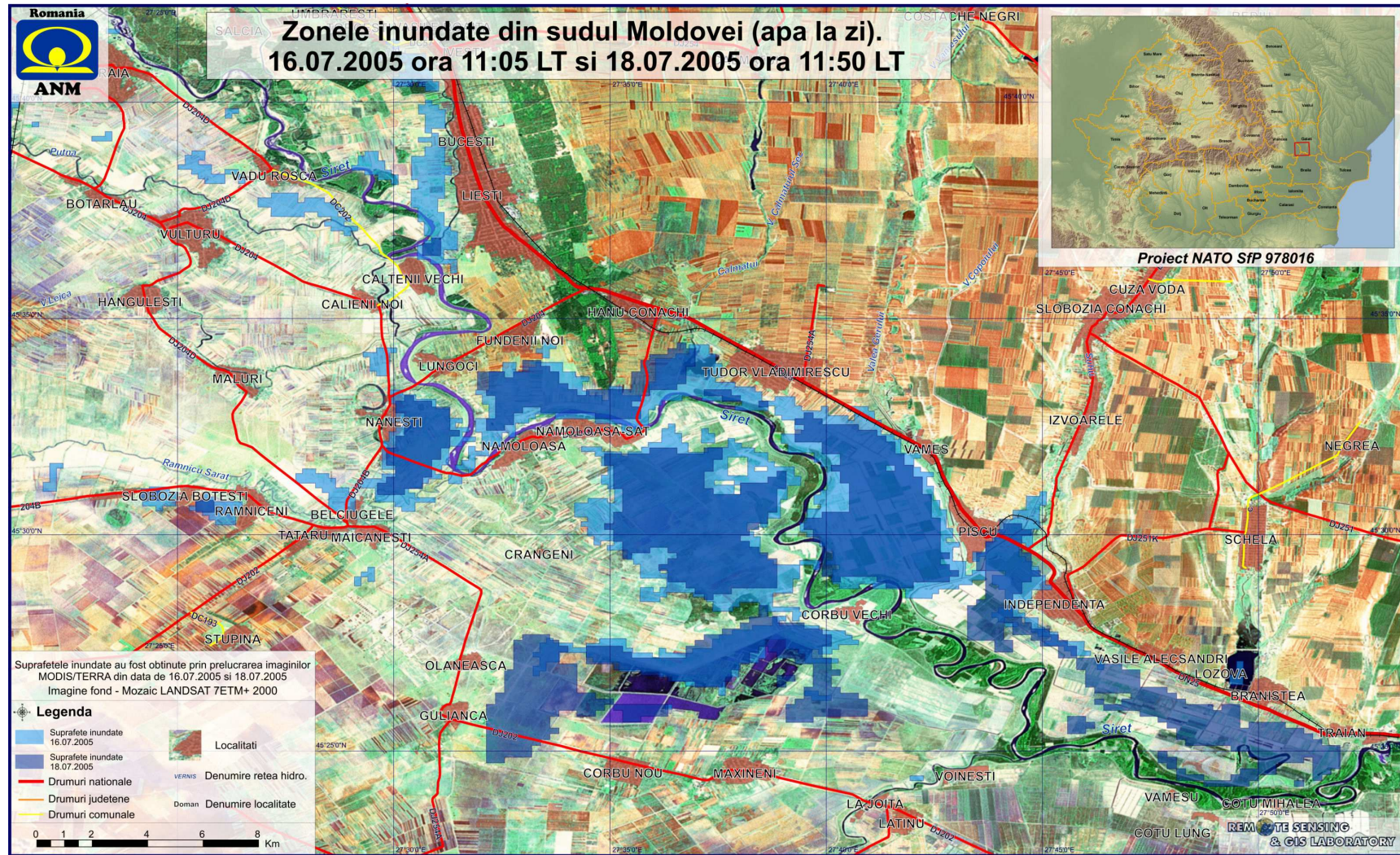


Map example: Timis river 2005



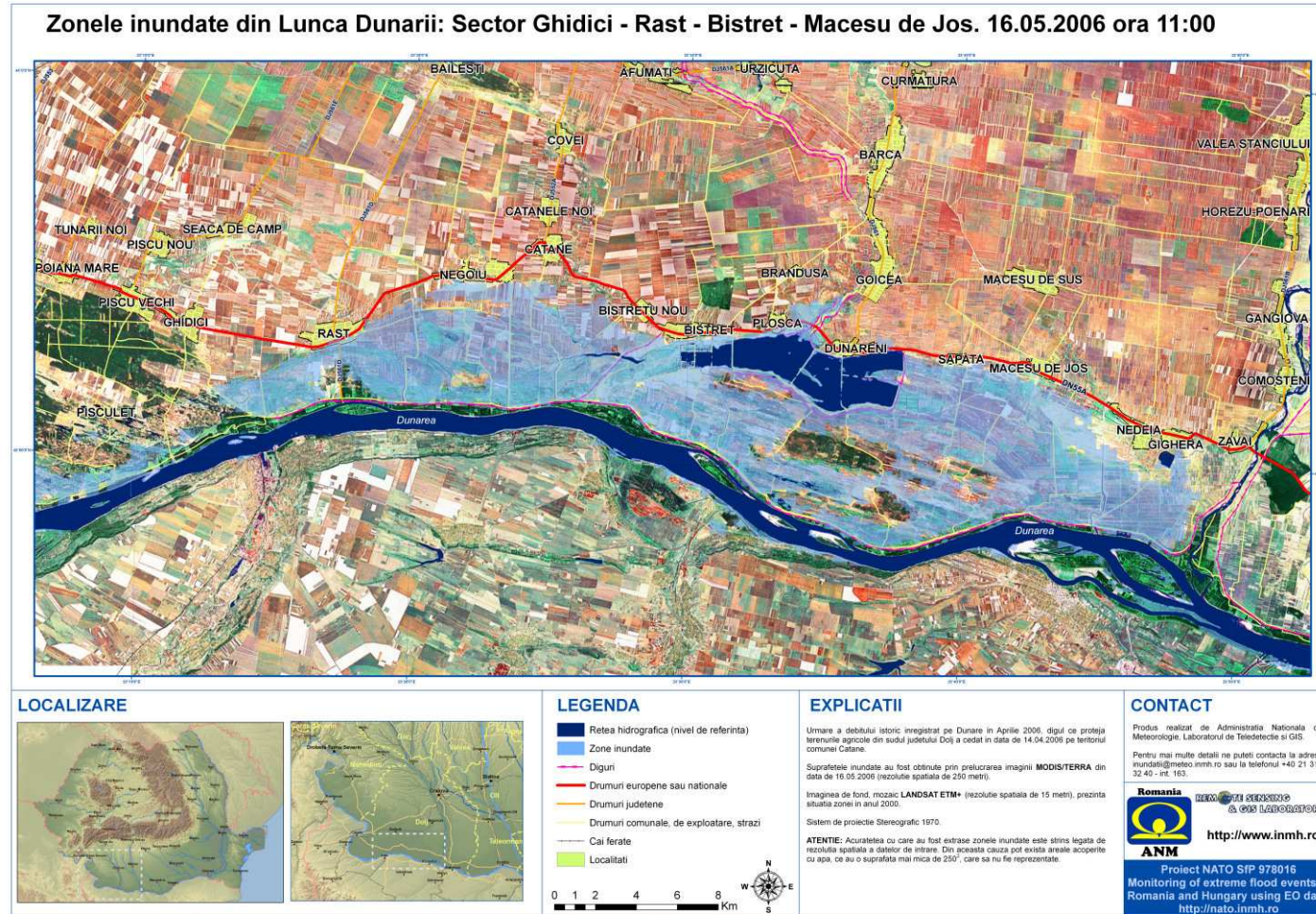


Map example: Siret river 2005



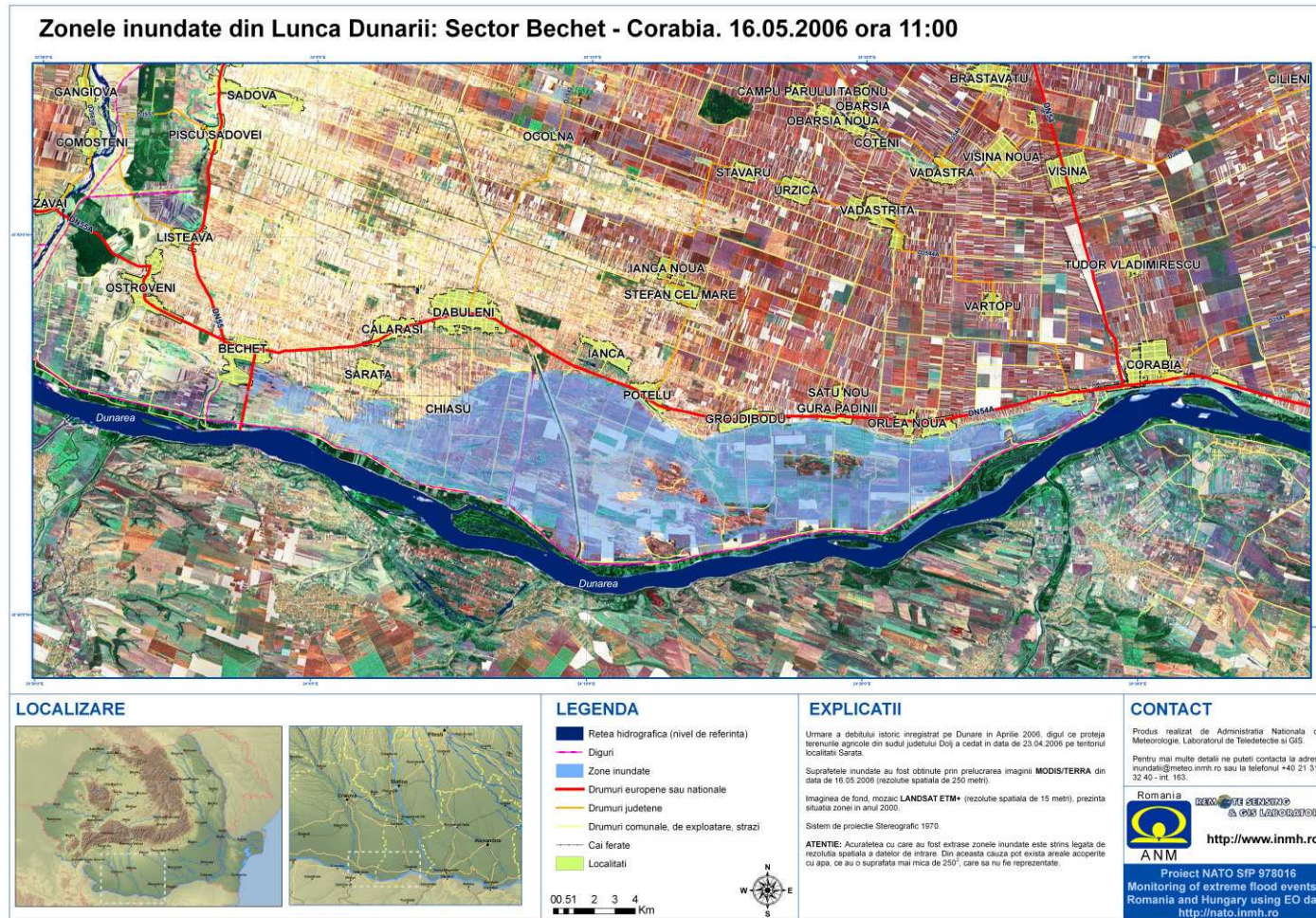


Map example: Danube river 2006





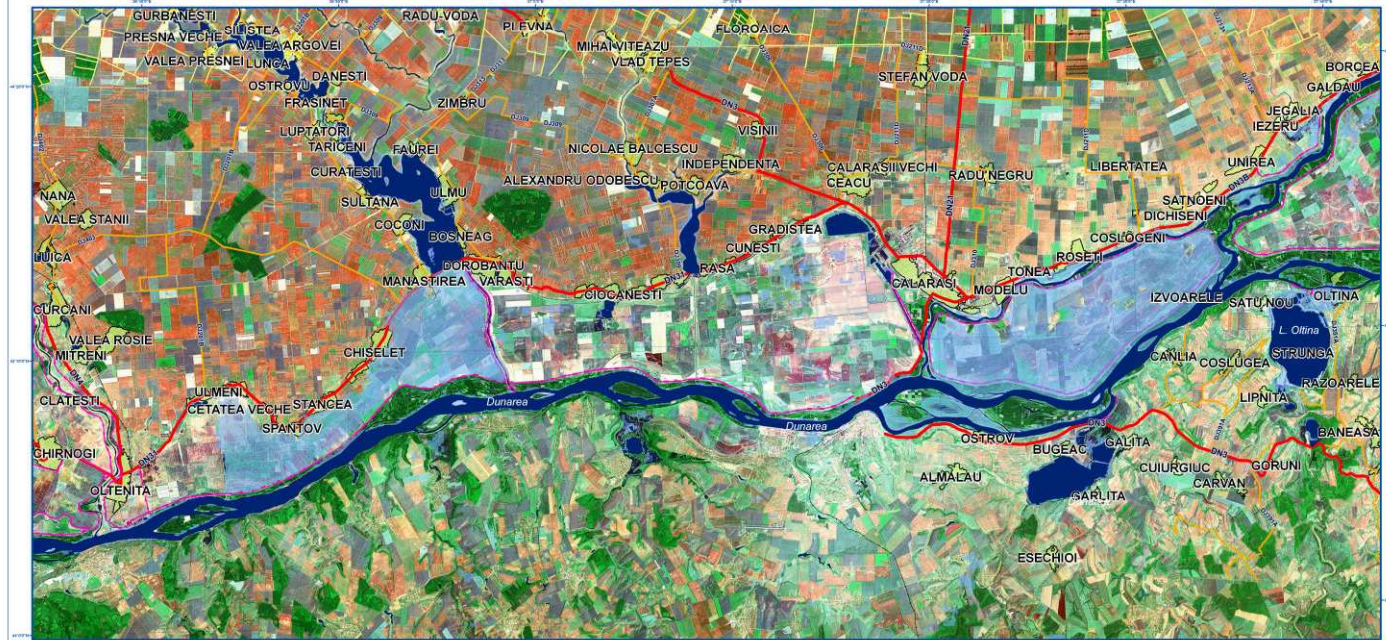
Map example: Danube river 2006





Map example: Danube river 2006

Zonele inundate din Lunca Dunarii: Sector Oltenita - Calarasi. 14.05.2006 ora 11:10



LOCALIZARE



LEGENDA

- Retea hidrografica (nivel de referinta)
- Diguri
- Zone inundate
- Drumuri europene sau nationale
- Drumuri judetene
- Drumuri comunale, de exploatare, strazi
- Cai ferate
- Localitati

0 1.5 3 6 9 12 Km

EXPLICATII

Urmare a debitului istoric inregistrat pe Dunare in Aprilie 2006, digul ce proteja terenurile agricole din sudul judetului Calarasi a cedat in data de 24.04.2006 pe teritoriul comunei Spantov. Apele revarsate s-au apropiat pericolos de mult de oraful Oltenita.

Anterior, in data de 23.04.2006 s-a produs o breasa in digul ce separa bratul Dunarii de lacul Oltea. Datorita cresterii nivelului in lac a fost amenajata localitatea Oltea.

Suprafetele inundate au fost obtinute prin prelucrarea imaginii MODIS/TERRA din data de 14.05.2006 (rezolutie spatiala de 250 metri).

Imagines de fond, mozaic LANDSAT ETM+ (rezolutie spatiala de 15 metri), prezinta situatia zonei in anul 2000.

Sistem de proiectie Stereografic 1970.

ATENTIE: Acuratetea cu care au fost extrase zonele inundate este strins legata de rezolutia spatiala a datelor de intrare. Din aceasta cauza pot exista areale acoperite cu apa, ce au o suprafata mai mica de 250', care sa nu fie reprezentate.

CONTACT

Proiect realizat de Administratia Nationala de Meteorologie, Laboratorul de Teledetectie si GIS.

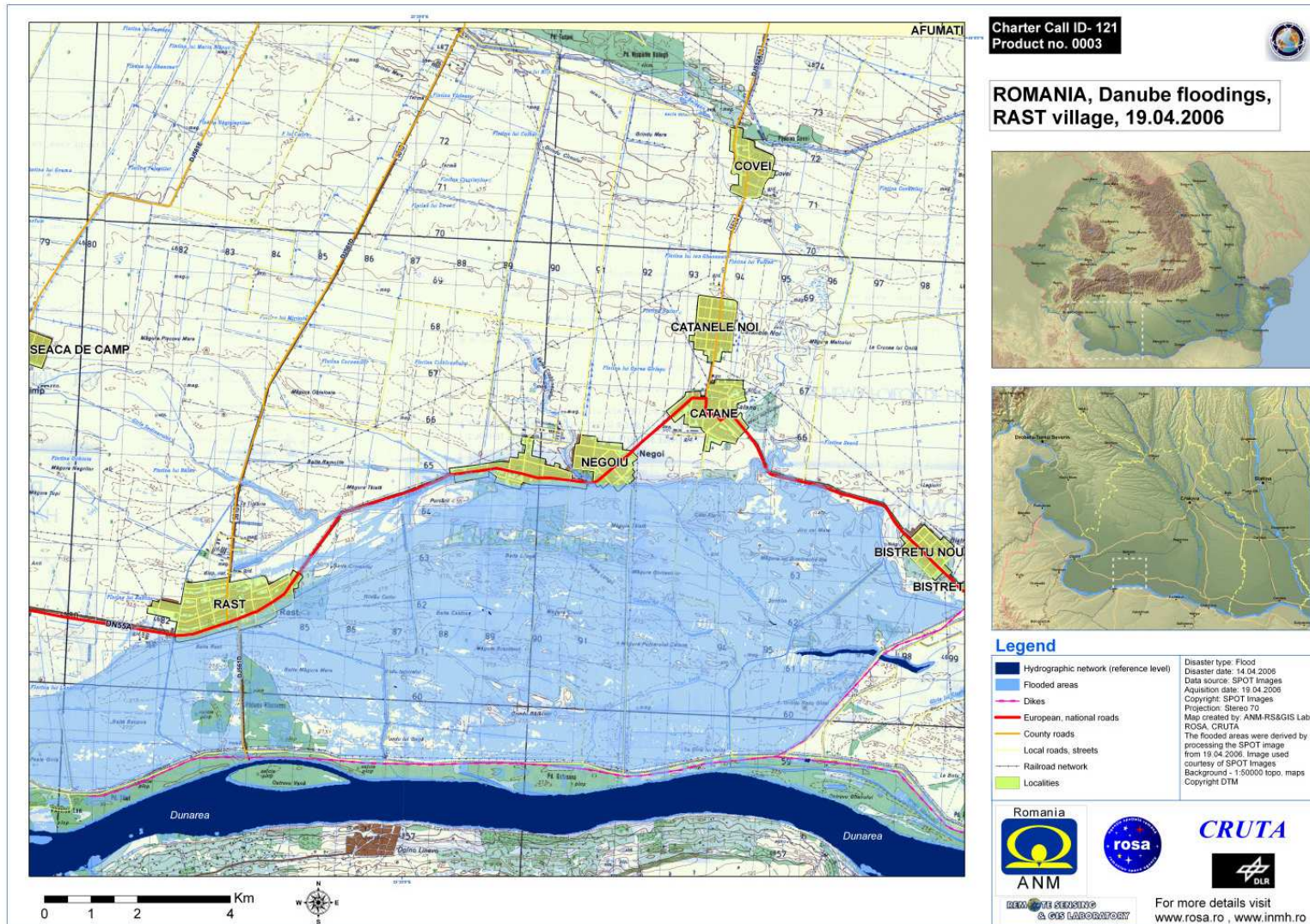
Pentru mai multe detalii ne puteti contacta la adresa mundata@meteo.inmh.ro sau la telefonul +40 21 318 32 40 - int. 163.



Proiect NATO SFP 978016
Monitoring of extreme flood events in Romania and Hungary using EO data.
<http://nato.inmh.ro>



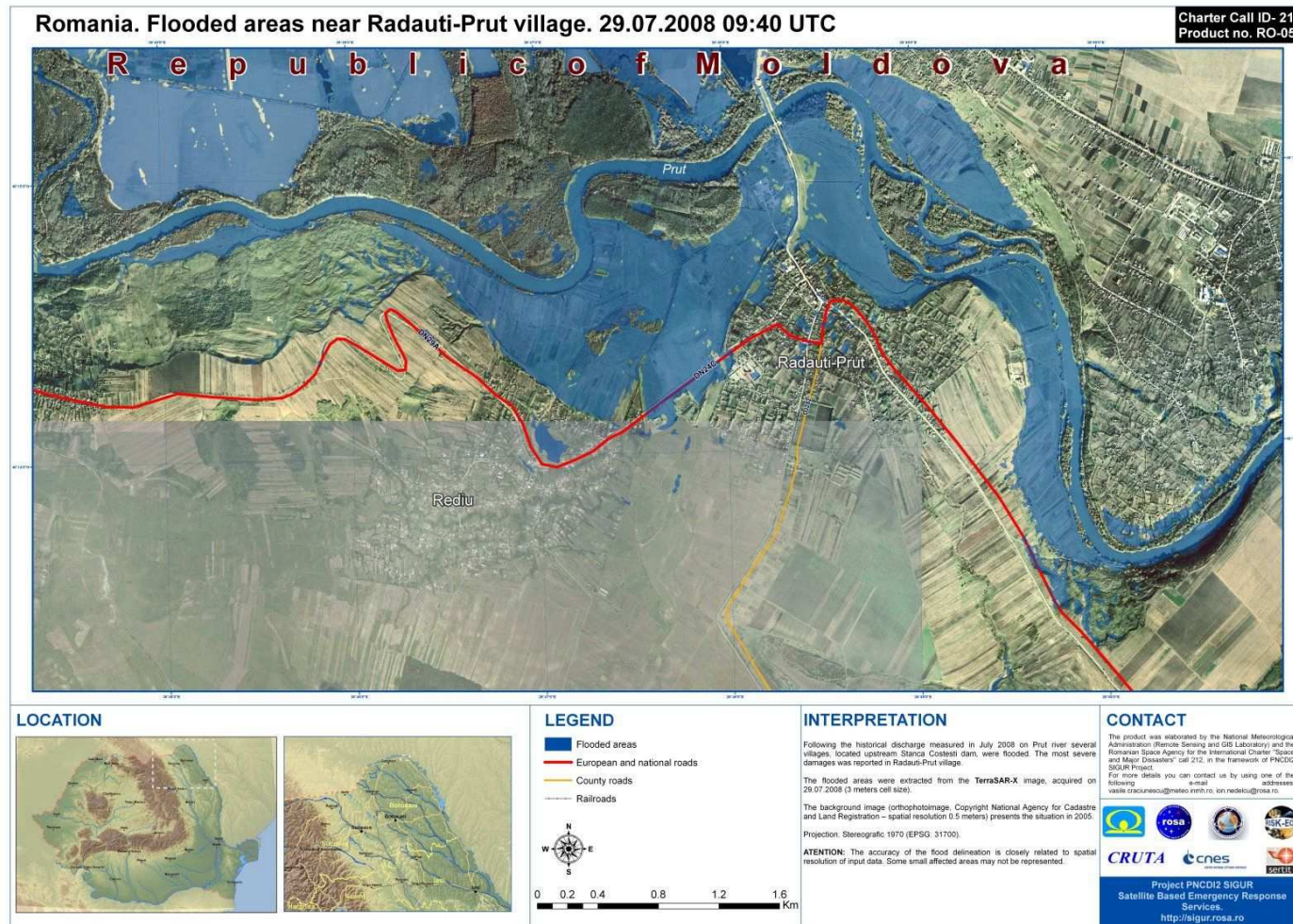
Map example: Danube river 2006







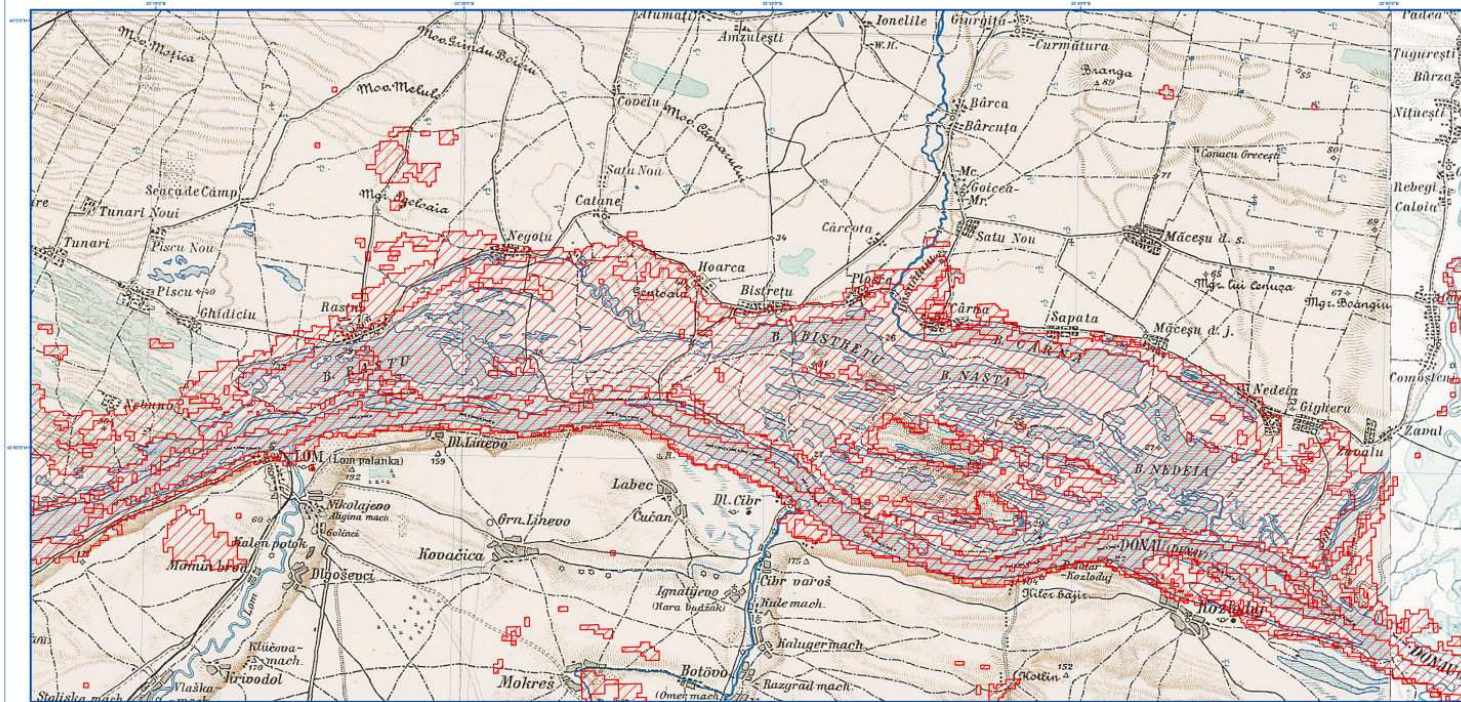
Map example: Prut river 2008





Integration with historical data

Zonele inundate din Lunca Dunarii: Sector Ghidici - Rast - Bistret - Macesu de Jos. 14.04.2006 - 14.05.2006



LOCALIZARE



LEGENDA

- Zone inundate
- Suprafete acvatice
- Zone miastinoase
- Zone nisipoase
- Paduri
- Localitati

0 1 2 4 6 8 Km

EXPLICATII

Urmare a debitului istoric inregistrat pe Dunare in Aprilie 2006, digul ce proteja terenurile agricole din sudul judetului Dolj a cedat in data de 14.04.2006 pe teritoriul comunei Catane.

Suprafetele inundate au fost obtinute prin prelucrarea a 15 imagini MODIS/TERRA si MODIS/AQUA din perioada 14.04.2006 - 14.05.2006 (rezolutie spatiala de 250 metri).

Imagineri de fond hartile topografice austriece (1910) obtinute in urma celei de a treia campanii a militarilor Imperiului Habsburgic (Neue Aufnahme).

Sistem de proiectie Stereografic 1970.

ATENTIE: Acuratetea cu care au fost extrase zonele inundate este strins legata de rezolutia spatiala a datelor de intrare. Din aceasta cauza pot exista areale acoperite cu apa, ce au o suprafata mai mica de 250², care sa nu fie reprezentate.

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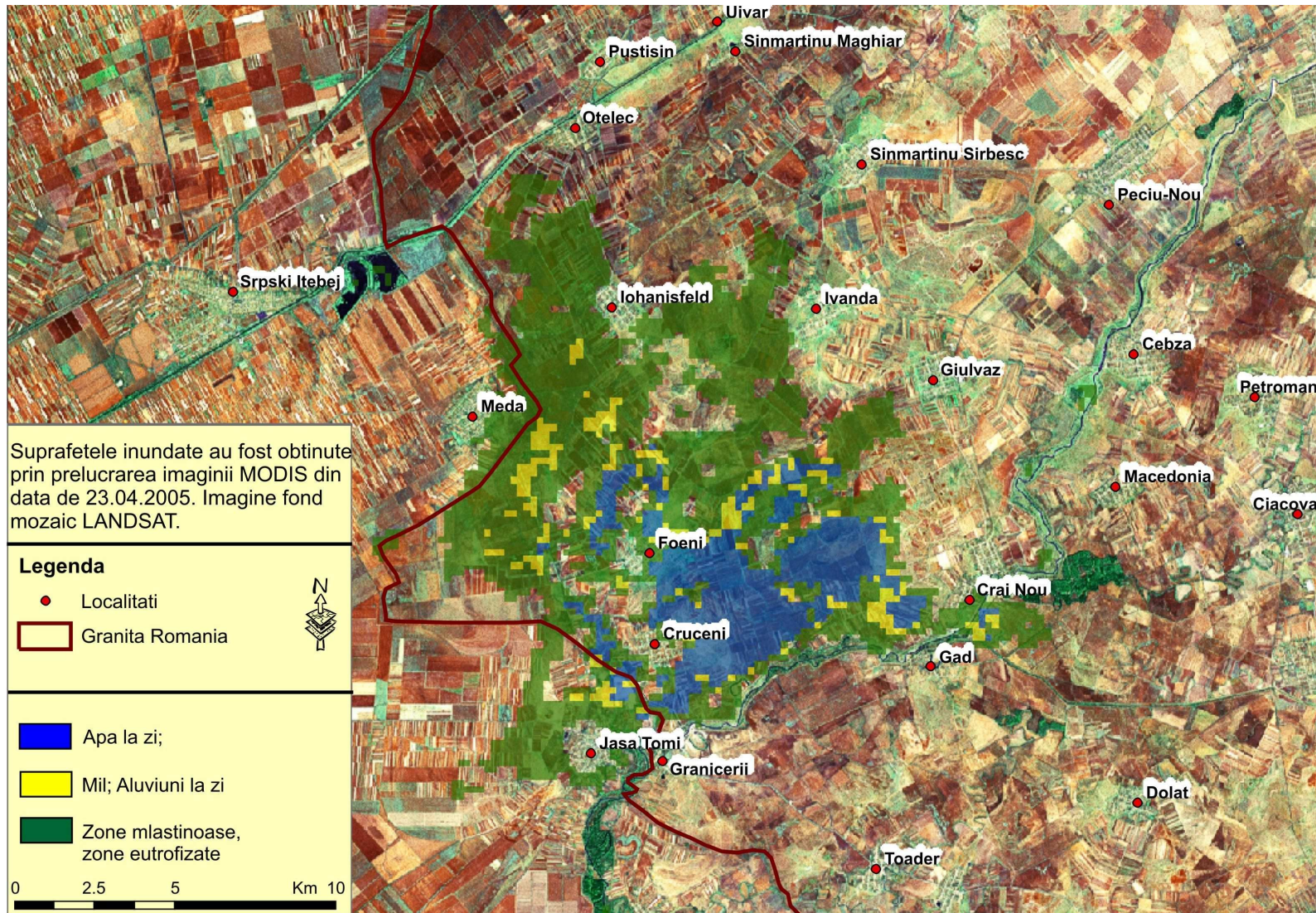
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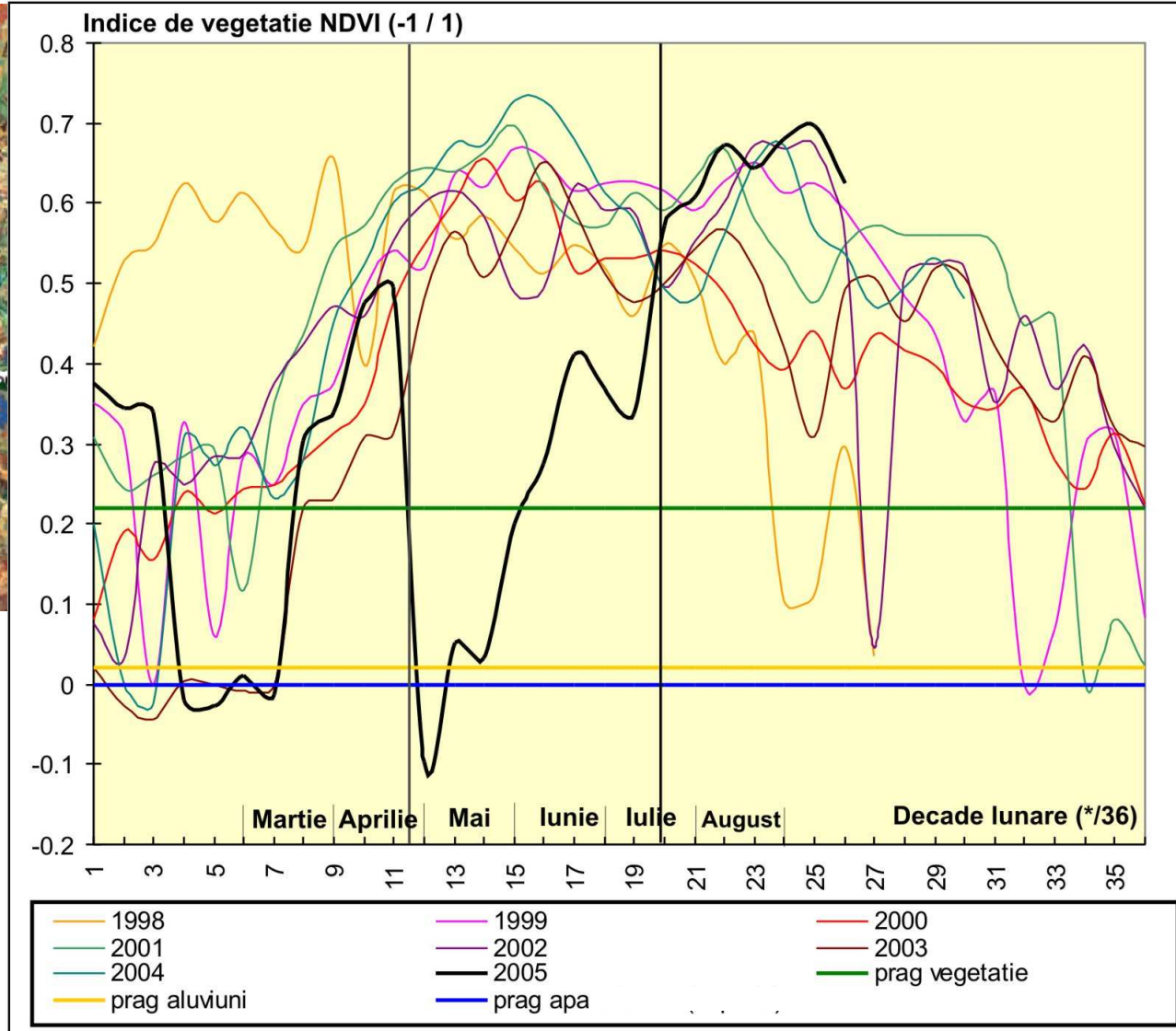
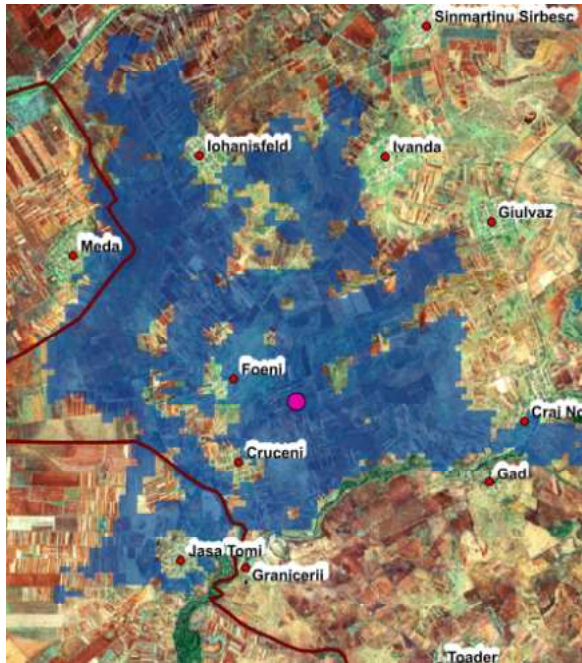


Water classification example



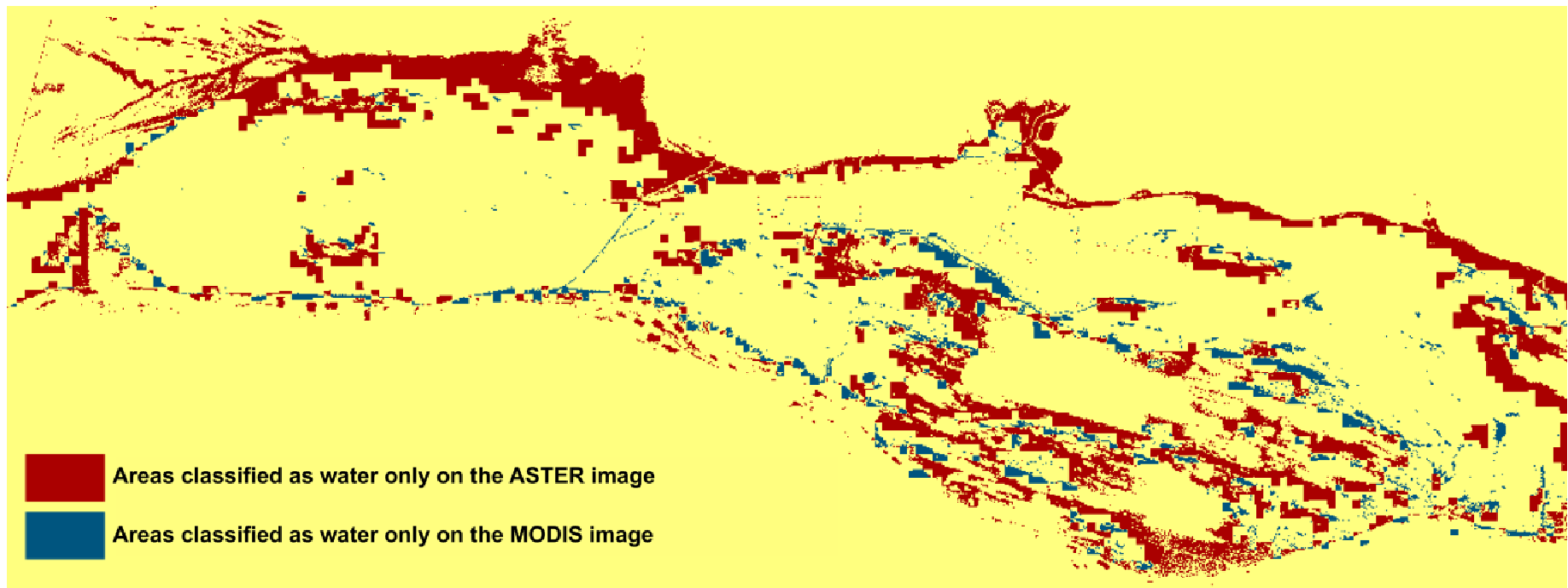
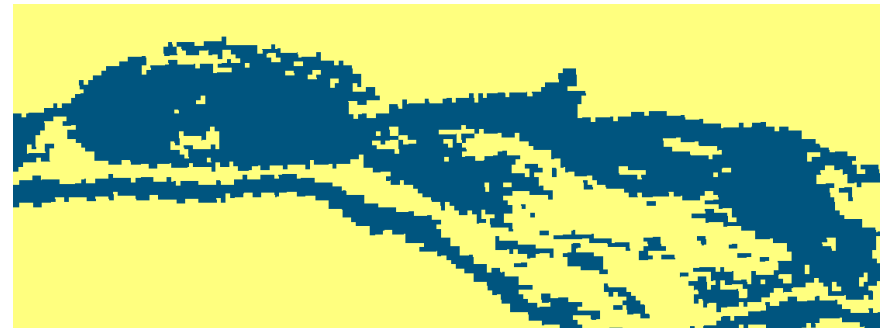
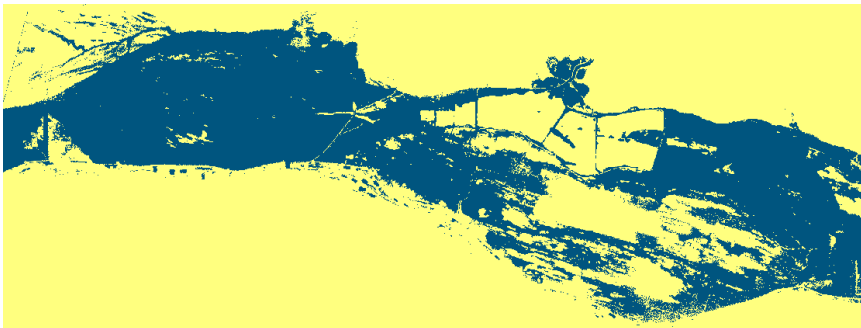


Post-crisis monitoring example





Validation example





Data access

The collage displays the following interfaces:

- GeoNetwork Identification Info:** A form for entering metadata such as Title, Date, Publication, and Abstract.
- GeoNetwork Search:** A page for finding interactive maps, GIS datasets, and satellite imagery with various filters.
- GeoServer FeatureType Editor:** A page for editing the definition and schema of a feature type, showing details like Name, Alias, Style, and SRS.
- Map View 1:** A standard map view showing a geographical area with labels like 'Rovin' and 'Curio-Limeve'.
- Map View 2:** A map view with a blue flood mask overlay, showing the same area with a different data layer.



Conclusions & future work

Numbers:

- Service activations: 5
- 2005: 82 products
- 2006: 124 products
- 2008: 39 products

What's next:

- Extend the service to cover other types of disasters
- Dedicated geoportal
- Better communication with the end-users
- Identification of new data sources
- Further algorithm development and validation
- Find new financial opportunities



The end

Thanks for your attention. Questions?