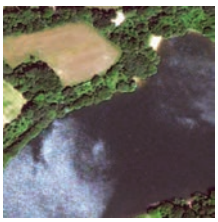
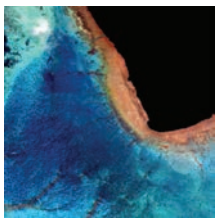
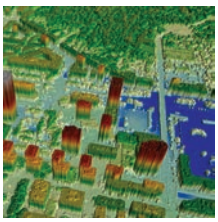

EUSI
FROM FLOODS TO DROUGHTS
Building Europe's Water Security With VHR Satellite Data

SATELLITE IMAGERY FOR **WATER RESILIENCE**

Scalable, accurate and cost-efficient

Water across Europe is facing severe pressure from climate change, urbanisation and agricultural demands, creating **critical concerns for water security.** We need to act quickly to build stronger systems and sustainable water resilience practices that serve both human communities and natural ecosystems. This challenge requires innovative monitoring and management solutions. One of them is satellite-based Earth Observation – a powerful, cost-effective tool which provides comprehensive, consistent data across entire regions, enabling informed policy decisions on water quality, flood risk, drought management, and biodiversity protection. By integrating Very High Resolution (VHR) satellite imagery into water governance frameworks, EU policymakers can **strengthen the implementation of the Water Framework Directive, develop precise water quality assessments, and create effective early warning systems** – all essential components for creating a water-resilient Europe that protects both communities and natural

WATER USE IN **AGRICULTURE**

Agriculture is one of the largest consumers of water in the EU, and water overuse and unsustainable abstraction are major issues. Climate change exacerbates these problems by increasing drought risks and water scarcity in certain regions. To mitigate these challenges, farmers and policymakers can use VHR multispectral, SWIR and hyperspectral satellite images to **monitor water consumption, soil conditions, and plant health** with unprecedented accuracy.

Soil moisture monitoring

VHR SWIR imagery maps soil moisture content across large fields. This helps predict irrigation needs, manage water distribution, and assess field readiness for planting or harvesting.

Irrigation system evaluation

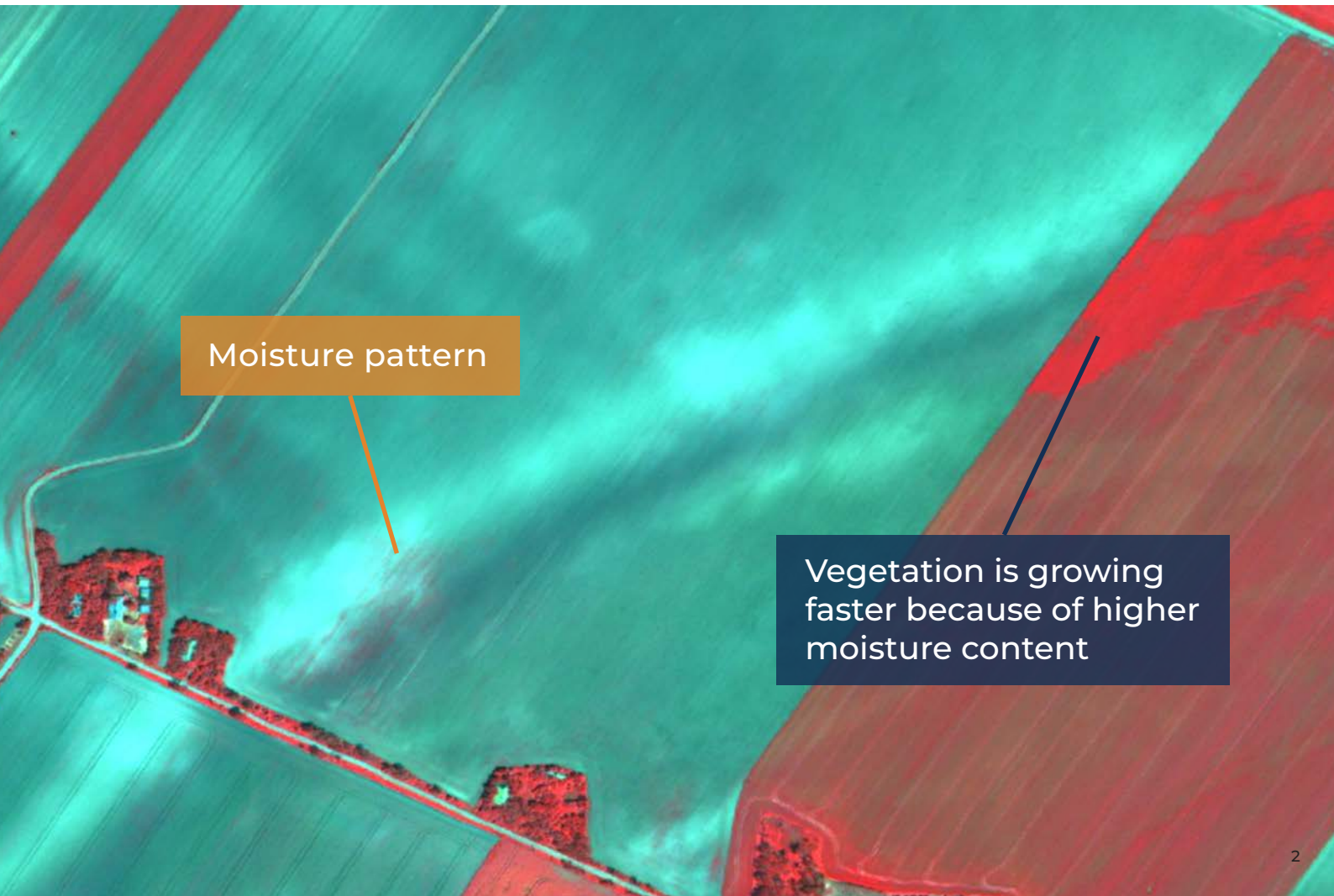
Pansharpened multispectral imagery at 30 cm resolution detects irrigation inefficiencies and water stress, which guides irrigation adjustments. NDVI calculated from the imagery is used to estimate water requirements.

Improving drought resilience

Analysis of multispectral data from an archive dating back to 1999 tracks long-term soil and crop trends, which improves predictive models for drought resilience.

Regulatory compliance

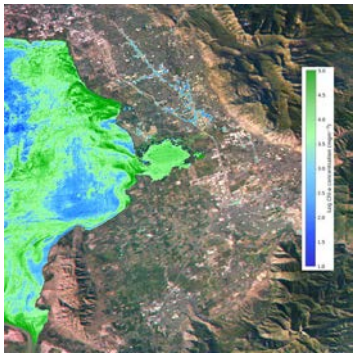
VHR imagery documents water use for compliance with regulations like CAP, Water Framework Directive, EU Carbon Removals, or Carbon Farming Certification Regulation.



WATER **POLLUTION** ANALYSIS

Hyperspectral images for precise water quality monitoring

Europe's water bodies suffer from **chemical contamination**, primarily through air pollution and agricultural runoff, and most protected aquatic habitats and species in the EU are assessed as having a poor or bad conservation status. Hyperspectral satellite images can help analyse and monitor water quality by **precise identification and measurement of various pollutants** across entire water bodies – without requiring physical samples.



What is hyperspectral imagery?

Hyperspectral imagery detects specific wavelengths which are invisible to the human eye and conventional satellite sensors. These wavelengths enable the detection, classification and quantification of water contaminants.

Hyperspectral sensors detect **subtle changes in water colour and reflectance** that indicate the presence of pollutants including heavy metals, algal blooms, petroleum compounds, and agricultural runoff. By analysing the unique spectral signatures of different contaminants, authorities can identify pollution sources, track dispersion patterns, and assess concentration levels without physical sampling.

This technology enables continuous monitoring of remote or inaccessible areas and allows for **early detection of contamination events**, verification of regulatory compliance, and assessment of remediation effectiveness across EU member states.

WAVELENGTH	WATER QUALITY PARAMETERS	SIGNIFICANCE
400–850 nm	Total Suspended Sediments (TSS)	Determines the level of turbidity and murkiness; water clarity, water colour, and degree of water quality and pollution
467–675 nm 690–710 nm	Total Phosphorus (TP)	Proxy for monitoring the growth of aquatic autotrophs; directly linked to Chl-a content, indirectly linked to water quality
450–705 nm 761–891 nm	Chlorophyll-a (Chl-a)	Proxy for phytoplankton abundance and trophic state
Bands centered on: 1200, 1730, 2300 nm	Hydrocarbon detection	Detects the presence of oil spills, their thickness, and emulsion rate

BIODIVERSITY MONITORING

Monitor freshwater ecosystems and river restoration

Rivers face significant threats from physical alterations like dams and artificial channels that destroy natural habitats. To maintain biodiversity and ensure the health of freshwater environments, it's necessary to focus on restoring these ecosystems. The EU therefore aims to **substantially increase river restoration efforts by 2030** in line with the Water Framework Directive objectives. EUSI can help by supplying Very High Resolution satellite imagery which shows details like individual trees, vegetation health, small water bodies, or migration corridors for wildlife species. The multiple daily opportunities for new collections, together with an extensive archive of satellite images dating all the way back to 1999, enable **consistent and accurate monitoring** of ecosystems across Europe.

15 HD PROCESSING

New processing technologies have bridged the resolution gap between satellite and aerial sensors.

NEW SENSORS LAUNCHED IN 2024/2025

A significant increase in 30 cm class satellites now allows for efficient growing season collection of any European region.

INTEROPERABILITY WITH SENTINEL

The spectral bands of Maxar WorldView Legion sensors enable seamless use of Sentinel-based indices.

FLOOD REGULATION

Prediction, prevention, rapid response and damage mapping

As a result of climate change, we see **an increased number of extreme weather events in Europe**, including floods. Effective, sustainable and affordable solutions for flood regulation are needed, from prediction models and other preventative measures to rapid response and damage mapping. The use of satellite imagery for flood management is invaluable. Satellite images and products created from them help rescuers save lives when disasters strike, assist with damage assessments, and in many cases contribute to successfully preventing and predicting emergencies.

PREVENTION

Multispectral satellite images are used to conduct analysis of soil properties that influence water infiltration and runoff.

3D models created from satellite imagery are used to analyse the terrain and assess which areas are at risk of flooding.

RAPID RESPONSE

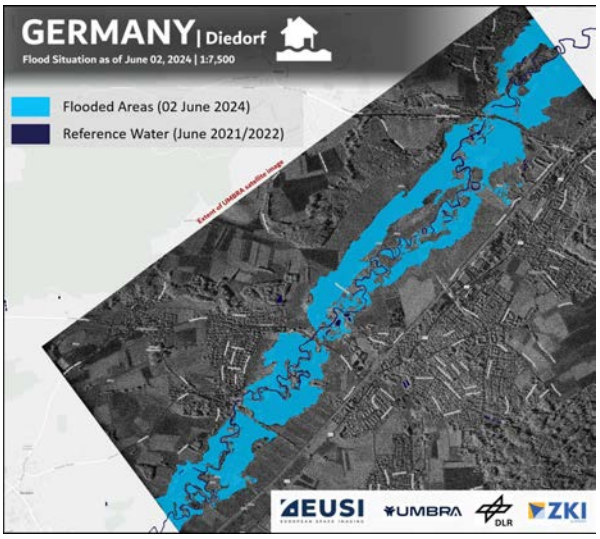
VHR optical imagery, delivered as fast as 15 minutes after collection, allows detailed analysis.

SAR imagery penetrates cloud cover and is therefore extremely valuable under bad weather conditions.

Use Case: Floods 2024

In June 2024, EUSI worked closely with the German Aerospace Center (DLR) to **rapidly collect and deliver both optical and SAR satellite images** of floods in Southern Germany.

Initially, the region was covered by clouds and the collection of optical imagery was challenging. Analysts from the IFAS project therefore first received high resolution SAR images and created **maps detailing flooded areas**. On the first cloud-free occasion, EUSI delivered optical imagery which was used for analysis. The results were **immediately made available to authorities** and relief organisations such as the Bavarian Red Cross (BRK) and the German Federal Agency for Technical Relief (THW).



MONITORING WATER **INFRASTRUCTURE**

With many European areas facing recurrent water stress and climate volatility, authorities need precise, cost-effective tools to **monitor the extensive network of water infrastructure across diverse landscapes**, such as irrigation canals or water reservoirs. Traditional ground-based monitoring is resource-intensive, provides limited coverage, and thus creates **blind spots in rural and remote areas** where crucial water systems operate. The answer to this problem is satellite imagery.

Threat

Hydrological infrastructure is vulnerable to wear, sedimentation and leaks, as well as extreme weather events and potentially dangerous activities, such as construction near the water source. This can result in water pollution, agricultural losses, increased operational costs, damage of the ecosystem, and an overall threat to water security.

Solution

Real-time monitoring with 30 cm satellite imagery detects water level changes, pollution, damage, or suspicious activities near the infrastructure. This enables predictive maintenance, extends infrastructure lifespan, and reduces expenses from emergency repairs and disaster recovery. It also allows authorities to reduce ground surveys for remote sites, identify infrastructure at risk from extreme weather and other threats, and validate adherence to EU regulations.

Use Case: Satellite images revealed drinking water damage after landslides

After two landslides in Saxony, Germany, EUSI was activated by the Copernicus EMS to supply VHR satellite images at 50 cm in order to **assess possible effects on drinking water infrastructure** in the area. The map showed that the landslides had blocked a tunnel connecting two water reservoirs, potentially having a severe impact on drinking water in the Berlin area.

Monitor long-term trends with an archive dating back to 1999

Show All Images

Source	Collected	Area Clouds	Area Off Nadir
LG01	2025/04/23	2.4%	42.9°
WV02	2025/04/23	15.4%	28.4°
WV03	2025/04/23	40.5%	36.2°
WV03	2025/04/23	3.7%	28.8°
WV03	2025/04/23	9.7%	18.9°
WV03	2025/04/23	70.4%	7.3°
WV03	2025/04/23	84.0%	17.4°
WV03	2025/04/22	0.0%	24.1°
LG04	2025/04/22	0.0%	14.1°

IMPERVIOUS SURFACE MAPPING

HIGH SPATIAL RESOLUTION

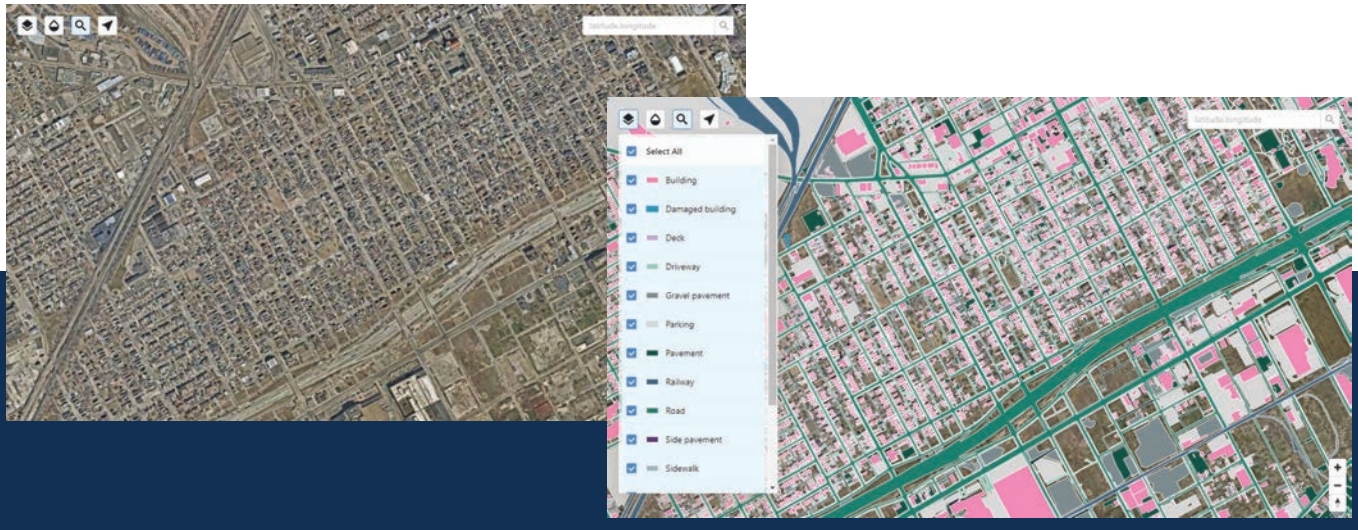
LARGE-SCALE MAPPING

SEMI-AUTOMATIC IMAGE ANALYSIS

REDUCING COSTS

The exponential increase of impervious surfaces in urban areas brings **negative consequences** in many domains, such as increased surface runoff and flood risk, decreased groundwater recharge, or intensification of the urban heat island effect. That's why the administrations of cities, municipalities or countries, as well as commercial users, use high-precision land cover data to create objective documentation and monitor land consumption.

VHR satellite imagery is used for creating impervious surface maps – maps that highlight **areas where the surface doesn't absorb water**. These are usually solid surfaces like roads, buildings and parking lots. The resulting data helps city administrators create objective documentation of land use trends and **supports informed policy decisions**.



- Stormwater management
- Flood modelling
- Impervious surface mapping

PRODUCTS OVERVIEW

PRODUCTS	RESOLUTION	SPECTRAL BANDS
RGB OPTICAL IMAGERY	30–50 cm	4 (RGB + panchromatic)
HD IMAGERY	15 cm HD	4 (RGB + panchromatic)
MULTISPECTRAL	30 cm after pansharpening	8 (R, G, B, Y, Coastal, Red Edge, NIR 1, NIR 2)
SWIR	3.7 m	8 (SWIR)
HYPERSPECTRAL IMAGERY	5–10 m	250+
3D MODELS	30 cm – 5 m	3 (RGB)
SAR IMAGERY	25–100 cm	–
LAND COVER MAPS	derived from 30–50 cm images	–

MUNICH, GERMANY | 15 CM HD

Collected on 3 March 2025 using Maxar WorldView Legion satellite

15 min delivery

Using **the most advanced satellite downlinking and processing technology**, EUSI offers Near Real-Time (NRT) satellite image delivery in only 15 minutes after collection – with the ability to process multiple NRT orders simultaneously.

15 daily collections

Six new 30 cm satellites available to European users were launched in 2024 and 2025. The ability to capture a single target 5, 10 or even 15 times in a single day **significantly improves the success of challenging collections** involving bad weather, continuous monitoring, or natural disasters.

Regional solution partners

We work closely with **innovative partners and solution providers**. Thanks to this, users can access solutions from GAF AG (3D models), Umbra (SAR imagery), Pixxel (hyperspectral imagery), or Ecopia (Impervious Surface Mapping).

25 years of archive imagery

EUSI offers access to an archive dating back to 1999 and covering the globe several times over in 15–80 cm imagery. This archive presents a unique asset for users working to **meet the EU's sustainability goals** – supporting biodiversity protection, climate adaptation, and water security.

SARCA RIVER, ITALY – UNLOCKING BATHYMETRIC PRECISION WITH YELLOW & NIR-2 SPECTRAL BANDS

CASE STUDY

Optimal Band Ratio Analysis of WorldView-3 Imagery for Bathymetry of Shallow Rivers (Case Study: Sarca River, Italy) Niroumand-Jadidi, M., & Vitti, A.

Italy's rivers play a crucial role in supplying drinking water, supporting agriculture, and sustaining biodiversity. Accurate mapping of riverbed depth (bathymetry) is essential for water resource management, sediment transport studies, and ecological conservation. Traditional in-situ surveys can be time-consuming and disruptive to sensitive environments, creating a demand for precise, remote sensing–based solutions.

Challenge

The Sarca River in northeastern Italy presents a typical challenge for shallow-water bathymetry: variable substrates, mixed sediment sizes, and fluctuating water clarity. Conventional high-resolution imagery with only four bands (RGB + NIR) struggles to discriminate subtle spectral differences in shallow, heterogeneous river systems, limiting depth accuracy and consistency.

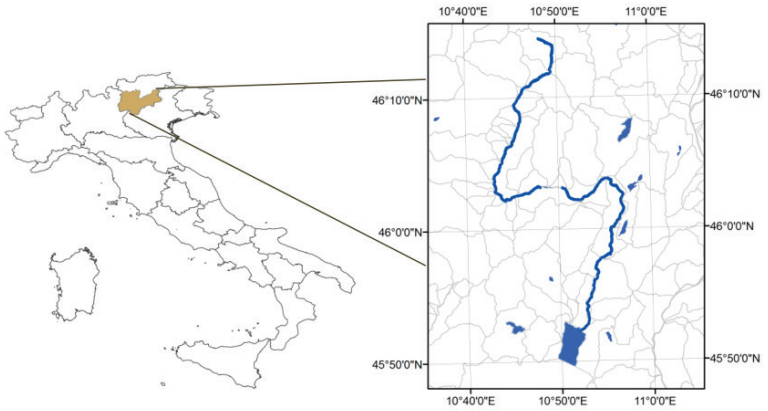


Figure 1. Sarca river located in northeast of Italy

Method

Researchers used Optimal Band Ratio Analysis (OBRA) on WorldView-3 imagery, comparing results to a 4-band GeoEye-1 dataset. WorldView-3 offers eight multispectral bands in the VNIR range, including Yellow and NIR-2, which are absent from GeoEye-1. The Yellow band captures finer sediment-water contrast in the visible spectrum, while NIR-2 penetrates shallow water more effectively than a single NIR band, providing a stable denominator for depth calculation.

Results

Yellow/NIR-2 ratios from the WorldView-3 data improved correlation with measured depths, achieving R^2 values around 67% and reducing error from 6 cm RMSE (4-band) to 4 cm RMSE. The extra bands delivered about 10% higher accuracy, showing that expanded spectral coverage can significantly boost bathymetric precision without changing spatial resolution.

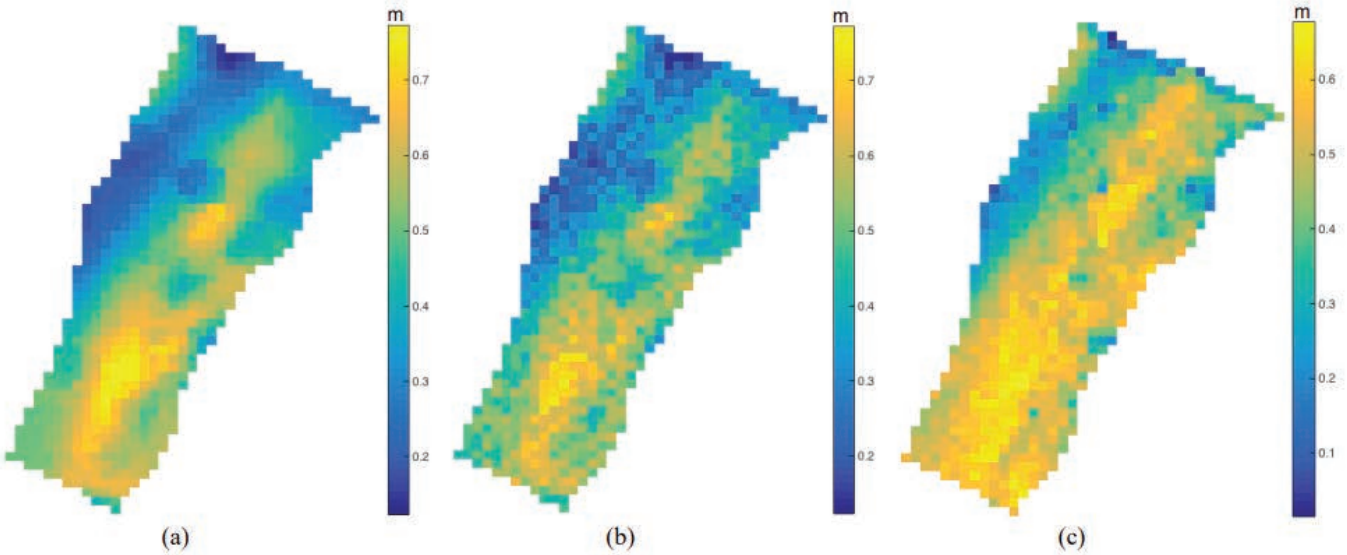
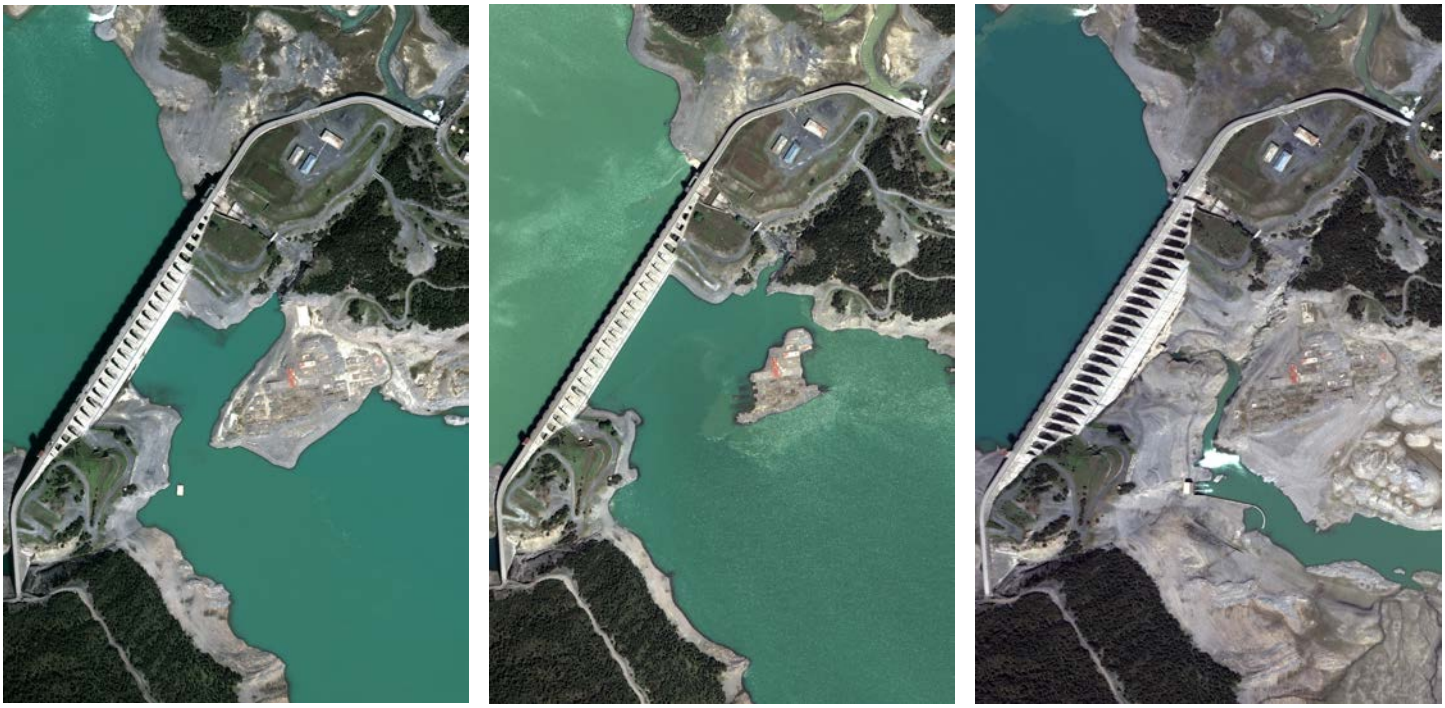
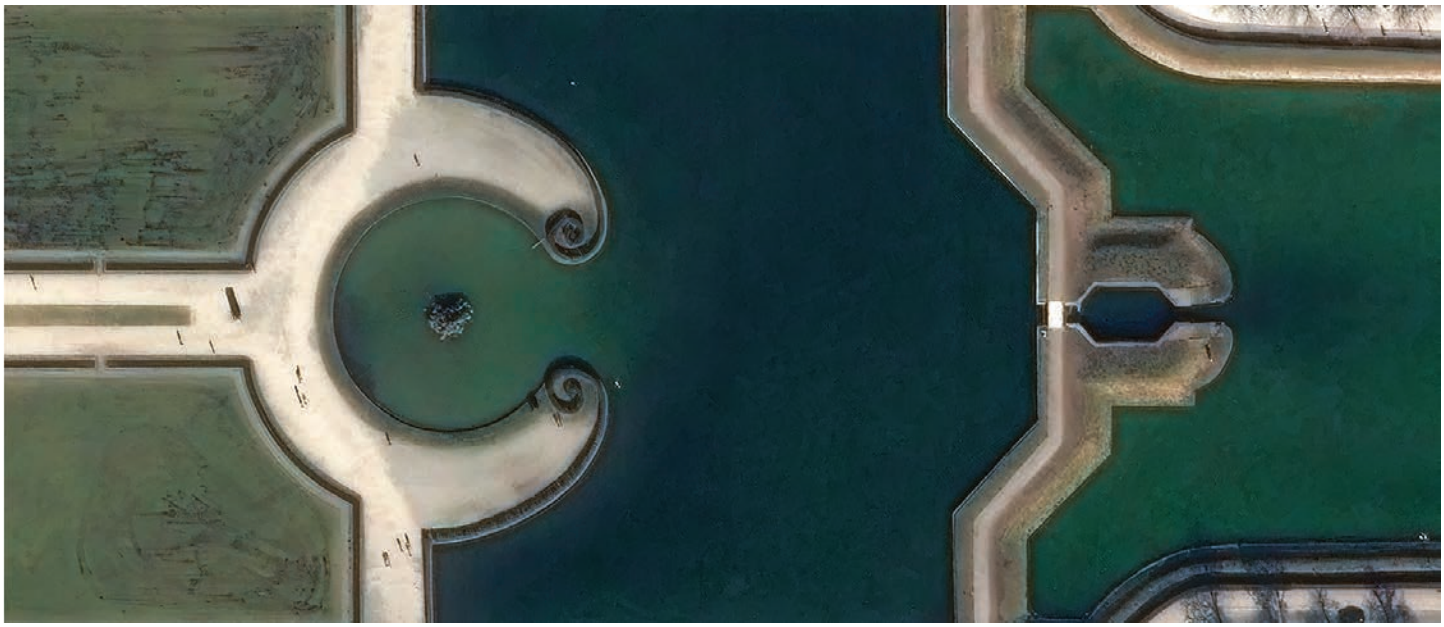


Figure 5. Comparison of the (a) in-situ depths with the bathymetric maps obtained from OBRA of (b) WV-3 and (c) GeoEye images



Time series of the dam at Bacino di San Giacomo, Italy. August 2016, June 2019, August 2022.

Closer look at the dam. August 2016, June 2019, August 2022.



15 cm HD resolution satellite image of Munich, Germany. Collected by Maxar WorldView Legion.

EUSI

EUROPEAN SPACE IMAGING

DYNAMIC TASKING. RAPID RESPONSE. MISSION READY.

YOUR MISSION, OUR SOLUTION

European Space Imaging (EUSI) delivers unparalleled Very High Resolution (VHR) satellite tasking solutions, tailored to the critical needs of European authorities, member states, and crisis response agencies. Leveraging direct tasking capabilities and a locally integrated ground station, EUSI ensures rapid response and real-time mission support. With access to the world's most advanced optical, SAR, and hyperspectral satellite constellations, we provide decision-makers with actionable intelligence with the highest precision, speed and reliability.

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