

# Optimizing collection, transmission, transformation of space data to take up security challenges

*Towards improved crisis prevention and response*

ESA\_Labs Annual Event - May 8, 2023 “Space Data Management Workshop”

Venice – 8 May 2023



The world is facing a set of expanding, evolving security challenges and inter-connected crises

There is a need to enhance the means to act for world citizens' security



Humanitarian crises

Geopolitical instability

Climate impact

Vulnerable critical infrastructure

Cyber crime

First step as an ESA seed of R3 Accelerator



# Civil Security from Space

## A European answer to addressing crises events



Act swiftly for the security for people, state and critical assets



Reduce the societal and financial impact of crises



Ensure supply of resources, e.g. clean water, energy and food supply

Prevent and Mitigate against Crises

Rapid Response during Crises

Efficient follow-up to Crises



# A European Level Federation of Capabilities



## OBSERVATION

SMART EO

## TELECOM

5G / 6G / IoT / QUANTUM / AI

## DATA PROCESSING

CLOUD / AI / HPC



SUSTAIN



SECURE



CONNECT



COMPUTE



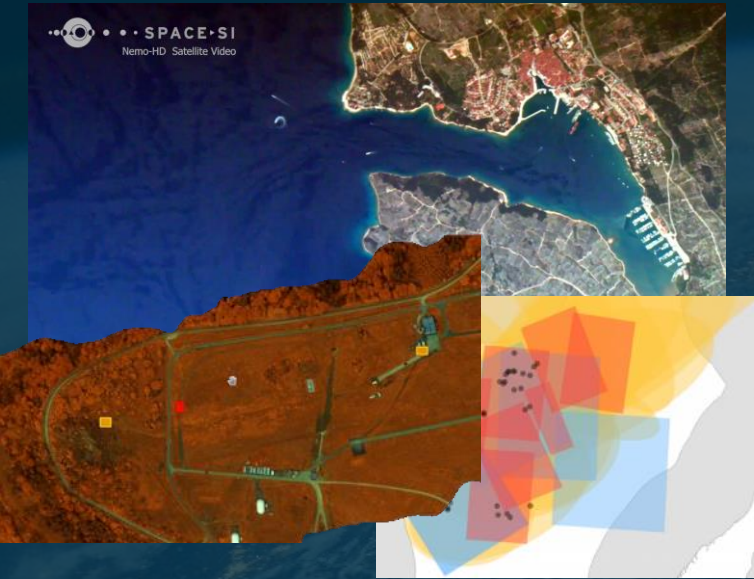
PROTECT

**A UNIFIED, SECURE, RESILIENT, RESPONSIVE AND SMART NETWORK**





# New Development Opportunities for Industry



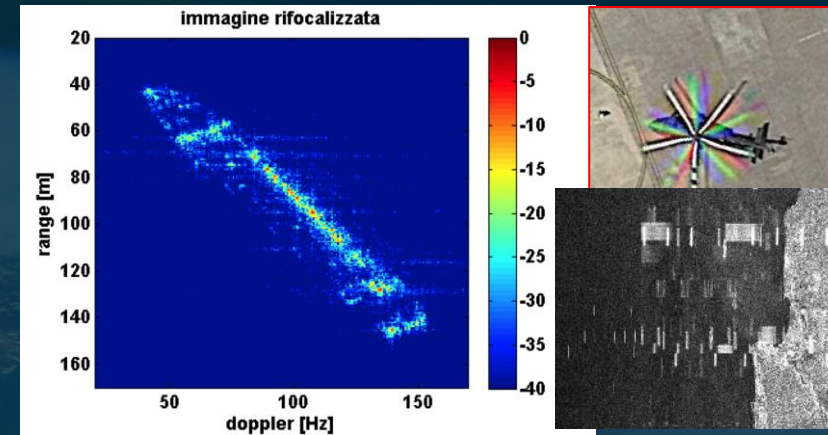
**New processing methods** for expanded information content, e.g.:

- ISAR/Multi-Static SAR
- Parallax exploitation
- Super-resolution enhancement
- Noise characterisation



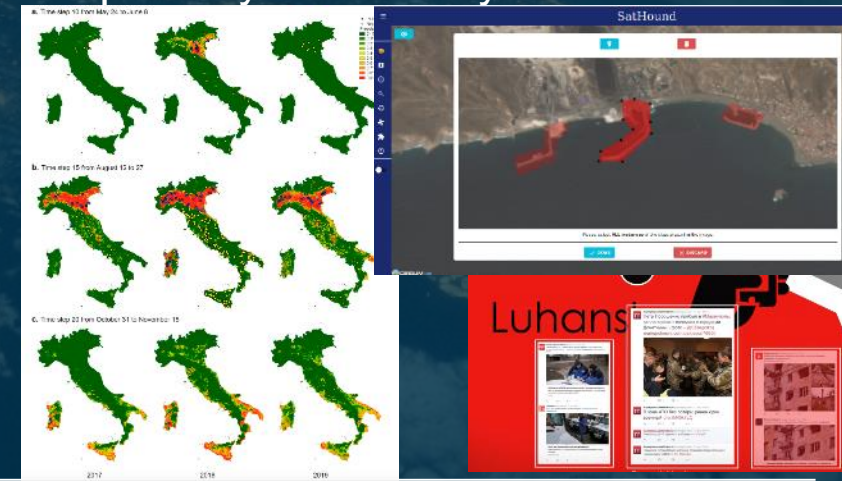
**AI enabled/enhanced capabilities**

- Feature detection/identification/characterisation
- Heterogeneous data fusion
- Inference & prediction



**New systems** enabling enhanced:

- Persistence
- Responsiveness & latency
- Adaptability & flexibility



# Key features of a Data Space (a new governance / spacecoop / onecub)



A secure and privacy preserving IT infrastructure to pool, access, process, use and share data

A data governance mechanism, comprising a set of rules of legislative, administrative and contractual nature that determine the rights to access, process, use and share data in a trustful and transparent manner

Data holders are in control of who can have access to their data, for which purpose and under which conditions it can be used

Presence of vast amounts of data that can be reused under certain conditions against remuneration or for free, depending on the data holder's decision

Participation by an open number of organizations/individuals



# Common European data spaces

Rich pool of data  
(varying degree of  
accessibility)

Free flow of data  
across sectors and  
countries

Full respect of GDPR

Horizontal  
framework for data  
governance and data  
access

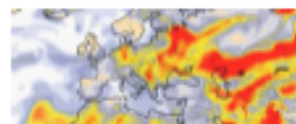


- Technical tools for data pooling and sharing
- Standards & interoperability (technical, semantic)
- Sectoral Data Governance (contracts, licenses, access rights, usage rights)
- IT capacity, including cloud storage, processing and services

Personal data spaces



High-value data sets from the public

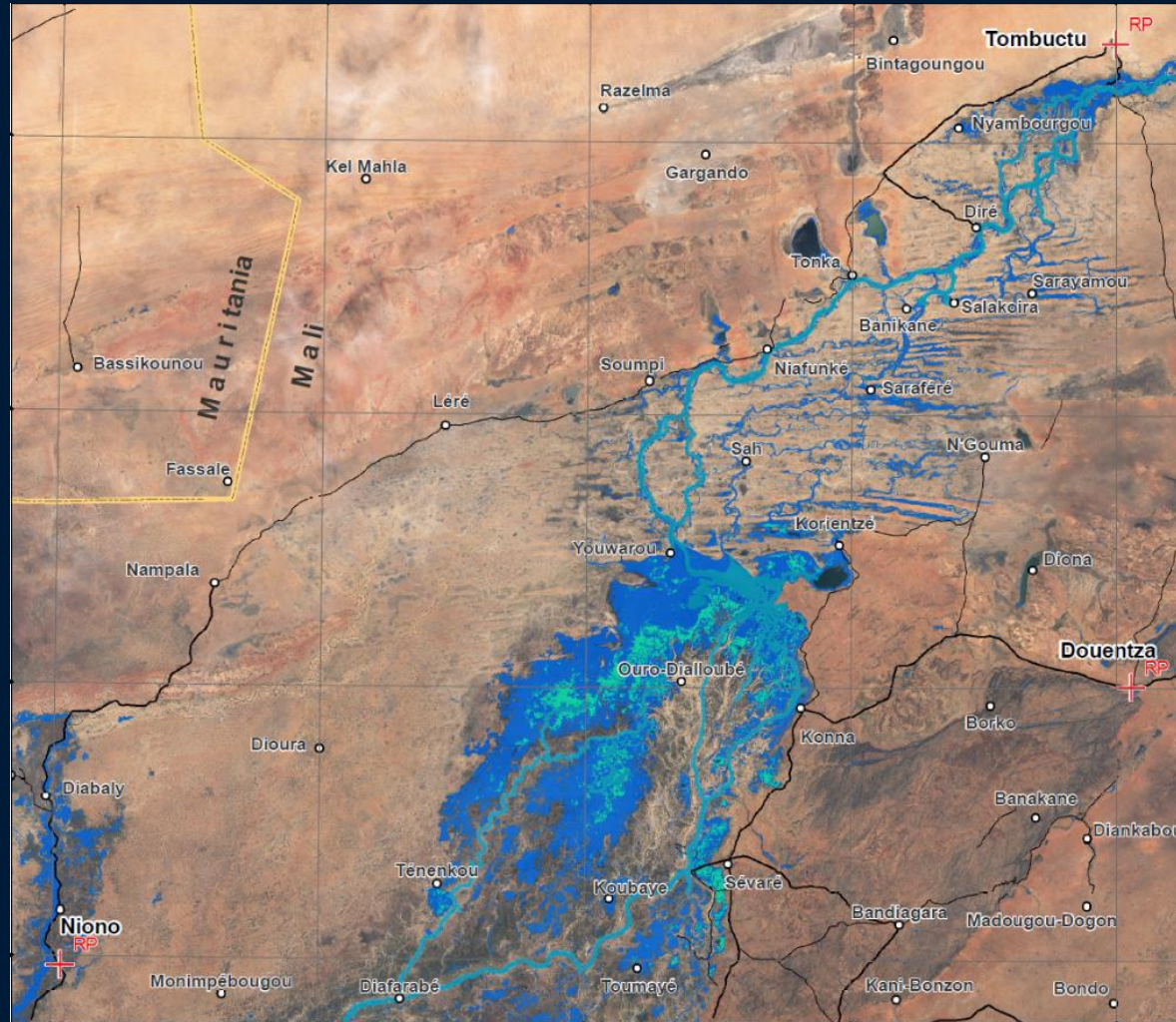


sector  
e.g. weather,  
geospatial,  
statistics.





# Flood Analysis: Mobility Impact (EU SatCen)



**Land Subject to Flooding**

- Flood
- Wet

**Hydrography**

- River

**Transportation**

- Main road
- Secondary road

**Populated Places**

- Town

**Reference Points**

- Reference point



- Sentinel-2 (22 June 2017)
- Sentinel-2 (17 July 2017)
- Sentinel-2 (16 August 2017)
- Sentinel-2 (30 September 2017)
- Sentinel-2 (30 October 2017)
- Sentinel-2 (29 November 2017)

# Wildfires in Russia

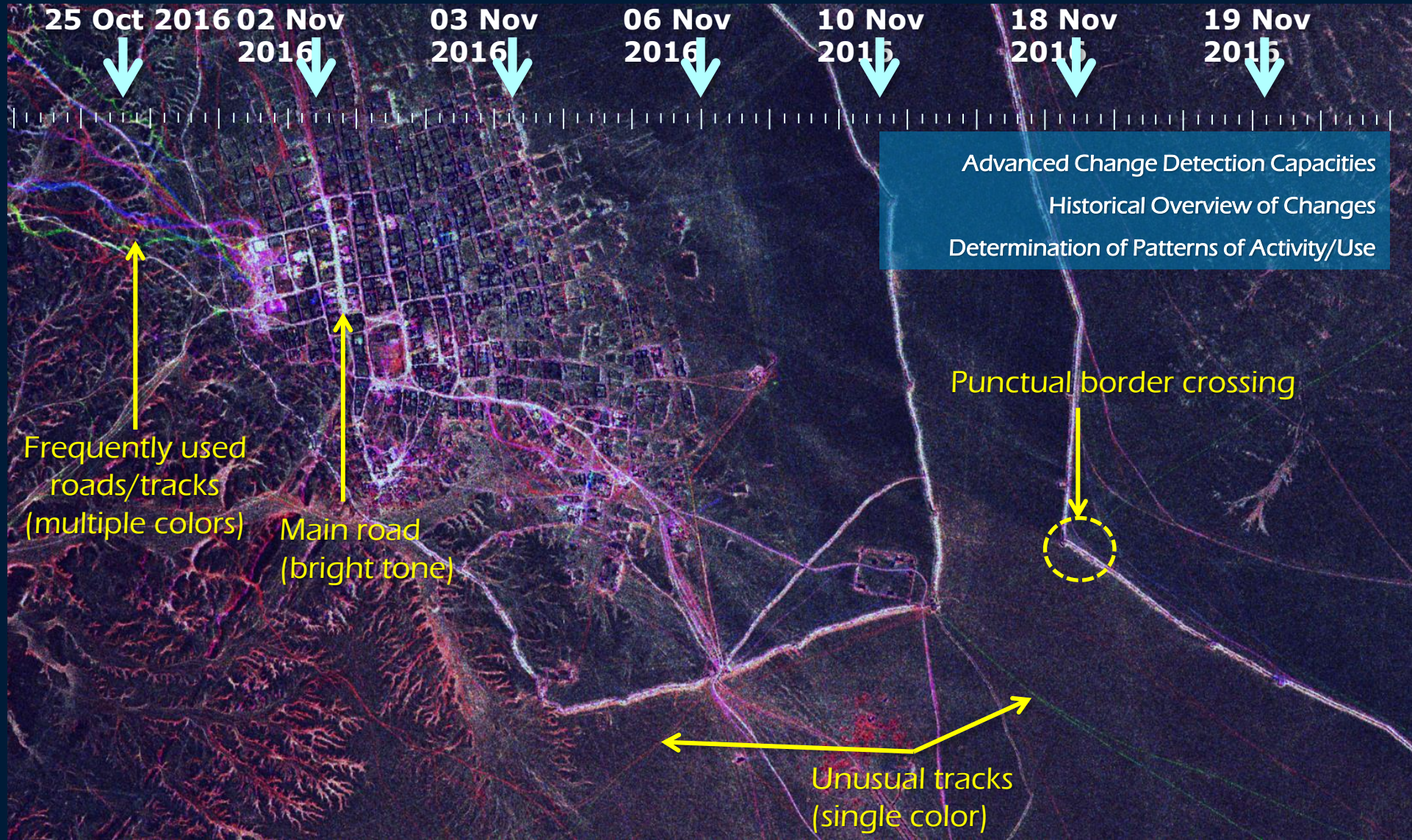


## Sentinel-2

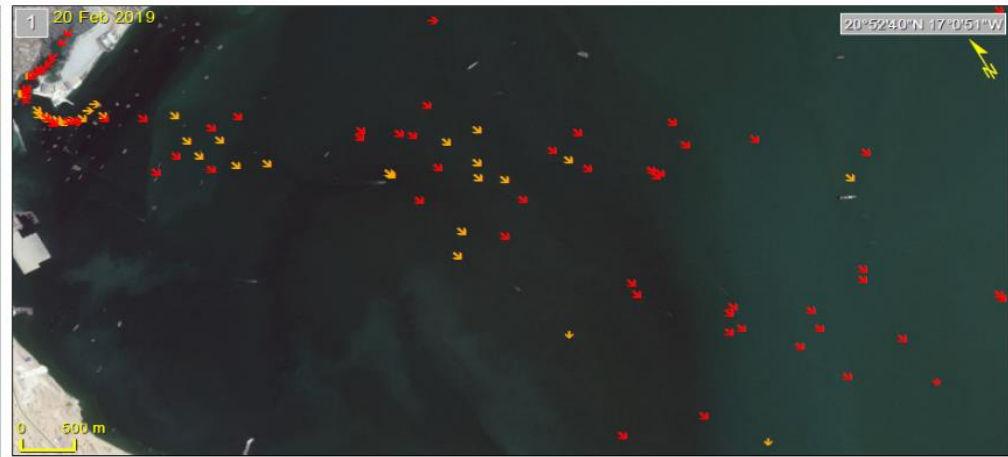
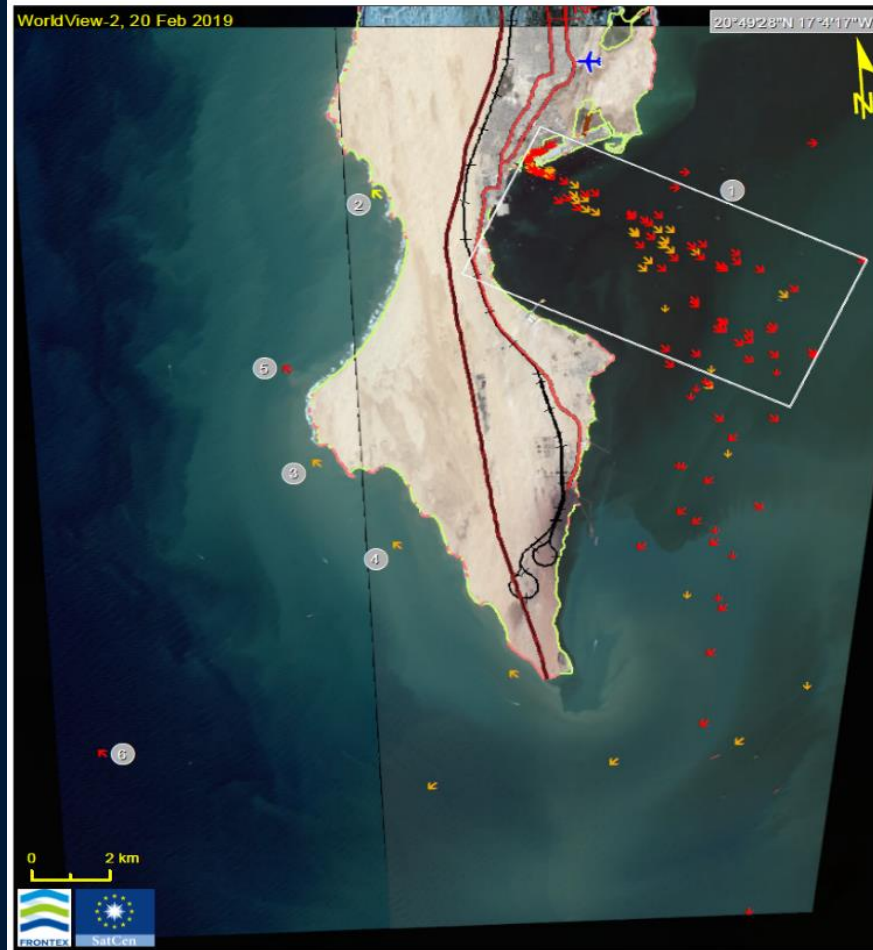
Amur Oblast  
9 May 2018



# Monitoring of trafficking routes (EU SatCen)







# Towards real-time HD Video?



**Buenos Aires**  
Time, context and layers of data

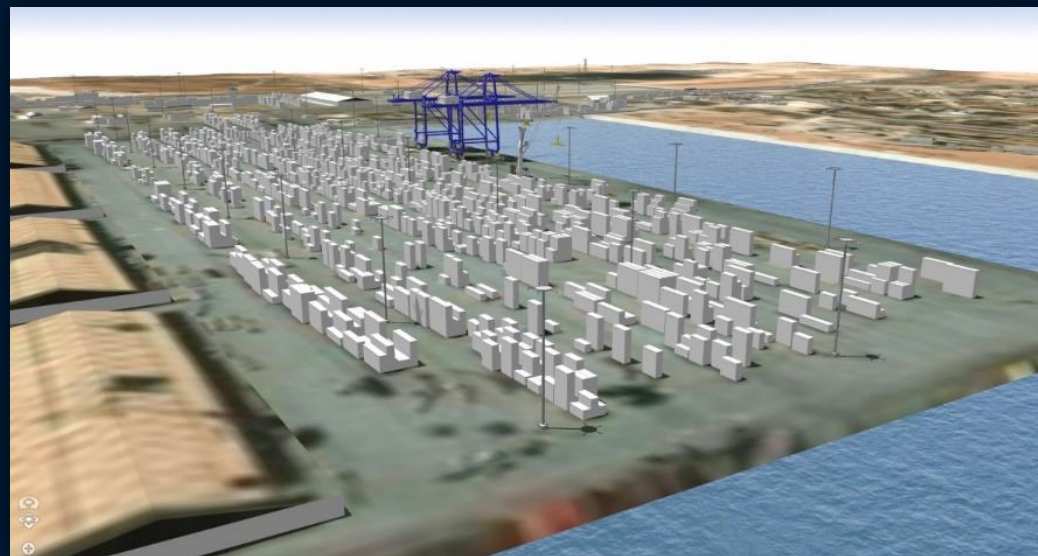


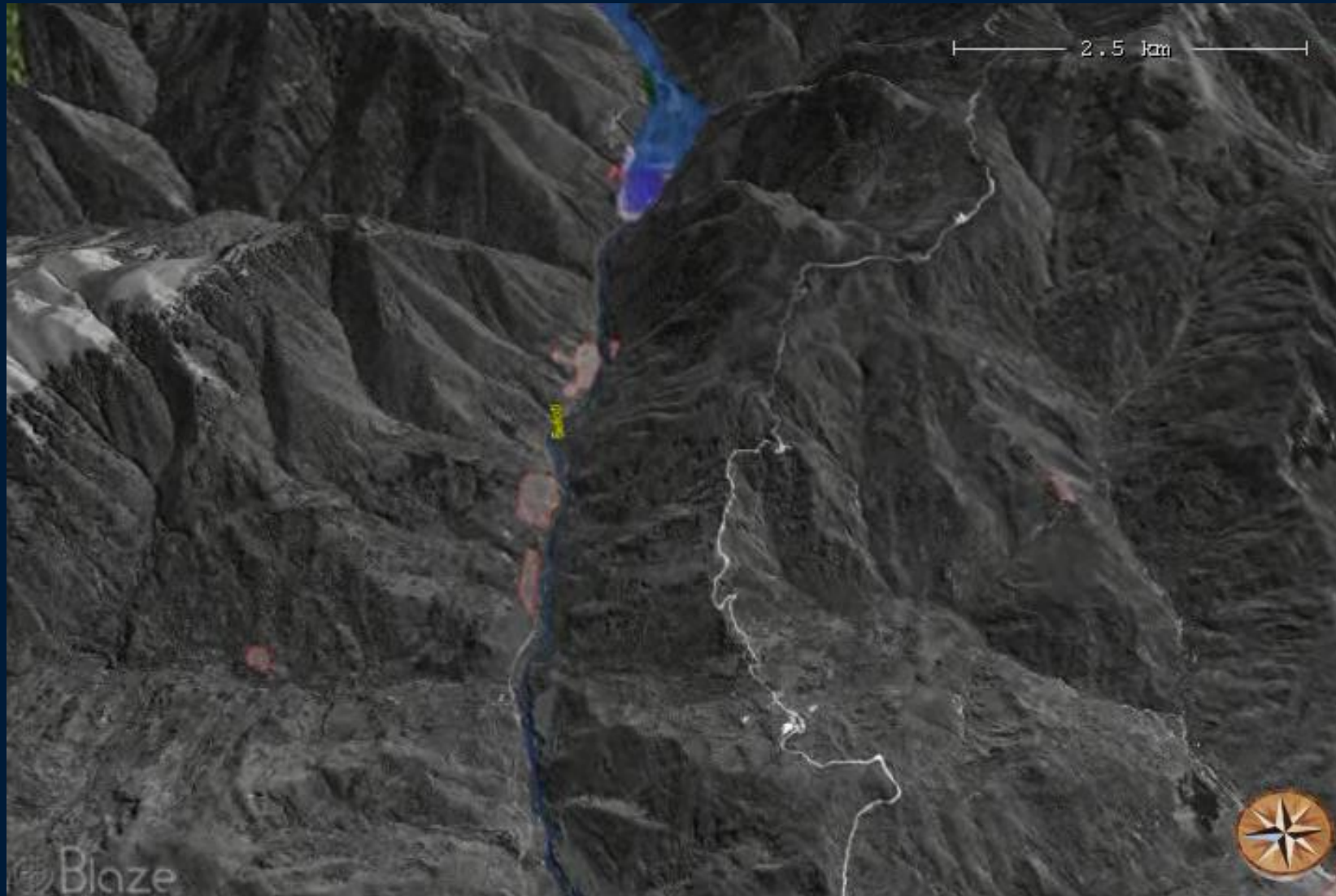
ESA UNCLASSIFIED – For Official Use



European Space Agency

# 3D Models for Operational Use (EU SatCen)





## 3D Flood Simulation





# To take away

- **Reliable chain from sensor to end-user**
- **Data is central (collection/transmission/transformation) - speed up data circulation (optical 3D)**
- **Fast & secure data management/access: « Space Data Space » approach**
- **Industry/Private partnership = Innovation (tailor-made solutions, off the shelf solutions) – Hardware/Software – Subscription contract (data provider)**
- **Training: educated users**
- **Cyber security (infra + software) to guarantee the protection of the whole chain sensor to end-user (availability + integrity + confidentiality)**
- **Do you want to own all capacities and to keep them at the top?**
- **Future: Rapid Resilient Crisis Response**

# THANK YOU

---