

GEODIM & Romanian Emergency Services

Iulia DANA NEGULA¹, Vasile CRACIUNESCU², Ion NEDELICU¹

1 – Romanian Space Agency, 2 – National Meteorological Administration



Romanian Emergency Service

- Satellite based service for flood monitoring in Romania (statistics: more than 1,000,000 hectares of floodplain, more than 900,000 people living in areas with high risk of flooding, more than 88,000 households could be flooded at any time in average, 8 people lose their lives annually).



Siret, 2005

at least 15 people have been killed
more than 12,000 people have been
evacuated from their homes



Danube, 2006

more than 4,700 people had to be evacuated (3,000 in Rast village)
600 buildings were flooded (115 collapsed)
more than 40,000 hectares covered by flooding



Siret, Prut, 2008

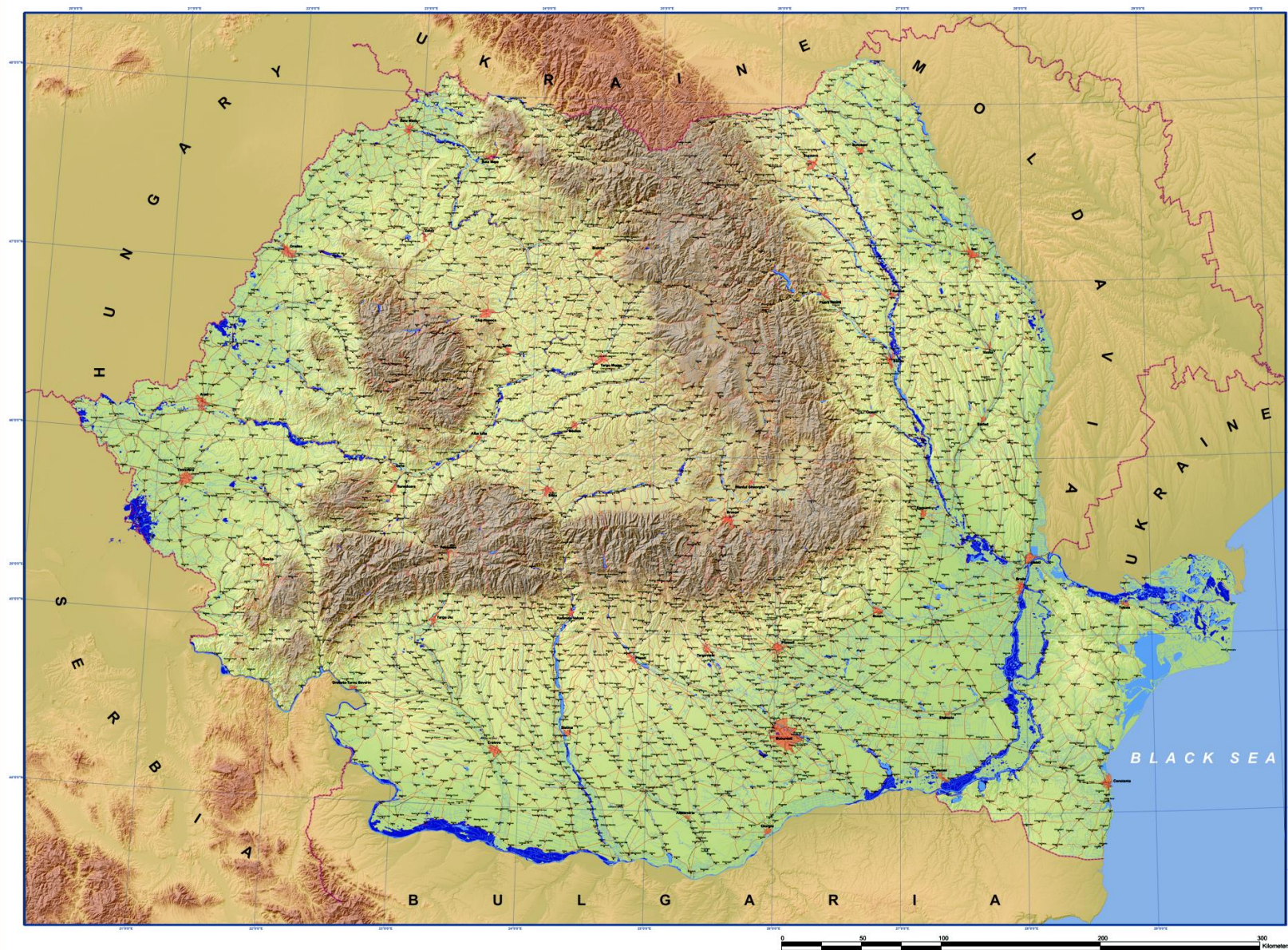
thousands of people were evacuated
at least 4 people died



Siret, Danube 2010

numerous people were reported dead
hundreds of hectares of farmland were flooded

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



LEGEND

Elevation

High: 2550 m

Low: 1 m

Transportation

- Railways
- County Road
- National Road
- European Road

Populated places

- Major city
- Minor city
- Commune

Borders

- Country border

Reference water (normal water level)

- Lakes & large water bodies
- Major rivers
- Minor rivers

Water detected by MODIS (2000 - 2006)

-

Universal Transverse Mercator - UTM Zone 35

Graticule: 1 degrees

Romanian Emergency Service - framework

Projects:

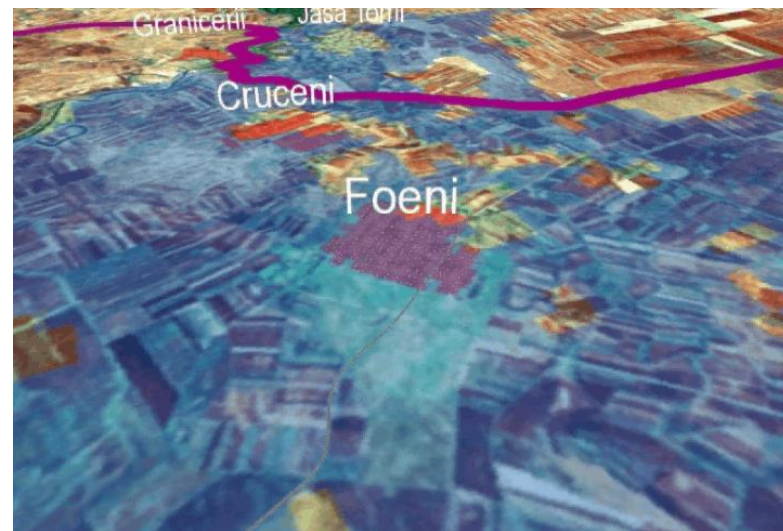
- 2003 – 2006: NATO SfP 978016, Monitoring of extreme flood events in Romania and Hungary using EO data
- 2007 – 2010: PNCDI2 SIGUR, Satellite Based Emergency Response Service
- 2007 – 2010: PNCDI2 RISCASAT, Development of New Satellite-Derived Products Adapted to Users Requirements for Hydro-Meteorological Risk Management
- 2009 – 2012: FP7 SAFER, Services and Applications For Emergency Response
- 2012 – 2015: PNCDI2 GEODIM, Platform for GeoInformation in Support of Disaster Management

Beneficiaries:

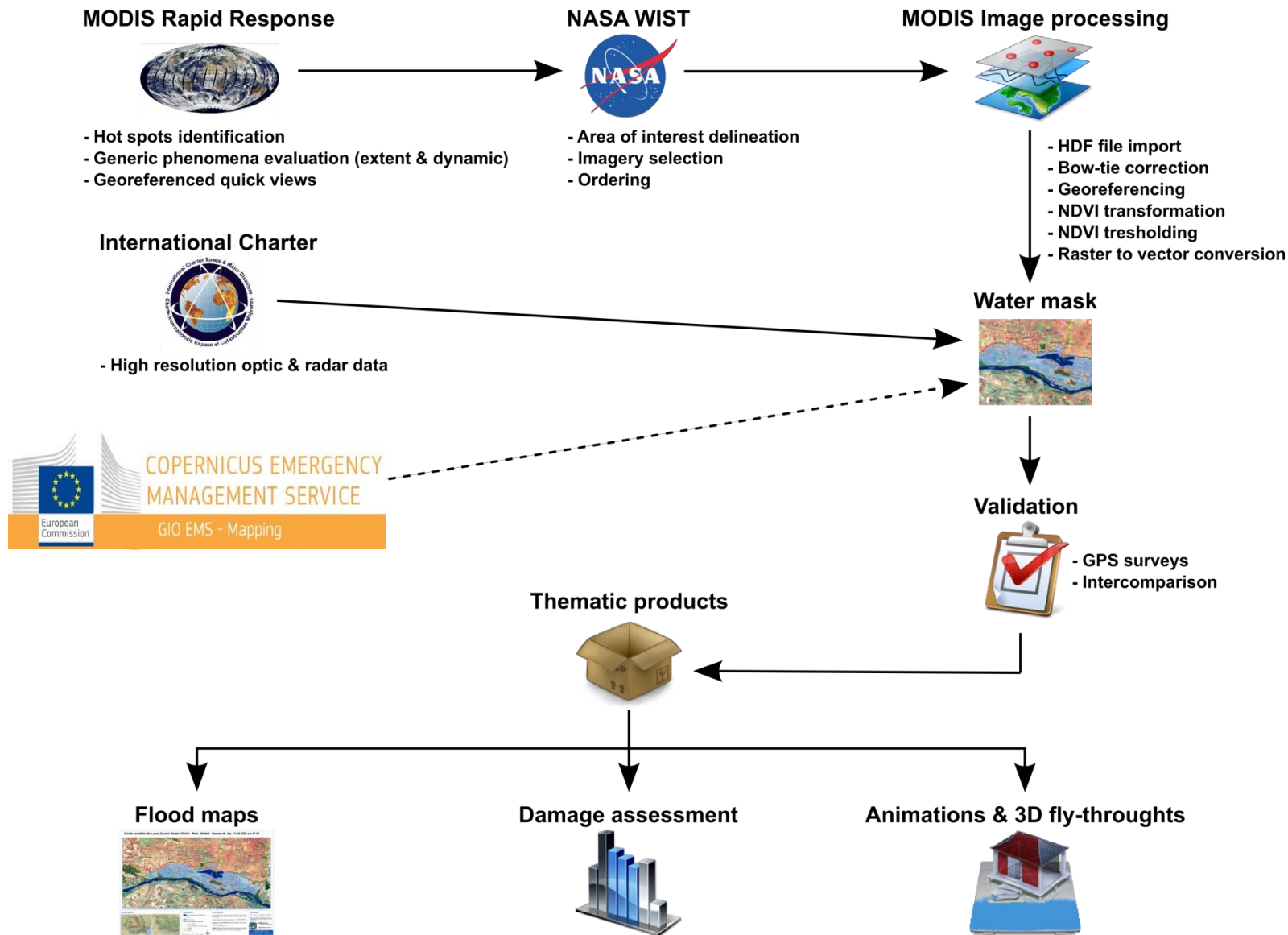
- General Inspectorate for Emergency Situations
- Ministry of Environment and Sustainable Development
- Local county councils, prefectures, etc.

History:

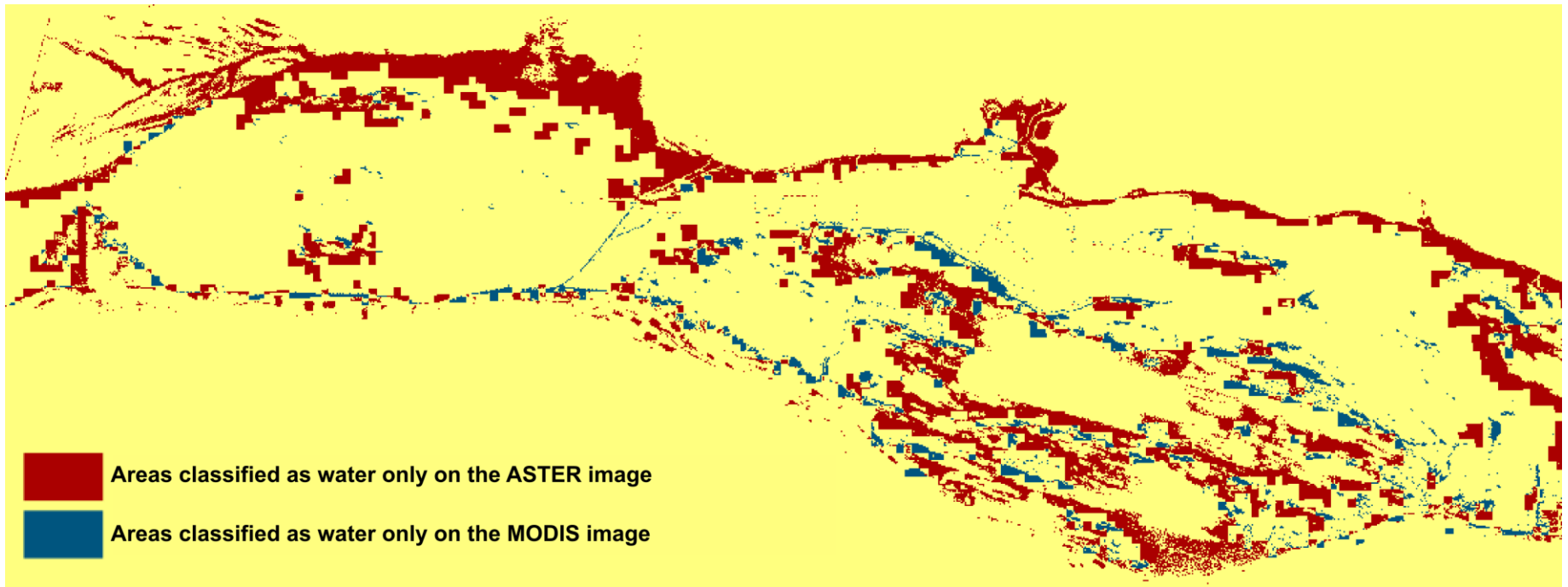
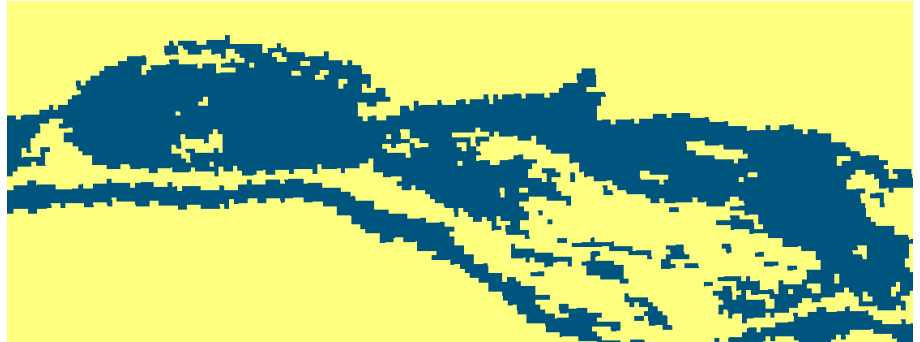
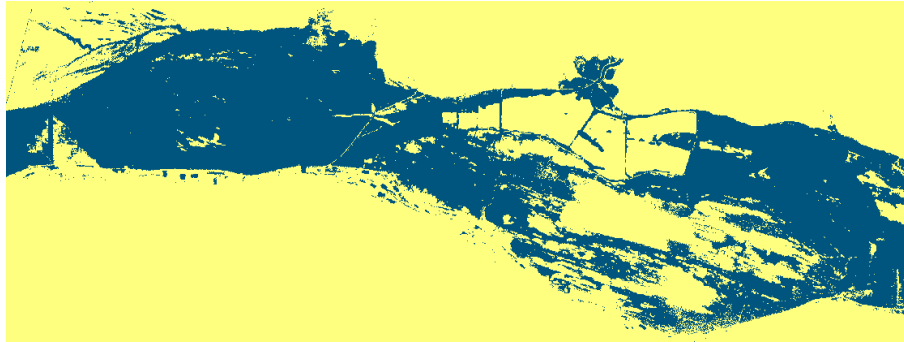
- version 1: started in 2005
- version 2: started in 2007
- version 3: started in 2012



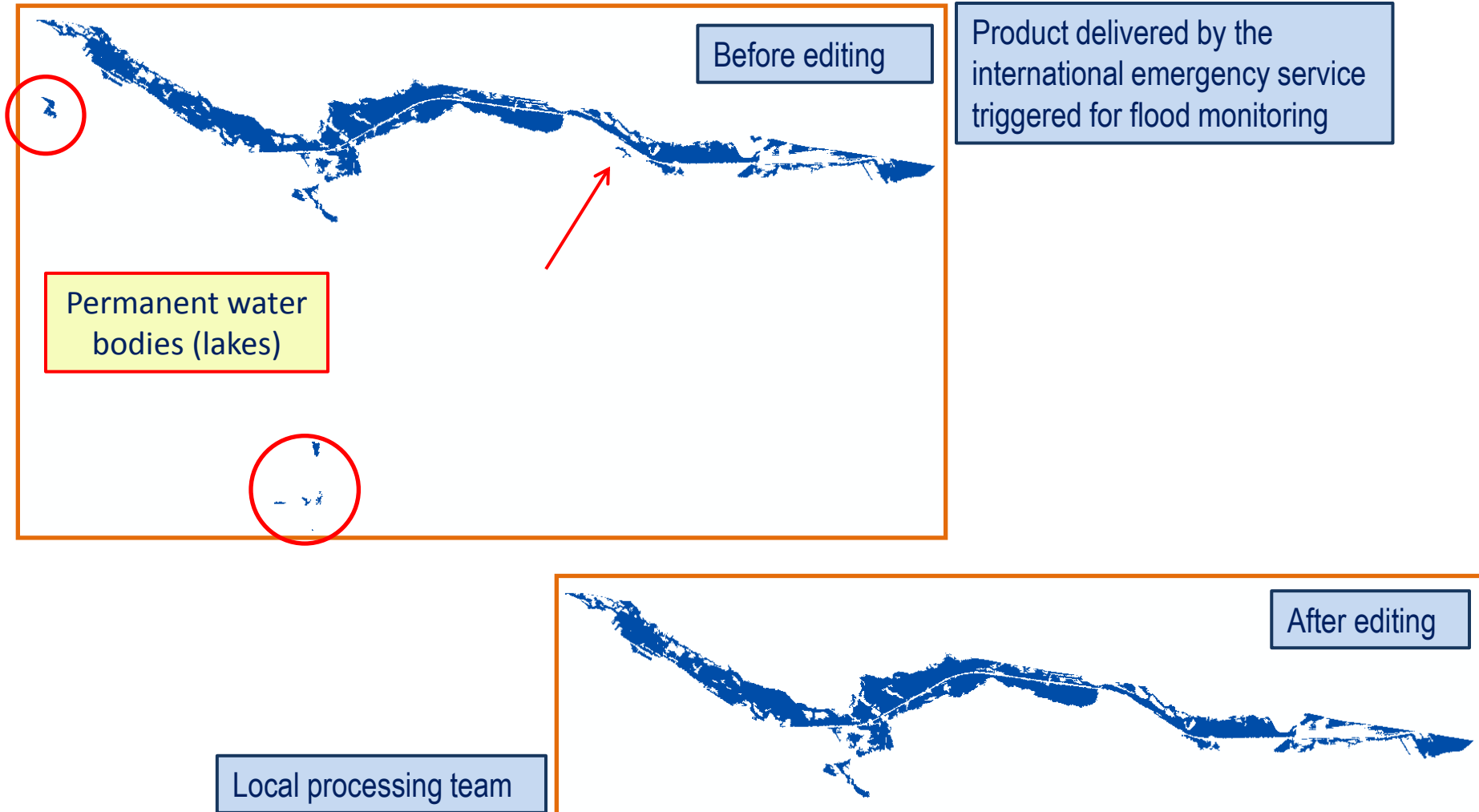
Romanian Emergency Service – processing chain



Romanian Emergency Service – validation examples



Romanian Emergency Service – validation examples

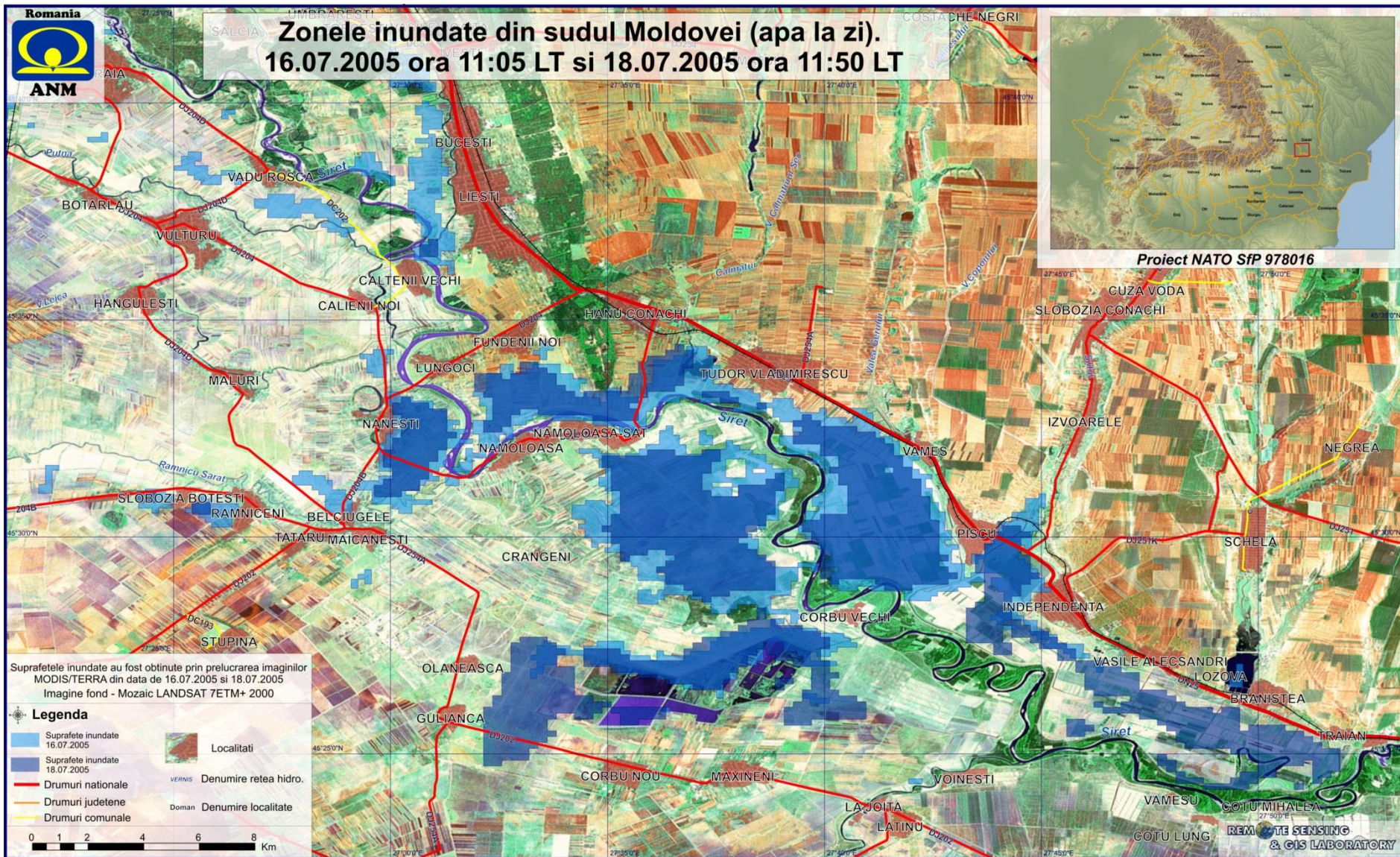


Romanian Emergency Service - activations

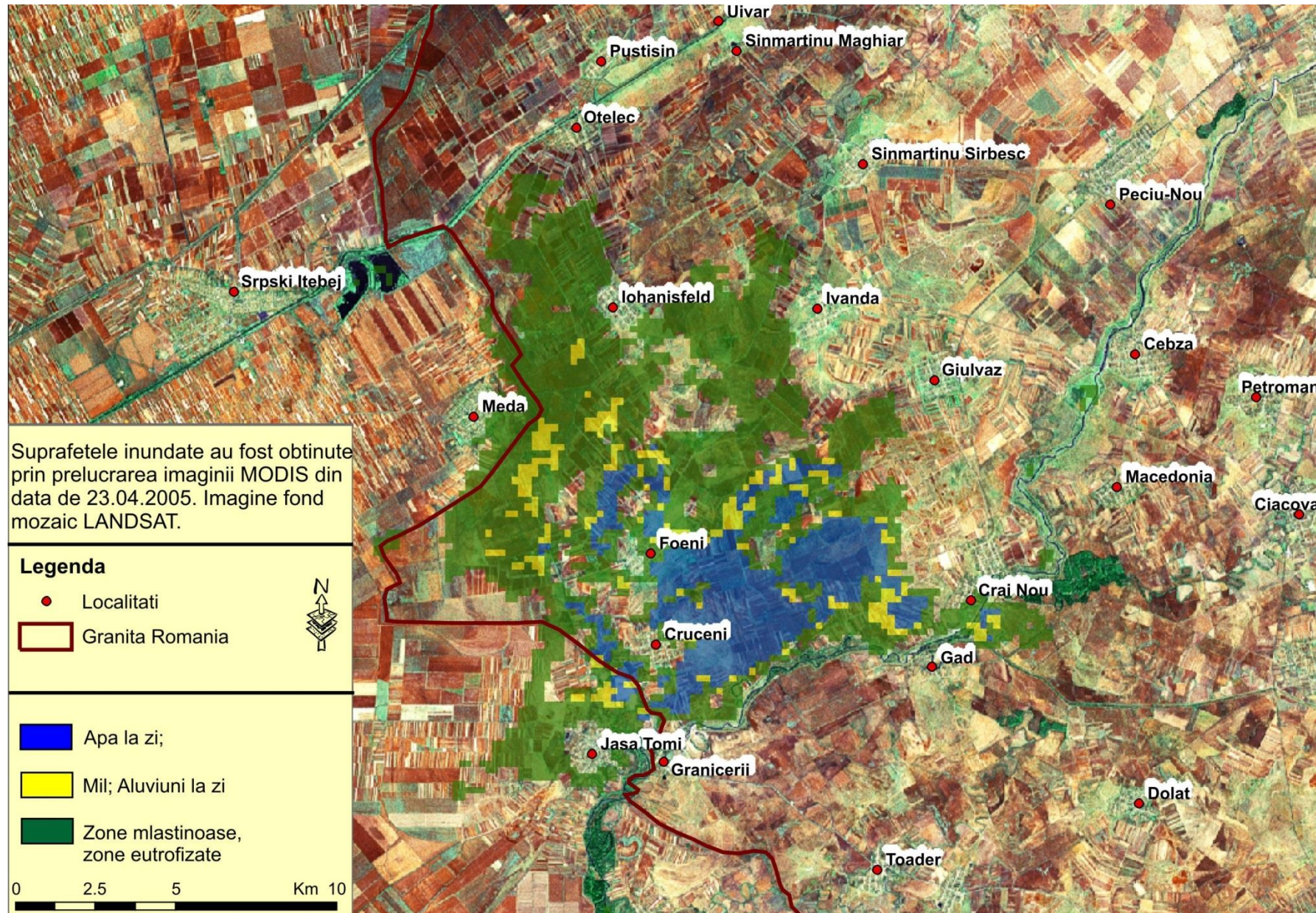
International emergency response services triggered for flood disasters in Romania

2005	International Charter "Space and Major Disasters"	CNES	SERTIT	Satellite imagery
2006	International Charter "Space and Major Disasters"	DLR	DLR / ZKI	Satellite imagery
2008	International Charter "Space and Major Disasters"	CNES	SERTIT	Satellite imagery
2010	Copernicus Emergency Management Service	SAFER PROJECT	DLR / ZKI	Satellite-based products

Romanian Emergency Service – examples of maps - 2005



Romanian Emergency Service – examples of maps - 2005



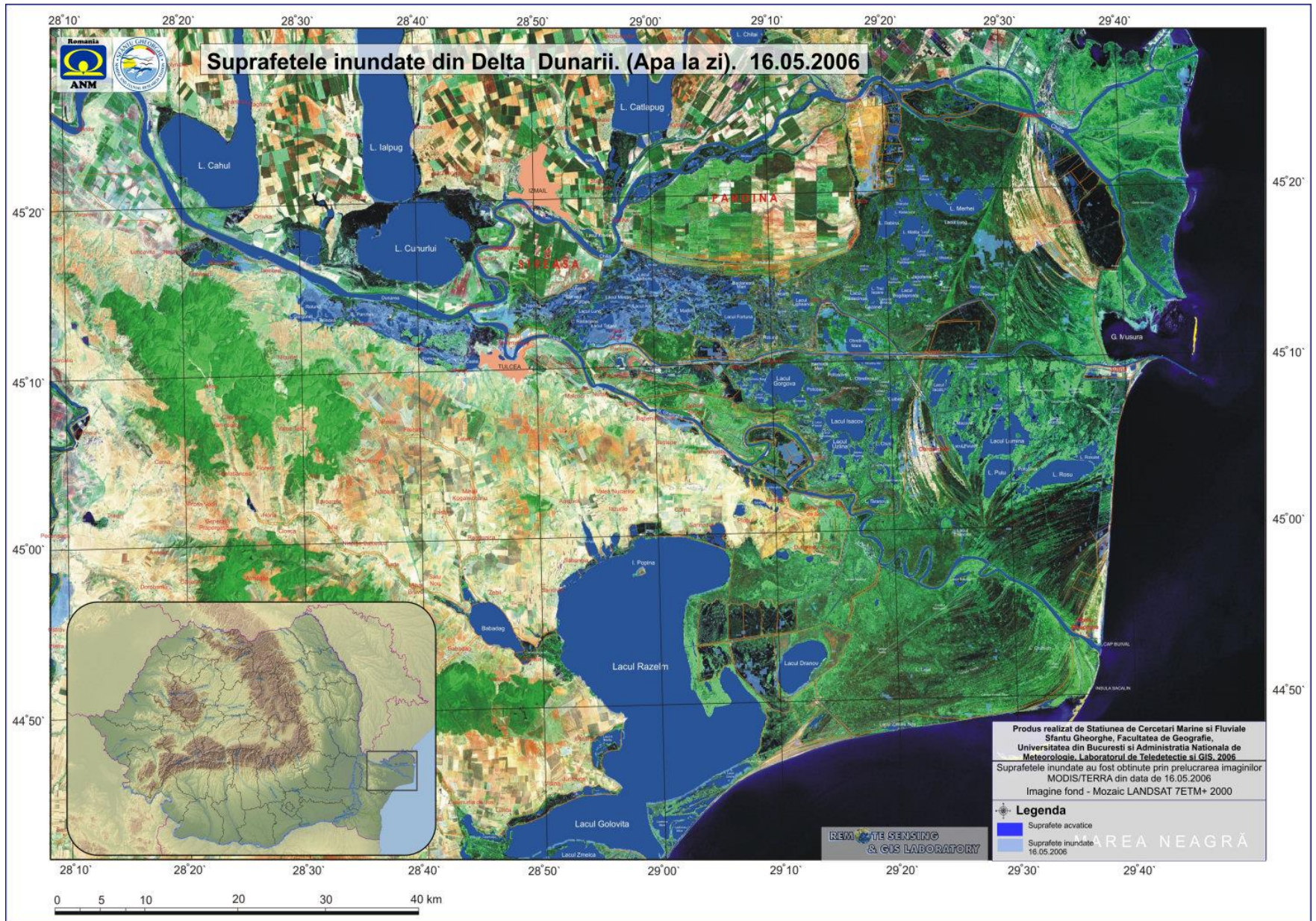
Romanian Emergency Service – examples of maps - 2006

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

01.04.2006



Romanian Emergency Service – examples of maps - 2006



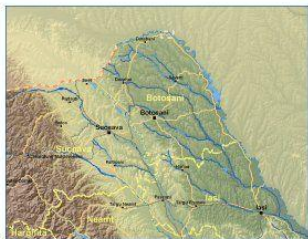
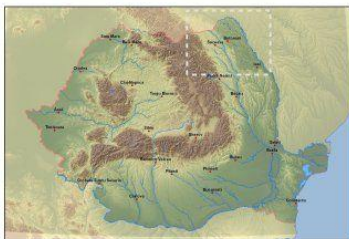
Romanian Emergency Service – examples of maps - 2008

Romania. Flooded areas near Radauti-Prut village. 29.07.2008 09:40 UTC

Charter Call ID- 212
Product no. RO-05



LOCATION



LEGEND

- Flooded areas
- European and national roads
- County roads
- Railroads



0 0.2 0.4 0.8 1.2 1.6 Km

INTERPRETATION

Following the historical discharge measured in July 2008 on Prut river several villages, located upstream Stanca Costesti dam, were flooded. The most severe damages was reported in Radauti-Prut village.

The flooded areas were extracted from the TerraSAR-X image, acquired on 29.07.2008 (3 meters cell size).

The background image (orthophotomage, Copyright National Agency for Cadastre and Land Registration – spatial resolution 0.5 meters) presents the situation in 2005.

Projection: Stereographic 1970 (EPSG: 31700).

ATTENTION: The accuracy of the flood delineation is closely related to spatial resolution of input data. Some small affected areas may not be represented.

CONTACT

The product was elaborated by the National Meteorological Administration (Remote Sensing and GIS Laboratory) and the Romanian Space Agency for the International Charter "Space and Major Disasters" call 212, in the framework of PNCDI2 SIGUR Project.

For more details you can contact us by using one of the following e-mail addresses:
vasile.craciunescu@meteo.inm.ro, ion.redetu@roa.ro



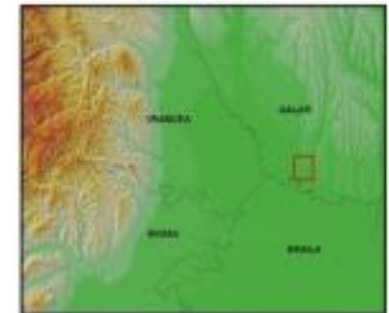
CRUTA **cnnes**

Project PNCDI2 SIGUR
Satellite Based Emergency Response
Services.
<http://sigur.rosa.ro>

Romanian Emergency Service – examples of maps – 2005/2010



EVALUAREA SUPRAFETELOR INUNDATE DIN COMUNA PISCU, JUDETUL GALATI 03.07.2010



LEGENDA



BILANTUL SUPRAFETELOR INUNDATE

CATEGORIA DE FOLOSINTA A TERENULUI	SUPRAFATA (ha)
SUPRAFATA CONSTRUITA	36
TEREN ARABIL	20
PASUNE	339
PADURIE	3
TEREN NEPRODUCTIV	50
TOTAL	348

INFORMATII

Masca de apa a fost realizata de catre ZKIDL (http://www.zki.dlr.de) prin prelucrarea imaginii RADARSAT-2 din data de 03.07.2010. Fondul hartii este reprezentat de imagini SPOT 5 (prin bunavointa SPOT IMAGE S.A.) cu rezolutia de 2,5 m multispectral, preluate in anul 2007. Bilantul suprafetelor inundate a fost efectuat folosind baza de date LCCS Romania (ROSA-CRUTA). Sistemul de proiectie folosit este Stereografic 1970. Informatiile geografice au limitari datorita scarii, rezolutiei si interpretarii datelor sursa. Producatorul hartii nu isi asuma nicio responsabilitate legata de continutul sau utilizarea acesteia.

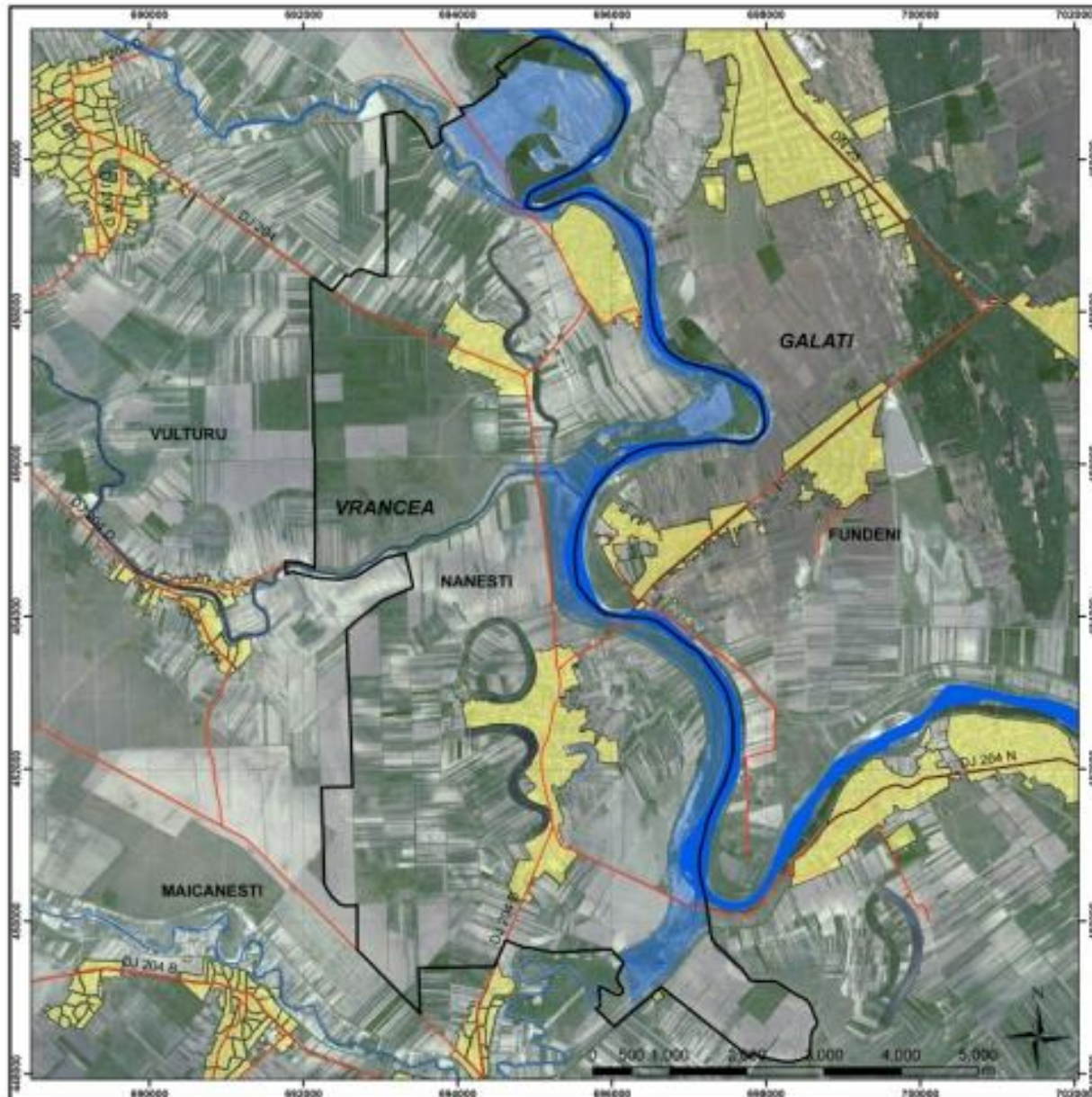
Harta produsa de Agentia Spatiala Romana (©ROSA 2010)
www.rosa.ro



CRUTA



Romanian Emergency Service – examples of maps - 2010



Produs nr. 06 / 06.07.2010
**EVALUAREA SUPRAFETELOR INUNDATE
 DIN COMUNA NANESTI, JUDETUL VRANCEA**
 03.07.2010



LEGENDA



BILANTUL SUPRAFETELOR INUNDATE

CATEGORIA DE FOLOSINTA A TERENULUI	SUPRAFATA [ha]
SUPRAFATA CONSTRUITA	7
TEREN ARABII	263
PASUNE	182
TEREN NEPRODUCTIV	37
TOTAL	529

INFORMATII

Masca de apa a fost realizata de catre ZIU/DUI (<http://www.ziu.diu.ro>) prin prelucrarea imaginii RADARSAT-2 din data de 03.07.2010. Fondul hartii este reprezentat de imagini SPOT 5 (prin bunavointa SPOT IMAGE S.A.) cu rezolutia de 2,5 m multispectral, preluate in anul 2007. Bilantul suprafetelor inundate a fost efectuat folosind bazele de date LCOS Romania (RCSA-CRUTA) si IACS/LPIS (IDAPIA 2009). Sistemul de proiectie folosit este Stereografic 1970. Informatiile geografice au limitari datorita scarii, rezolutiei si interpretarii datelor surs. Producatorul hartii nu isi asuma nici o responsabilitate legata de continutul sau utilizarea acestuia.

Produs realizat de Agentia Spatiala Romana (ROSA 2010) si Administratia Nationala de Meteorologie in cadrul proiectului PNCDI2 SIGUR.

Proiect PNCDI2 SIGUR – Serviciu bazat pe informatii primare satelitare pentru Gestionarea situatiilor de Urgenta.
floods2010@rosa.ro www.rosa.ro



Romanian Emergency Service – statistics and status

Statistics:

- number of service activations: 6
- number of products:
 - 2005: 82
 - 2006: 124
 - 2008: 39
 - 2010: 41

Current situation:

- 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

GEODIM

GEODIM – general information

- Title: Platform for Geoinformation in Support of Disaster Management
- Duration: July 2012 – June 2015
- Funding: Executive Agency for Higher Education, Research, Development and Innovation Funding - Romanian Ministry of Education, Research, Youth and Sport
- Consortium:
 - leader: National Meteorological Administration
 - partners: Romanian Space Agency (ROSA), Advanced Studies and Research Center (ARSC), Politehnica University of Bucharest – Research Centre for Spatial Information (CEOSpaceTech), University of Agronomic Science and Veterinary Medicine Bucharest (USAMVB)



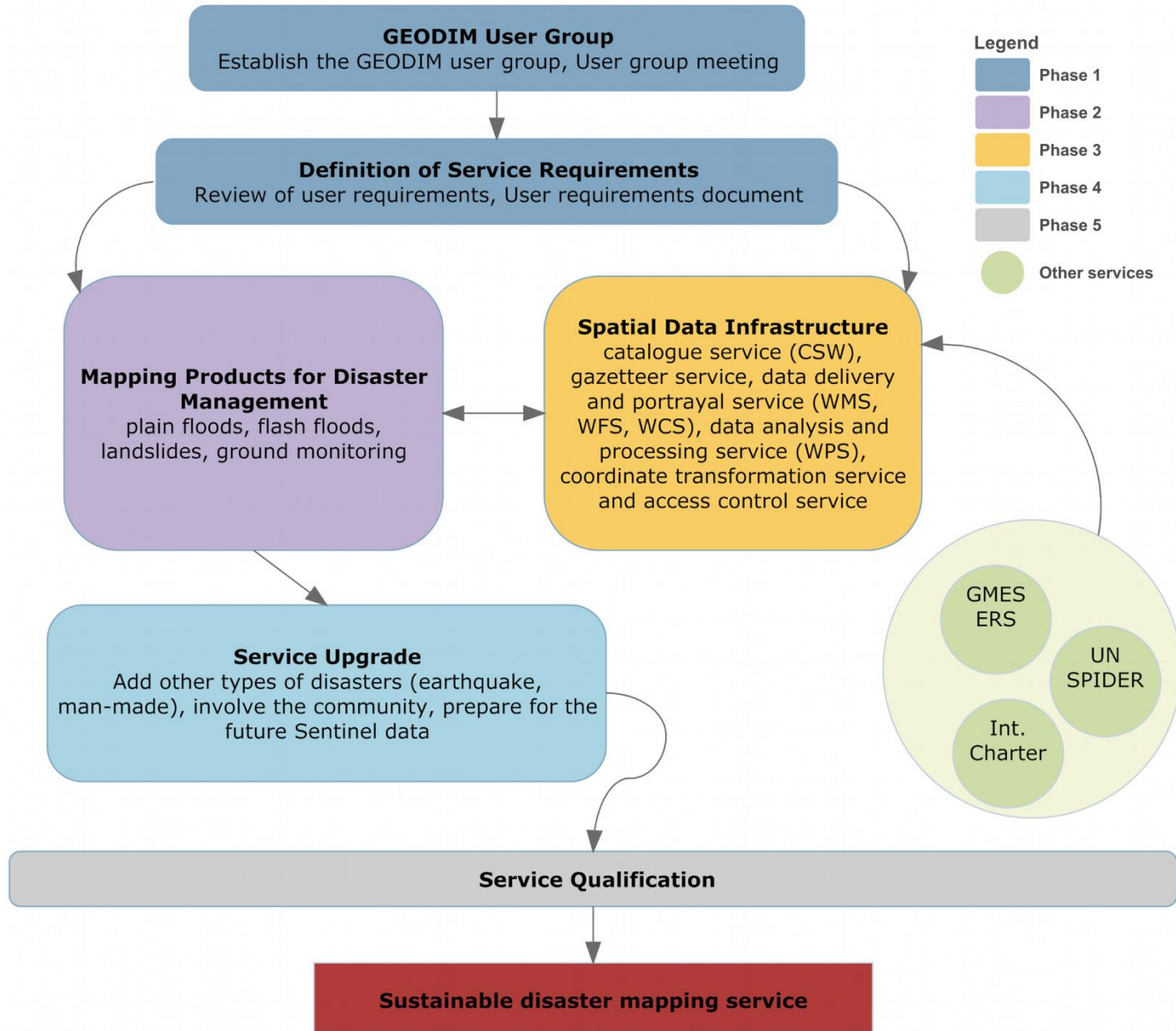
GEODIM – objectives

- GEODIM will develop a platform for local disaster and risk management based on geoinformation, in order to provide a value-added service that covers all the phases of a disaster: preparedness/prevention, emergency response, and recovery.
- The project will identify the users' requirements for the emergency response service and for the related products that are specific to Romania.
- GEODIM will gather all the puzzle pieces consisting in services provided by SIGUR, International Charter, Copernicus Emergency Management Service, UN-SPIDER under a unique Romanian emergency response downstream service.
- The project will establish a data center containing archive and newly acquired satellite imagery, in-situ data, different types of useful auxiliary data, all stored in geodatabases.
- The center will also incorporate improved satellite image processing algorithms that will be adapted for each disaster type. The algorithms might be further integrated in the processing flow charts of the existing emergency response services.

GEODIM – objectives

- GEODIM will strengthen the expertise of the Romanian experts both when operating specific actions for local disaster events (calls of SIGUR, International Charter, Copernicus Emergency Management Service, UN-SPIDER) and when assisting other countries as an UN-SPIDER Regional Support Office.
- GEODIM acknowledges, welcomes and uses the emergency response services provided by the International Charter, Copernicus Emergency Management Service and UN-SPIDER, but it complements them with a downstream service that offers value-added and validated products for each disaster management phase (preparedness/prevention, emergency response, and recovery).
- GEODIM will establish partnerships and agreements with Government and local authorities, civil protection, general inspectorate for emergency situations, research and development institutes, and universities in order to assure a good cooperation for disaster risk reduction and efficient and timely disaster management actions.

GEODIM – activities

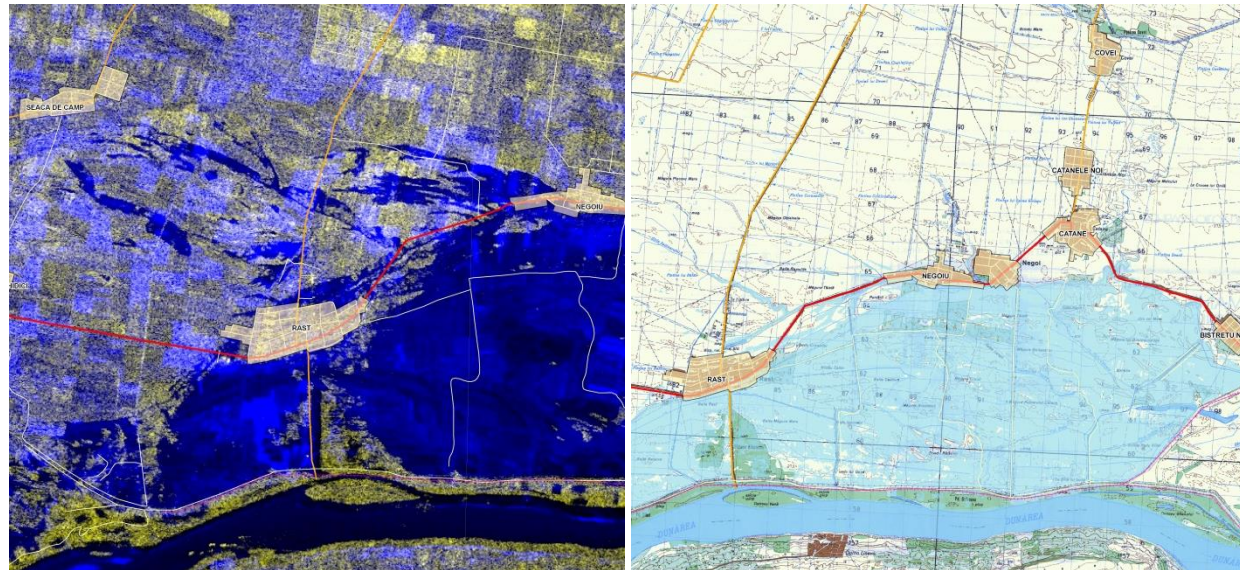
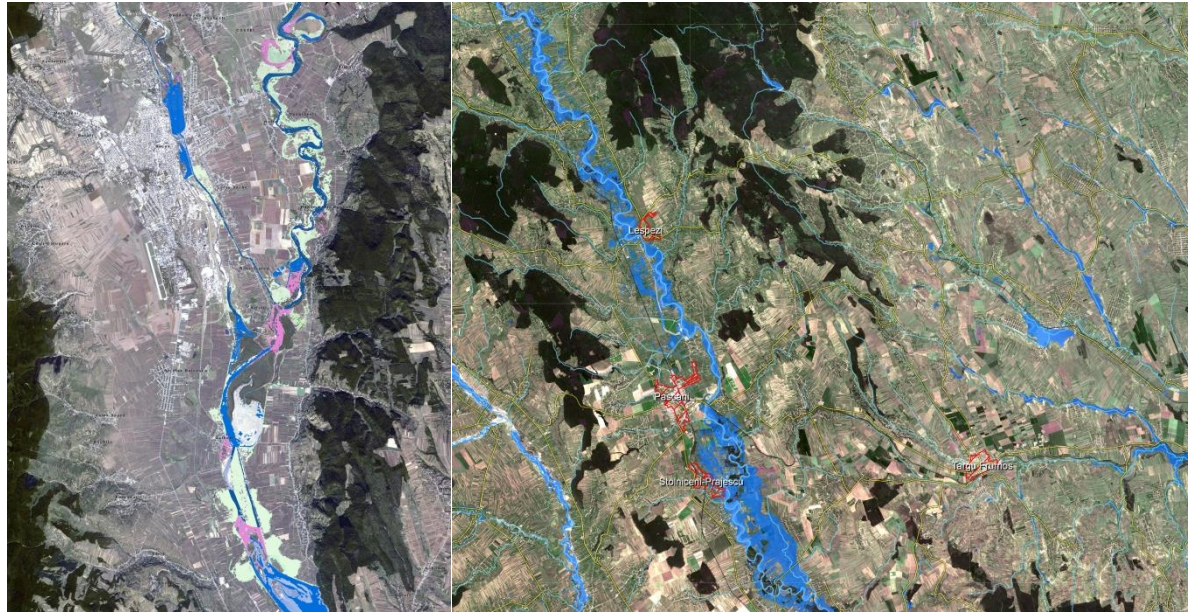


GEODIM – products

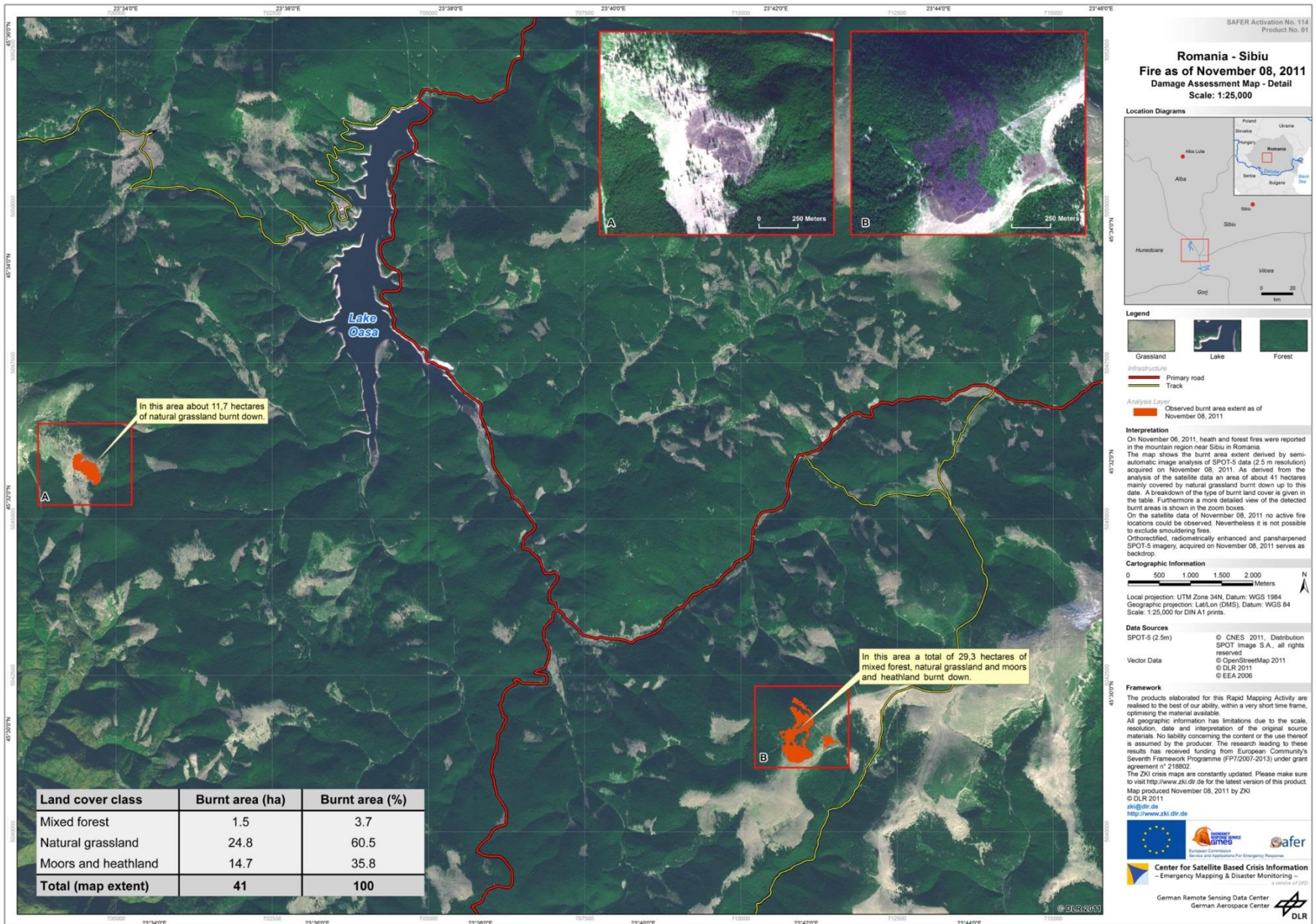
- Reference maps: geographic maps containing information regarding the topography (contour lines, benchmarks, digital elevation/surface models), hydrology, and transport networks, localities, others. These maps shall be available in a digital form (as GIS info-layers) before the beginning of crisis situation. The scale-map will be 1: 100 000. Depending of the type of disaster, affected territory and severity, maps with higher scales would be used (1: 50 000, 1: 25 000). The existence of reference maps will be done by using the existing geospatial database and cooperation with responsible institutions.
- Situation maps: maps that are critical for intervention teams and decision-making committee. They are drawn-up through updating and completion of geographical maps with specific information. During a crisis, depending of the disaster dynamic, the situation-maps could face several up-dates (Ex: state of infrastructure, meteorological conditions, extension of affected area). These maps will be set-up in a standardized manner and distributed either in electronic form or printed. Because the time is playing a major role during the decision-making stage, the situation-maps generated during the disaster crisis (emergency response phase) shall be promptly delivered, preferably maximum 24 hours after disaster starts-up.

GEODIM – types of disasters

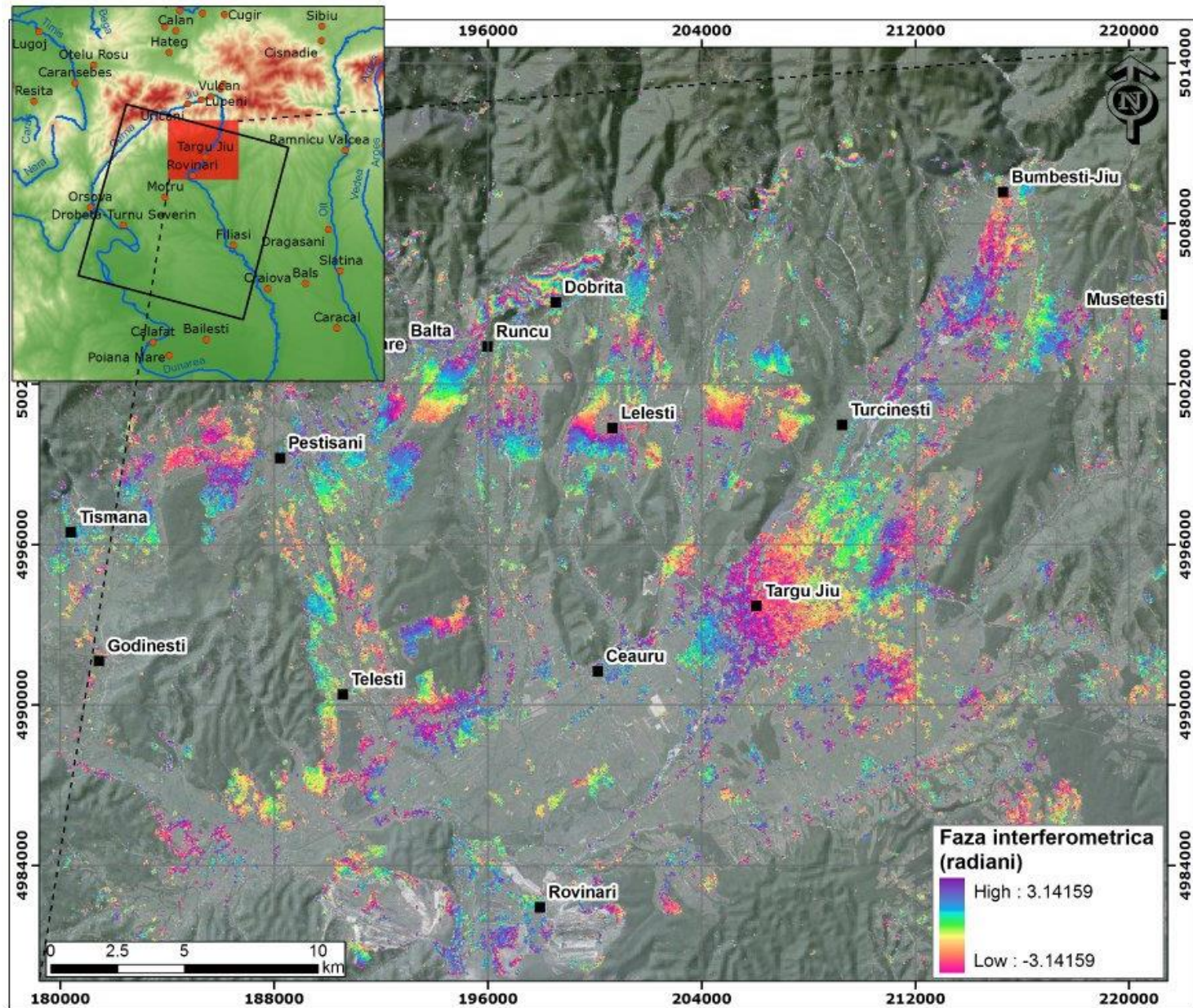
1. Floods
2. Extreme meteorological phenomena
3. Fires
4. Drought
5. Earthquakes
6. Landslides
7. Industrial accidents



GEODIM – example of maps – forest fires



GEODIM – example of maps – landslides



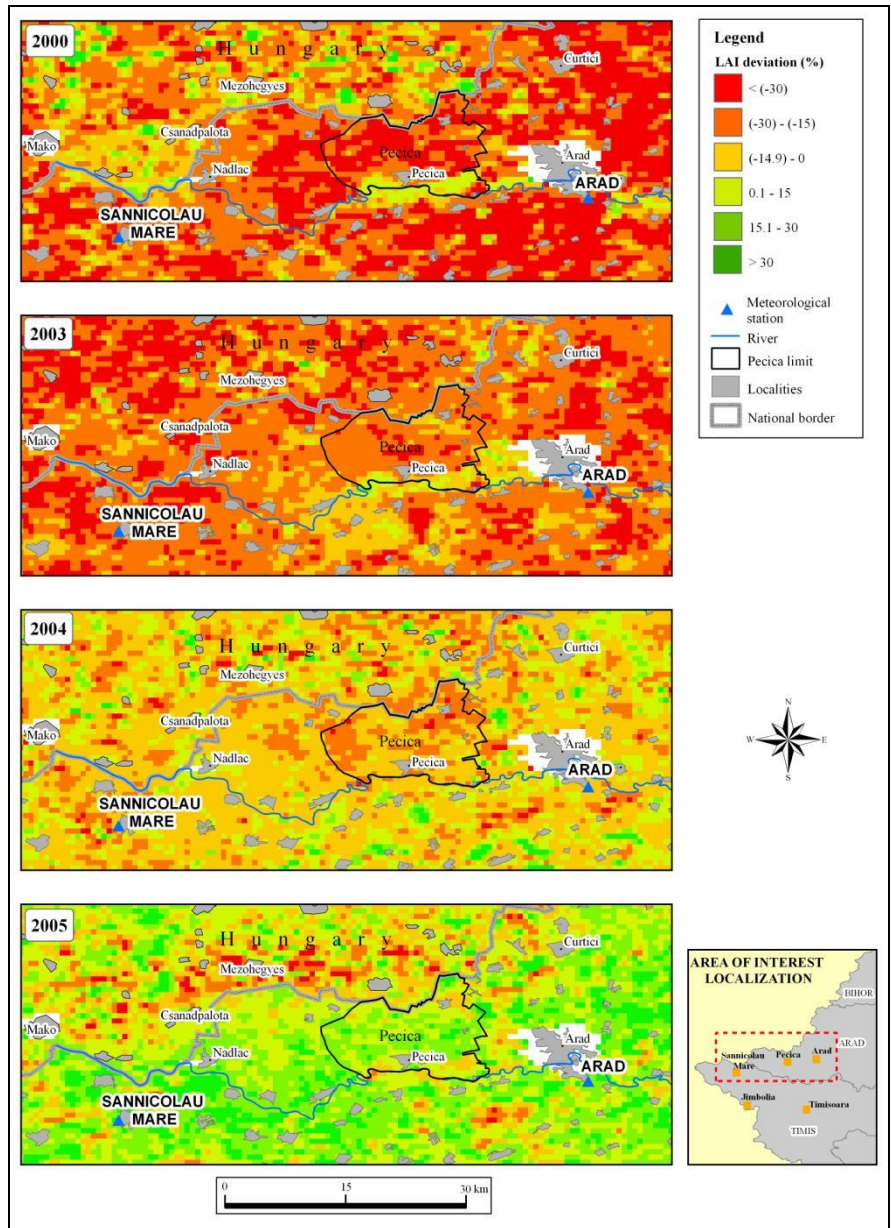
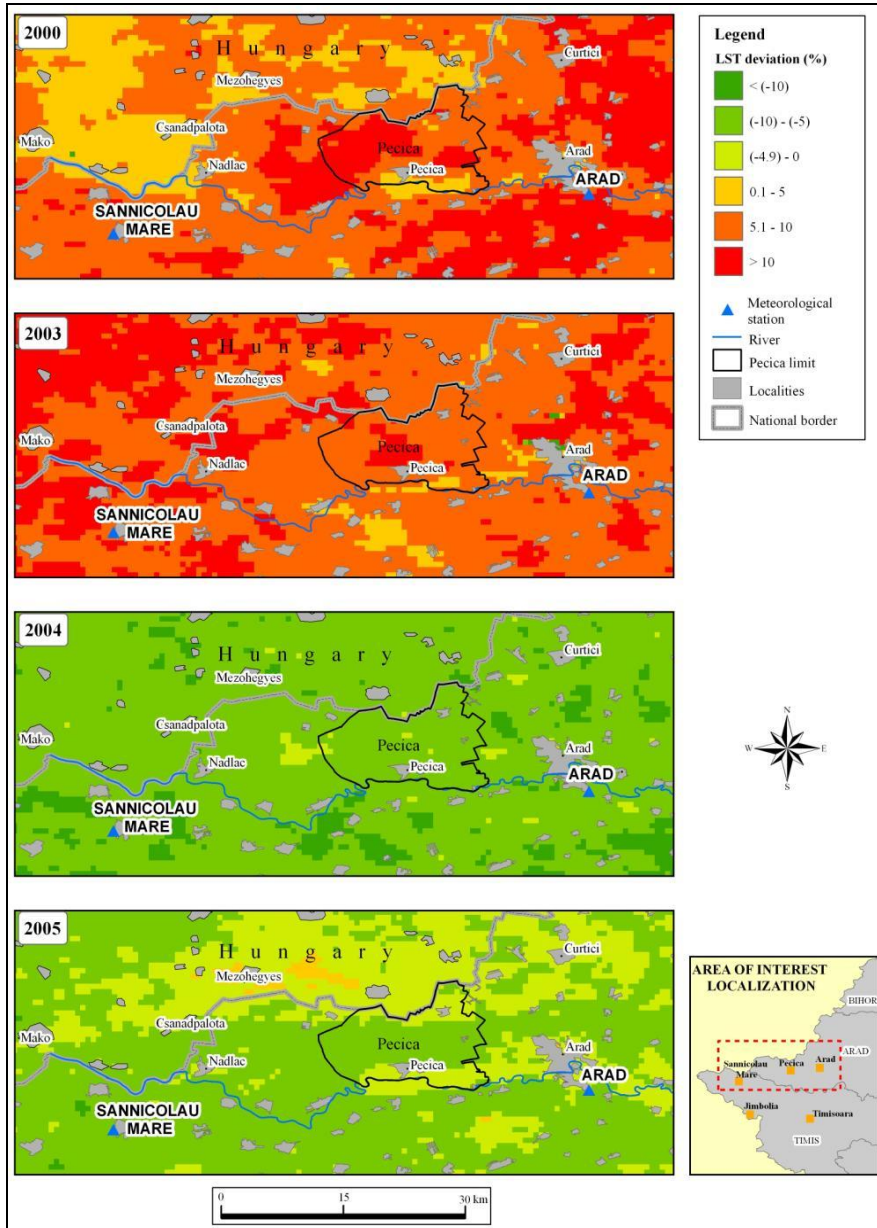
The figure is a map of the Siriu Reservoir area. The main map shows the reservoir and surrounding terrain with color-coded deformation data. The colors range from red (positive deformation) to blue (negative deformation). The map includes a scale bar (0 to 500 m) and a north arrow. An inset map in the bottom left corner shows the location of the study area within Romania. A legend in the bottom right corner explains the symbols and color scale.

Legend

- Black line: Natural road - DN10
- Blue line: Siriu Reservoir
- Deformation map (m):
 - Red: 0.010000000000000000 - 0.0100
 - Orange: 0.0100 - 0.0050
 - Yellow: 0.0050 - 0.0000
 - Green: 0.0000 - 0.0000
 - Light Green: 0.0000 - 0.0000
 - Dark Green: 0.0000 - 0.0000
 - Blue: 0.0000 - 0.0000
 - Dark Blue: 0.0000 - 0.0000

Deformation map of the Siriu area, for the time interval 31.10.2009 – 11.11.2009

GEODIM – example of maps – drought



Romanian Emergency Service – conclusions

- Satellite remote sensing data and its derived products (space-based maps) are essential components in the management of emergency situations.
- The integration of ancillary data improves the quality and content of the disaster crisis maps offering the guarantee of the in situ collected basic information.
- From the user's point of view:
 - satellite data should be received as fast as possible
 - both temporal and spatial resolution are critical, but (at least) in the first phases of the crisis situation temporal resolution is more important than spatial resolution

GEODIM – conclusions

- The downstream emergency response service will be designed and implemented according with the specific Romanian conditions that are defined by the final users (Ministry of Environment, General Inspectorate for Emergency Situations), and further integrated with the National System for Emergency Situations Management.
- GEODIM will provide an operational and validated service that will help the responsible authorities to use the products during all stages of the crisis management cycle (preparedness/ prevention, response, recovery), as a support for their decision-making actions.
- The establishment and implementation of this downstream service would represent an absolute first performance for Romania, fitting the current European policies and trends related to Copernicus Downstream Services that are an extension of the Emergency Response Core Service.



Thank you for your attention!

iulia.dana@rosa.ro

ion.nedelcu@rosa.ro

vasile.craciunescu@meteoromania.ro