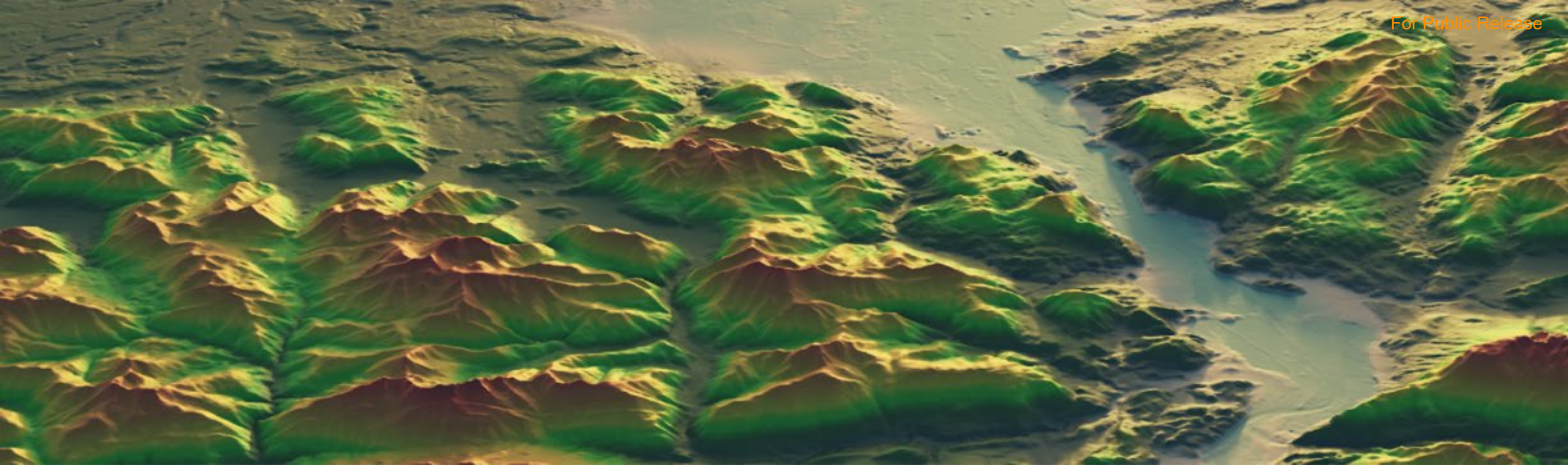




DEFENCE AND SPACE

32nd IAF WORKSHOP ON “RESILIENT COASTS, RESILIENT EARTH: INNOVATIVE SPACE SOLUTIONS FOR COASTAL RESILIENCE”
WITH THE SUPPORT OF THE UNITED NATIONS

WorldDEM NEO as a Foundation Enabler for Comprehensive Humanitarian Assistance and Disaster Response (HADR)

Matteo Emanuelli, Virginia Herrera-Cruz, Ciro Farinelli

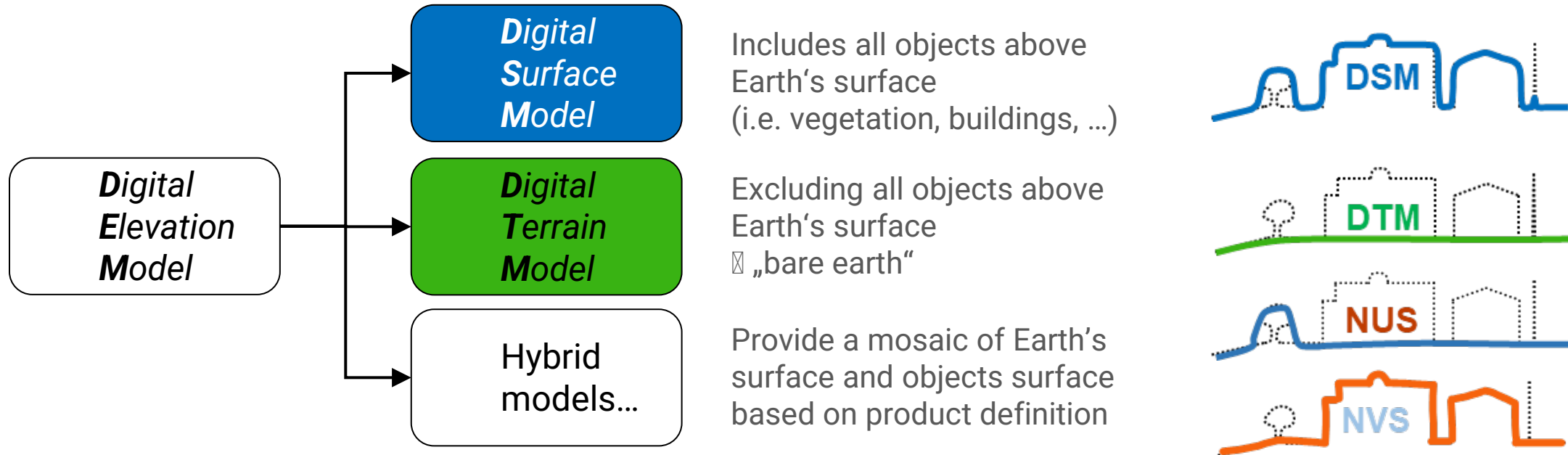
AIRBUS

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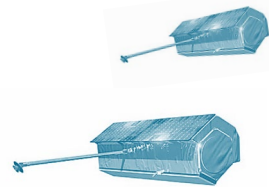
- Digital Elevation Models - Definitions
- Global Elevation Models
- WorIDEM NEO - Applications
- How to Access the DEM data

What is a Digital Elevation Model (DEM)?

... is a numeric/quantitative description of a topographic surface (in a digital format)



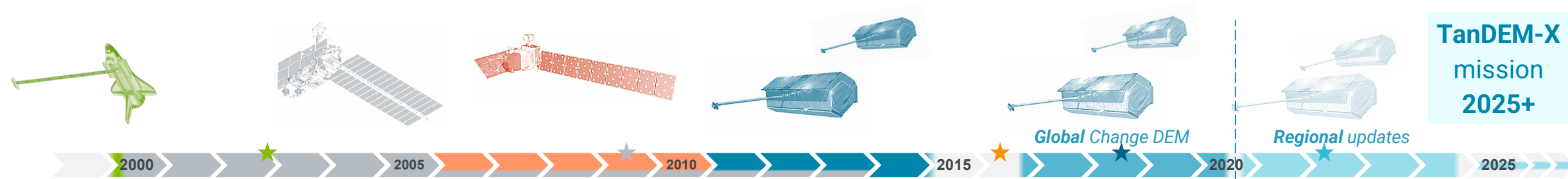
DEMs with a global or near-global coverage are based on Earth observation data by satellite sensors.



TanDEM-X Mission (since 2010)

German Space Agency (DLR) / Airbus

Time+Resolution - Comparison of Global DEMs



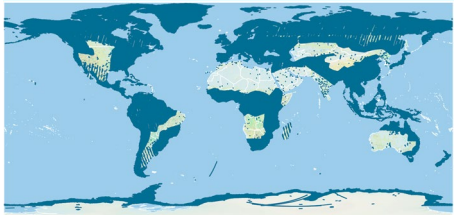
	SRTM ¹⁾	ASTER GDEM ¹⁾	AW3D30 ¹⁾	WorldDEM	WorldDEM Neo	
Method	C-band InSAR	Stereo optical	Stereo optical	X-band InSAR	X-band InSAR	
Time	2000	2000 – 2013 ²⁾	2006 – 2011	2010 – 2015	2017 – 2020(+)	
Coverage	60°N – 60°S	83°N – 83°S	82°N – 82°S	global	global	
Grid Spacing	30m & 90m	30m	30m	12m	5m	
Vertical accuracy	6.4 – 12.0m RMSE	12.6m RMSE	4.4m RMSE	2.5m LE90	1.4m LE90	1.0m RMSE

On-going since 2020:

Additional DEM acq.s for areas with expected height changes ▯ **4D**

- Forests (boreal, tropical)
- Greenland & coast of Antarctica
- Permafrost, glaciers and mountains
- Cities

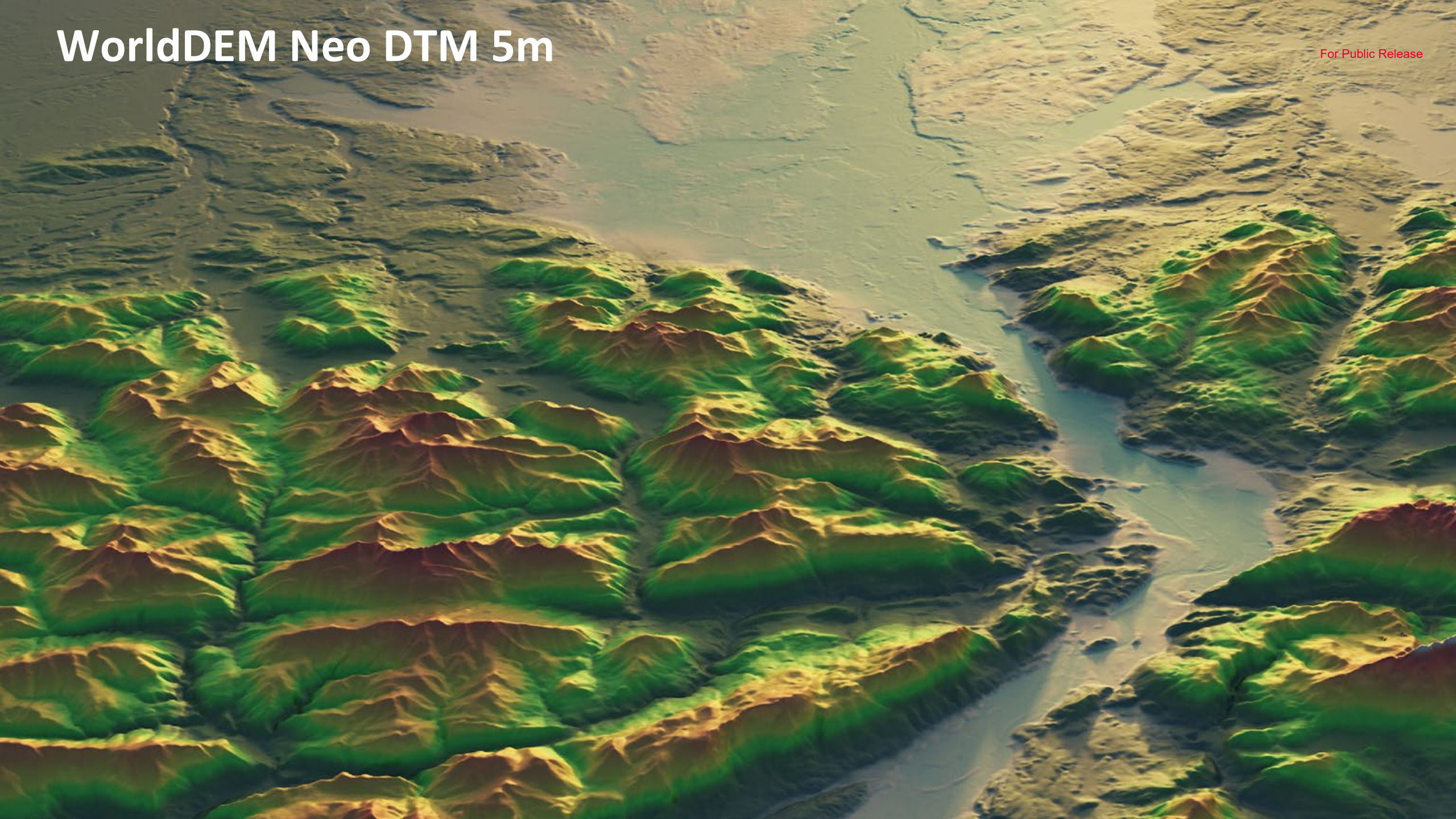
TDX 4D coverage



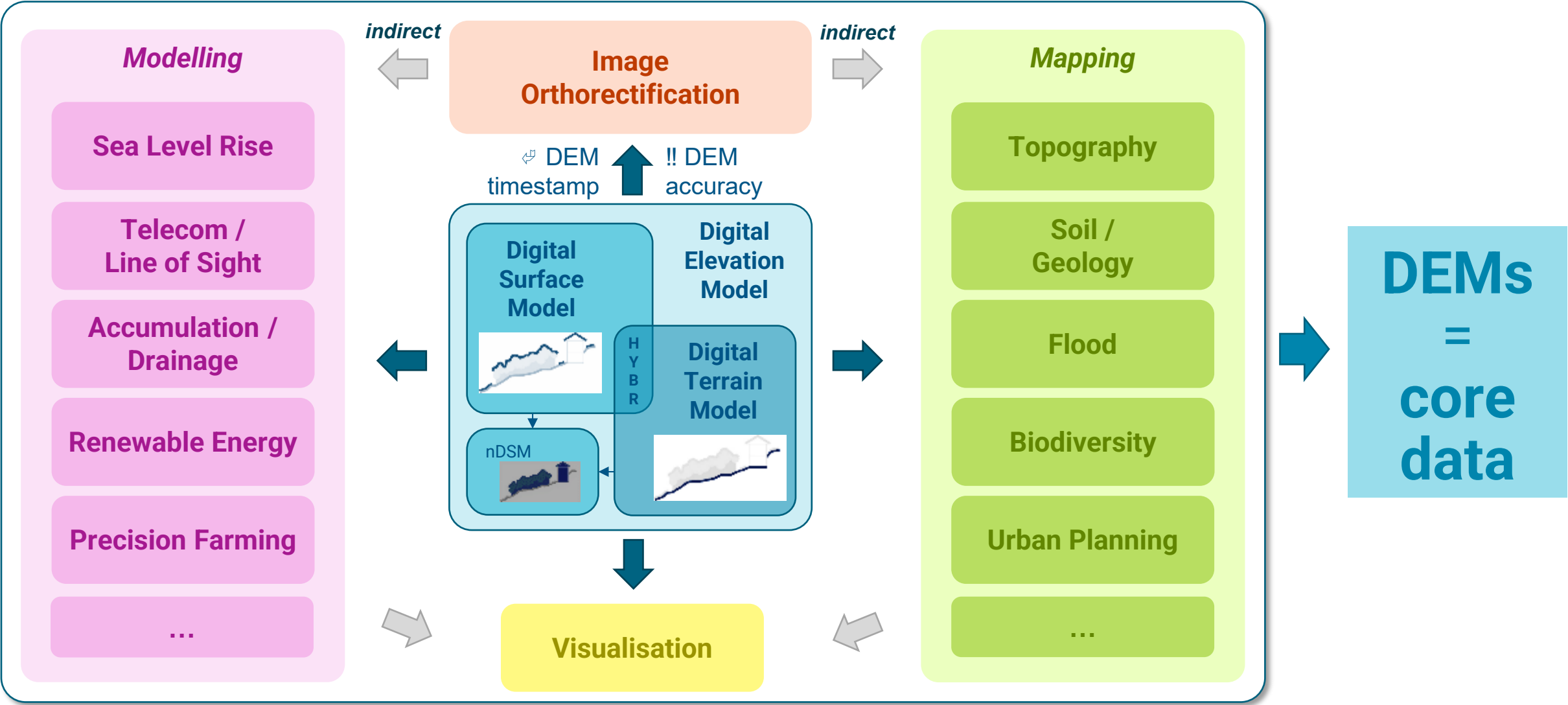
¹⁾ López-Vázquez, C.; Ariza-López, F.J. **Global Digital Elevation Model Comparison Criteria: An Evident Need to Consider Their Application.** ISPRS Int. J. Geo-Inf. 2023, 12, 337. <https://doi.org/10.3390/ijgi12080337>
²⁾ Source ASTER GTM Time: <https://lpdaac.usgs.gov/products/astgtmv003/>

WorldDEM Neo DTM 5m

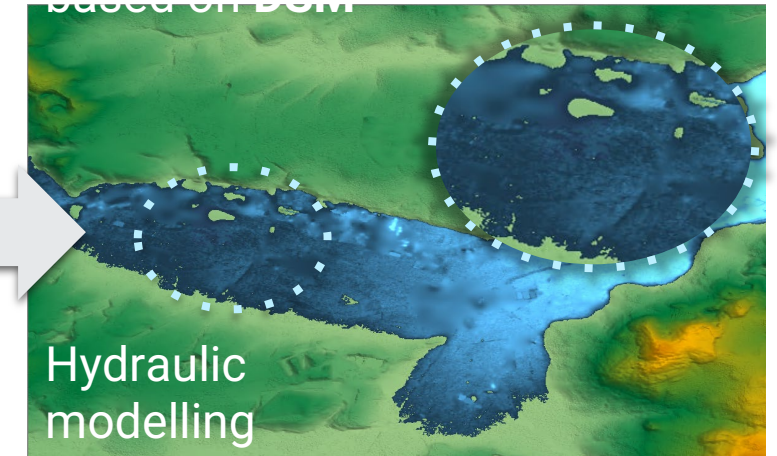
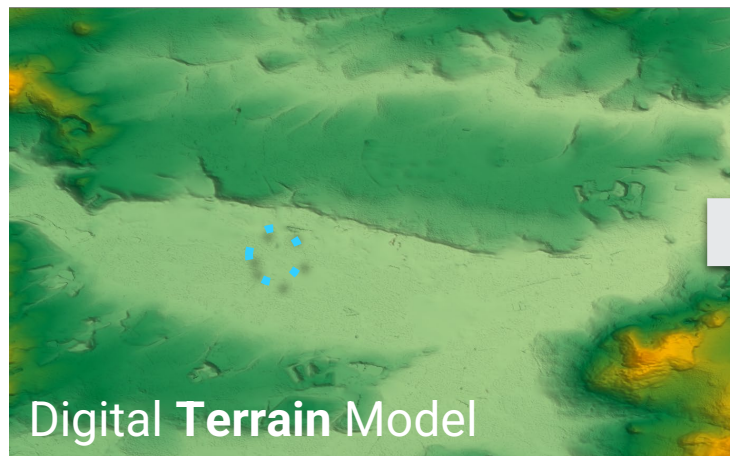
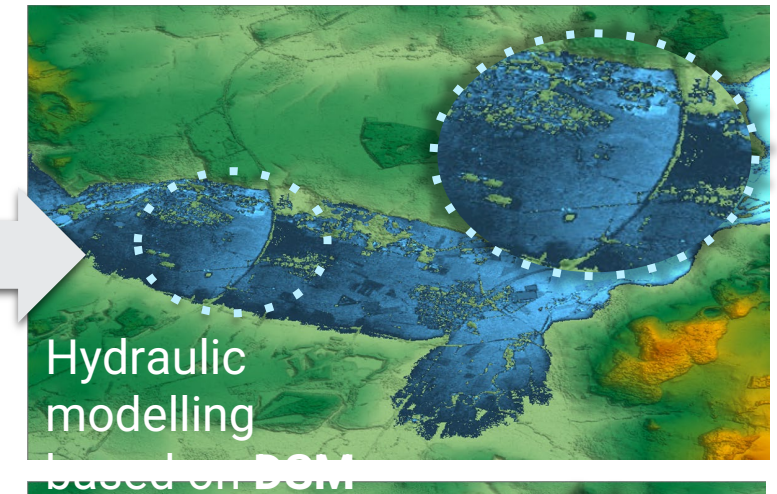
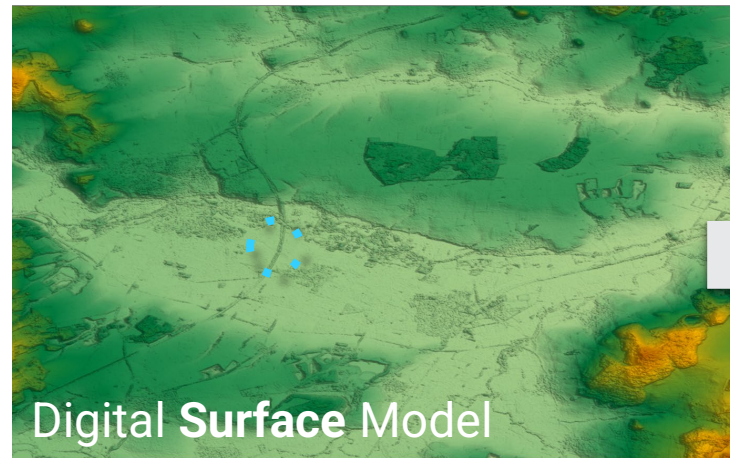
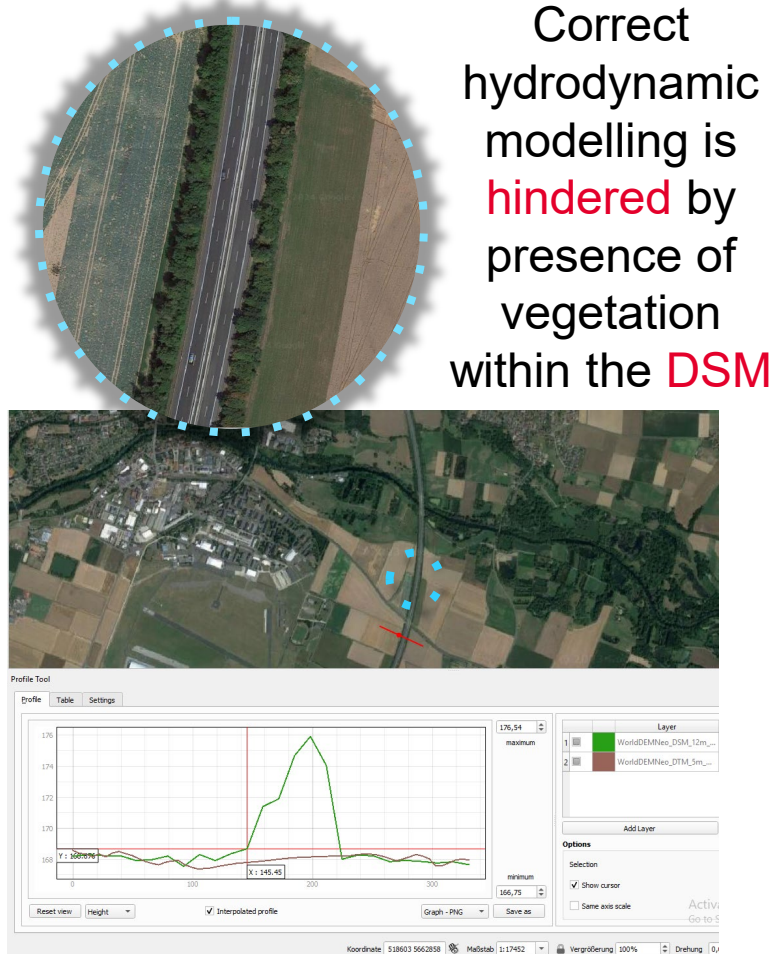
For Public Release



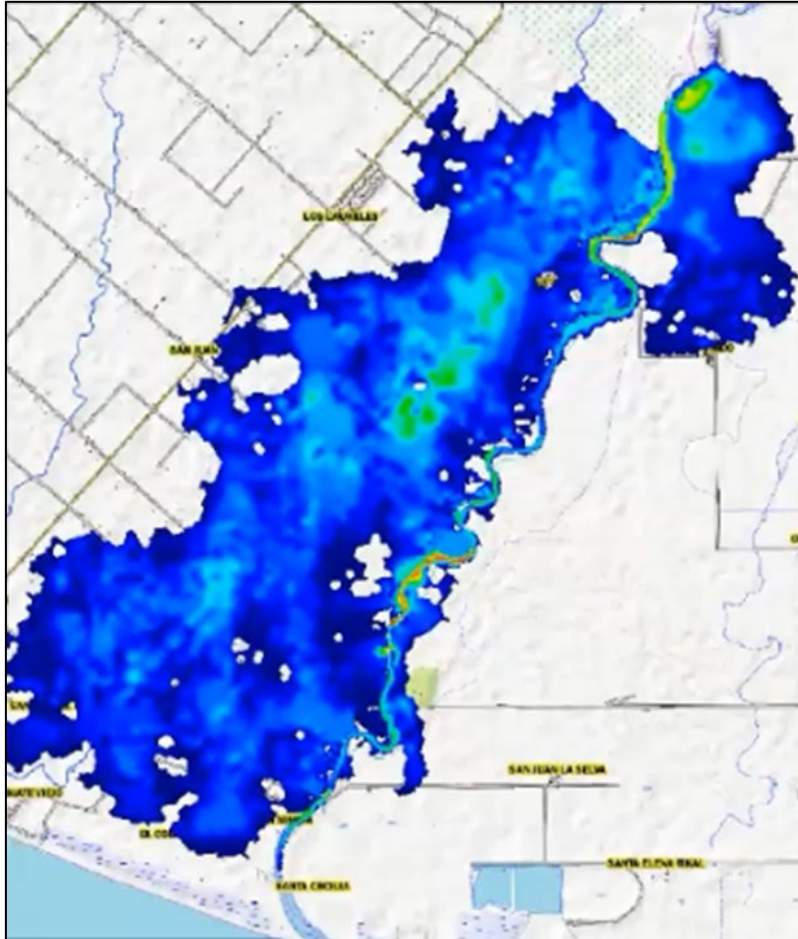
Applications vs DEM types



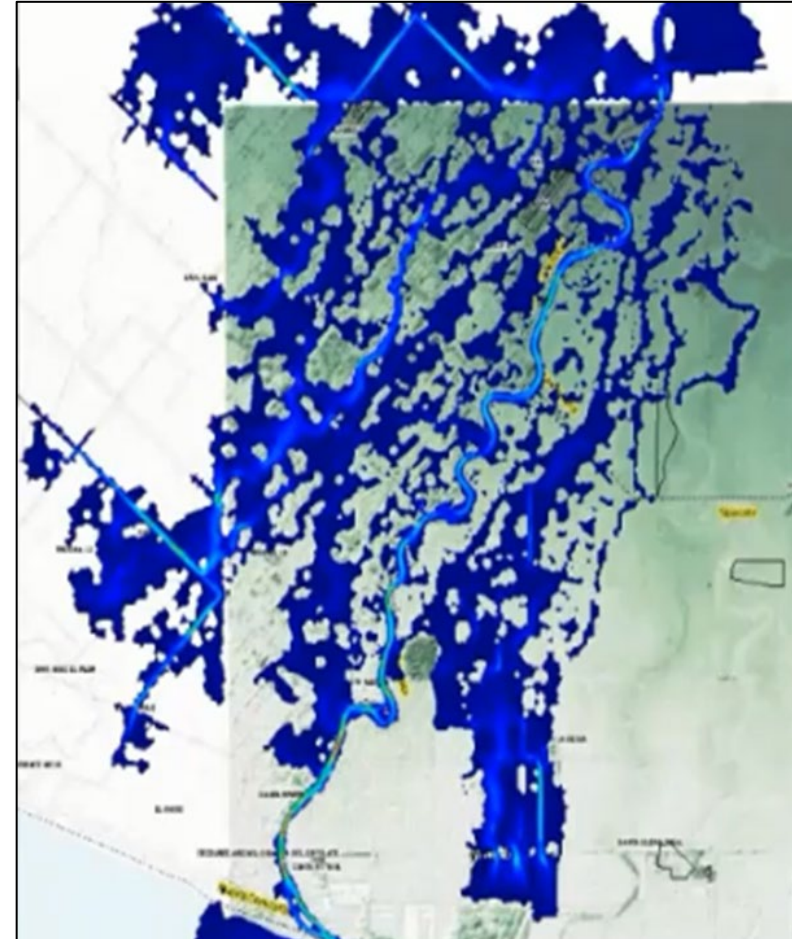
Applications vs DEM types: DSM vs. DTM



Application - River Inundation Modelling - Flood Simulation, (Coyolate River, Guatemala)



Specific discharge using
SRTM

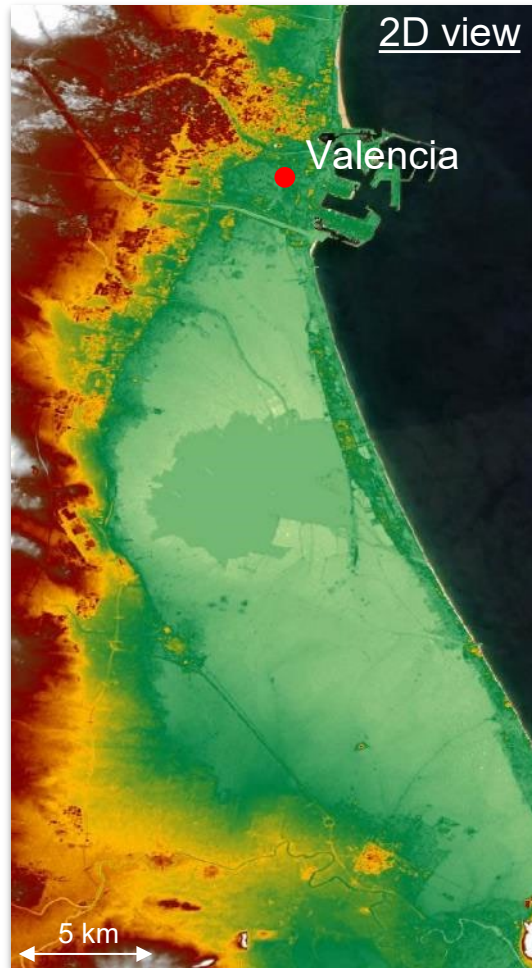
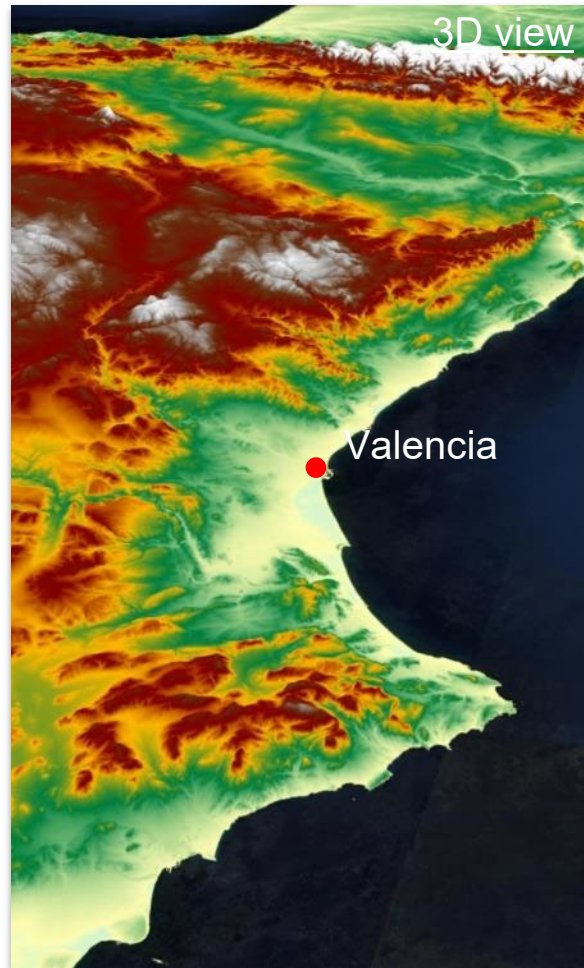


Specific discharge using
WorldDEM

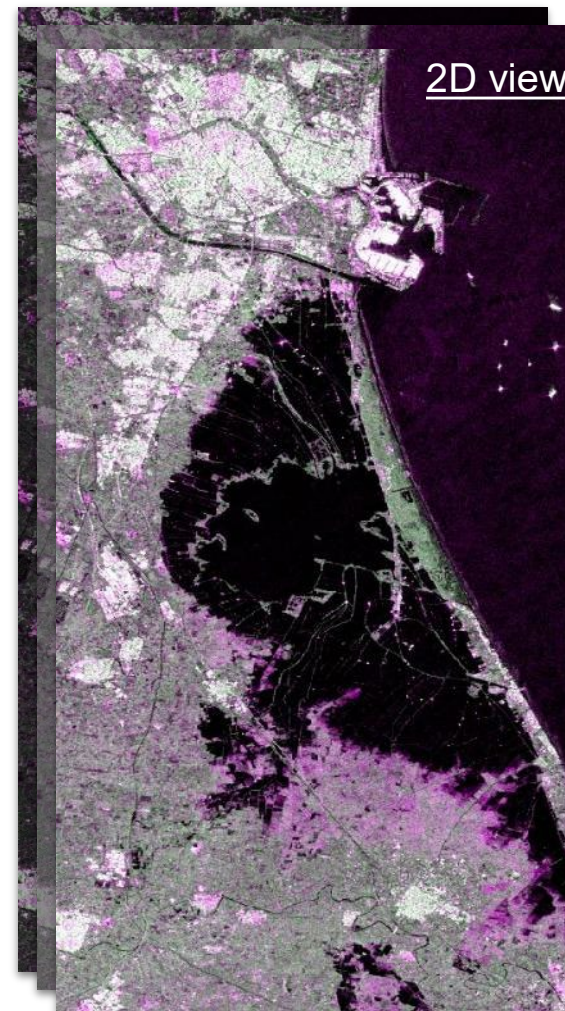
Application – Flood mapping (Valencia, Spain)

DEMs used with Sentinel-1 radar data to retrieve flooding maps.

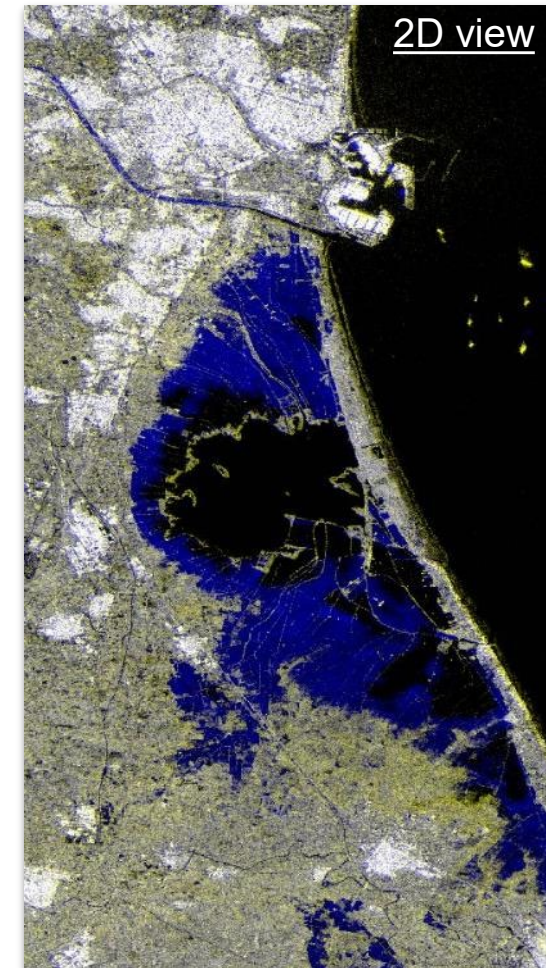
Copernicus DEM GLO-30 (**generated from WorldDEM**)



Sentinel-1 radar images



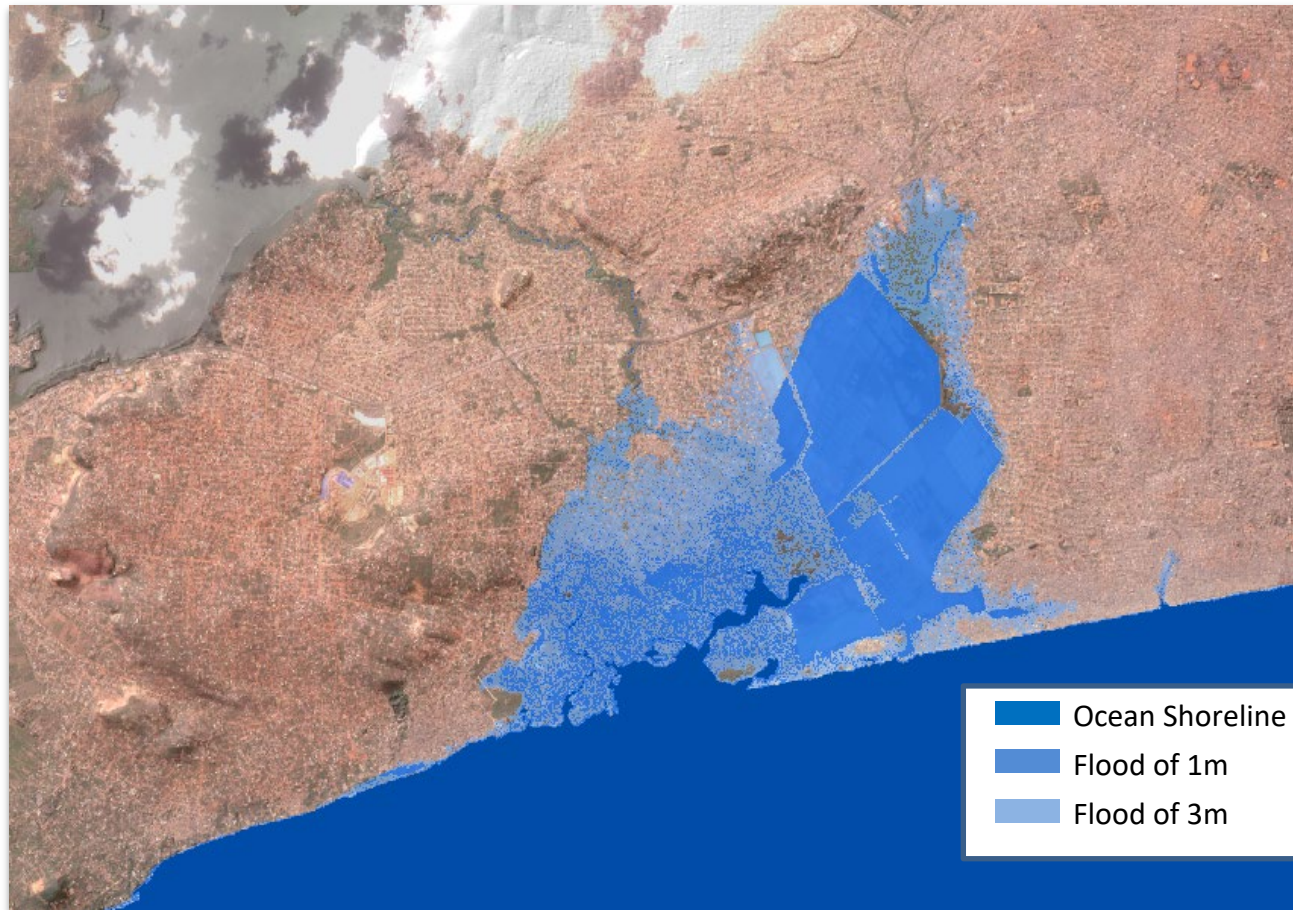
Flooding map



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Application - Coastal flood simulations / territorial planning (Accra West, Ghana)

DEM data used to identify areas potentially affected by **coastal flood events as storm surges or sea level rise**.



The coastal region of Ghana was heavily affected by tidal waves in June 2017. Terrain analysis can identify safer ground for relocation of exposed communities.

- Input data for the analysis: WorldDEM™
- Background image: Sentinel 2

<https://www.un-spider.org/advisory-support/recommended-practices/recommended-practice-use-digital-elevation-data-storm-surge>



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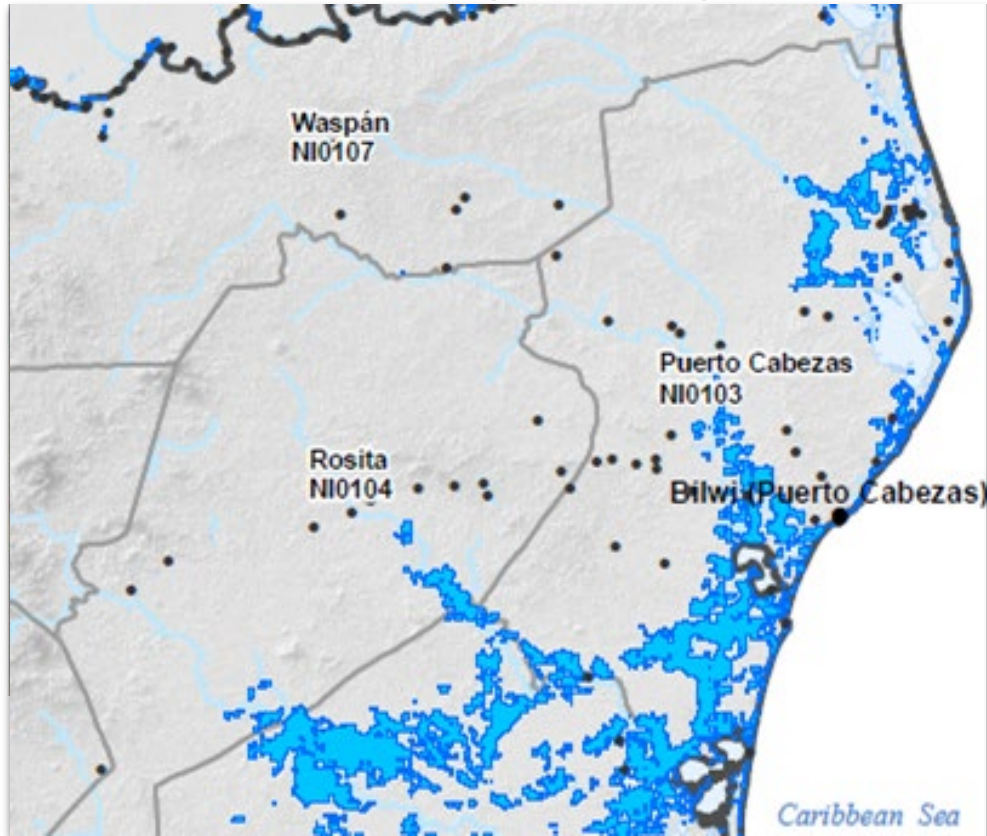


Application - Preparation to emergency response (Puerto Cabezas, Nicaragua)



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DEM used to assess in the potential impacts of storm surges to be provoked by the Hurricane ETA in Puerto Cabezas (2020).



Sentinel-1 (5-9.11.2020) based maps of affected areas (MapAction/OCHA)



Terrain analysis to identify and map secure areas to enable first aid to land in safe airfield (Airbus/UN-Spider).

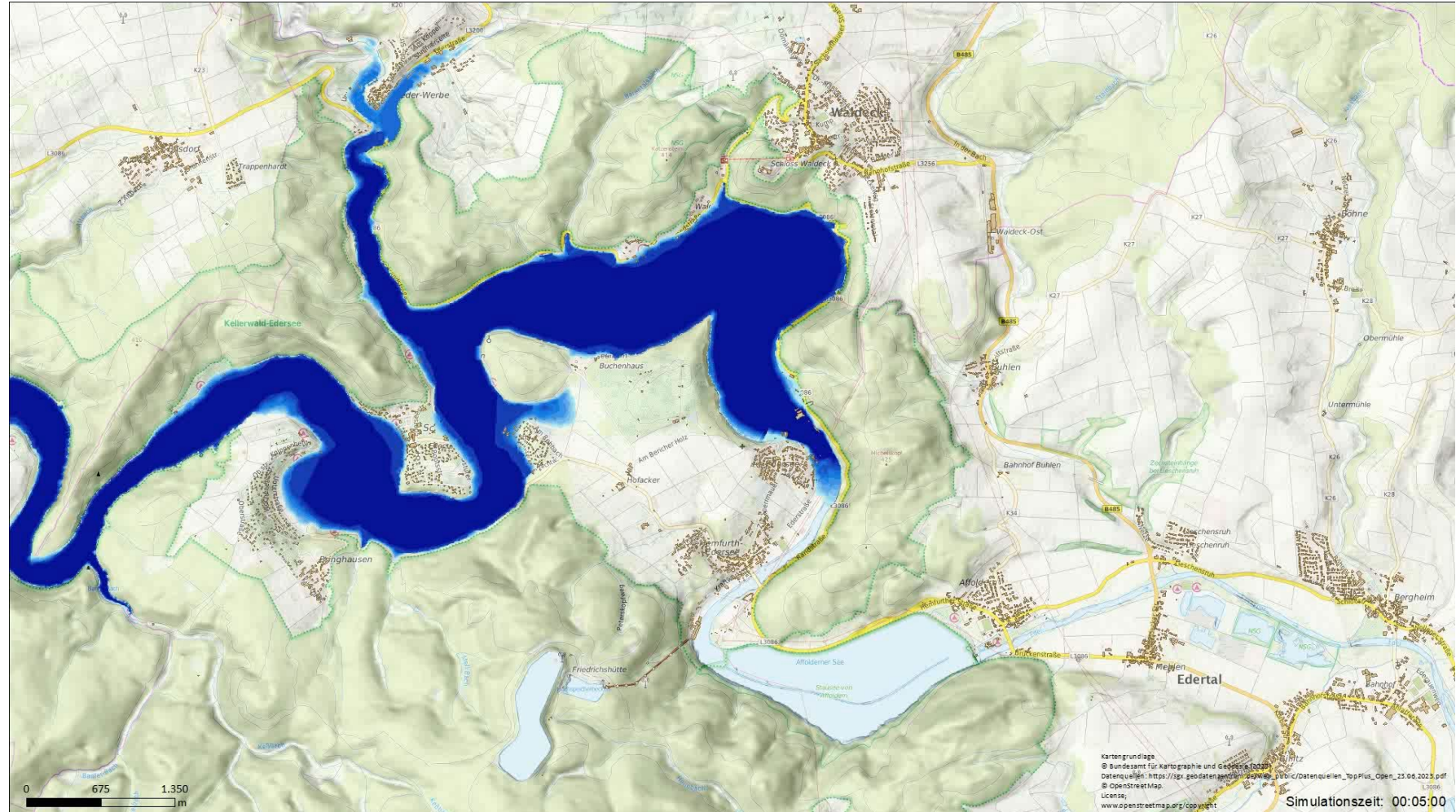
- Input data: WorldDEM DTM
- Date 3.11.2020 (during event)

Dam Failure Simulation with WorldDEM Neo DTM

*Edertalsperre, North Hessen
Germany*



geomer
GEOINTELLIGENCE AND BEYOND



Application - Hydrodynamic modelling

Dam Failure Simulation with WorldDEM Neo DTM

*Edertalsperre, North Hessen
Germany*

In collaboration with:



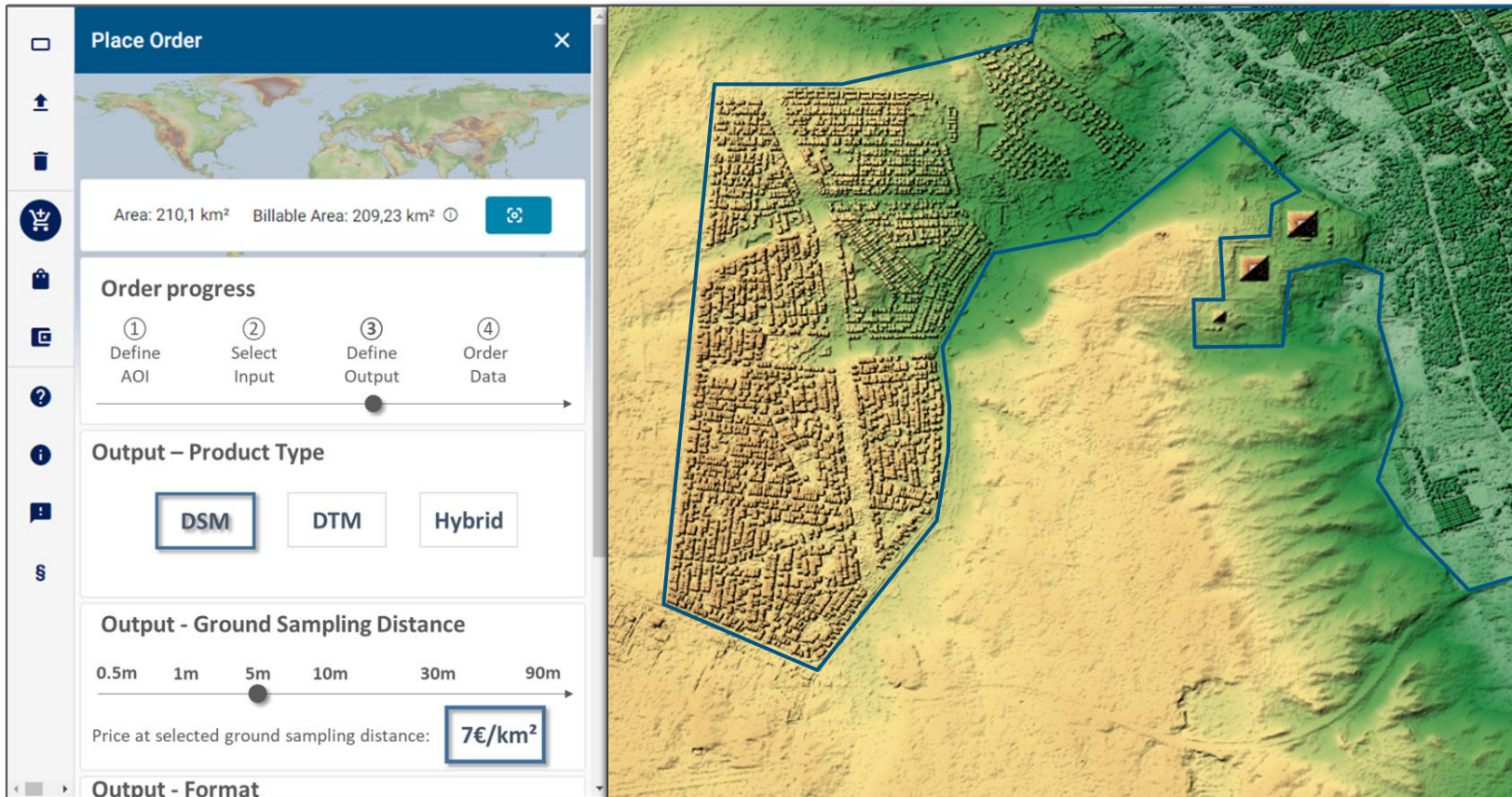
Application - Integrated Risk Management (Island of Tonga)

DTMs (WorldDEM Neo DTM) used to simulate the impact of **Sea Level Rise, Tsunamis, Storm Surges, and other flood events.**
Derived products as aspect and slope are further used in the **identification of other hazards as e.g. landslides.**



UN-SPIDER

Access point to WorldDEM



- One-Stop-Shop for elevation data (local / global, off-the-shelves / on-demand)
- High degree of customization and flexibility (“as-you-go”), tailored to needs
- Up-to-date fresh data
- On-the-fly preview & instant download
- Easy order process, area & data type selection
- Multiple AOIs & layers in one order within one delivery

<https://elevation.oneatlas.airbus.com/>

Matteo EMANUELLI

matteo.emanuelli@airbus.com

WorldDEM Neo DTM Technical Specifications

Specification Parameter		Value
Coverage		Global, pole-to-pole
Availability		off-the-shelf,
File format		GeoTIFF
Delivery unit		Quartercell, 0.5°x0.5°
Data type		32 Bit, floating
NoData value		-32767
Projection		Geographic Coordinates
Coordinate Reference System	Horizontal	WGS84-G1150
	Vertical	EGM2008, mean sea level
Pixel spacing		0.15 arcsec (approx. 5m)
Vertical Unit		Meters

