WHEN SPACE MEETS AGRICULTURE

14-15 November 2016 | Matera, Italy

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#WSMA16

TeRN - Basilicata aereospace cluster: Space technologies in Agriculture, solutions for precision farming

Angelo Raffaele Donvito, TeRN Consortium

Image from ESA Sentinel

REGIONE BASILICATA

nereus
network of european regions using space technologies

in collaboration with

TeRN

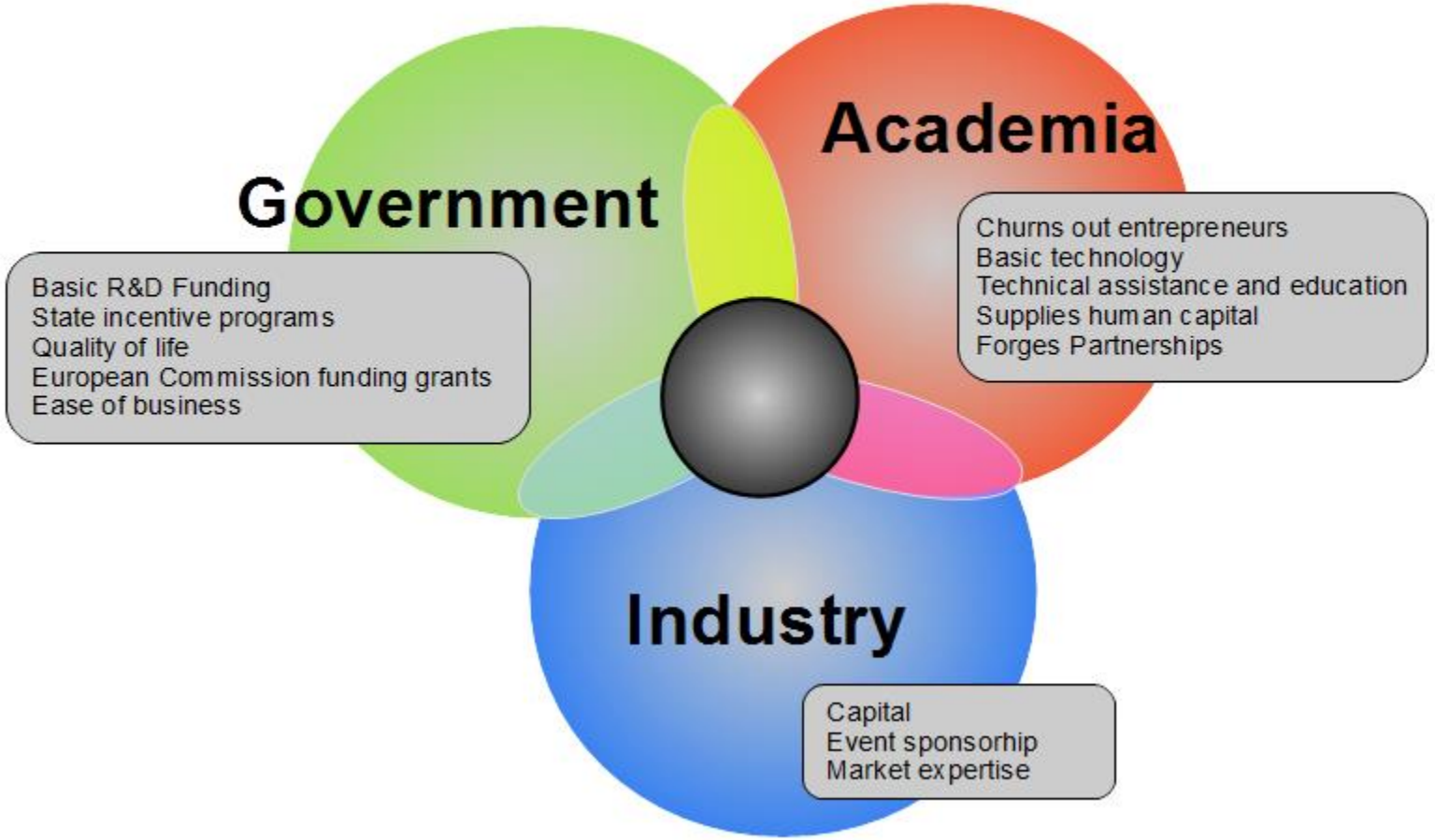
and the support of

copa cogeca
european farmers european agri-cooperatives

ERIAFF Network
European Regions for Innovation in Agriculture, Food and Forestry

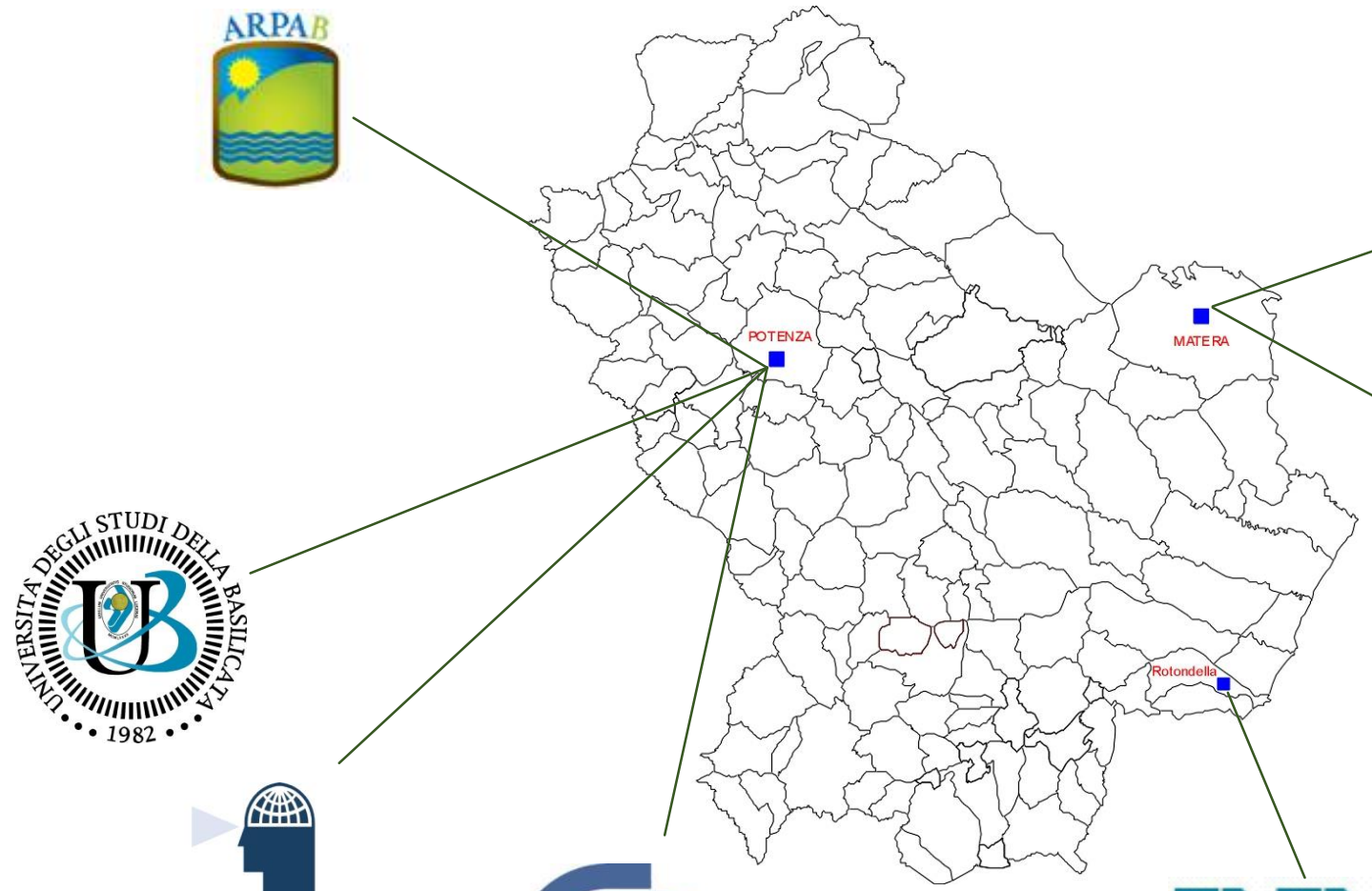
Triple Helix Model

The triple-helix organization (research - local authorities - enterprises) of the Consortium is in agreement with the European policies which concern technological clusters.



TeRN Consortium

TeRN Membership



ARPAB

e-geos
AN ASI/TELESPAZIO COMPANY

UNIVERSITÀ DEGLI STUDI DELLA BASILICATA 1982

CONSORZIO PER L'AMBIENTE E L'INNOVAZIONE TECNOLOGICA CREATEC

CONSORZIO PER L'AMBIENTE E L'INNOVAZIONE TECNOLOGICA CREATEC

imaa

ENEA

Ente per le Nuove tecnologie, l'Energia e l'Ambiente

TeRN Consortium

Consortium of Basilicata SMEs

CREATEC

digimat SYSTEM ENGINEERING

INNOVA CONSORZIO PER L'INFORMATICA E LA TELEMATICA

openet

sintesi

PUBLISYS SpA Consulting Technology Outsourcing

GEOCART sensing innovation

GEOTEC S.r.L.

CEDAT EUROPA S.r.l.

ACS ADVANCED COMPUTER SYSTEMS

TeRN Consortium

Consortium of Basilicata SMEs

Technologies for earth observation and Natural Risks

CREATEC capabilities

Telecommunications

- Broadband internet access;
- VPN & VoIP;
- Mobile satellite communication system

Aircraft instruments

- Hyperspectral;
- LASER Scanner
- UAV

CREATEC

Earth observation

- SAR;
- Hyperspectral;
- Ground segment

Web services

- Data archive;
- Data and products supplier;
- GIS

TeRN Consortium

Consortium of Basilicata SMEs

Technologies for earth observation and Natural Risks

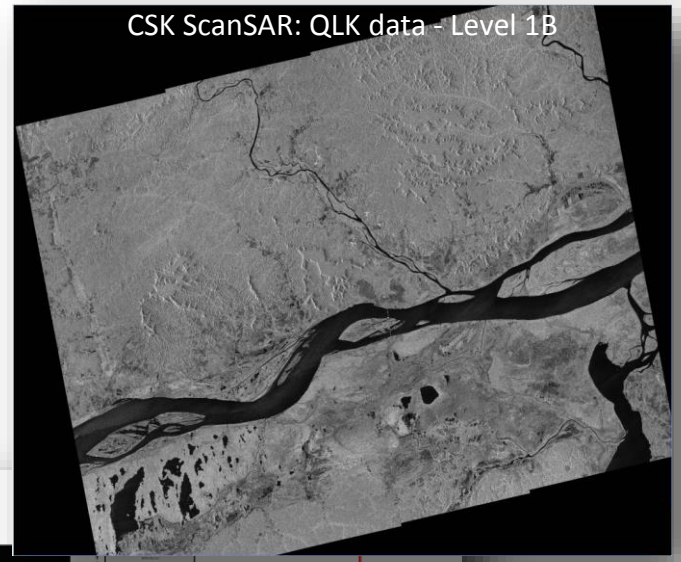
SAR Products for EO images

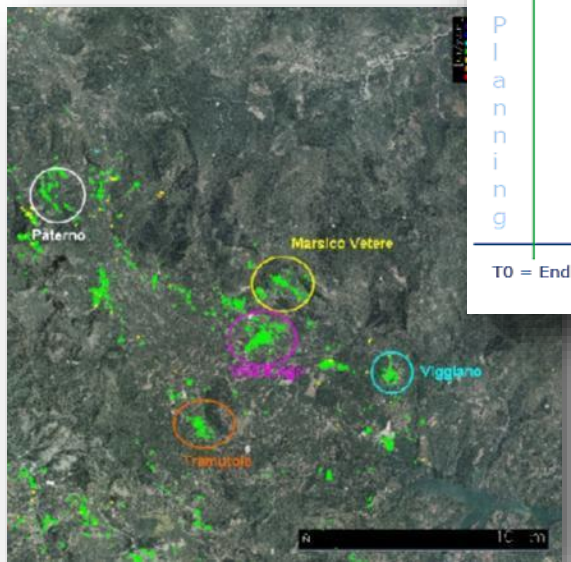
Focusing for ScanSAR/Stripmap/Spotlight/PingPong Acquisition modes

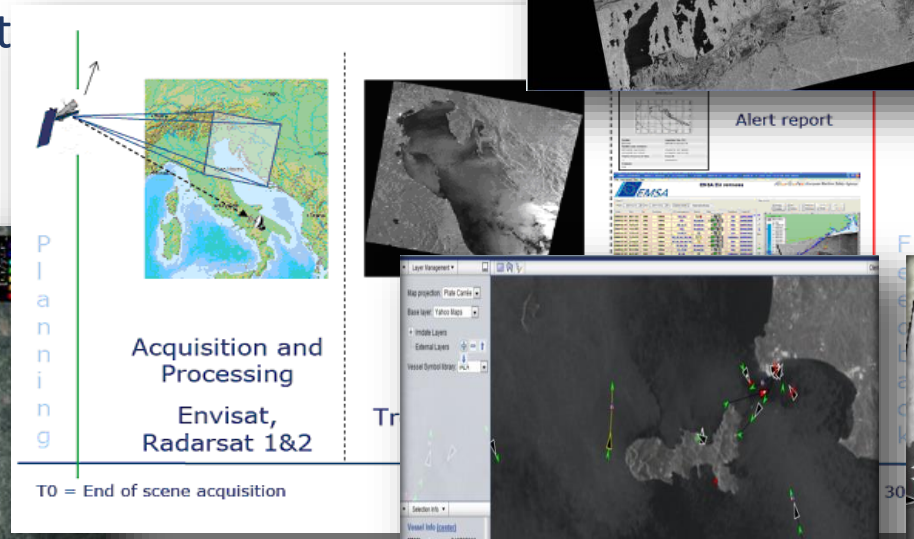
Oil Spill detection

Ship detection and route prediction

DInSAR application - PS Map product







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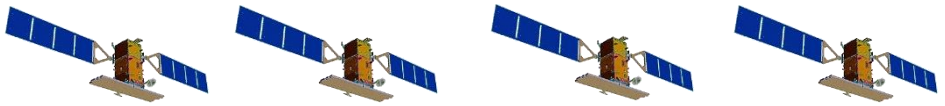
Technologies for earth observation and Natural Risks

SAR Products for EO images

CSK/CSG Payload Data Ground Segment



CSK Space Constellation

Receiving Ground Stations → Civilian User Ground Segment (COSMO SkyMed)

Public network

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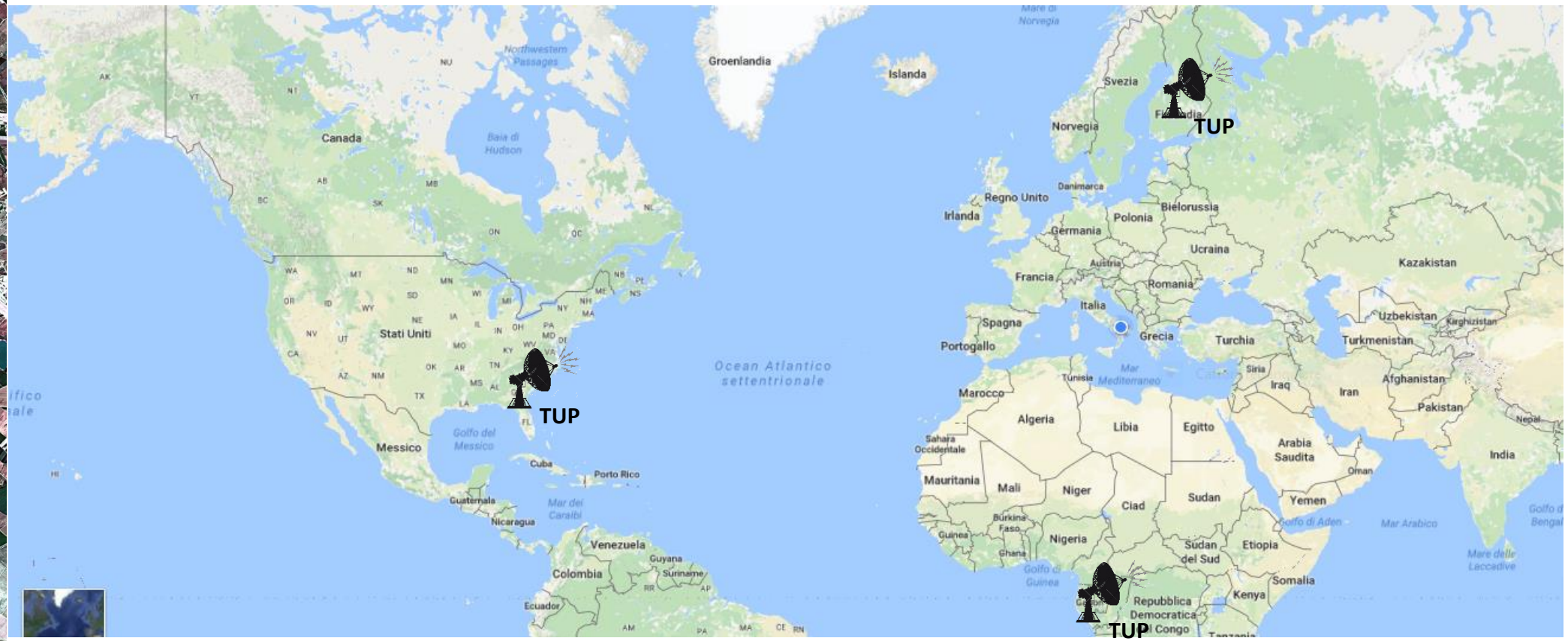
Technologies for earth observation and Natural Risks

SAR Products for EO images

Portable User Terminals CSK/CSG



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Technologies for earth observation and Natural Risks

CREATEC for Earth Observation

Client	Programme	Mission/project
ESA / EUMETSAT	Copernicus	Sentinel 1 Sentinel 2 Sentinel 3 DFEP
EUMETSAT	Earth Explorers	Meteosat METOP JASON-2 JASON-3
ASI	Cosmo SkyMed	1st Generation 2nd Generation
	Cross	
Third parties	Past/Other missions	Multi-mission centre Venus, ERS 1-2, JERS 1, Meris, Landsat 5-8, Spot 1-4

Createc Role

- PDGS and Data architectures
- Satellite data processing
- Downstream Services

International Projects

Doris: Ground Deformation Risk Scenarios: an Advanced Assesment Service

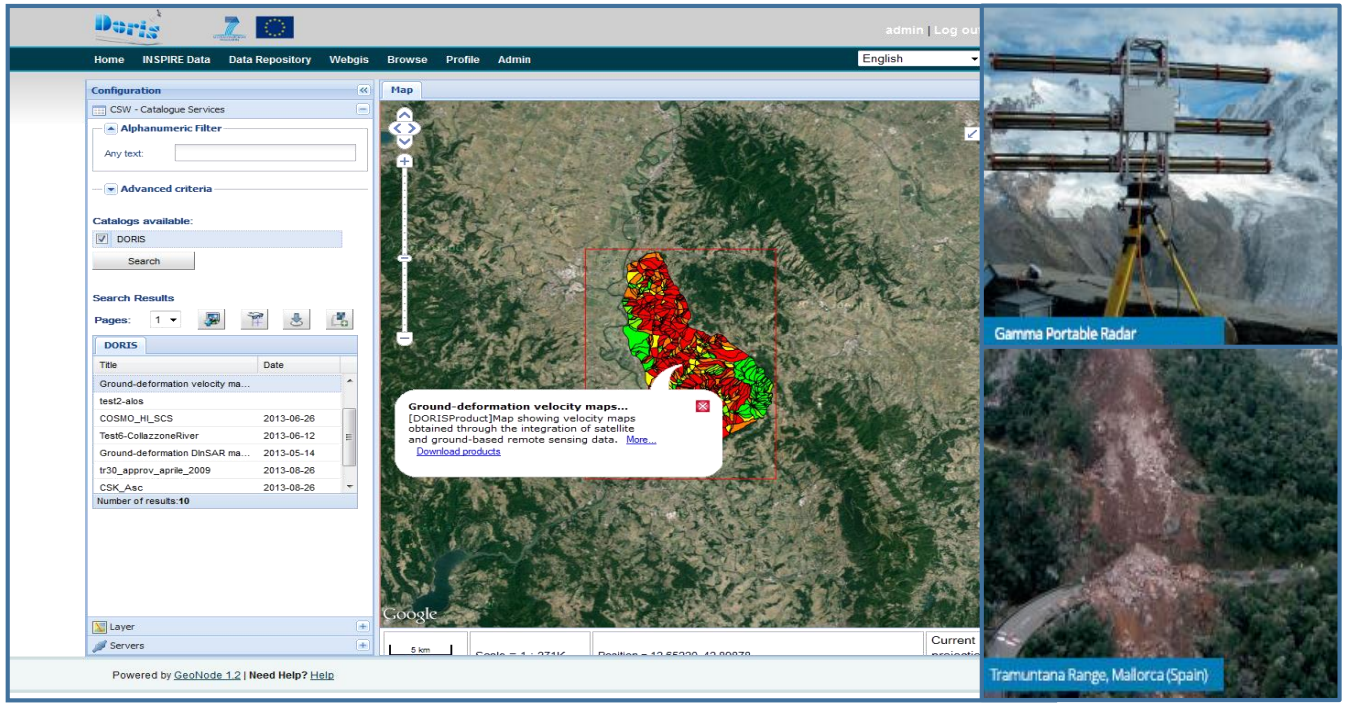
Prototype SW system to receive, archive and distribute Input data (EO and non-EO data, maps, in situ data)

Main features :

- Data and Map upload form, Data Explorer;
- Metadata editor;
- Web GIS;

DORIS :

- Integrates traditional and innovative Earth Observation (EO) with ground based (non-EO) data.
- Allows coordination of individual activities between the regions of Europe and European GMES governance, vital for growth in the downstream service sector.



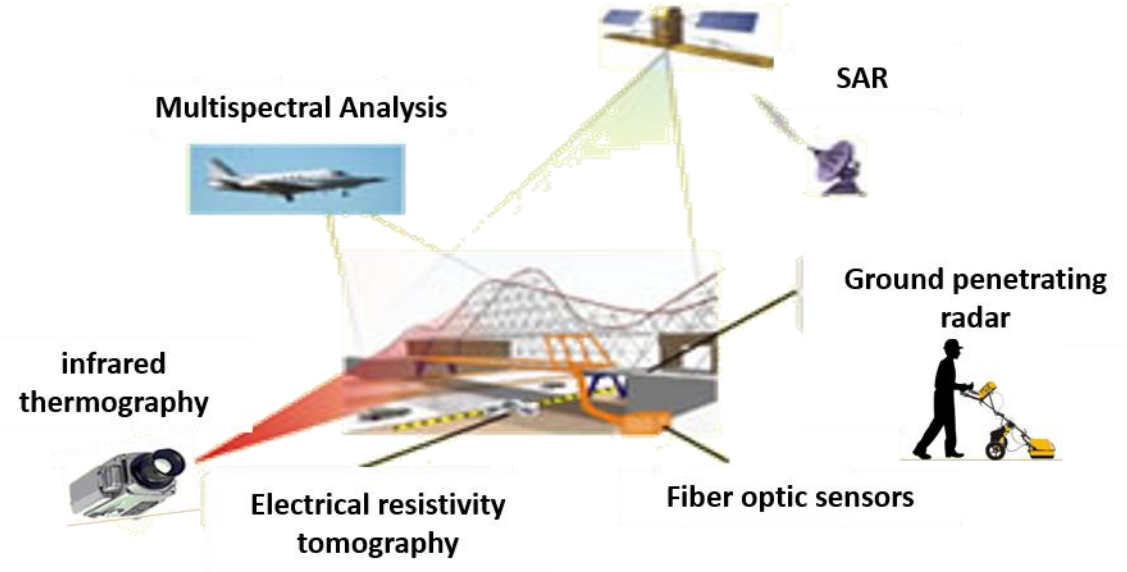
Partners: CNR; Università di Firenze; Tre; ASI; Państwowy Instytut Geologiczny; booz&co.; Protezione Civile Nazionale; Instituto Geològico y Minero de España; altamira; Gamma Remote Sensing; Eötvös Loránd Geophysical Institute; Federal Office for the Environment FOEN

International Projects

ISTIMES: Integrated System for Transport Infrastructures surveillance and Monitoring by Electromagnetic Sensing

Main features :

- The aim of the proposal is to design, assess and promote an ICT-based system, exploiting distributed and local sensors, for non-destructive electromagnetic monitoring in order to make the critical transport infrastructures more reliable and safe;
- The integration of electromagnetic technologies with new ICT information and telecommunications systems enables remotely controlled monitoring, surveillance and real time data imaging of the critical transport infrastructures;
- The architecture will be based on web sensors and service-oriented-technologies that comply with specific end-user requirements, including economical convenience, exportability, efficiency and reliability.



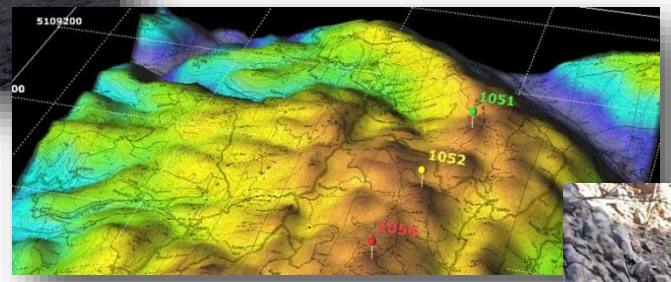
The system is evaluated on very challenging test beds such as: a highway-bridge and a railway tunnel.

National Projects

SESAMO: SistEma informativo integrato per l'acquisizione, **geStione** e condivisione di dati **AMbientali** per il **supportO** alle decisioni

Main features :

- Water service monitoring and efficient management to decrease losses;
- Assisted irrigation and stress maps for valuable crops;
- Characterizes the distributed evapotranspiration, potential foliar and lymph flow
- Early warning for landslides caused by rainfalls.



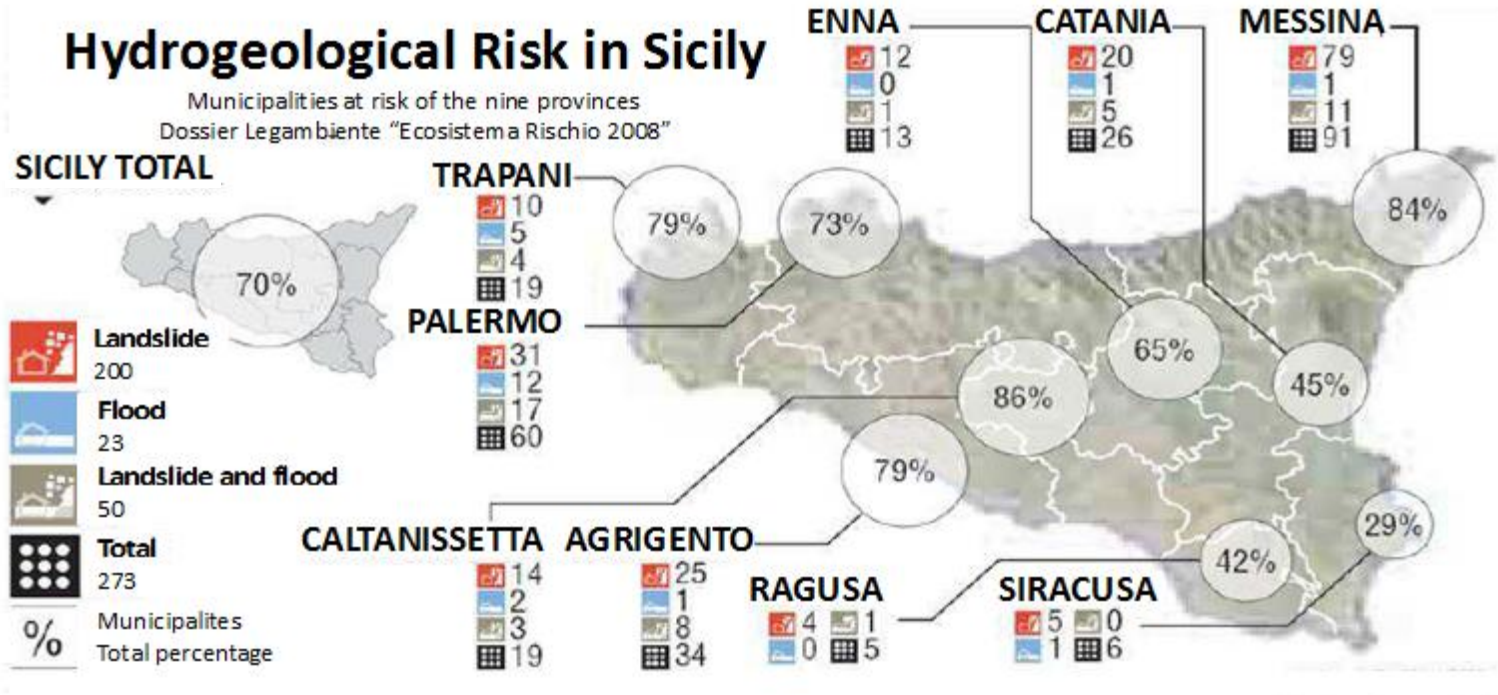
Partners: Consorzio Ticonzero; Gruppomega Spa; SISPI Spa; Università degli Studi di Palermo; Università degli Studi di Enna "KORE"

National Projects

CLARA: Cloud plAtform and smart underground imaging for natural **Risk Assesment**

Main features :

- Non-invasive substratum analysis to mitigate seismic and hydrogeological risk in urban areas;
- Case studies: *Matera*; *Ferrara*; *Enna.*



Partners: Università degli Studi di Catania; Università degli Studi di Enna "KORE"; CNR; Meridionale Impianti Spa; Etna Hitech Scpa; Consorzio ITER; SIDERCEM Srl; Geosystems Srl; Sinergis; OGS; Tecno In Spa; Ingegnerie Toscane Srl; Rotas Italia Srl; IDS Spa; Hera Spa

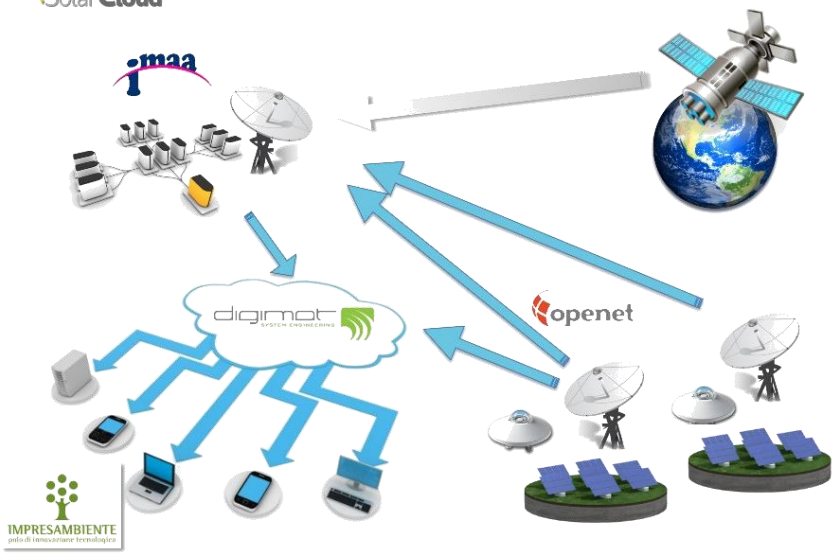
National Projects

SolarCloud: Study, prototyping and testing of a cloud service for estimation and forecasting of the primary source for the management of solar power plants

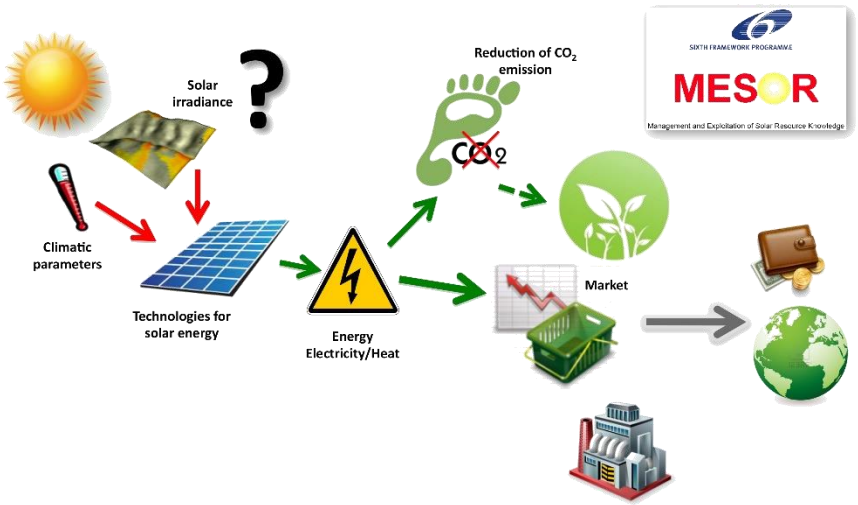
Main features :

- Photovoltaic network management;
- Sharing, interoperability of remote sensing and geospatial data
- Decision Support System for photovoltaic installations;
- Solar irradiance forecasting;

Project concept



Users needs



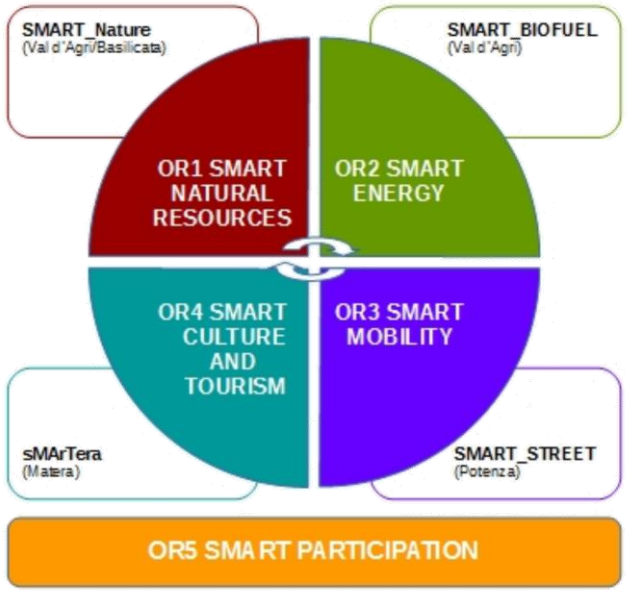
Partners: Openet Technologies Spa; Digimat Srl; ImpresaAmbiente Scarl; CNR-IMAA

National Projects

Smart Basilicata: Smart Cities and Communities and Social Innovation

Main features :

- Protection and promotion of natural resources (SMART NATURAL RESOURCE);
- sustainable mobility; intelligent management of traffic control systems; security and infrastructure monitoring (SMART MOBILITY);
- advanced technology services for the enhancement of the urban, cultural and landscape heritage (SMART CULTURE and TOURISM);
- management of energy efficiency & renewable energy; reducing the impact of energy grids (SMART ENERGY)



National Projects

ALADIN Innovazione Monitoraggio Ottimizzazione

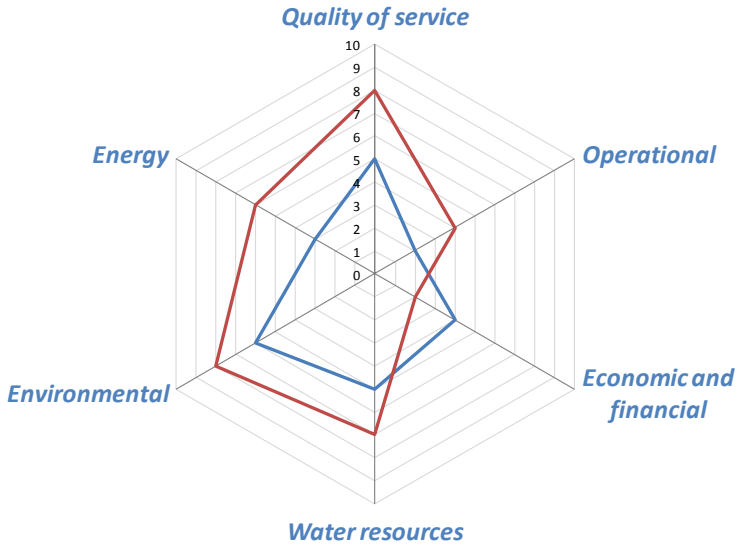
Technologies for earth observation and Natural Risks

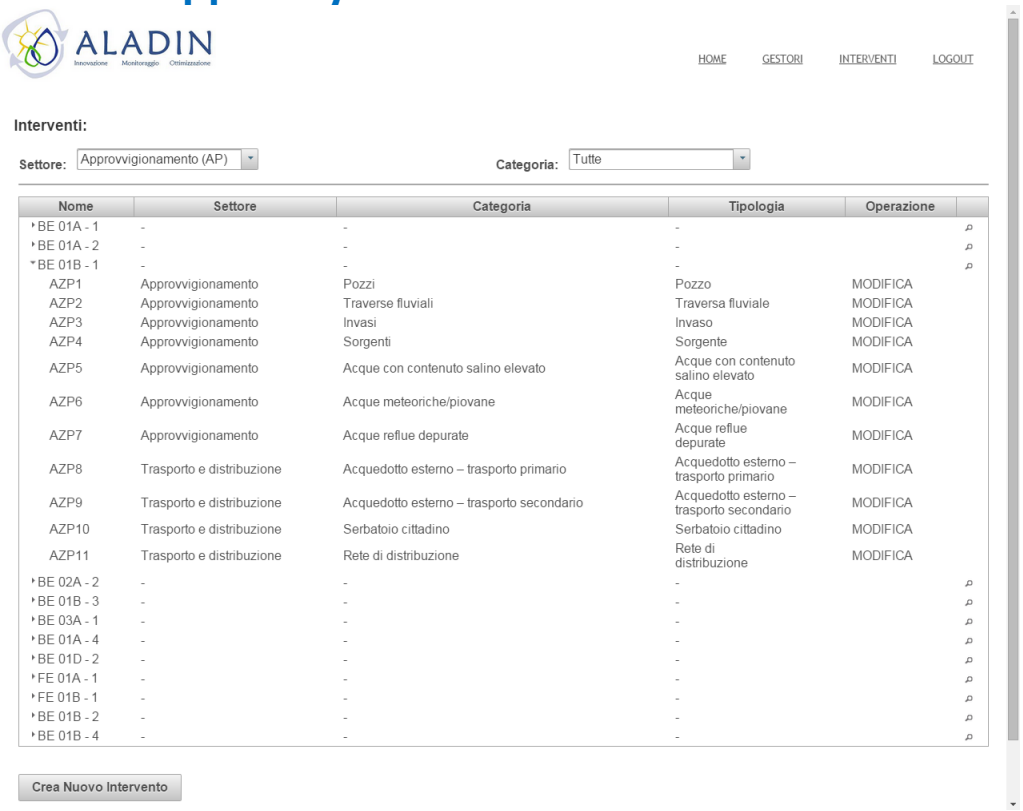
ALADIN: recupero di **Acqua** ed energia dispersa nel **cicLo** idrico **integrAto**. **salvaguarDia** ambientale tramite **Innovazione**, **moNitoraggio**, ottimizzazione

Main features :

- Monitoring, analysis and optimization of energy consumption;
- Drinking water and wastewater treatment;
- Water purification management

Web Service: Decision Support System





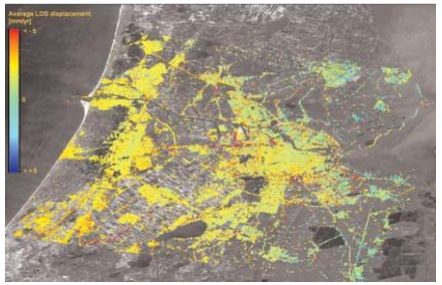
Nome	Settore	Categoria	Tipologia	Operazione
BE 01A - 1	-	-	-	
BE 01A - 2	-	-	-	
BE 01B - 1	-	-	-	
AZP1	Approvvigionamento	Pozzi	Pozzo	MODIFICA
AZP2	Approvvigionamento	Traverse fluviali	Traversa fluviale	MODIFICA
AZP3	Approvvigionamento	Invasi	Invaso	MODIFICA
AZP4	Approvvigionamento	Sorgenti	Sorgente	MODIFICA
AZP5	Approvvigionamento	Acque con contenuto salino elevato	Acque con contenuto salino elevato	MODIFICA
AZP6	Approvvigionamento	Acque meteoriche/piovane	Acque meteoriche/piovane	MODIFICA
AZP7	Approvvigionamento	Acque reflue depurate	Acque reflue depurate	MODIFICA
AZP8	Trasporto e distribuzione	Acquedotto esterno – trasporto primario	Acquedotto esterno – trasporto primario	MODIFICA
AZP9	Trasporto e distribuzione	Acquedotto esterno – trasporto secondario	Acquedotto esterno – trasporto secondario	MODIFICA
AZP10	Trasporto e distribuzione	Serbatoio cittadino	Serbatoio cittadino	MODIFICA
AZP11	Trasporto e distribuzione	Rete di distribuzione	Rete di distribuzione	MODIFICA
BE 02A - 2	-	-	-	
BE 01B - 3	-	-	-	
BE 03A - 1	-	-	-	
BE 01A - 4	-	-	-	
BE 01D - 2	-	-	-	
FE 01A - 1	-	-	-	
FE 01B - 1	-	-	-	
BE 01B - 2	-	-	-	
BE 01B - 4	-	-	-	

Partners: Sering Srl; Hydro Engineering Srl; Università degli Studi di Palermo; Università degli Studi di Enna "KORE"

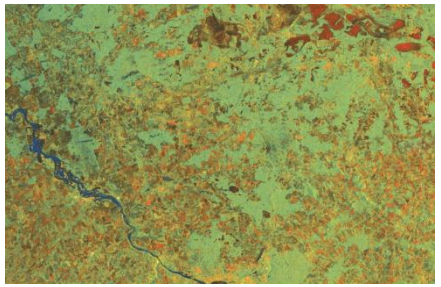
Missions and sensors type:

- Optical MR and LR: SPOT (VGT), PROBA-V;
- Optical VHR and HR: DMC, Pleiades, Deimos-2, RapidEye, SPOT(HRS);
- SAR: COSMO-Skymed, TanDEm-X, Radarsat
- Atmospheric: MetOp, Meteosat 2nd Generation;
- Altimetry: Jason, Cryosat;

SAR PRODUCTS



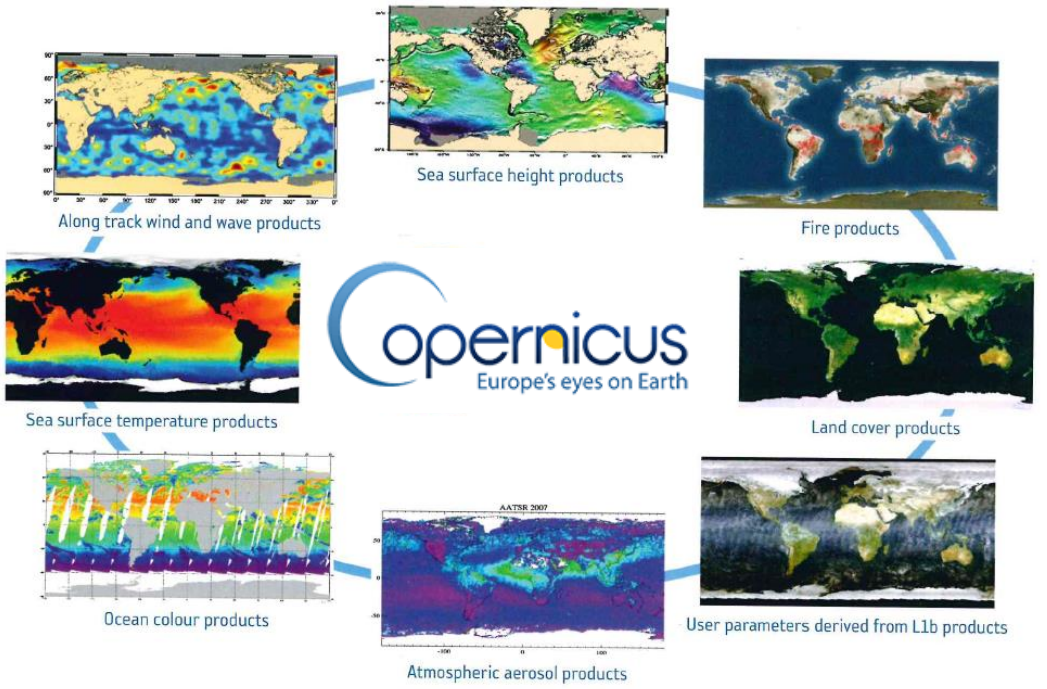
DInSAR, map deformation, Near Amsterdam - Netherlands



Dual-polarisation radar coverage, flooded Elbe River - Germany

Iper-Multi Spectral PRODUCTS

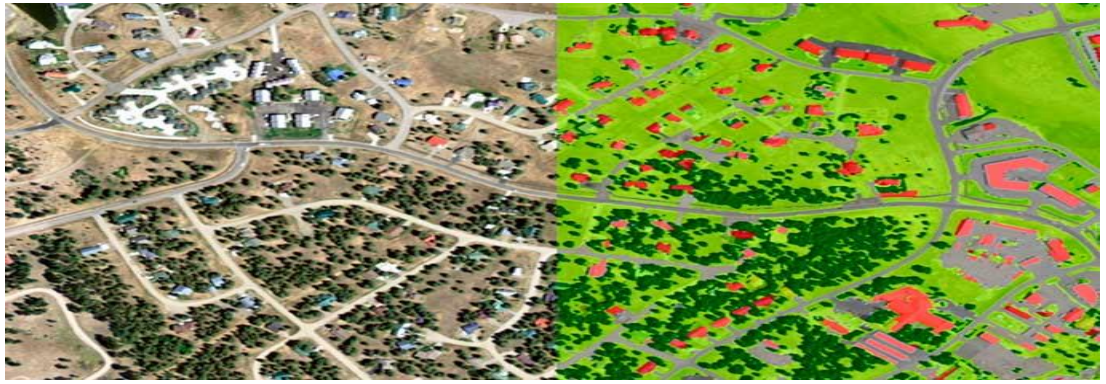
Key products from multi - iper spectral in support of Copernicus Service



Agricultural applications of satellite data

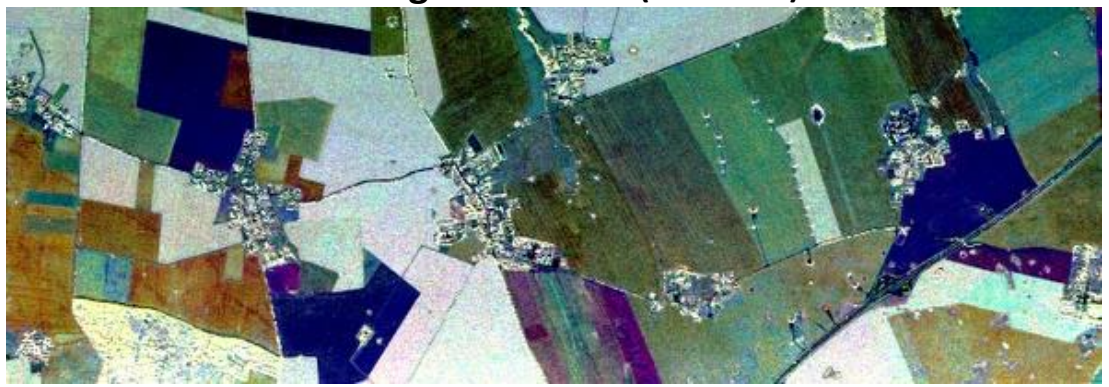
Object Based Image Analysis employs two main processes: Segmentation and Classification. These objects are achieved by statistical methods which can be used to classify objects. Statistics can include geometry, context and texture of image objects

Classification and change detection (multispectral data)



Pagosa Springs, Colorado, USA: Semi-automated object based classification of 1m 4-band NAIP. Classes include trees, lower vegetation, impervious type surfaces and hydrological features.

Classification and change detection (SAR data)



Colour Composite of Three SAR Images Taken Over the AGRISAR Test Site Within a Period of 2½ Weeks at the Beginning of the Growing Season (the different colours reflect the crop type and change in crop condition during this short time period).

How to employ the acquired know-how in the agricultural field

TeRN's aim is to put together data from different sources and scale.

Satellite missions

Internet

Geo DB

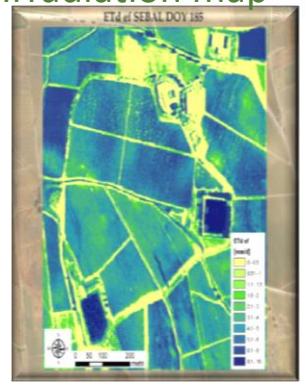
Sensor network

SDI

Internet

Growth forecast

Irradiation map



Smart irrigation

Assisted fertilization

TeRN's aim is to make it available to a wide number of users for territorial smart management.

MANY THANKS!

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