

# IRIDE Service Segment

## The IRIDE Emergency Service S7: Overview and Service Set up

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**About the IRIDE constellation.** The IRIDE constellation is a programme of the European Union – Next GenerationEU funded by the Presidency of the Council of Ministers of the Italian Republic, pursuant to Article 1, paragraph 254, of the Italian Law 160/2019 and Funded by the Presidency of the Council of Ministers from the Complementary Fund carried out under an ESA Contract for the purposes of EO PNRR IRIDE PROGRAMME.

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PIANO NAZIONALE  
DI RIPRESA E RESILIENZA





Rapid Damage Mapping / Delineation - Earthquake  
[SE-S7-01]

Rapid Damage Mapping / Delineation- Flood (riverine and coastal)  
[SE-S7-02]

Rapid Damage Mapping / Delineation - Volcanic eruption  
[SE-S7-03]

Rapid Damage Mapping / Delineation - Wildfires  
[SE-S7-04]

Rapid Damage Mapping / Delineation - Extreme Meteo Event  
[SE-S7-05]

Rapid Damage Mapping / Delineation - Landslide/Avalanche/Mudflow  
[SE-S7-06]

Rapid Damage Mapping / Grading - Earthquake  
[SE-S7-08]

Rapid Damage Mapping / Grading - Flood (riverine and coastal)  
[SE-S7-09]

Rapid Damage Mapping / Grading - Volcanic eruption  
[SE-S7-10]

Rapid Damage Mapping / Grading - Wildfires  
[SE-S7-11]

Rapid Damage Mapping / Grading - Extreme Meteo Event  
[SE-S7-12]

Rapid Damage Mapping / Grading - Landslide/Avalanche/Mudflow  
[SE-S7-13]

Rapid Damage Mapping / Grading - Tsunami

# Emergency Services – Why IRIDE

- **Disasters** are hardly predictable, spread rapidly, cause damages and may evolve dramatically
- For Disaster Management **time is crucial**. Information about the situation are needed soon after the disaster occurrence and kept updated over the time
- **IRIDE Service Portfolio for Emergency** provides :
  - **On demand access 24/7/365**: authorized users can trigger the service at any time
  - **Very high responsiveness**: the service value chain promptly starts as to deliver information within hours after service activation
  - **Large number of satellites**, allowing repeated observation to improved disaster monitoring

# Emergency Services – thematic information



Earthquake

Volcanic Eruption

Tsunami



Flood

Landslide/Avalanches/Mudflows

Wildfires

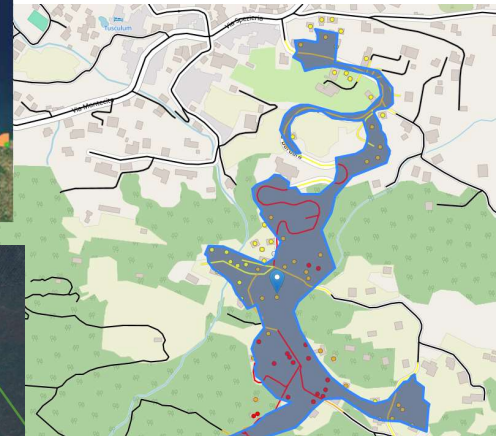
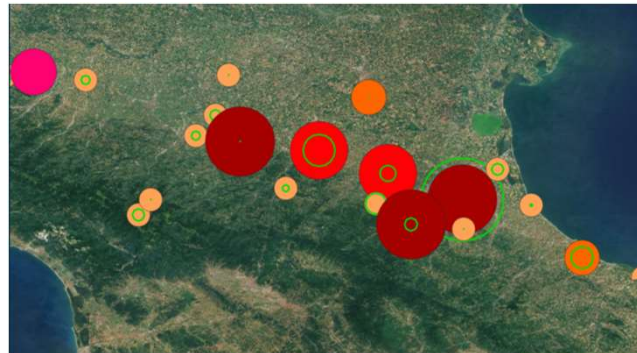
Extreme Meteo Event



Natural/Man Made Disaster

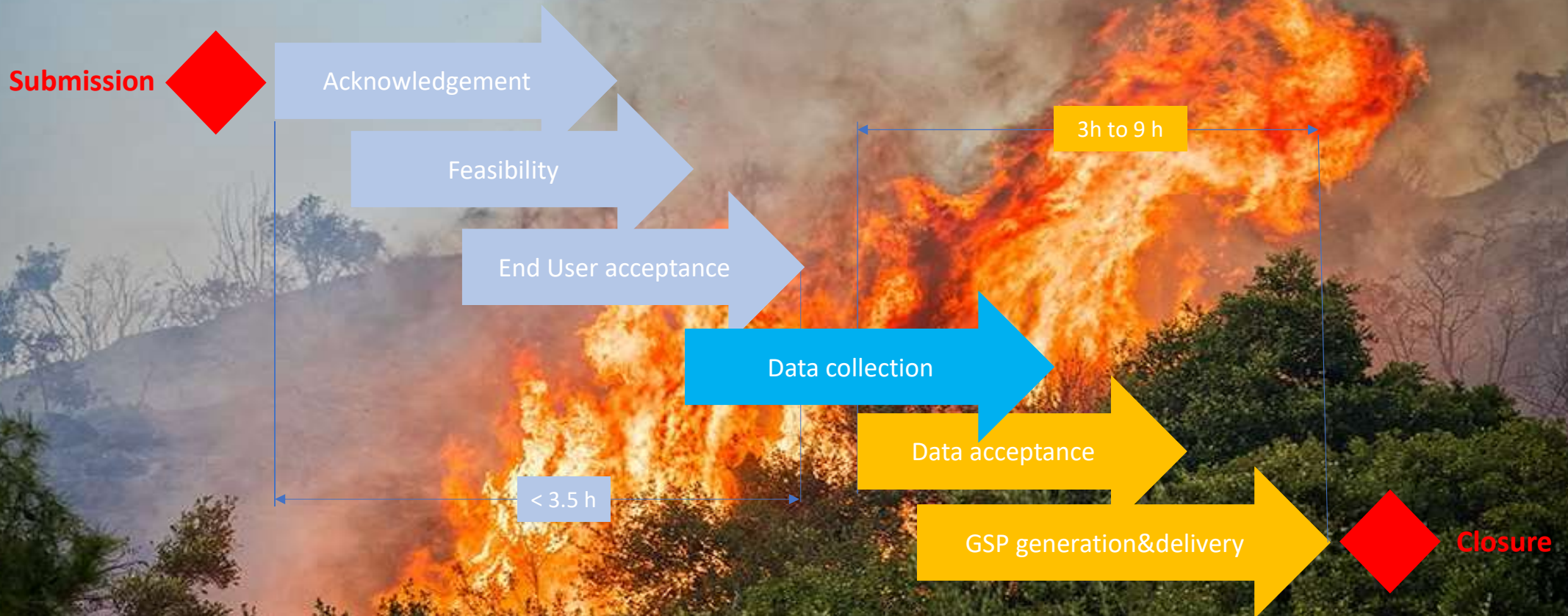
# Emergency Services – thematic information

- **First Information Product**
  - Obtained by social media crawling, showing
- **Delineation and Grading**
  - Extent and damage grade assessment of the affected areas





# On Demand Service Workflow



# Advancing geospatial services in support of the management of climate-related risks

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**esa**



# Flood / Extreme Meteo

## 2023 Overview in Italy



**378**

Extreme weather  
events in 2023



**+22%** wrt 2022

**+170%**

river floods

**+64%**

landslides from  
heavy rainfall

**+44%**

damage from  
storm surges

**+34%**

hail damage

Source: Osservatorio Città Clima di Legambiente

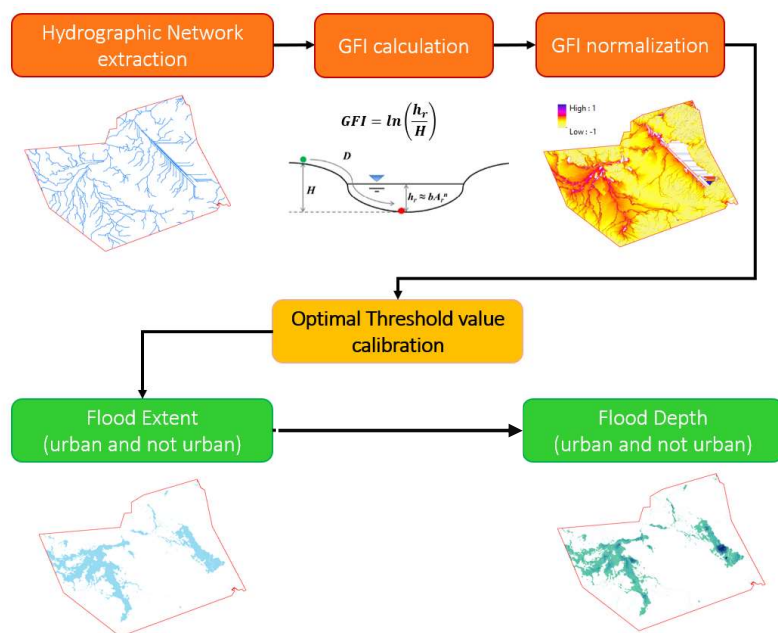




# Flood

## Geospatial Products – Main Technical Specifications

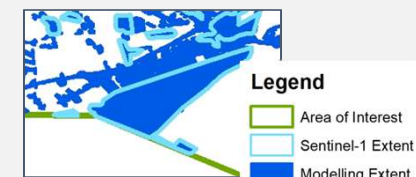
### Geomorphological Modelling



► Improved flood extent over urban areas & vegetated area → extremely relevant for flood based on SAR imagery

► Integration of flood depth information → relevant to perform a damage grade assessment also from SAR analysis

► Fast approach





# Flood

## Geospatial Products – Main Technical Specifications

- ▶ Vector providing information about the **extent** of the **flooded areas**
- ▶ Relevance: **high coverage** and **timeliness** of provided information, supporting first emergency rescue operations and the monitoring of the evolution of an event



SAR imagery based  
information

Delivery time:  $\leq 4h$  (from EO data availability)

Maximum AOI extent: 25 km x 25 km

Resolution: 1-10 m

## Delineation Product



# Flood

## Geospatial Products – Main Technical Specifications

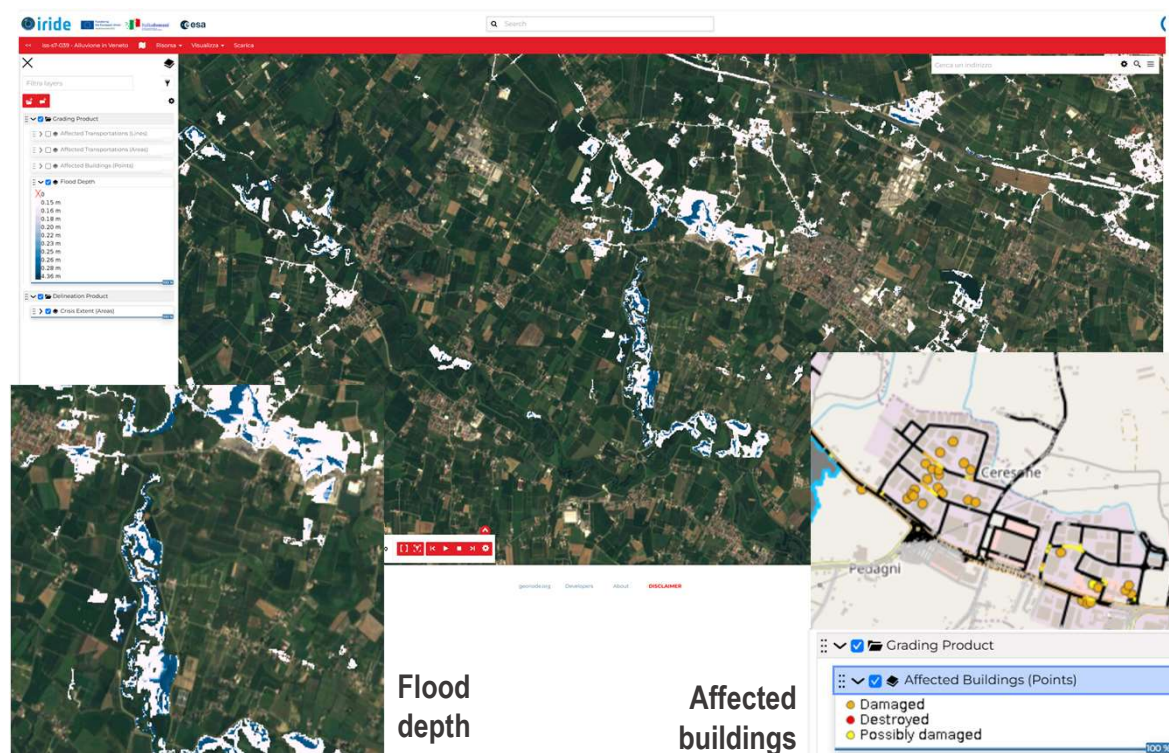
- ▶ Vector files with all the features and associated attributes providing **damage grade assessment** of assets (e.g.: building, transportation) and critical infrastructures
- ▶ Relevance: **high accuracy** and **timeliness** of information

**Delivery time:  $\leq 8h$  (from EO data availability)**

**Maximum AOI extent: 25 km x 25 km**

**Resolution: 1-10 m**

## Grading Product



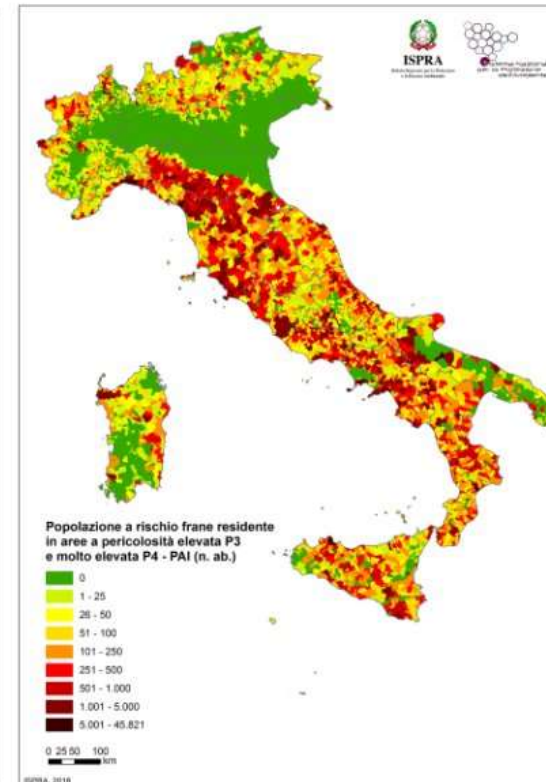
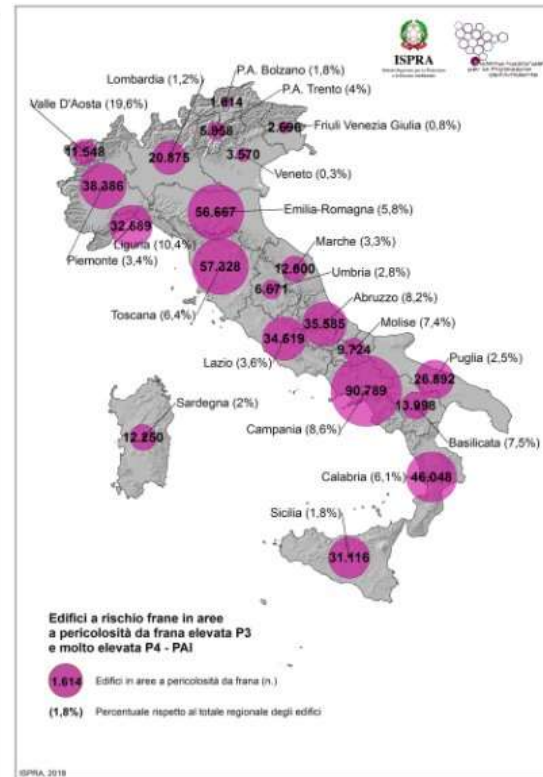
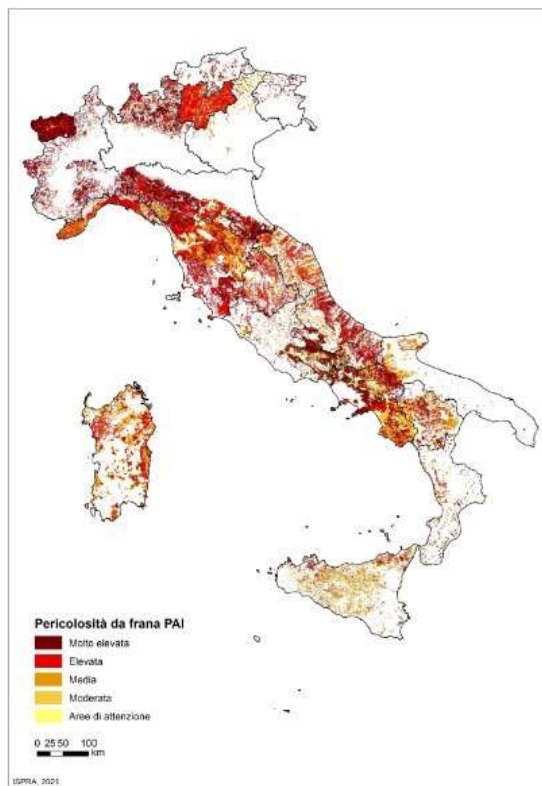
Flood  
depth

Affected  
buildings



# Landslide

## Overview



**70%**  
Of European  
Landslides are in  
Italy

# Landslide

## Geospatial Products – Main Technical Specifications

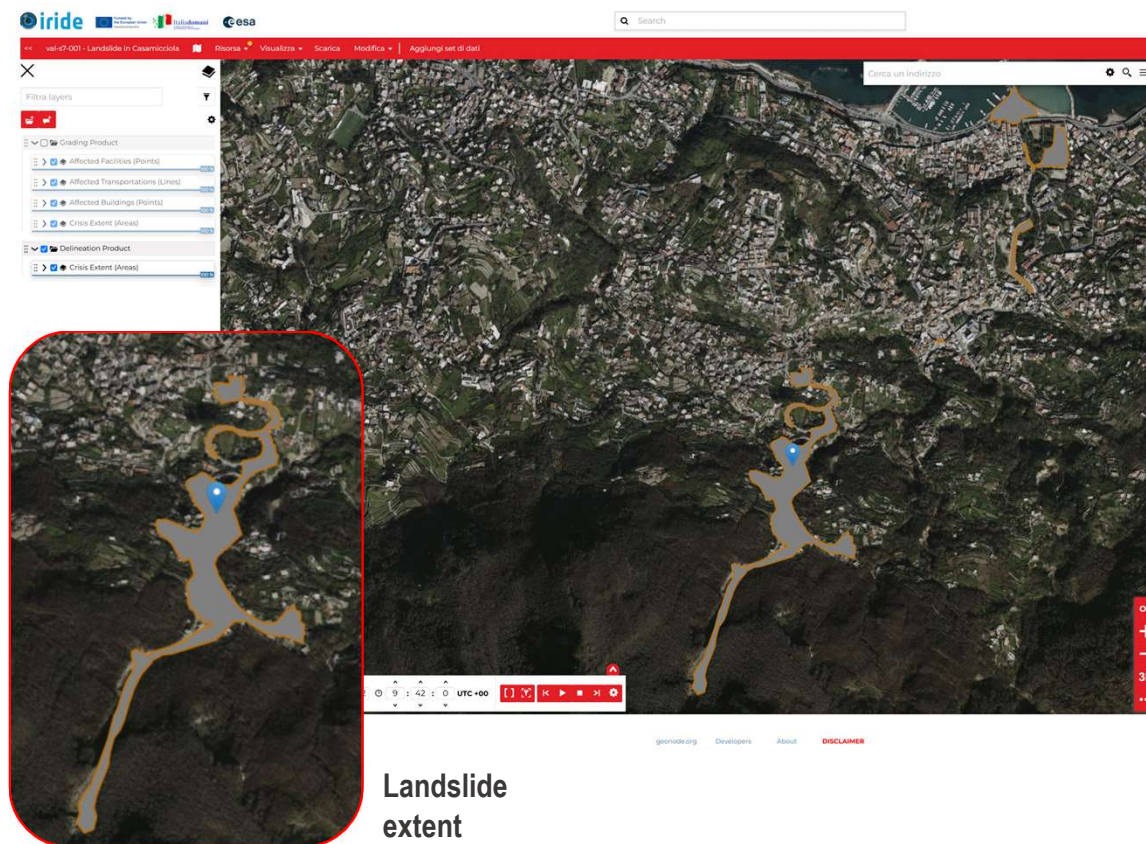
- ▶ Vector providing information about the **extent** of landslide
- ▶ Relevance: **high coverage** and **timeliness** of provided information, supporting first emergency rescue operations.

**Delivery time:  $\leq 4h$  (from EO data availability)**

**Maximum AOI extent: 25 km x 25 km**

**Resolution: 1-10 m**

## Delineation Product





# Landslide

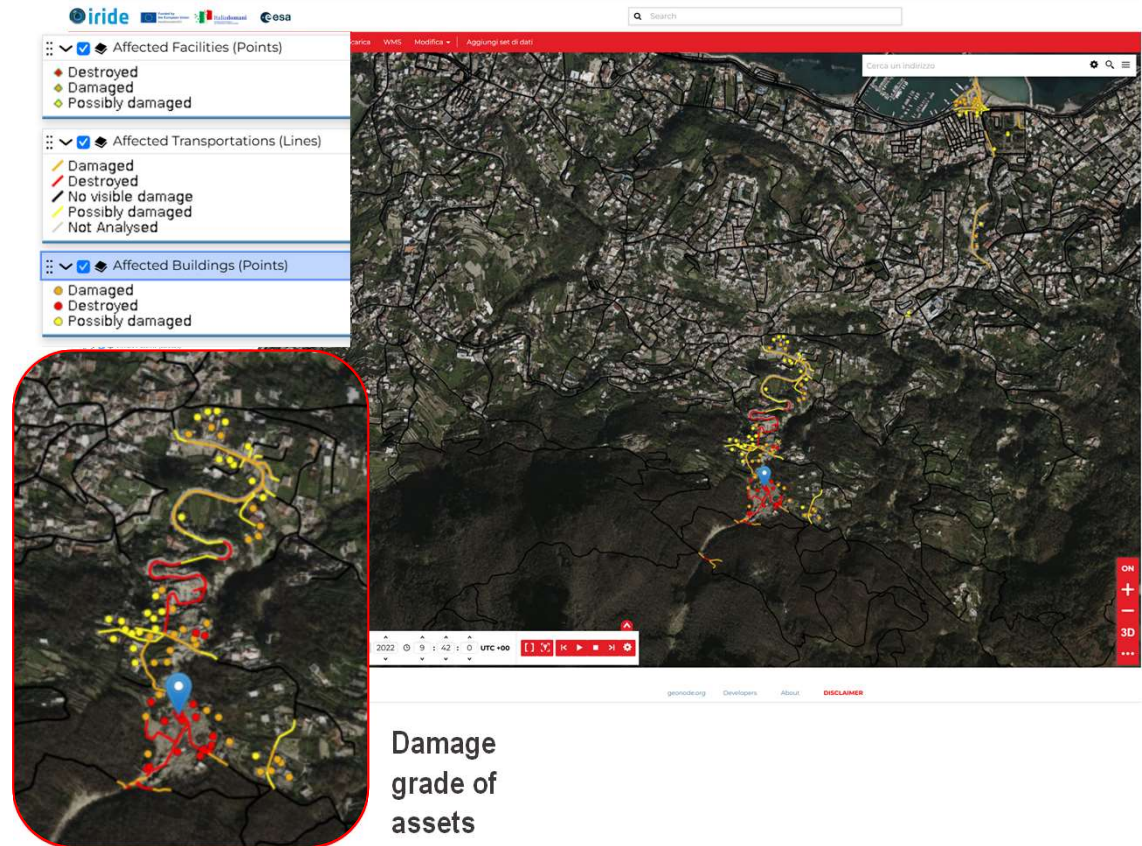
## Geospatial Products – Main Technical Specifications

- ▶ Vector files with all the features and associated attributes providing **damage grade assessment** of assets (e.g.: building, transportation) and critical infrastructures
- ▶ Relevance: **high accuracy** and **timeliness** of information

**Delivery time:  $\leq 8h$  (from EO data availability)**

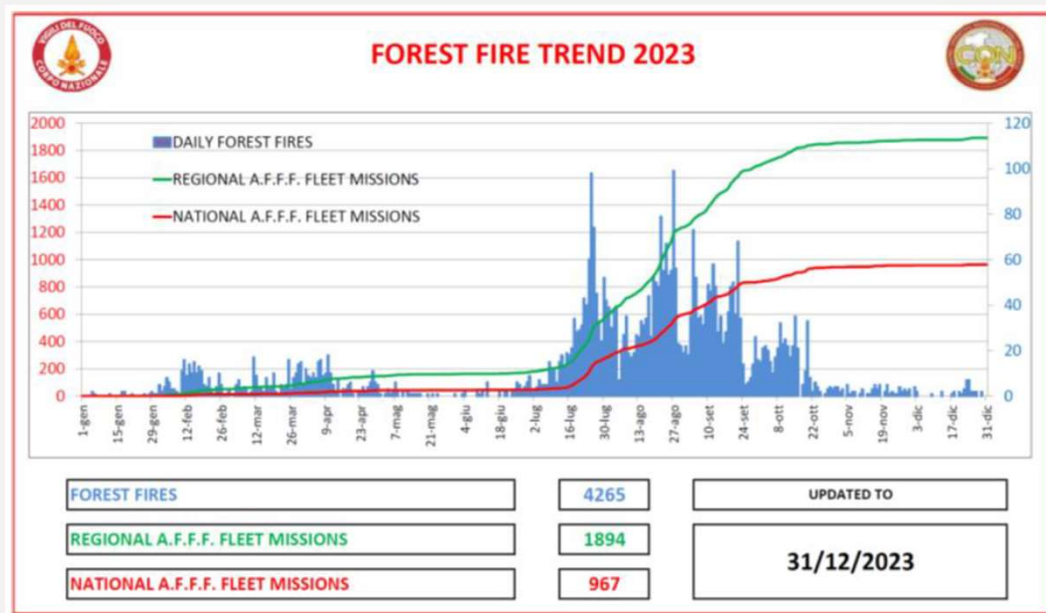
**Maximum AOI extent: 25 km x 25 km**

**Resolution: 1 m**



# Fire

## 2023 Overview



Source: COMANDO CARABINIERI PER LA TUTELA FORESTALE – Nucleo Informativo Antincendio  
Boschivo, ANALISI SUL FENOMENO INCENDI BOSCHIVI 2023



**4265**

N. fires

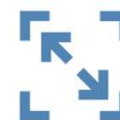


**41744**

Forest  
(hectars)

**47062**

Non-Forest  
(hectars)



**20,8**

Av. Fire size  
(hectars)

# Fire

## Geospatial Products – Main Technical Specifications

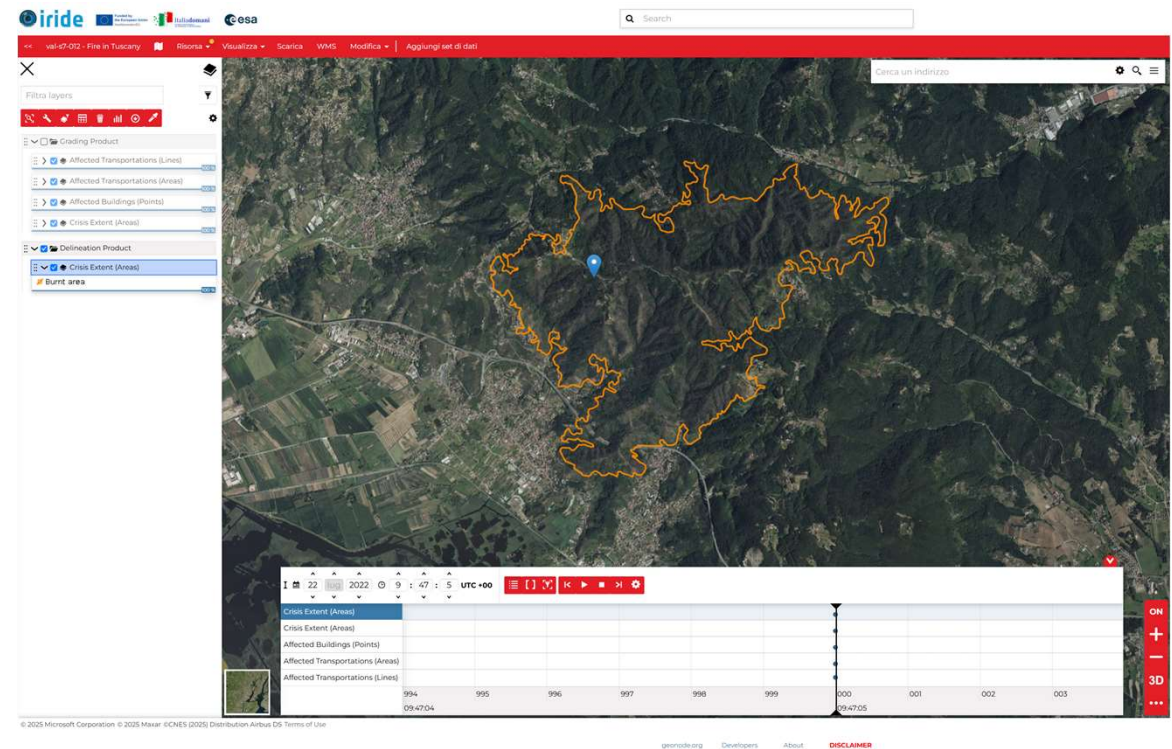
- ▶ Vector providing information about the **extent** of the **burnt areas & active fires**
- ▶ Relevance: **high coverage** and **timeliness** of provided information, supporting first emergency rescue operations and the monitoring of the evolution of an event.

**Delivery time:  $\leq 4h$  (from EO data availability)**

**Maximum AOI extent: 25 km x 25 km**

**Resolution: 1-10 m**

## Delineation Product





# Fire

## Geospatial Products – Main Technical Specifications

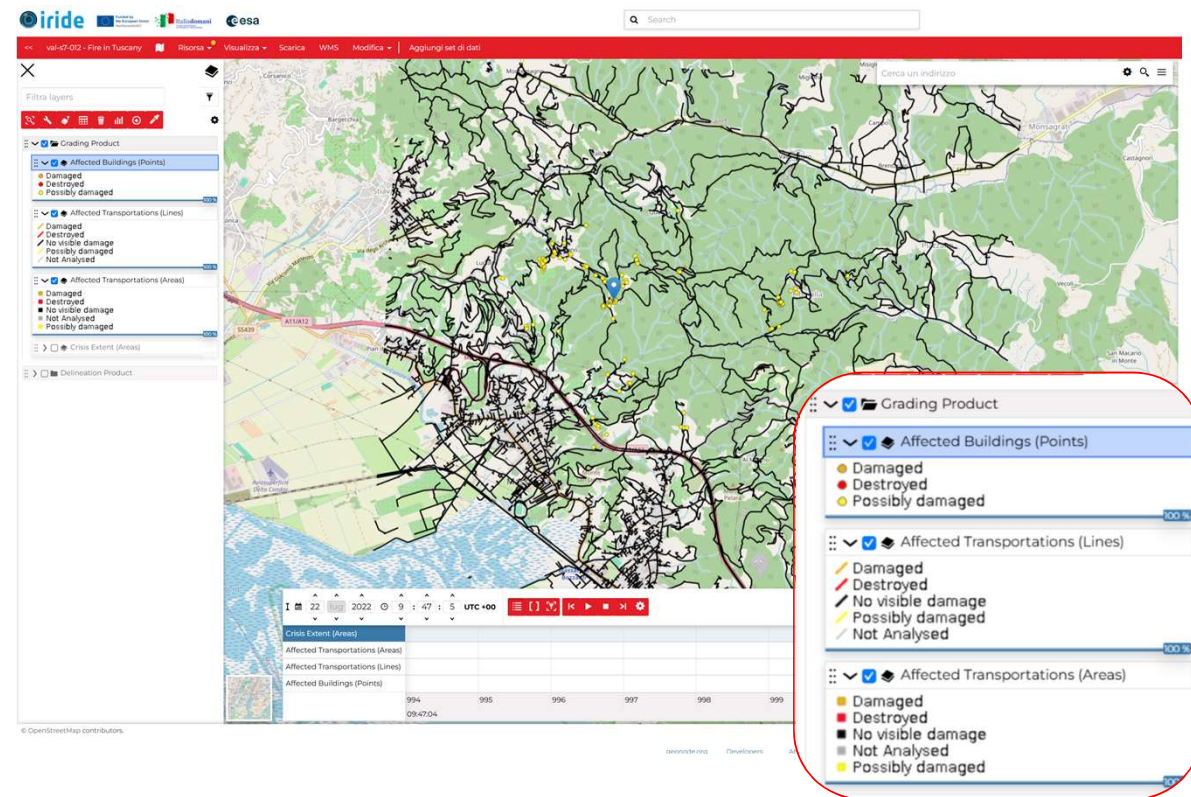
- ▶ Vector files with all the features and associated attributes providing **damage grade assessment** of assets (e.g.: building, transportation) and critical infrastructures
- ▶ Relevance: **high accuracy** and **timeliness** of information

Delivery time:  $\leq 8h$  (from EO data availability)

Maximum AOI extent: 25 km x 25 km

Resolution: 1 m

## Grading Product





# IRIDE improvement for Extreme Meteo and other events

## State of the Art



**Copernicus Emergency Services  
Rapid Mapping**

**on-demand and fast provision**  
(hours-days) of geospatial  
information in support of emergency  
management activities immediately  
following disaster

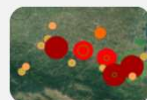


## IRIDE Improvements



**Delineation: 4 h** instead of 7 h

**Grading: 9 h** instead of 10 h



**FIP: New product** for fast response



Improved flood extent & flood depth with  
integration of **geomorphological modelling**



Damage assessment of assets based on  
**flood depth** indicators (SAR + modelling)



Customization of activation based on  
**first data available** or **best data available**



Integration into the End User System

# The contribution of IRIDE for improved capabilities in Geohazard mapping and monitoring

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ITHACA

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# Earthquake

## Earthquake Risk in Italy: Hazard Zones

> 50% of the national territory is classified as seismic hazard zone



3 Million People

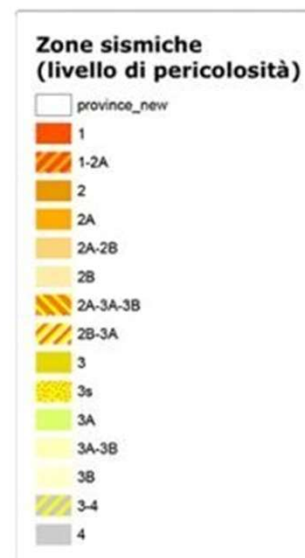
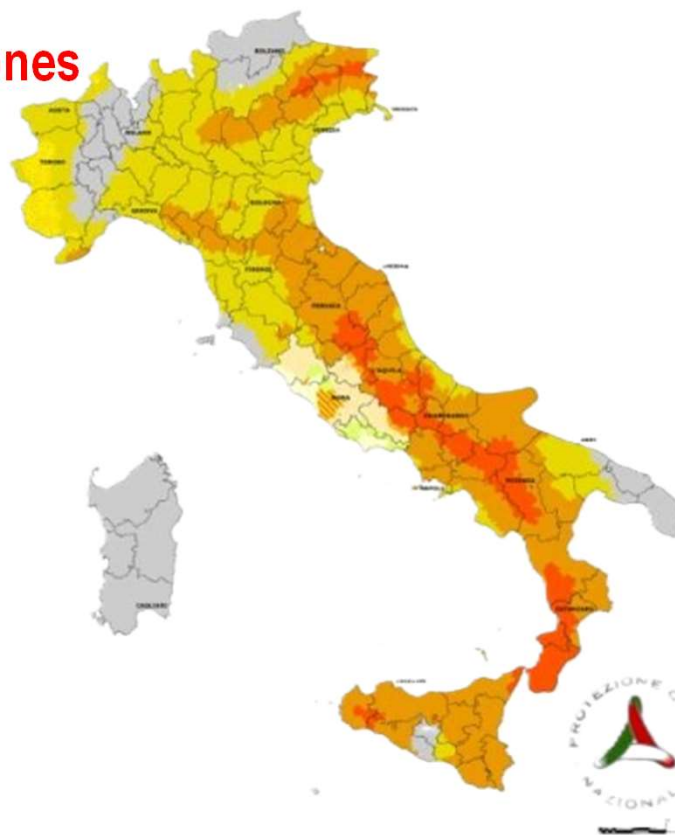


725 Municipality

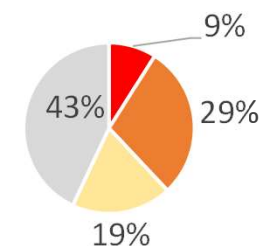


6 Million Buildings

In high-level seismic hazard zones



Distribution of the Italian Territory by Seismic Zones (INGV, DPCI)



■ Zona 1 High Seismicity    ■ Zona 2 Medium Seismicity  
■ Zona 3 Low Seismicity    ■ Zona 4 Very Low Seismicity

# Volcanic Eruption

## Volcanic Risk in Italy: Hazard Zones

Italy is one of the European countries most exposed to volcanic risk



12 volcanoes considered active



670.000 People



25 Municipalities

### Vesuvio Red Zone

Vesuvio	Campi Flegrei	Etna	Stromboli
Vulcano	Ischia	Pantelleria	Lipari
Colli Albani	Panarea	Marsili	Ferdinandea

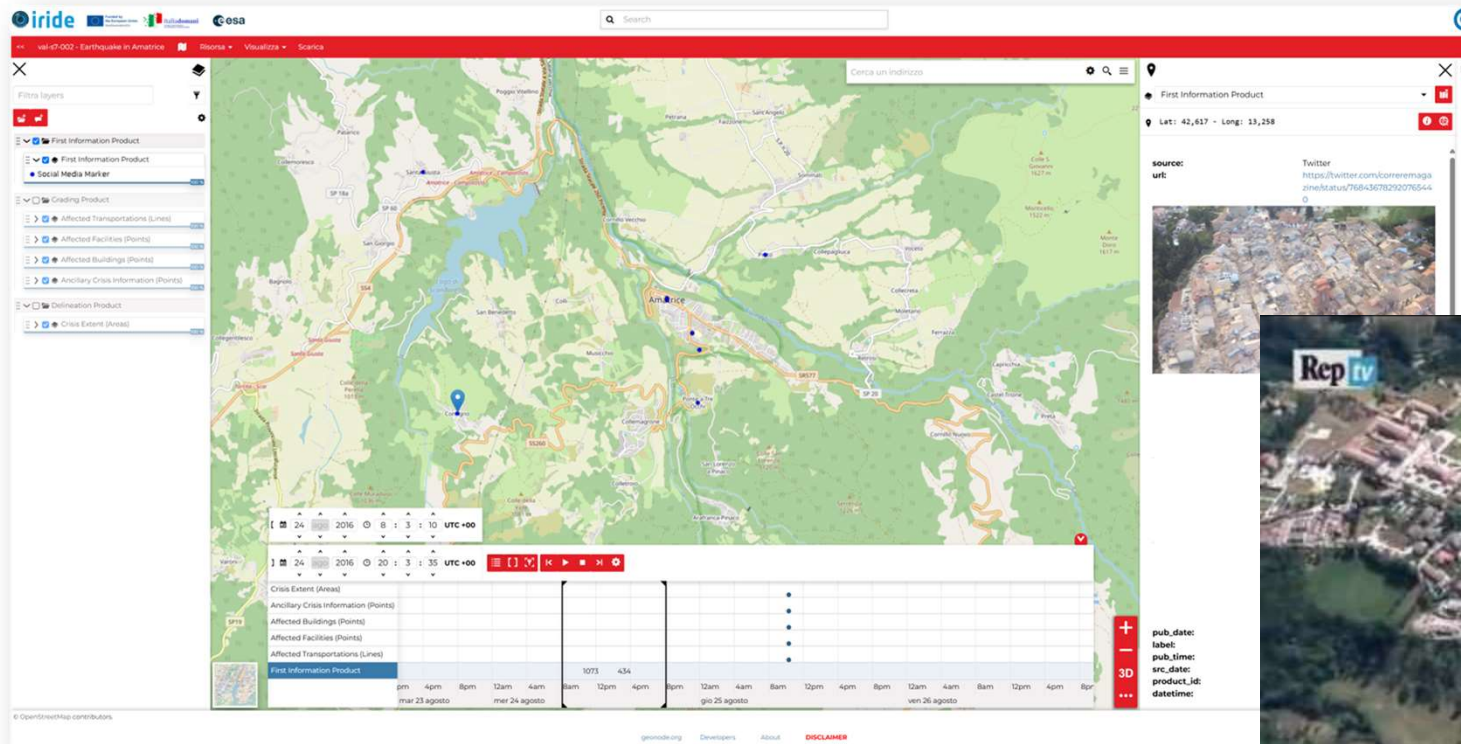






# Earthquake/Volcanic Eruption

## FIP – First Information Product



Case Study (Product Validation): Amatrice Earthquake – August 24, 2016



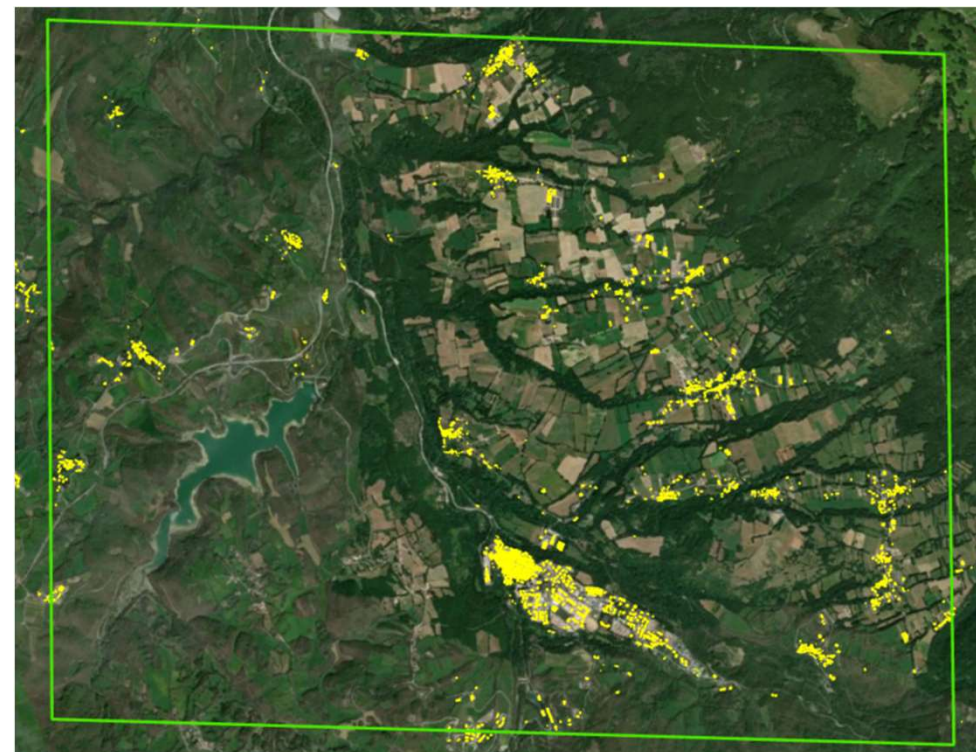
# Earthquake

## Delineation Products

- ▶ Vector providing information about the **extent** of the affected areas
- ▶ Relevance: **high coverage** and **timeliness** of provided information, supporting first emergency rescue operations and the monitoring of the evolution of an event. This product also supports the identification of most affected areas and the triggering of higher spatial resolution imagery for accurate damage assessment tasks

**Delivery time:  $\leq 4h$  (from EO data availability)**

**Maximum AOI extent: 25 km x 25 km**

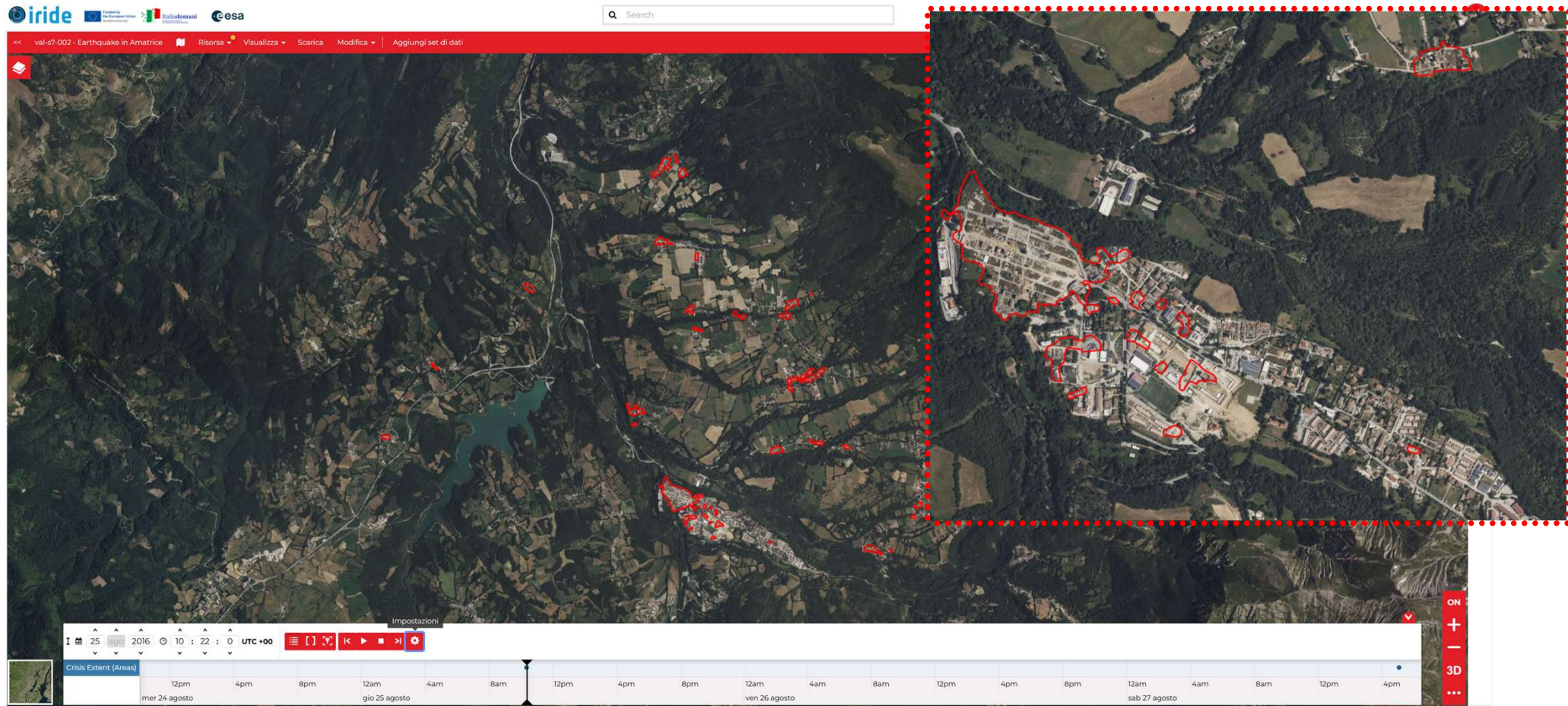


Case Study (Product Validation): Amatrice Earthquake – August 24, 2016



# Earthquake

## Delineation Products





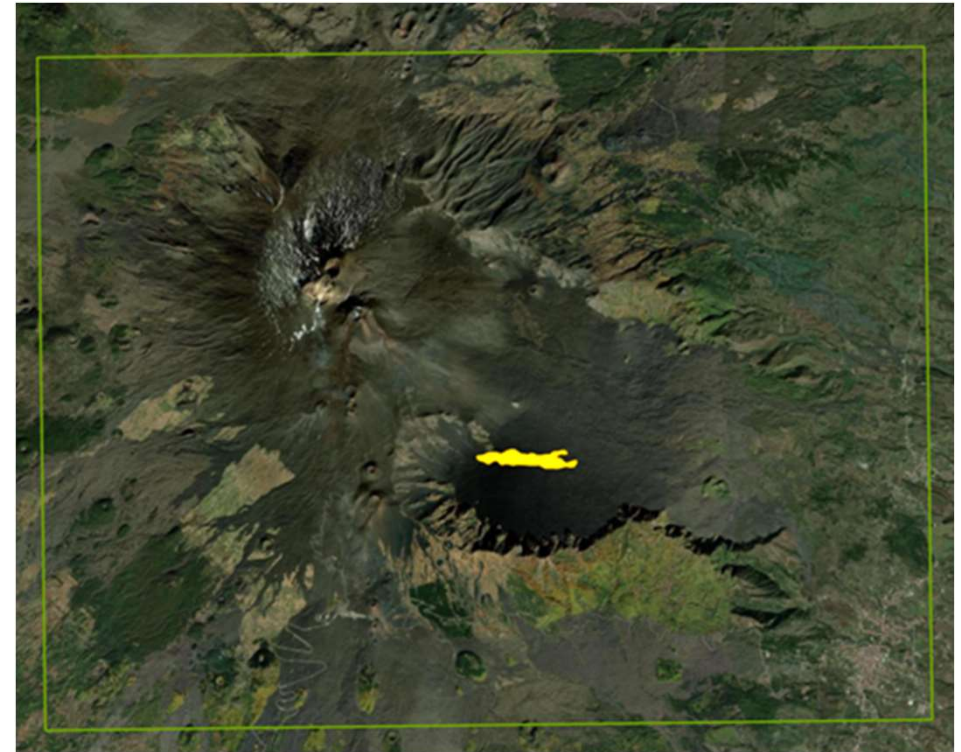
# Volcanic Eruption

## Delineation Products

- ▶ Vector providing information about the **extent** of the affected areas
- ▶ Relevance: **high coverage** and **timeliness** of provided information, supporting first emergency rescue operations and the monitoring of the evolution of an event.

**Delivery time:  $\leq 4\text{h}$  (from EO data availability)**

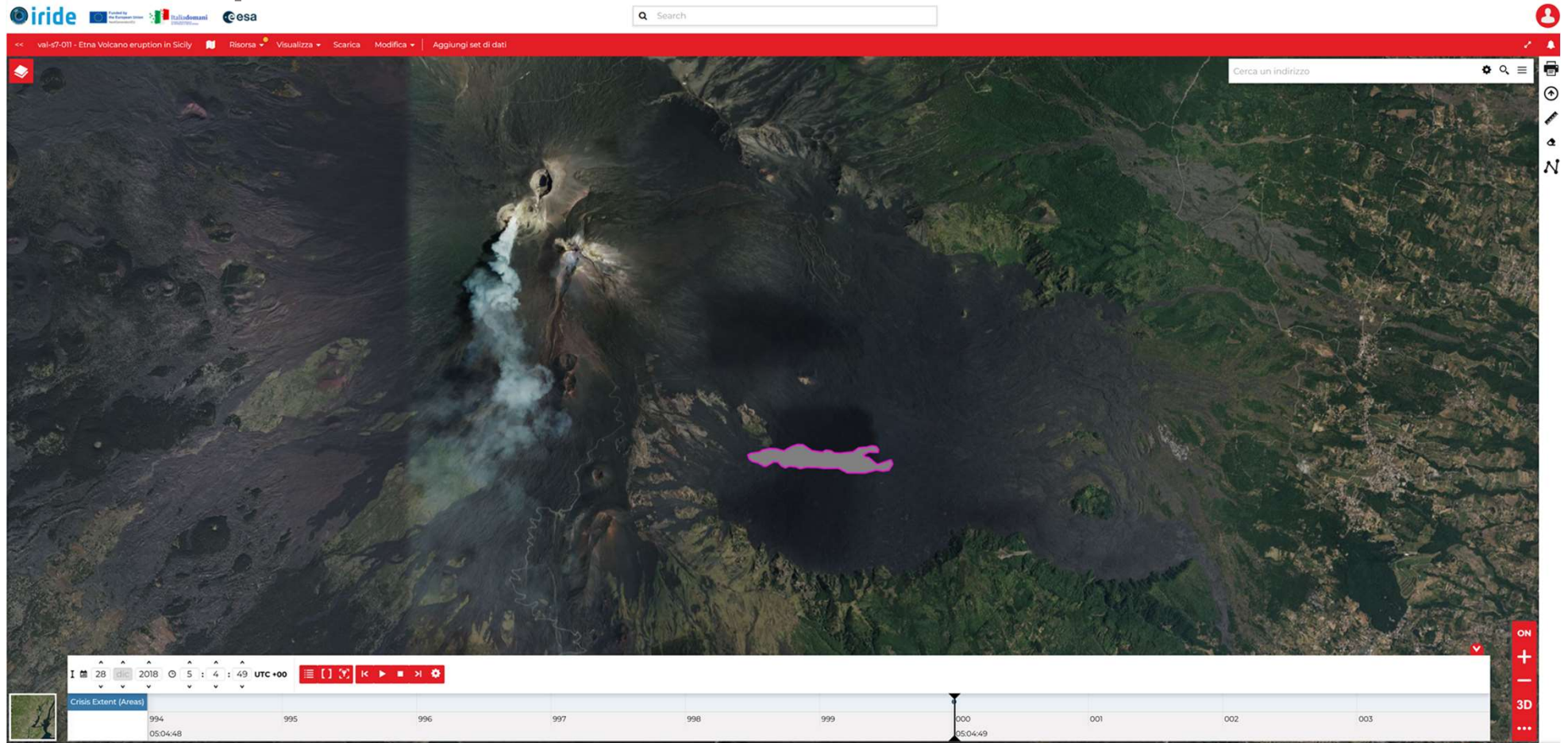
**Maximum AOI extent: 25 km x 25 km**



Case Study (Product Validation): Etna Volcano – December 24, 2018

# Volcanic Eruption

## Delineation Products





# Earthquake/Volcanic Eruption

## Grading Product: Damage Grade Assessment

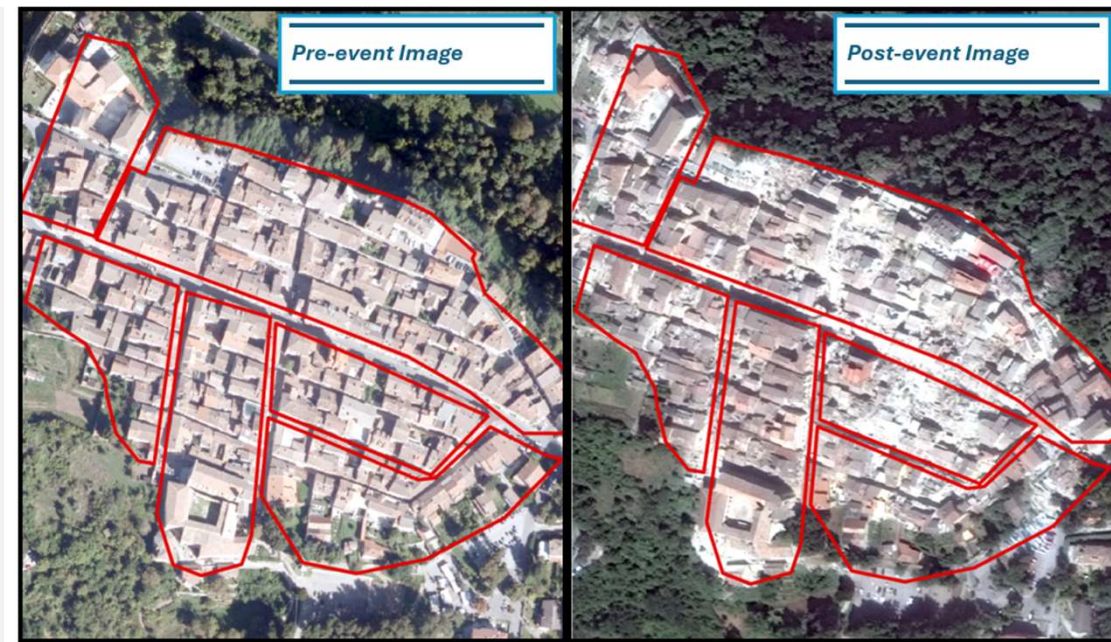
- ▶ Vector files with all the features and associated attributes providing damage grade assessment of assets (e.g.: building, transportation) and critical infrastructures
- ▶ Relevance: **high accuracy** and **timeliness** of information

**Overall Accuracy  $\geq 85\%$**

**Delivery time:  $\leq 8h$  (from EO data availability)**

**Monitoring frequency: 8 days**

**Maximum AOI extent: 10 km x 10 km**



Case Study (Product Validation): Amatrice Earthquake – August 24, 2016



# Earthquake/Volcanic Eruption

## State of the Art



### Copernicus Emergency Services Rapid Mapping

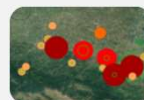
**on-demand** and **fast provision**  
(hours-days) of geospatial  
information in support of emergency  
management activities immediately  
following disaster



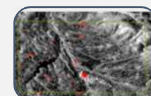
## IRIDE Improvements



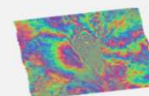
**Delineation: 4 h** instead of 7 h  
**Grading: 9 h** instead of 10 h



**FIP:** Information extraction from value-added social  
media content



**Earthquake mapping with SAR:** beyond weather,  
beyond night



IRIDE SAR satellites allow for a **wide area** of analysis  
thanks to a swath of up to 100 km



**Effectiveness** and **ease of use** of tools provided to  
search, exploit and download the geospatial products



**Integration** into the End User System