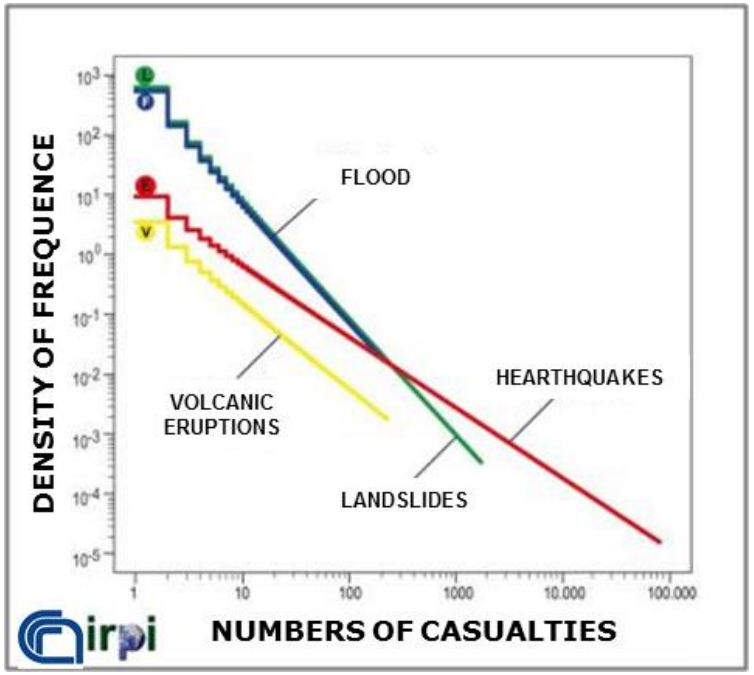
Synergic use of COSMO-SkyMed and Sentinel data for Disaster Management Support

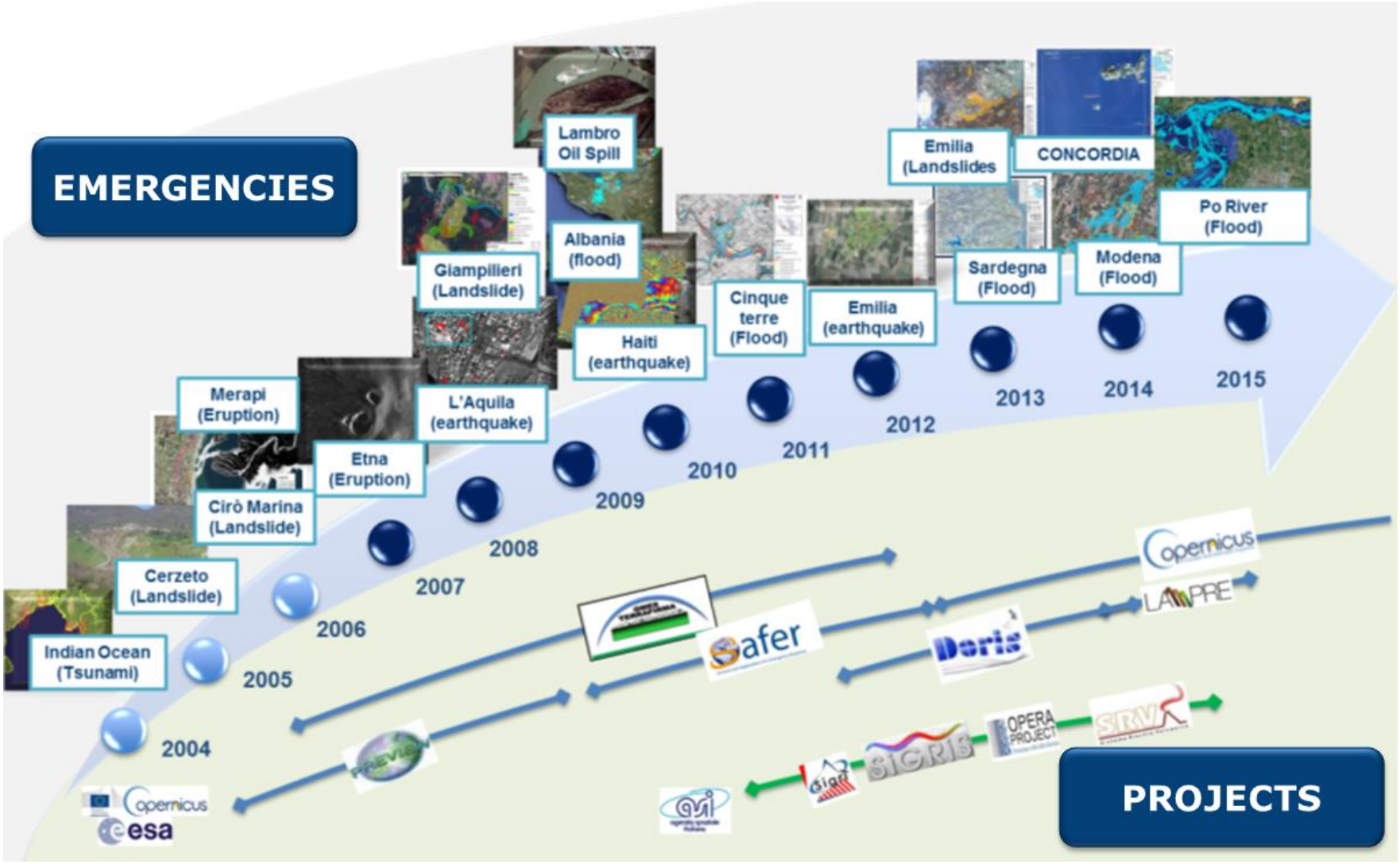
Laura Candela

Head of Earth Observation Unit

Risks in Italian Territory



…more than 10 years



Satellite Data & products

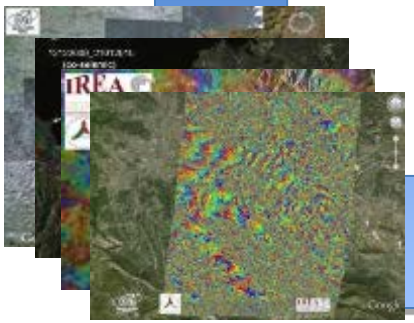
agenzia spaziale italiana

EUMETSAT

NOAA

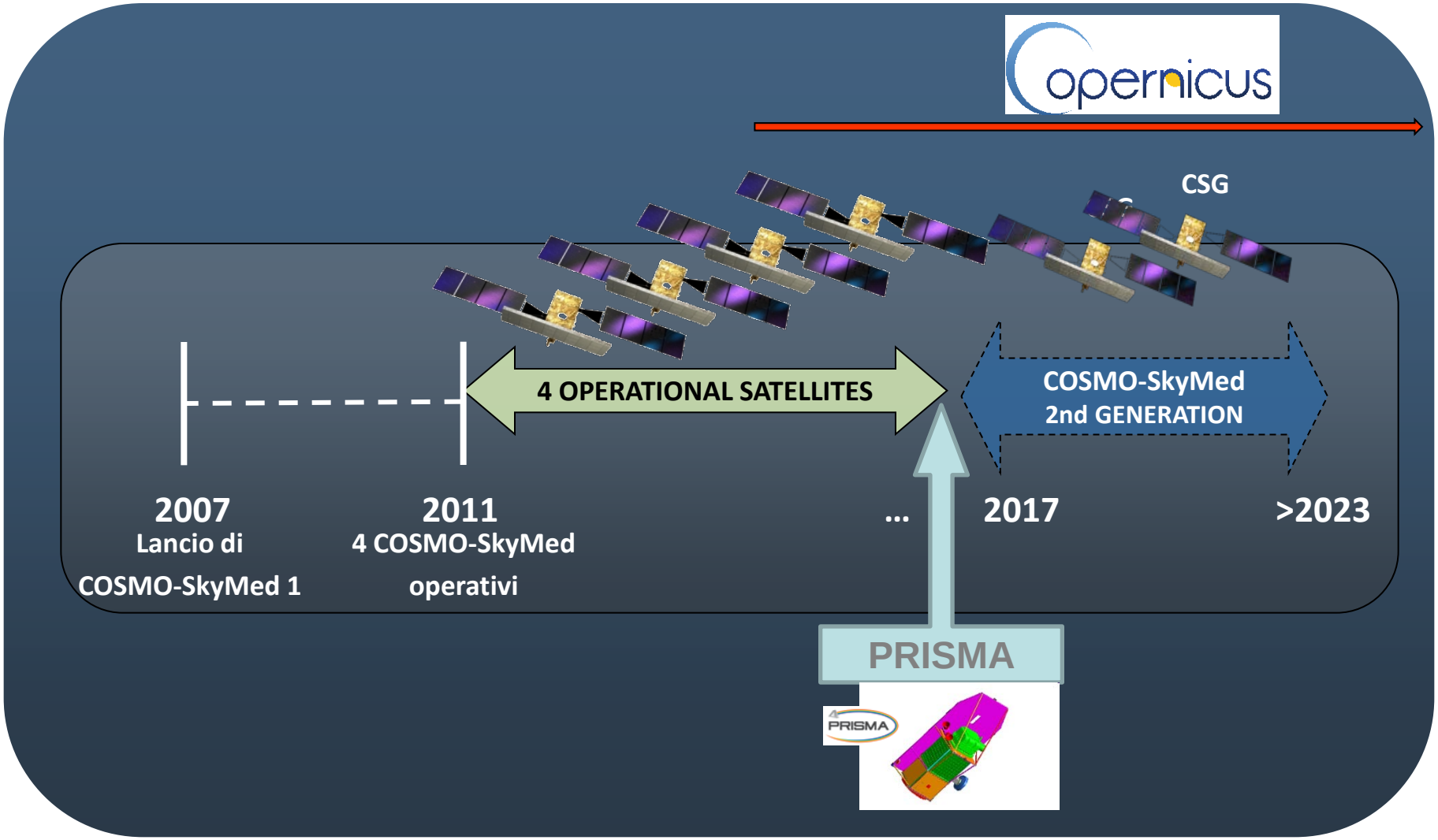
Copernicus

esa



PROTEZIONE CIVILE
Presidenza del Consiglio dei Ministri
Dipartimento della Protezione Civile

The Italian Space Segment



Copernicus Sentinels

S1A/B: Radar Mission — 2014/2016

S2A/B: High Resolution Optical Mission — 2015/2016

S3A/B: Medium Resolution Imaging and Altimetry Mission — 2016/2017

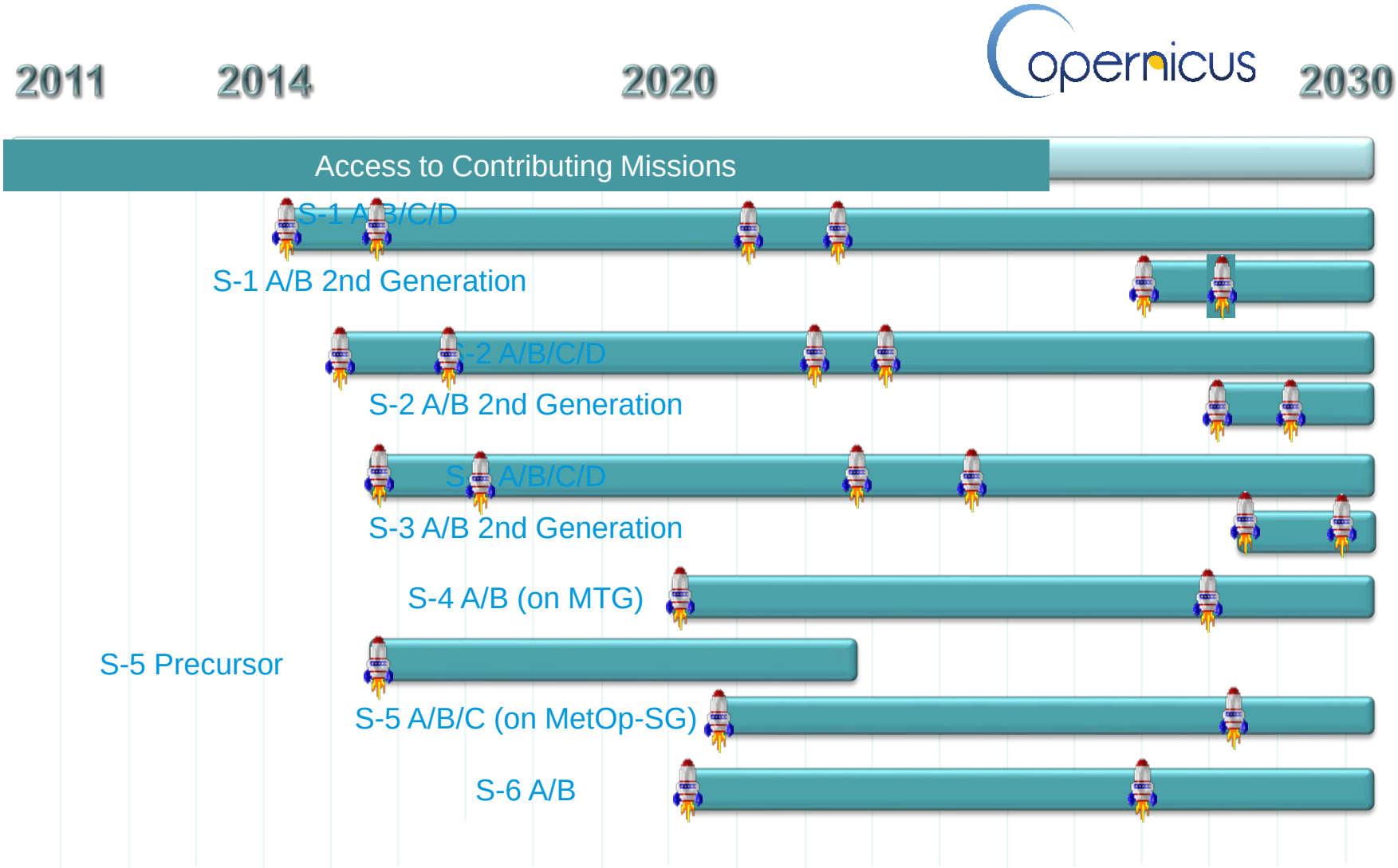
S4A/B: Geostationary Atmospheric Chemistry Mission — 2019/2027

S5P: Low Earth Orbit Atmospheric Chemistry Mission — 2016

S5A/B/C: Low Earth Orbit Atmospheric Chemistry Mission — 2020/2027

Jason-CS A/B: Altimetry Mission — 2019/2025

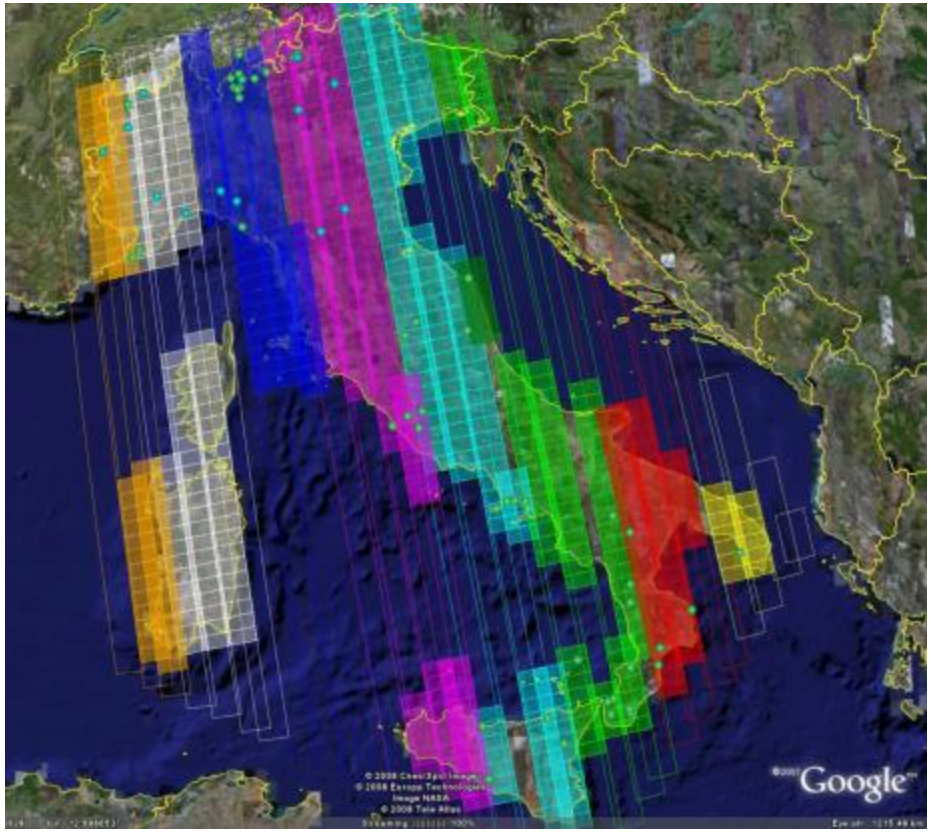
A long term operational perspective

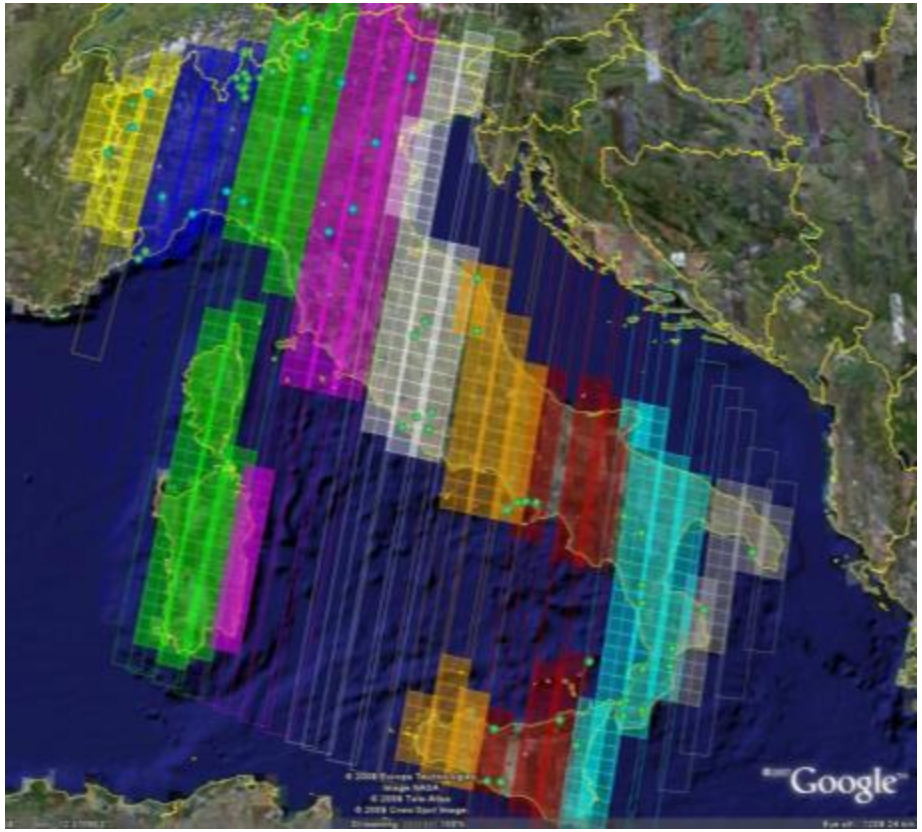


Reference archive: Mapitaly Programme

Earth Observation

OBJECTIVE: “acquire CSK temporal series to perform interferometric analysis to support the civil protection authorities”.

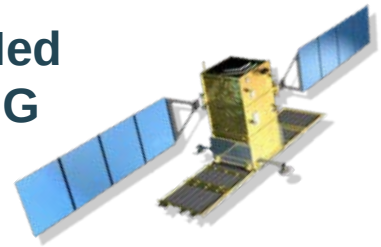




COSMO-SkyMed as Contributing Mission

Earth Observation

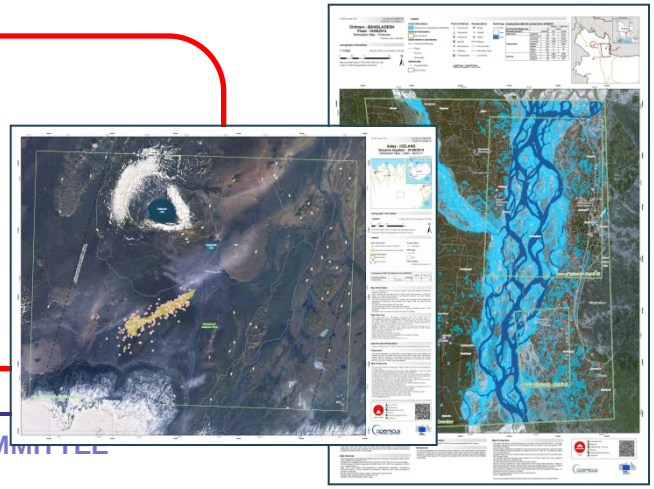
THANKS TO 4-SATELLITES CONSTELLATION, COSMO-SkyMed HAS PROBABLY BEEN THE MOST USED SAR MISSION DURING

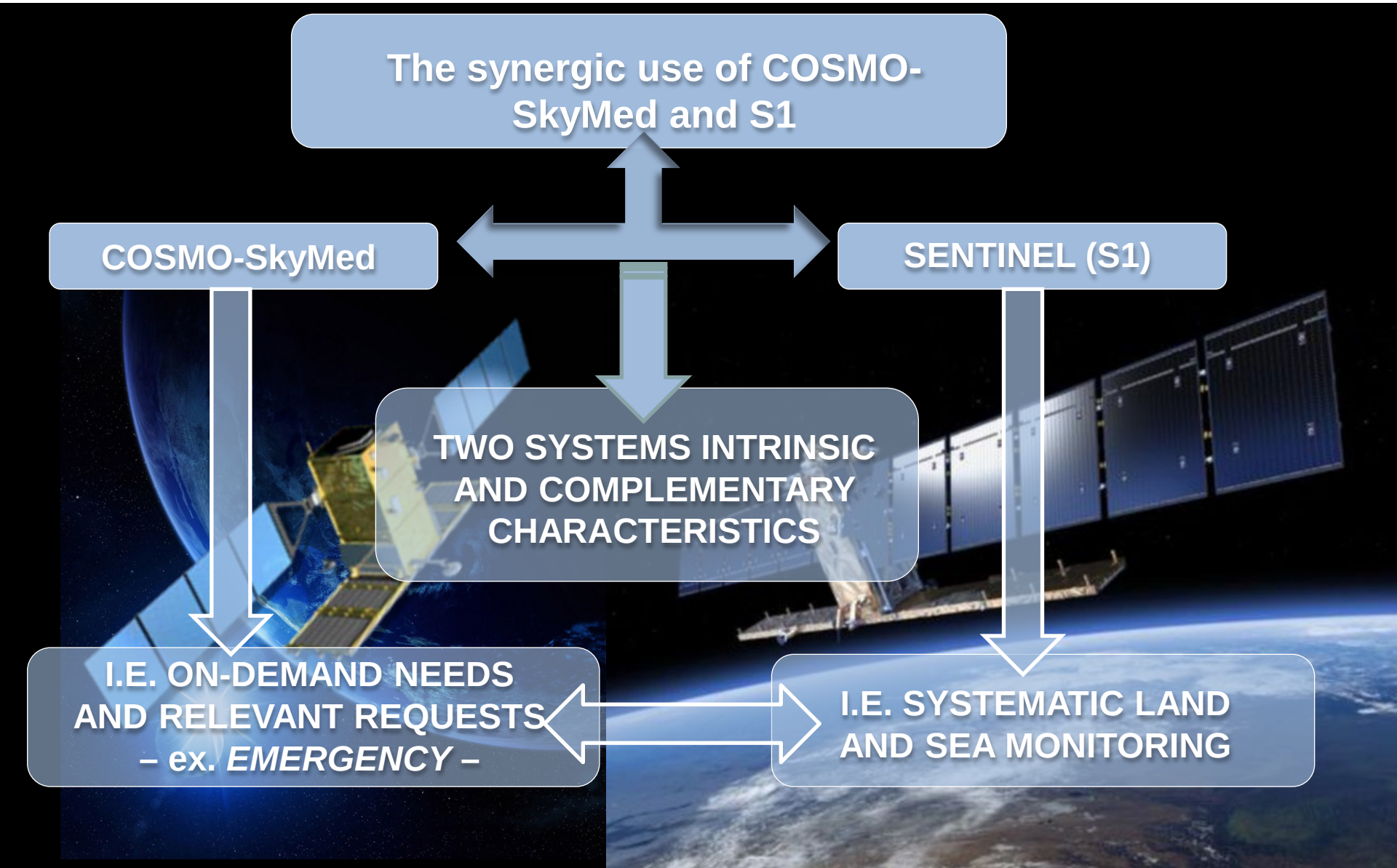


EMERGENCY ACTIVATION

EXAMPLES

- **EMSR099: Volcanic Eruption in Iceland**
- **EMSR097: Floods in Bangladesh**




The synergic use of COSMO-SkyMed and S1
COSMO-SkyMed
SENTINEL (S1)
TWO SYSTEMS INTRINSIC AND COMPLEMENTARY CHARACTERISTICS
I.E. ON-DEMAND NEEDS AND RELEVANT REQUESTS – ex. EMERGENCY –
I.E. SYSTEMATIC LAND AND SEA MONITORING

North Italy

October - November 2014

Provided by

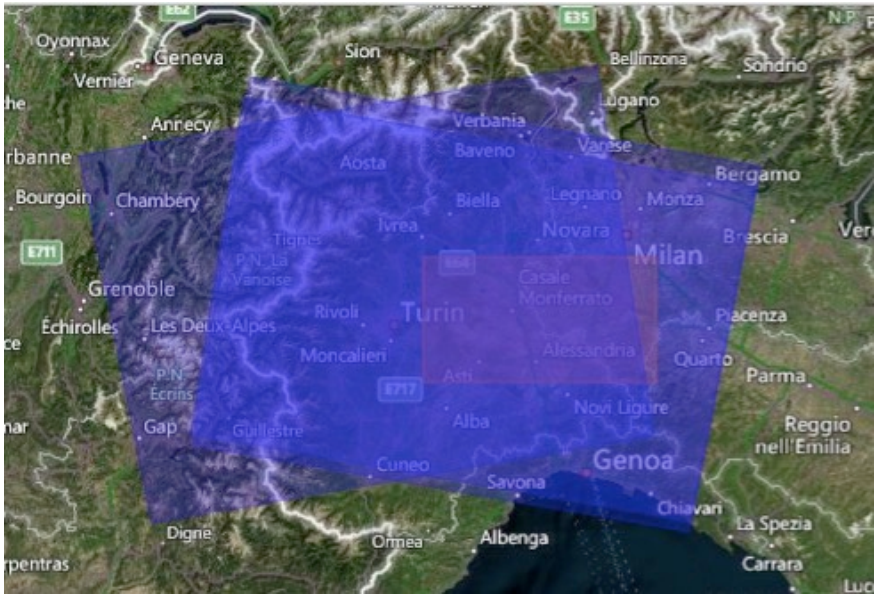
PROTEZIONE CIVILE
Presidenza del Consiglio dei Ministri
Dipartimento della Protezione Civile

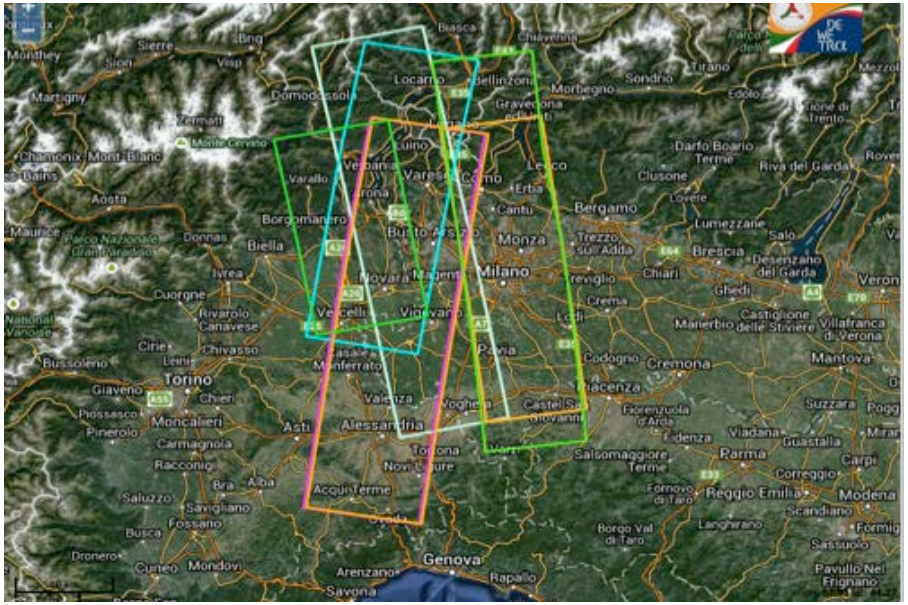
Monitoring and satellite maps

Earth Observation

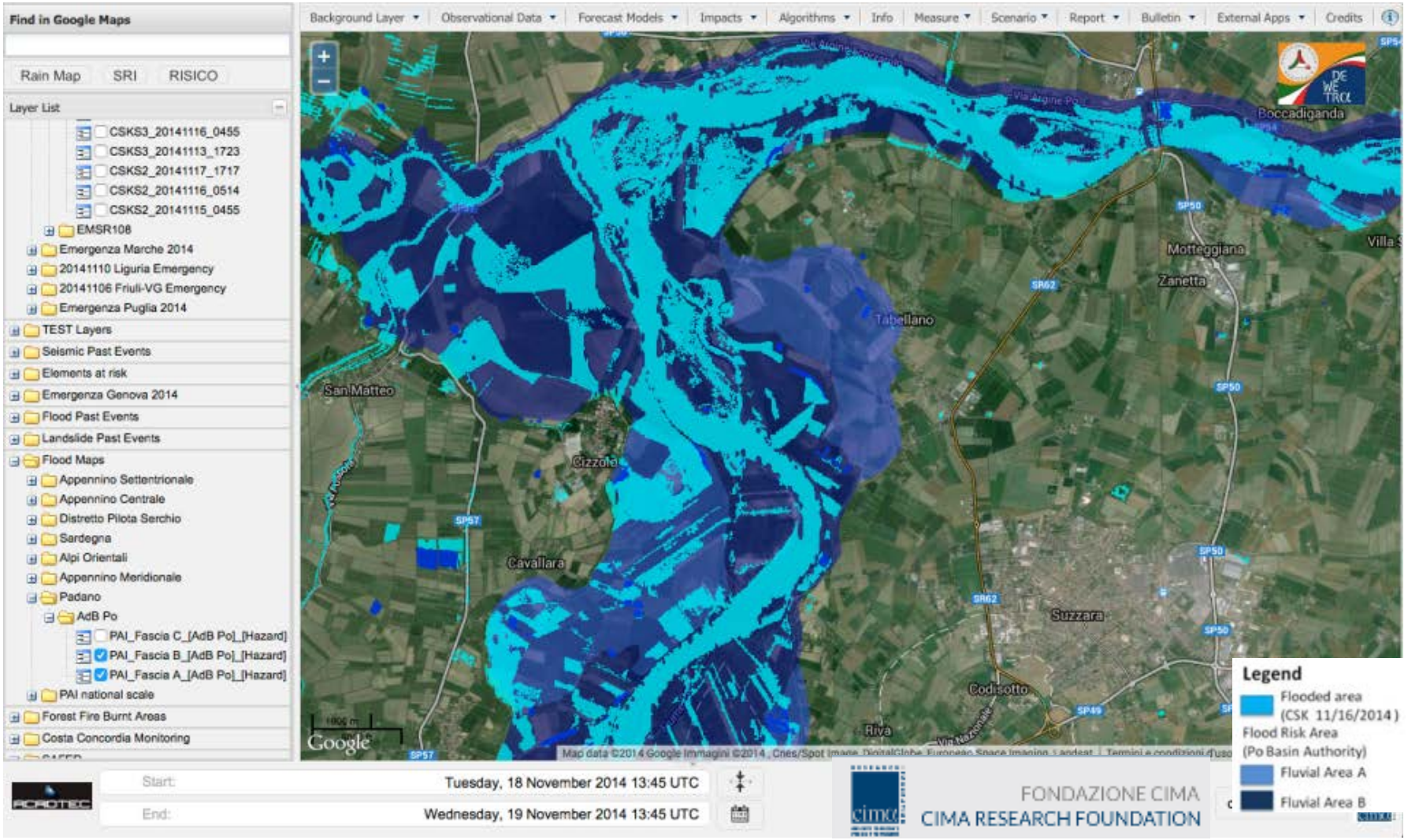
Lago Maggiore Po	Flood monitoring (CSK e Sentinel1)
Liguria	Map of flooded area & damages (CSK + Optical VHR)

Spatial coverage of S1 (left) and CSK (right) acquisitions for the AOI of the Po river in the period 13-20 November 2014



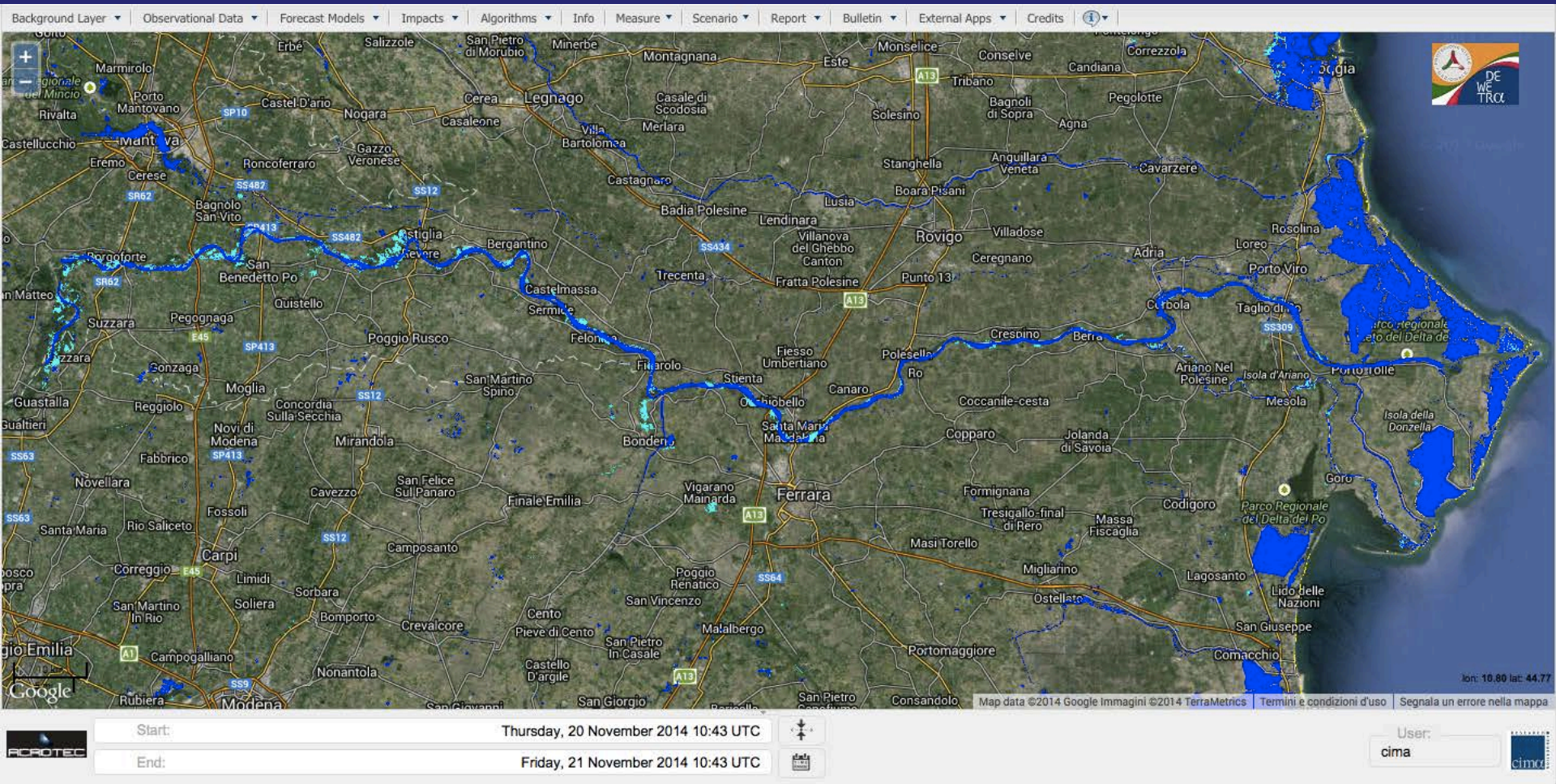


Example of flood map

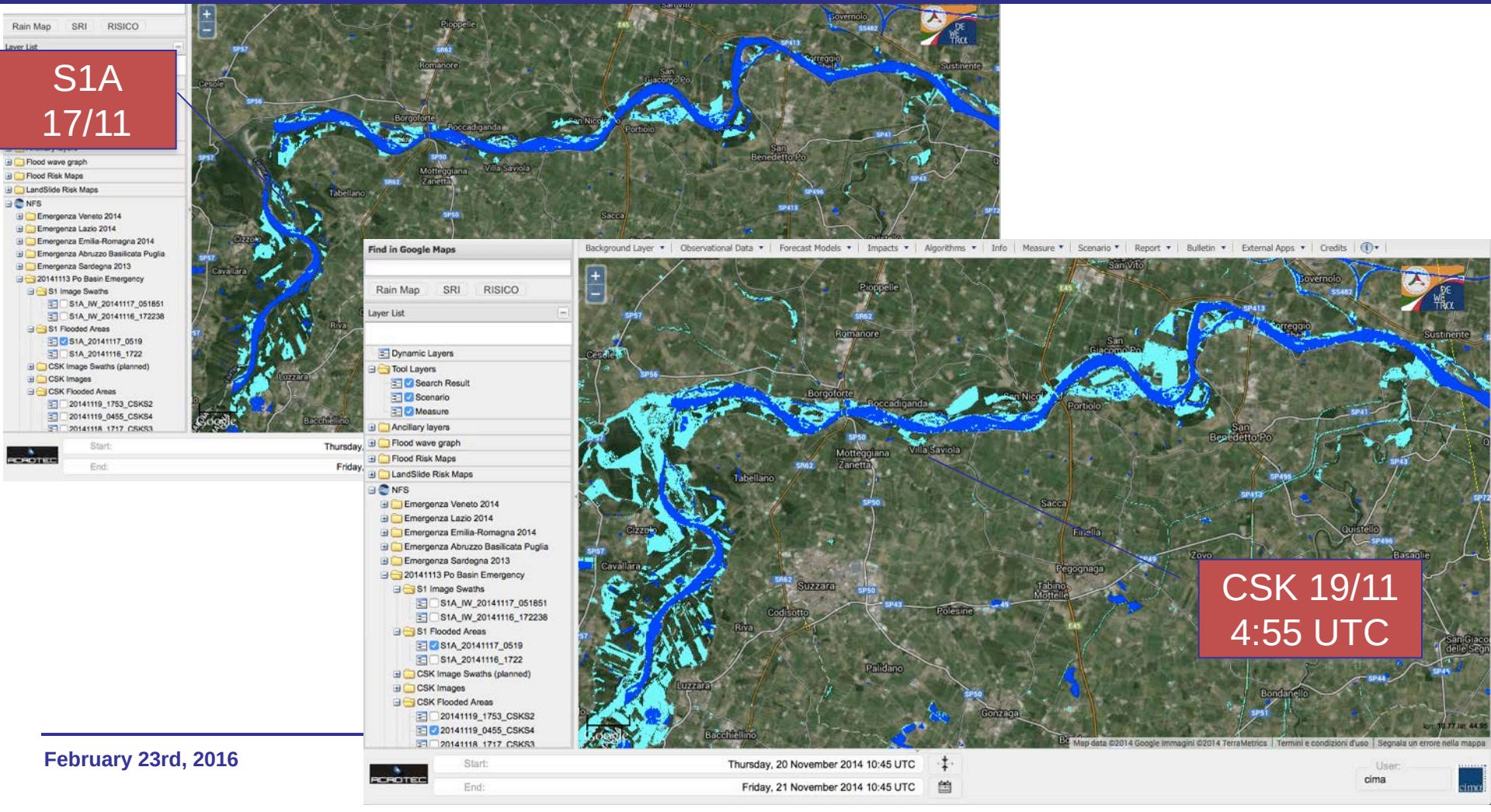


The S1 acquisition of November 17 at 5:18 UTC provides a synoptic view of the area. Although prior to passage of the flood peak, it already shows water in the flood plain areas.

The availability of a series of images in interferometric mode (Oct. 24 and nov. 17) allowed the detailed definition of the permanent water bodies



The comparison between the S1 acquisition of November 17 at 5:18 UTC and CSK acquisition of November 19 at 4:55 UTC shows the increase of the flooded area due to the pass of the flood peak between S1 and CSK acquisitions



CEOS DRM

- WG Disasters - ensures the sustained coordination of disaster-related activities undertaken by the CEOS Agencies and acts as an interface between CEOS and the community of stakeholders and users involved in risk management and disaster reduction.
  - Pilot project on Seismic (DLR/ESA), Flood (NASA/NOAA), Volcano (ASI/USGS)
  - Recovery Observatory (CNES, ASI,DLR, ESA, JAXA, NASA)
  - Geohazards Supersite and Natural Laboratories (ASI, CNES, CSA, JAXA, ESA, DLR, NASA, USGS, NOAA)

WCDRR, Sendai 2015

Earth Observation

Flood Mapping by Italian Civil Protection

The Italian system of Civil Protection has engaged a number of national agencies, in particular the Italian Space Agency (ASI), in a variety of disaster response activities. This includes cross-agency collaboration on flood-extent mapping.

The experiences of the Italian authorities demonstrates the importance of organisation, cooperation between stakeholders, and the integration of satellite data with models, informed by interaction with regional and local authorities, to produce accurate and timely flood map products in support of disaster preparedness and response.

1.1 The Italian Framework

The Italian national territory is exposed to a broad range of natural hazards, including floods, which cause fatalities and significant economic damage every year. The vulnerability of the population and built environment is often high and in some cases has been exacerbated by human activities. The National Civil Protection Service operates the Department of Civil Protection (DPC), which has activities covering prevention, forecast and assessment, early warning and alerting, and emergency response and recovery from emergency.

To address its mandate, the Civil Protection Service has organized a comprehensive system that includes a great number of both local and centralised resources. In particular, for hydrogeological risk, a national alert system is run by the DPC and regional authorities built around a network of Functional Centres (CF). One CF covering the national level is located at the DPC and one CF is located in each region. This national alert system provides services in two phases – forecast of expected flooding and then monitoring and observations of current weather and flooding conditions.

The activities of DPC are daily supported by research efforts through a network of national Competence Centres (CC), focused on the integration of technological and scientific advancements into the emergency response and management cycle. In this framework, the products based on the integration of traditional and innovative EO and ground-based (non-EO) data and technologies foster the ability of Civil Protection Authorities in flood risk management activities.

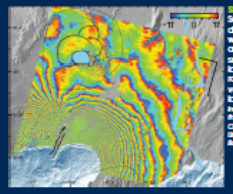
The ASI has been designated as the CC for EO within the national Civil Protection system. ASI's role is to support the DPC by developing applications based on EO data, coordinating with other space agencies, and transferring scientific and technical know-how to national authorities. In 2009 following the requirements of the DPC, ASI funded nine technological pilot projects focused on specific hazards such as floods, volcanoes, seismic risk, landslides, fires, oil spills, and air quality. These projects were strongly user driven, and have produced tools, procedures, and applications now operational and used for emergency management.

During an incident, emergency flood monitoring using EO is activated by DPC or at the request of a regional authorised user. The International Centre on Environmental Monitoring (CIMA) Research Foundation is the CC and value adder for hydrogeological risk management and ASI acts as its data provider during flood emergencies. The DPC, ASI, and CIMA

CEOS Committee on Earth Observation Satellites

Satellite Earth Observations are Critical for Disaster Risk Reduction

FLOODS – Satellite data help enhance flood-monitoring capabilities and can be used for rapid mapping, damage estimation, and recovery.



SEISMIC HAZARDS Satellite data can help detect terrain deformation with centimeter-level accuracy and track subsidence rates to identify post-seismic strain rates, movement around volcanoes, and potential landslide risks.

VOLCANOES Satellites can detect ground deformation (which may signal future eruptions) and track volcanic ash plumes (a danger for civil aviation).

DISASTER RECOVERY Satellite imagery help measure disaster recovery progress to inform the direction of reconstruction aid.

Partner with CEOS — the world's space agencies — to address the priorities of the Post-2015 Framework for Disaster Risk Reduction.

- Satellite Earth observation data complement other data sources and provide unique information.
- Satellite data contribute to issues at every scale — global, regional, and local.
- CEOS coordinates satellite Earth observations and supports availability and transformation of the data into useful hazard and risk information for better mitigation, preparedness, response, and recovery management decision-making.
- CEOS seeks cooperation with major Disaster Risk Reduction stakeholders to:
  - Identify user information needs to address the priorities of the Post-2015 Framework for Disaster Risk Reduction.
  - Initiate a series of major actions to address the most important user needs and support countries in the use of satellite data and derived information for their national disaster-related activities.

JAXA www.ceos.org/wgdisasters

Final consideration

- In Emergency Response, the Italian experience demonstrates that synergic use of different EO data and sensors (CSK, Sentinels, and Copernicus contributing missions) can greatly optimize the product performances in support to risk management activities in terms of time of delivery, accuracy, spatial and temporal resolution.