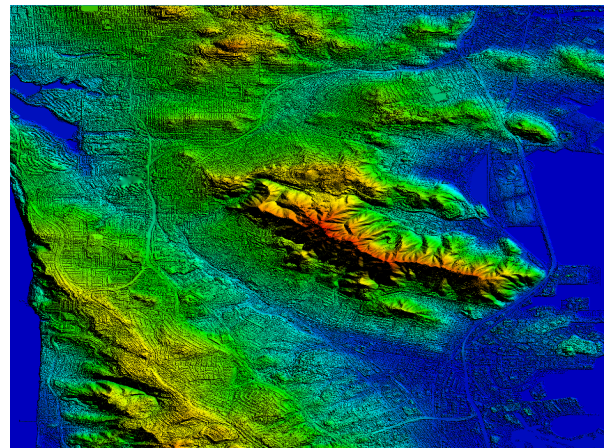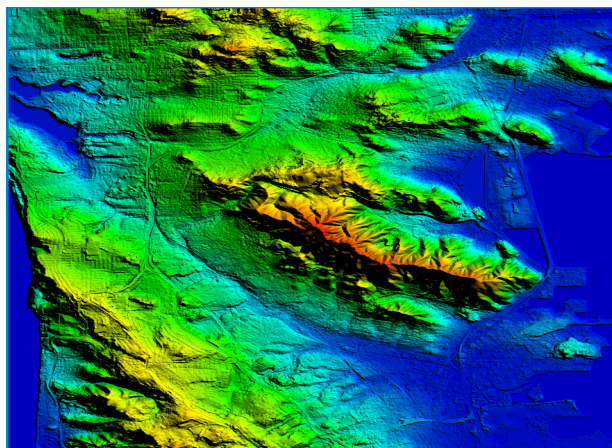# NEXTMap® Core Products

NEXTMap® Core Products
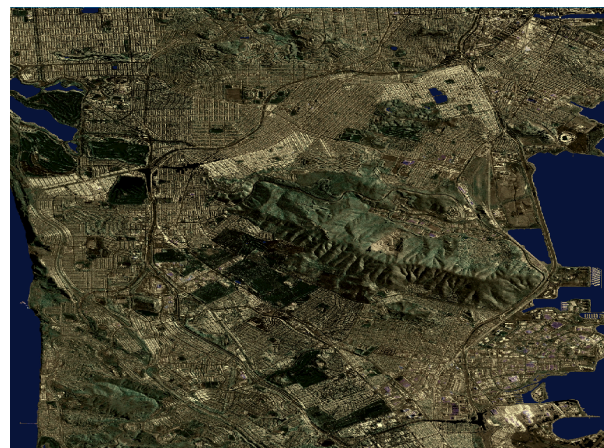

ORI Orthorectified Radar Image

DSM Digital Surface Model

DTM Digital Terrain Model

CORI Colour Orthorectified Radar Image

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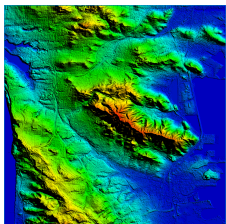TECHNOLOGIES

NEXTMap® Core Products
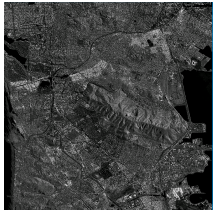
Orthorectified Radar Images (ORI)

- ORIs look somewhat like monochromatic aerial photos. They are radar images acquired by the IFSAR sensor.
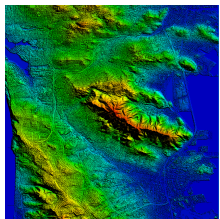
Digital Surface Models (DSM)

- Elevation model that displays the elevation of the first surface on the ground that the radar signal strikes.

Digital Terrain Models (DTM)

- DSMs are used to create DTMs by digitally removing the elevations of cultural features and treed areas. DTMs are useful for applications where an accurate sense of the underlying terrain is required.

Colour Orthorectified Radar Image (CORI)

- Is an Image of the earth's surface with geometrical distortions removed. The colour imagery is created by fusing multi-spectral imagery with orthorectified radar imagery.

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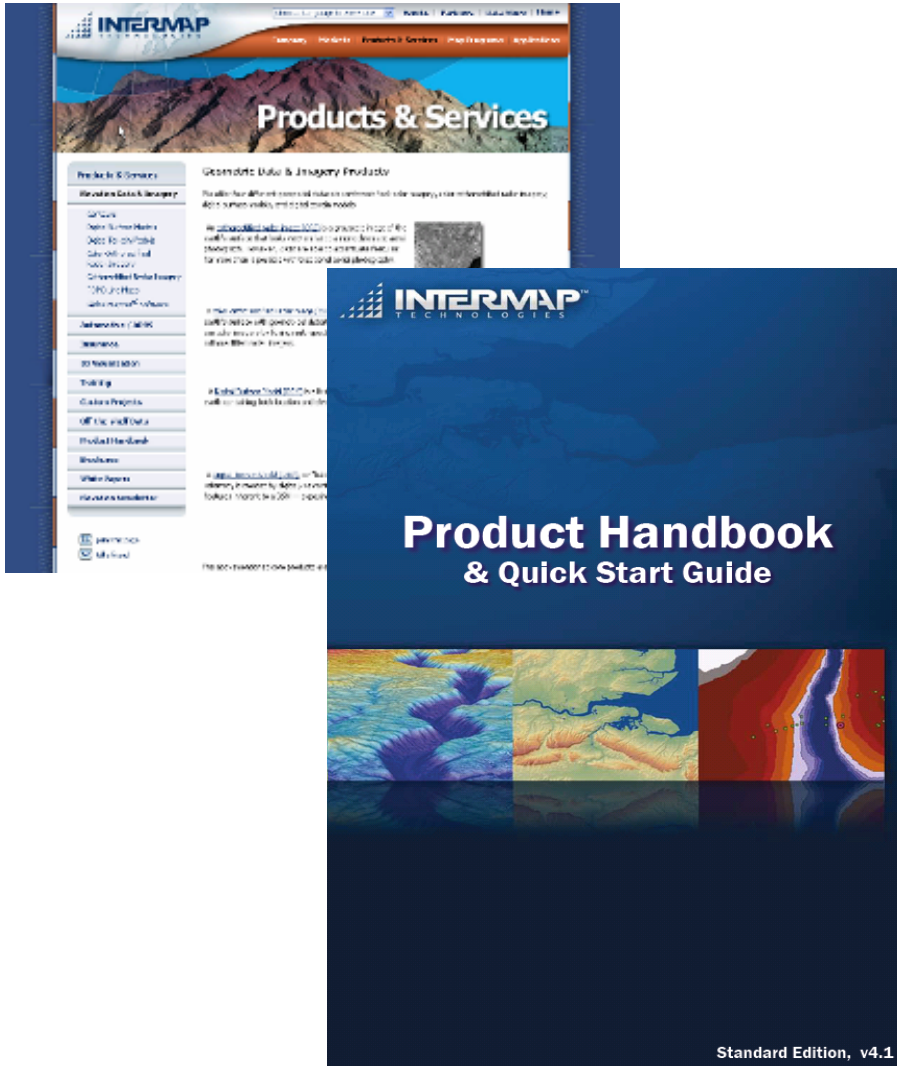
- Core products are created using IFSAR technology using ISO 9001:2000 certified processes.

- These products only vary when we make improvements to our editing software or processes, for example.
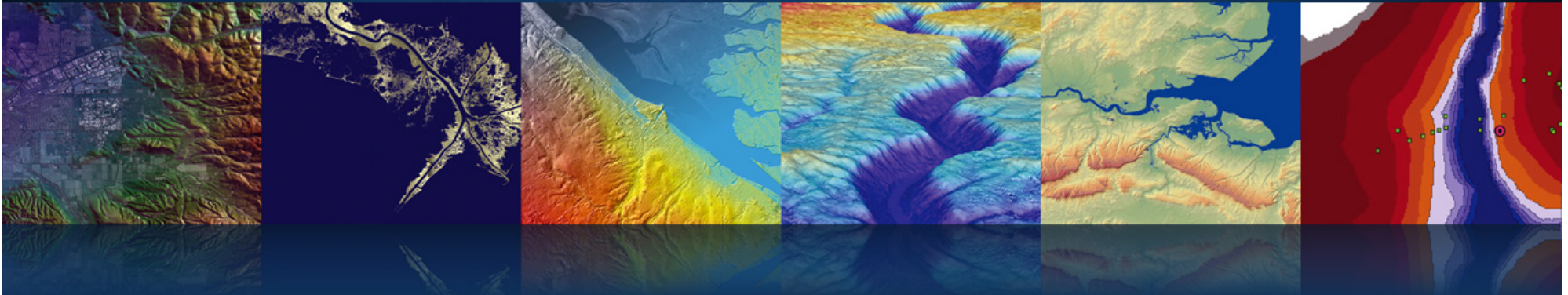
Orthorectified Radar Image Specifications

Core Product ORI

- An **Orthorectified Radar Image** (ORI) is a grayscale image of the earth's surface

- The ORI has been corrected to remove geometrical distortions that are a normal part of the imaging process.

- This product provides a means of viewing the earth's surface in a way that accentuates features far more than is possible with aerial photography.

- The radar looks to the side of the aircraft and casts 'shadows' that enable the user to visually perceive the elevation information in the image – even if they are unfamiliar with the underlying technology.

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Core Product ORI

- The ORI may be used to extract features such as road networks, buildings, rivers, and vegetation boundaries, to name a few.

- It supports many applications such as terrain, land cover or floodplain mapping, telecommunications, and forestry and geological analysis.

- Intermap's ORIs are coincident with the corresponding digital elevation data discussed next.

Figure depicts an area in California east of San Francisco Bay, just south of the city of Antioch showing Contra Loma and Antioch Municipal Reservoirs.

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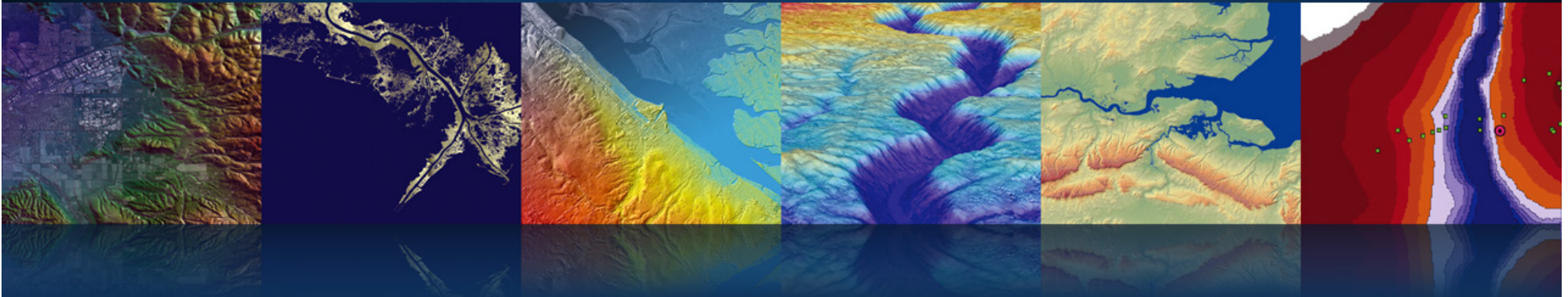
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Deutschland Example ORI

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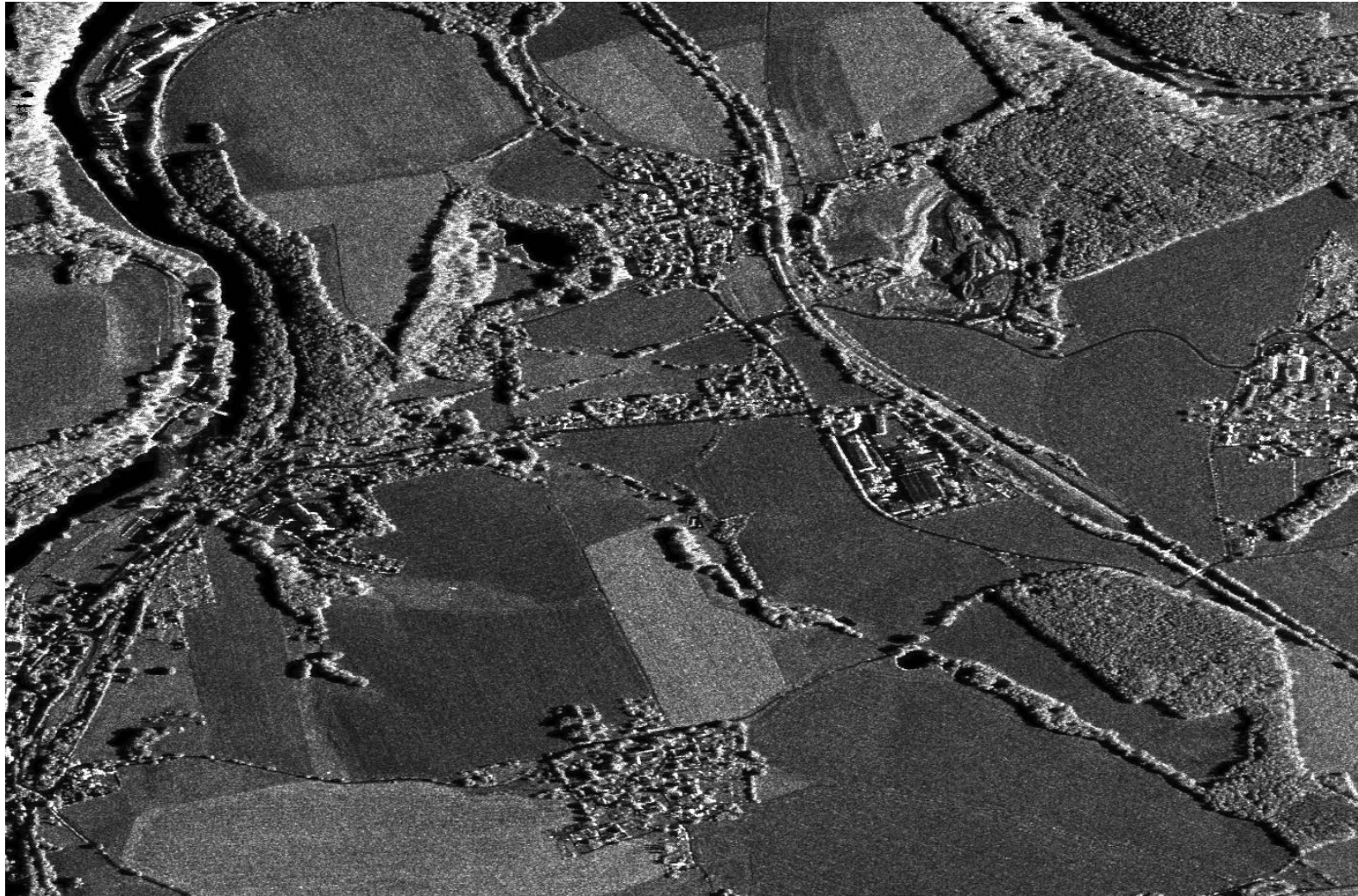
ORI Accuracy Specifications

◢ Horizontal accuracy specifications for Intermap ORI:

Pixel Size (m)	RMSE (m)	CE(95) (m)
1.25	2.0	4.0

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Colour Orthorectified Radar Image Specifications

CORI

- The CORI is a colorized version of the ORI.

- It combines the spatial and radiometric properties of the ORI with the multispectral properties of 30 m Landsat 7 imagery,

- The CORI production process involves imagery fusion, color transformation, color balancing, and interactive color enhancements, resulting in a natural color image with the same resolution as the ORI.

Figure depicts an area in California east of San Francisco Bay, just south of the city of Antioch showing Contra Loma and Antioch Municipal Reservoirs.

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CORI

Fused image layers to maintain the spectral integrity of the Landsat data while improving the spatial resolution.

Pan-sharpening describes the process of transforming a set of coarse (low) spatial resolution multispectral (colour) images to fine (high) spatial resolution colour images, *by fusing* a co-georegistered fine spatial resolution panchromatic (black/white) image.

Low Resolution Multispectral Image:
  - Landsat 7 – 30m pixel

High Resolution
  - Orthorectified Radar Image – 1.25m pixel

Aerial Photograph

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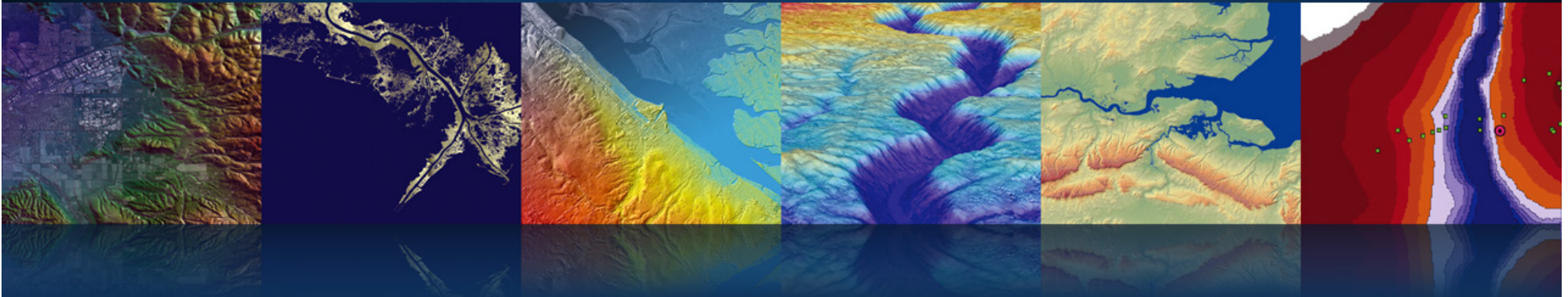# CORI Accuracy and Specifications

- The CORI is a fusion of low resolution Landsat imagery with high resolution ORI.

- The product produced from this fusion has the same accuracies as the ORI.

| Pixel Size (m)	RMSE (m)	CE(95) (m)
1.25	2.0	4.0

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Digital Elevation Models

DEM Definition at Intermap

1) **DSM** stands for **D**igital **S**urface **M**odel

- A DEM where the elevation represents the first surface the microwave beam comes in contact.

- Depends on wave length (X-Band: Tree Tops) with uniformly spaced z-values.

2) **DTM** stands for **D**igital **T**errain **M**odel

- Derived product from DSM.

- A DEM where the elevation represents the bare earth.

- Processing a DTM involves classification, IFSAR controlled ancillary infill data, and breaklines.

DSM

DTM

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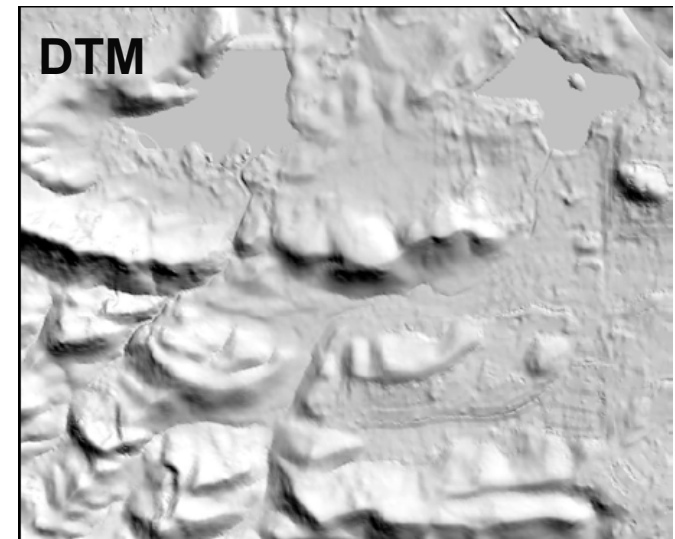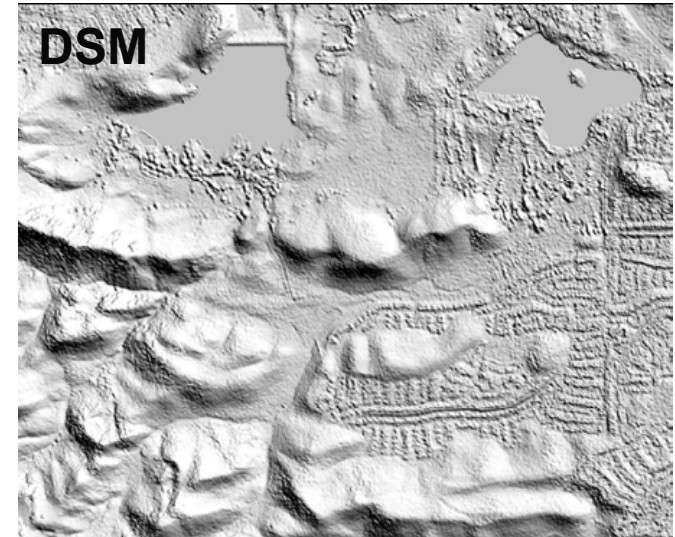
Conceptual View of IFSAR DEMs

- **DSM** - elevation of the first surface the microwave beam comes in contact

- **DTM** - derived product from DSM: elevations values approaching bare earth

Digital Surface Model (DSM)   Bald-Earth DTM

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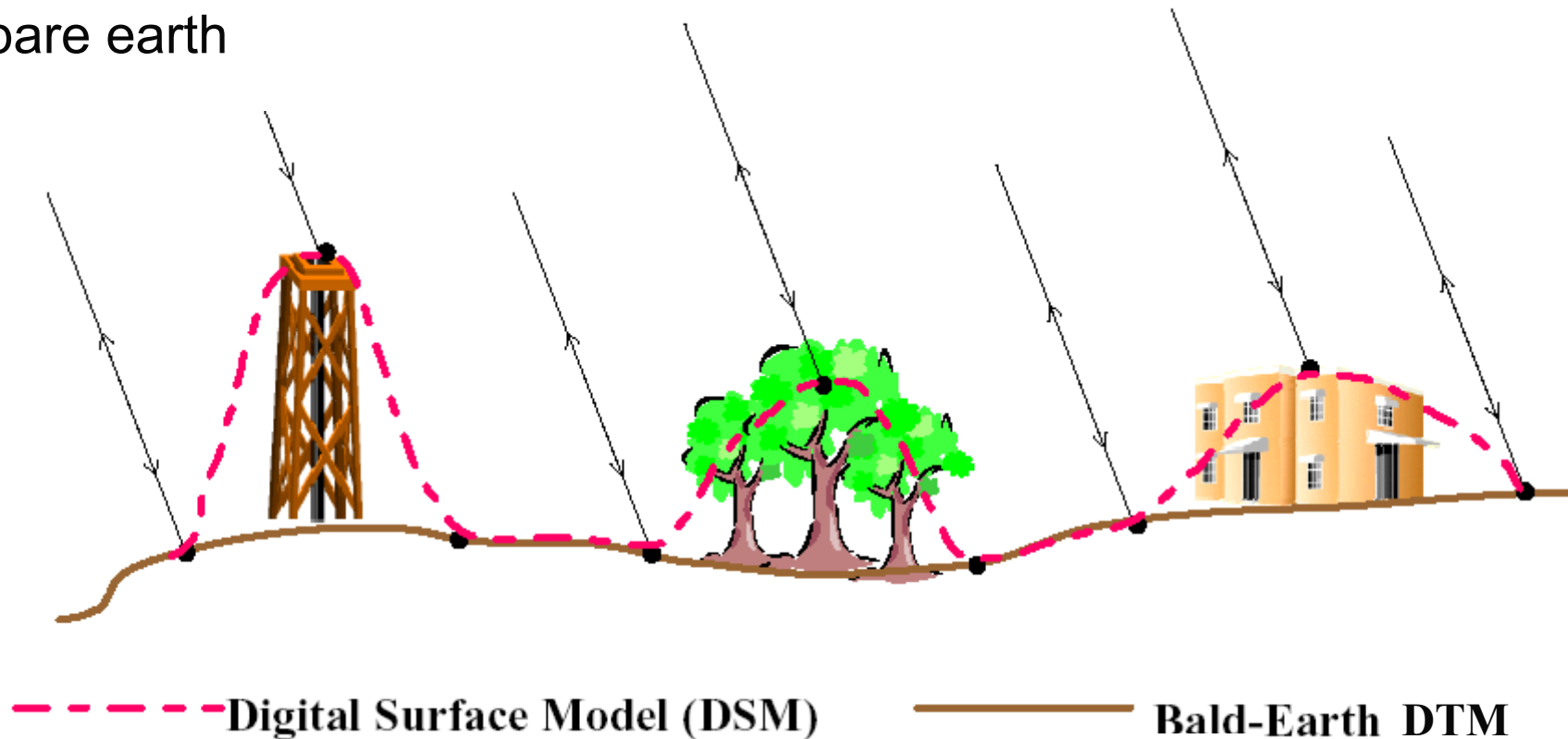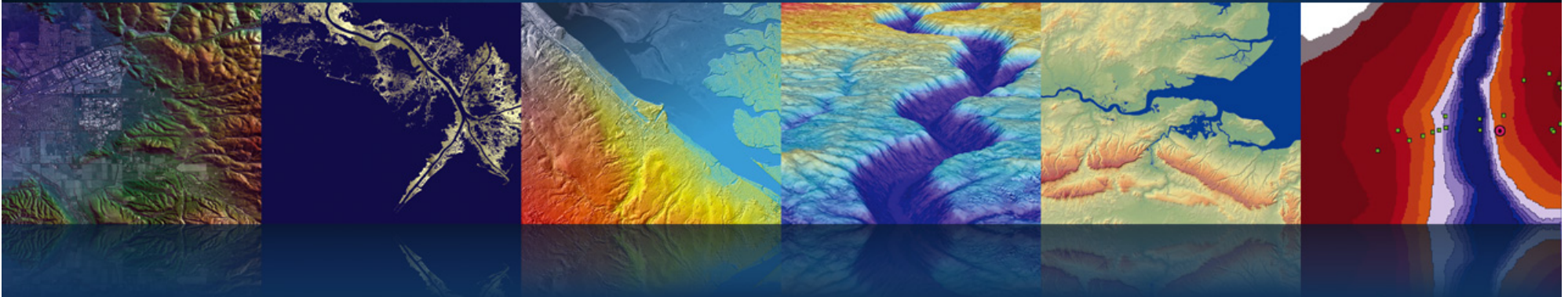
DSM Specifications

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Core Product DSM

- The DSM is a topographic model of the earth's surface.

- The DSM is a 5m posted raster layer, elevations are laid out on a grid.

- The radar signals bounce off the first surface they strike, making the DSM a representation of any object large enough to be resolved. This includes buildings, vegetation, and roads, as well as natural terrain features.

- This product provides a geometrically correct reference frame over which other data layers can be draped.

Figure 2 shows the corresponding DSM for the same region displayed in Figure 1. In this color mapping, blue has been associated with the lowest elevation – red with the highest.

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Core Product DSM

A DSM supports many applications and can be used, for example, to enhance a pilot's situational awareness, create 3D fly-throughs, conduct viewshed analyses, support location-based systems, calculate lines-of-sight, and augment simulated environments.
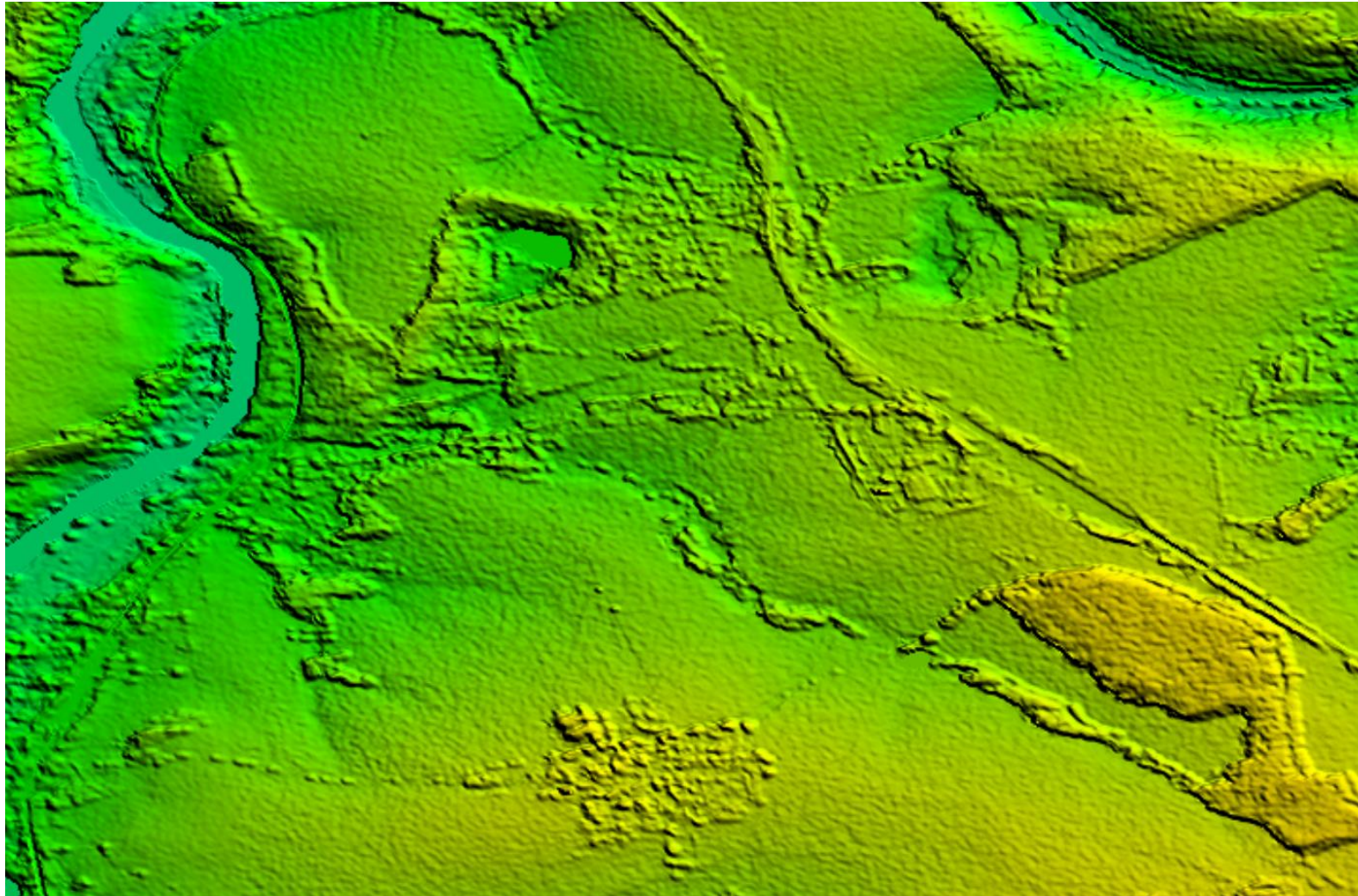
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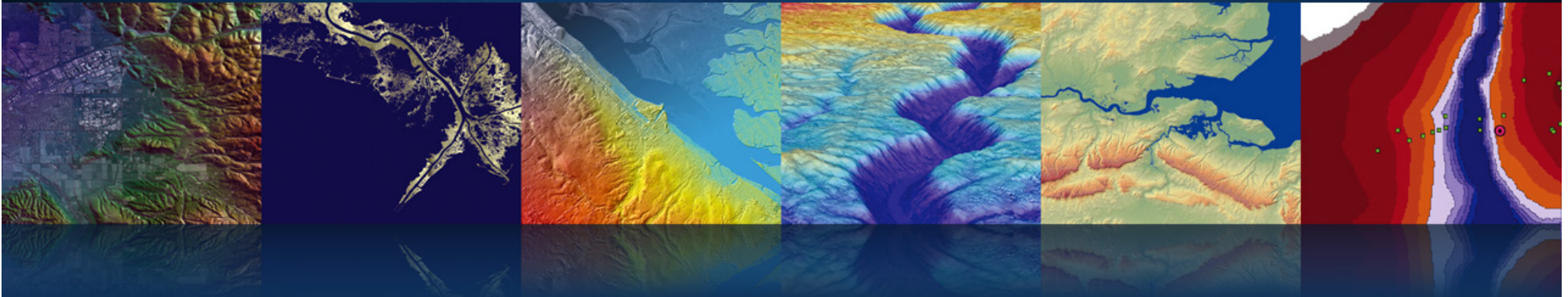
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DSM Accuracy Specifications

- The horizontal accuracy of the DSM and DTM core products are inferred by the horizontal accuracy of the corresponding ORI.

- RMSE is calculated using the difference between the DEM and independently obtained "truth" data and is calculated in unobstructed areas with slopes less than 10 degrees.

DSM	Measures of Accuracy Specifications		Pixel Size / Post spacing
Product Type	RMSE	CE95	
I	0.5 m	1.0 m	5 m
II	1.0 m	2.0 m	5 m
III	3.0 m	6.0 m	5 m

Table 5-5: DSM vertical accuracy specifications

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Deutschland Example DSM

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DTM Specifications

Digital Terrain Model

- A digital terrain model (DTM) is a digital representation of the bare earth that is derived from the DSM.

- A DTM has had the heights of vegetation, buildings, and other cultural features digitally removed, leaving just the elevations of the underlying terrain.

- This is achieved by using Intermap's proprietary software based on measurements of bare ground contained in the original DSM.

- - - Digital Surface Model (DSM) ———— Bald-Ear

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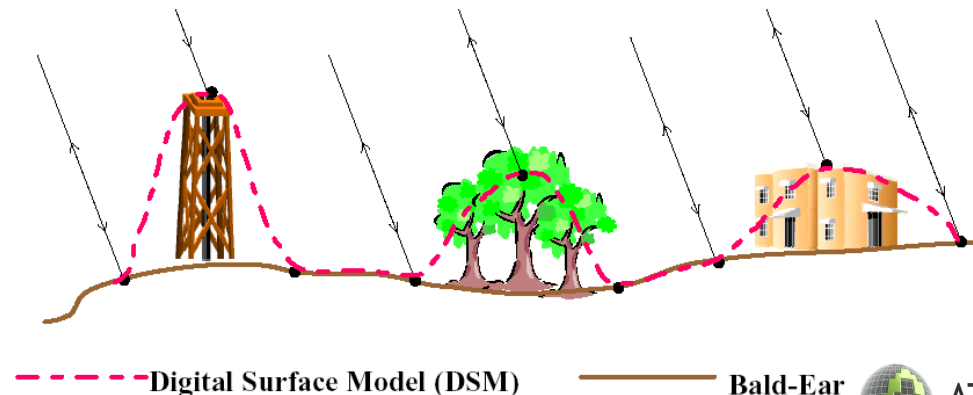
DTM Accuracy Specifications

- The horizontal accuracy of the DSM and DTM core products are inferred by the horizontal accuracy of the corresponding ORI

- Note that Type III products are not available for DTMs – hence only Type I and II are shown

DTM	Measures of Accuracy Specifications		Pixel Size / Post spacing
Product Type	RMSE	CE95	
I	0.7 m	1.5 m	5 m
II	1.0 m	2.0 m	5 m

Table 5-6: DTM vertical accuracy specifications

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Updated DTM Edit Rule Changes

- Single Line Drains (SLDs) – Saddles will be removed where the DTM is interrupted by elevations greater than 1 meter (saddle). Previously 2m.

- Bridges – Removed in the DTM. Previously bridges were in in both DSM and DTM.

  - Classification of bridge deck extents will allow optional addition of bridge deck elevation into the DTM or DSM if requested - OR -

  - Supply of an optional bridge elevation dataset

- Buildings – Removed in the DTM. Previously isolated buildings were removed but remnants remained in dense, built up areas.

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Updated DTM Edit Rule Changes

- Trees and Forests – Removed in the DTM. Previously tree stands greater than 100m remained in the DTM.

- Crops that can be detected in radar data above surrounding bare ground are removed. Previously as sensed.

- Flood Defenses – Maintained in the DTM. Altered by no more than 1m from DSM in unobstructed areas. Previously remained as sensed by the radar.

- Roads and Railroads – As sensed by the radar in DSM and DTM. Previously some classifications these features were flattened in both DSM and DTM.

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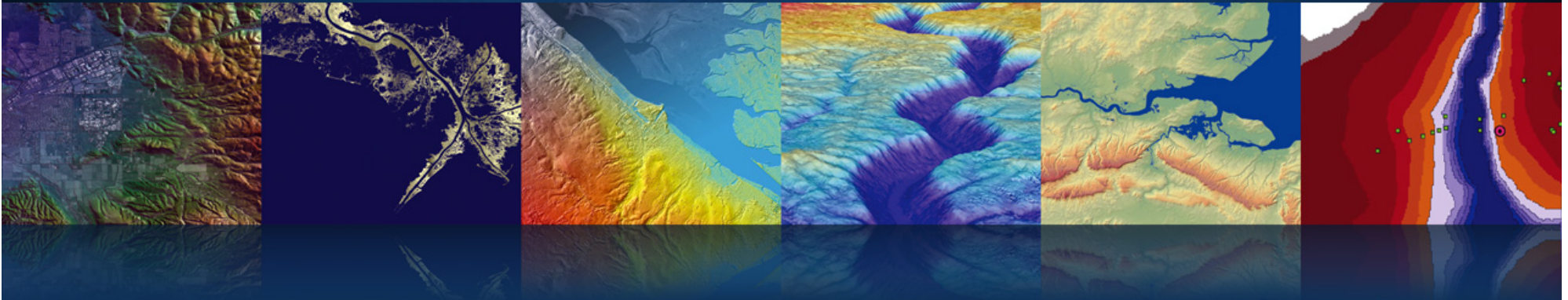
NEXTMap Core Product Examples

Hawaii Example - ORI
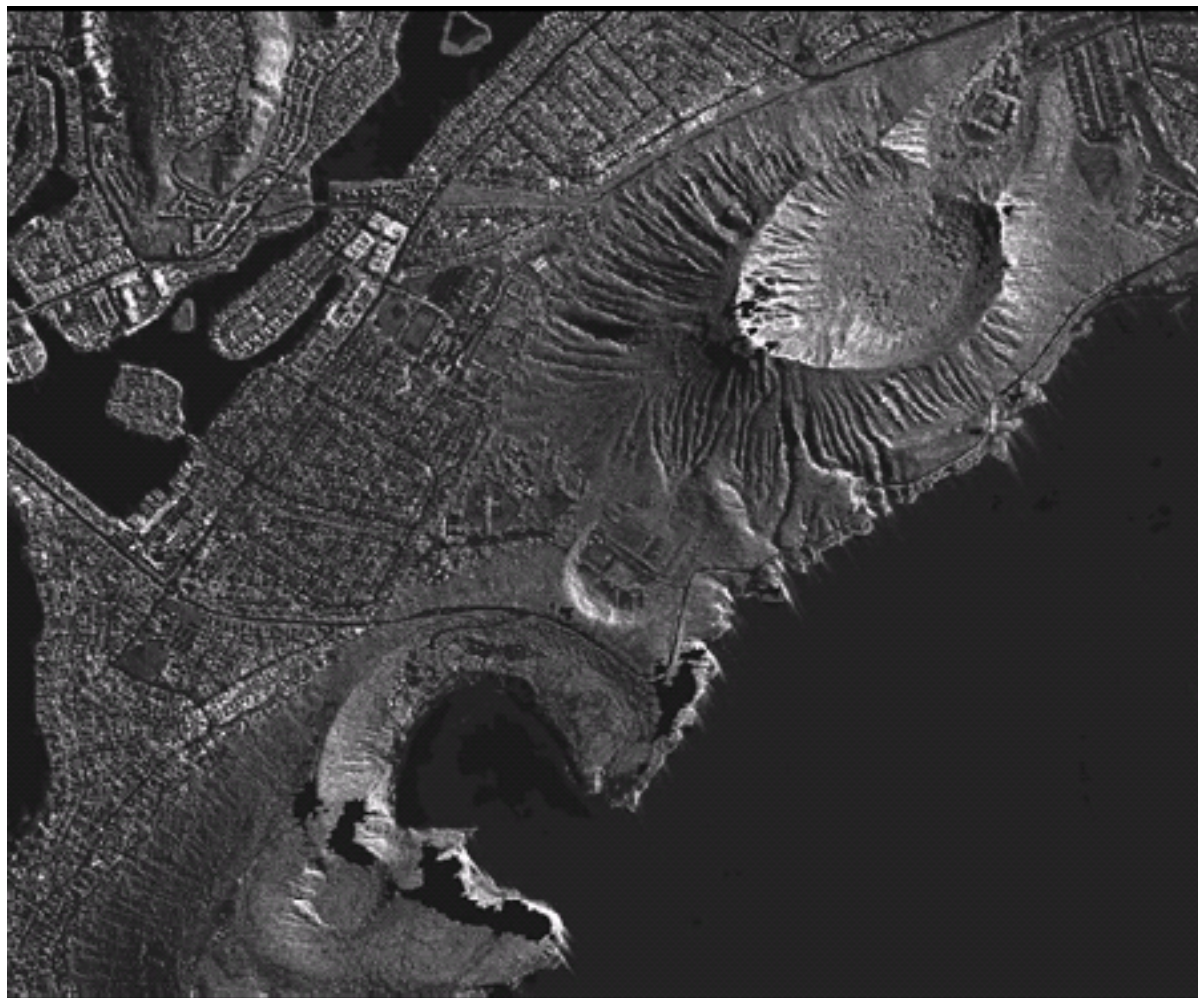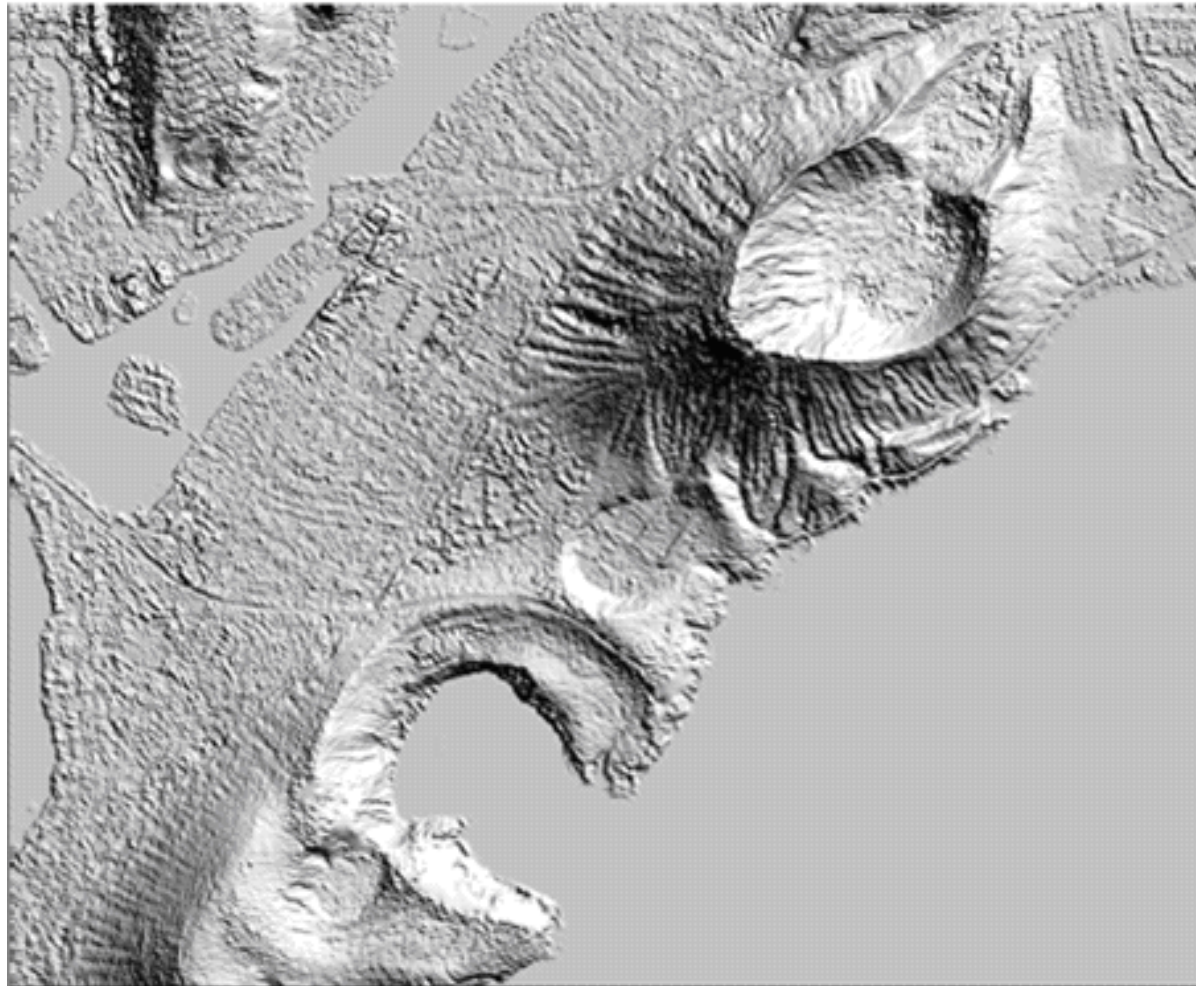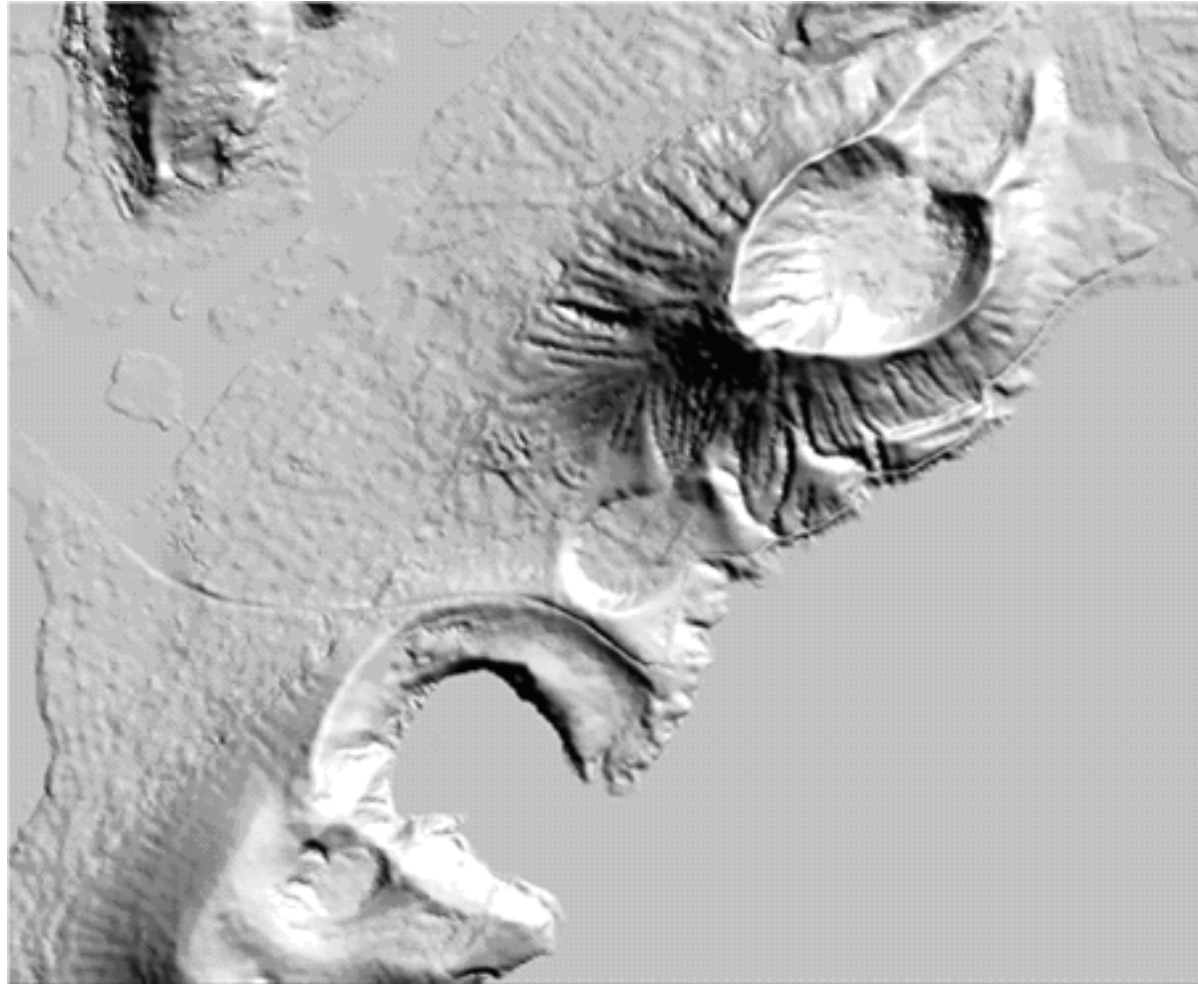
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Hawaii Example - CORI

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Hawaii Example - DSM

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Hawaii Example - DTM

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California Example - ORI

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California Example - CORI

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California Example - DSM

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California Example - DTM

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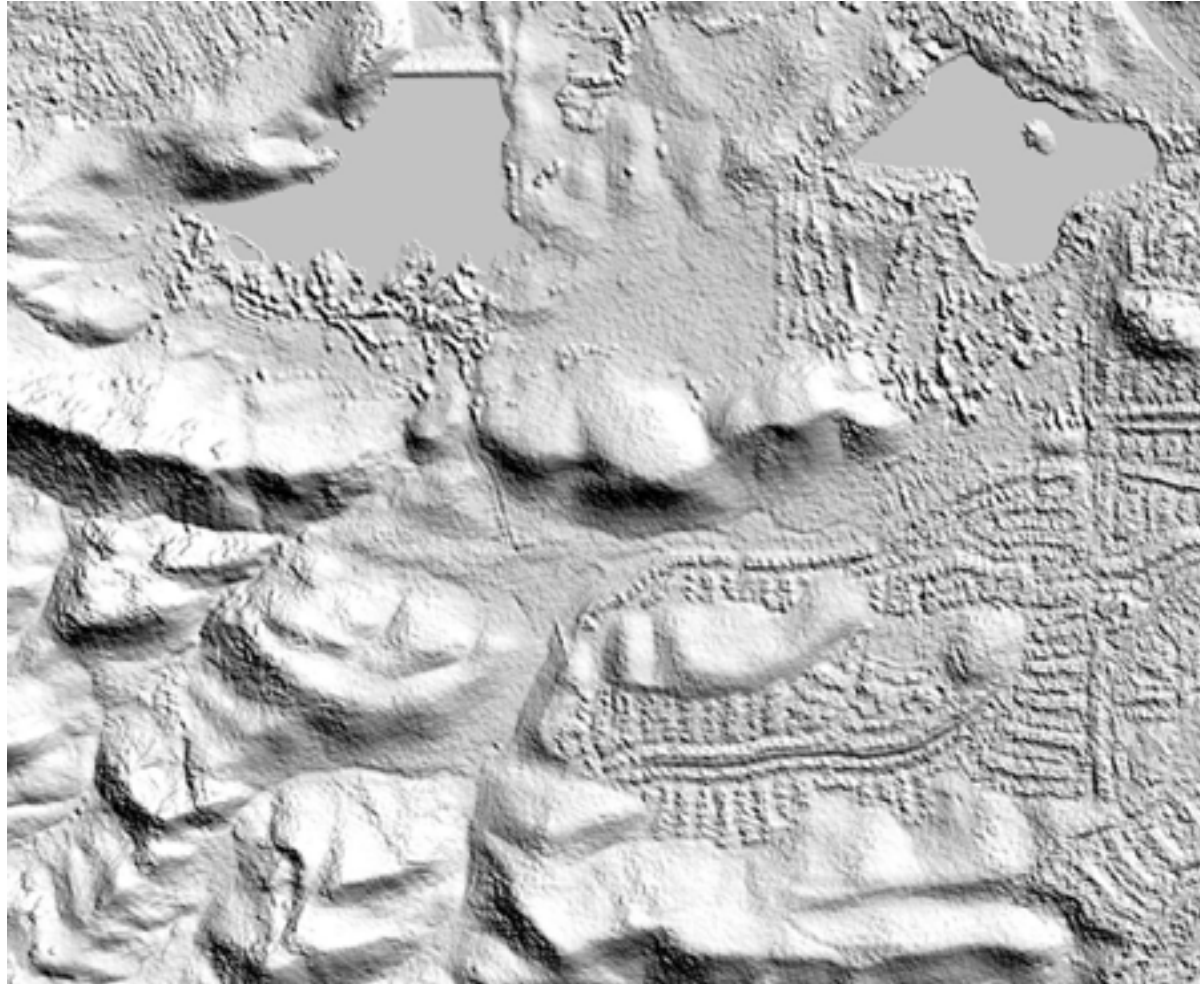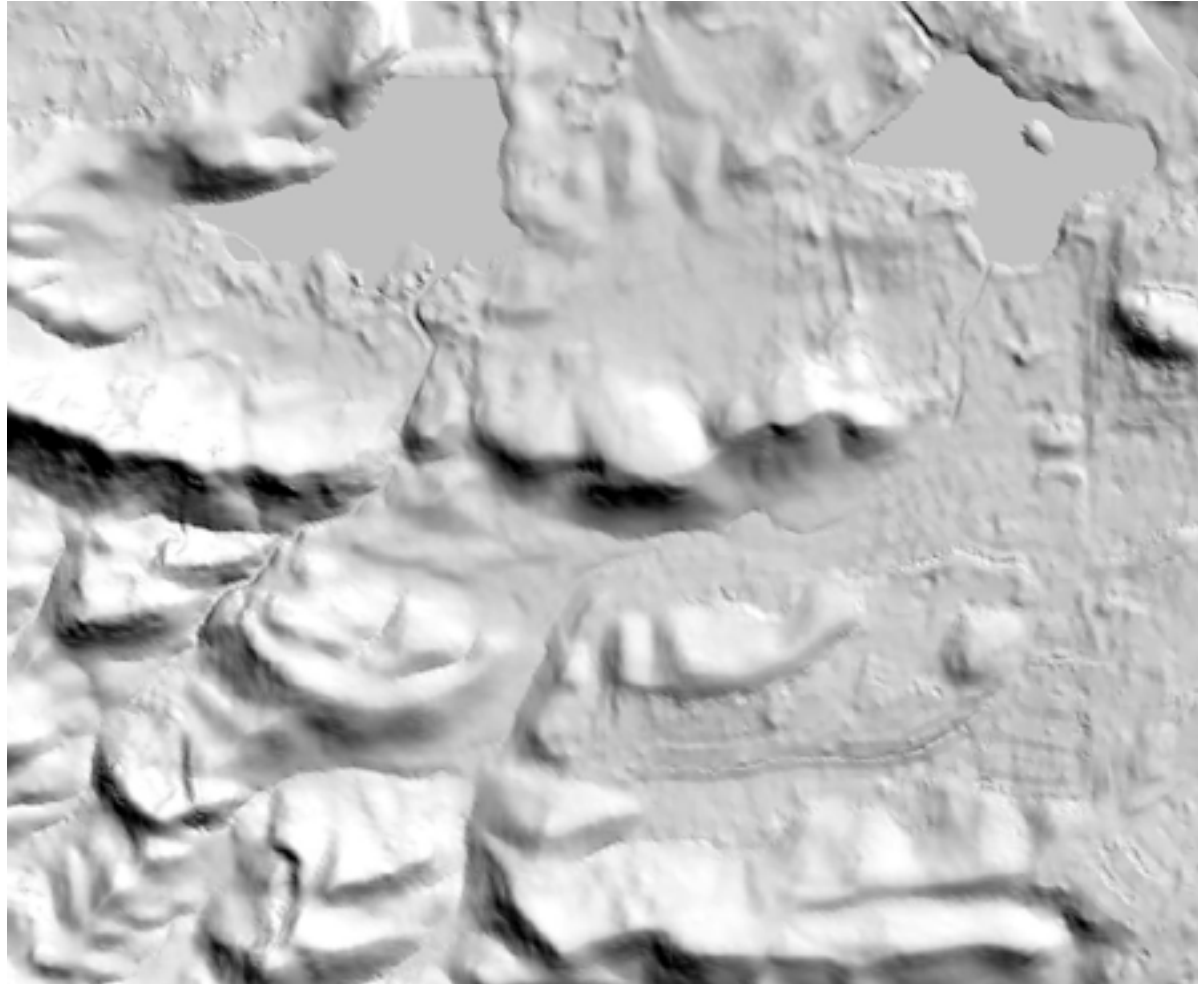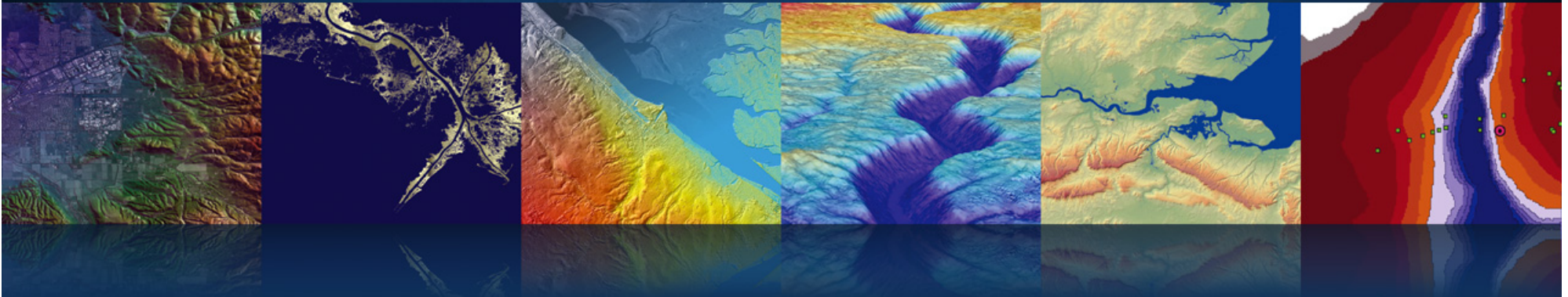
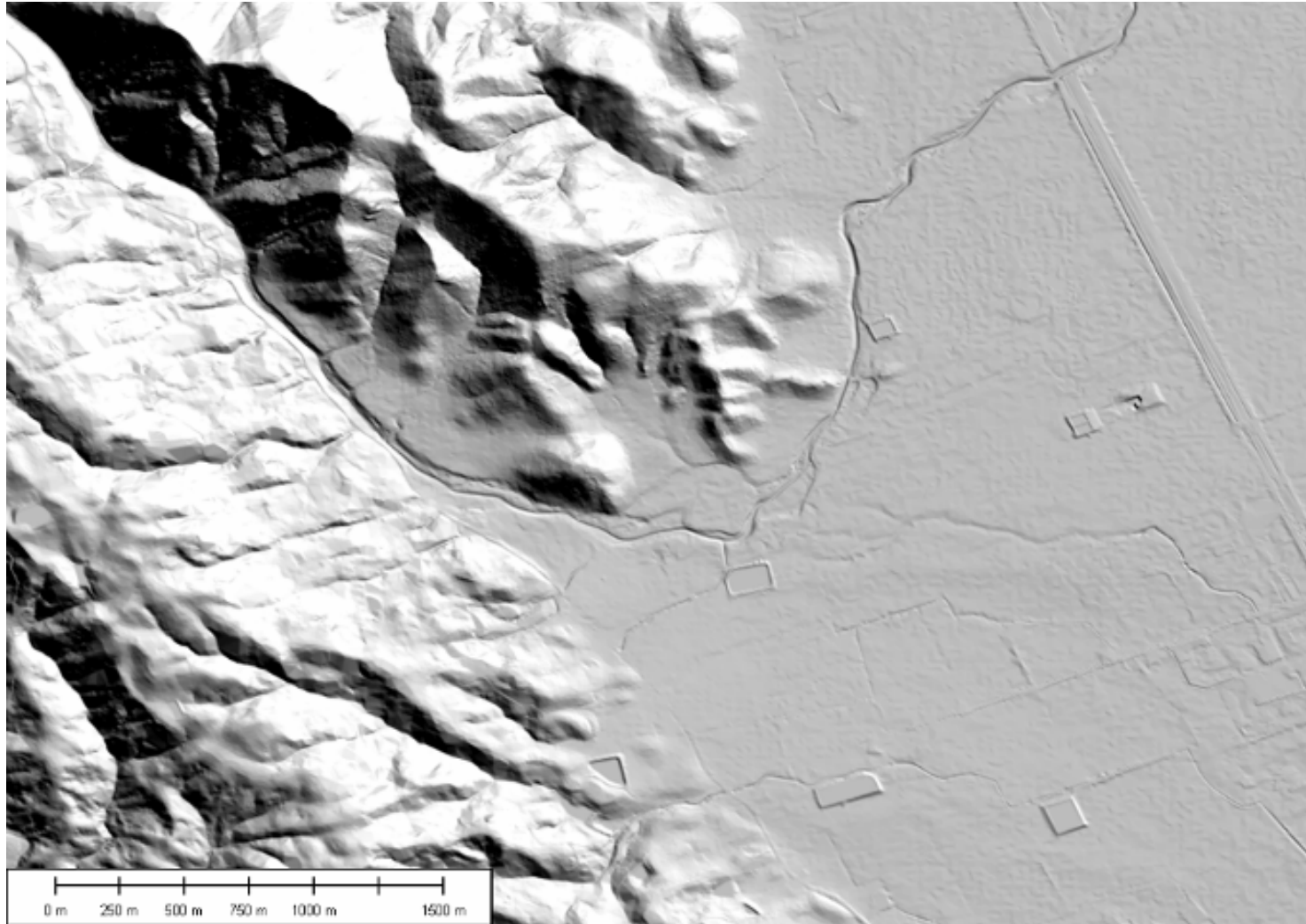# Comparison of Updated DTM and Legacy DTM

Rural Example ORI

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DSM

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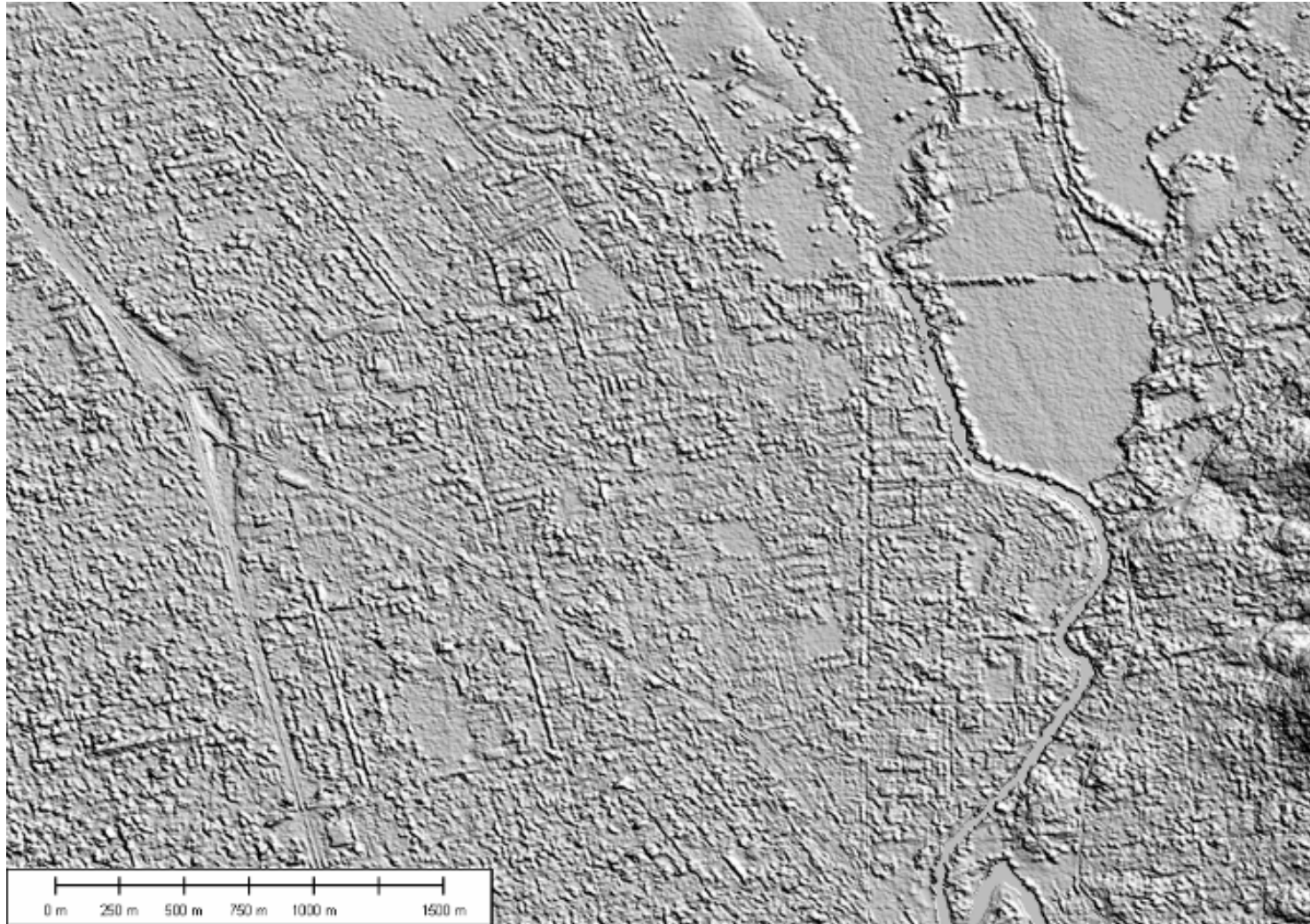TECHNOLOGIES
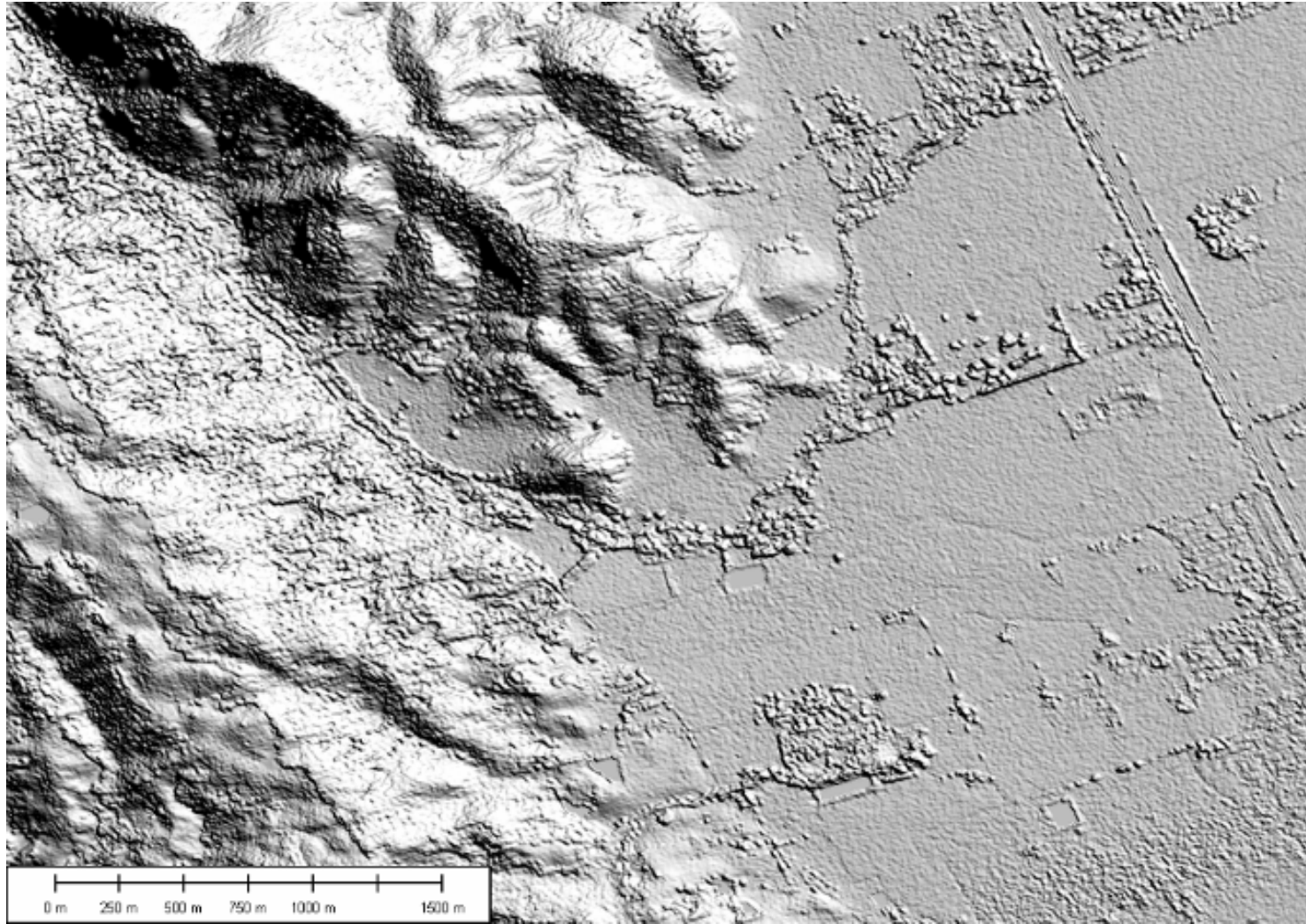
Legacy DTM

Updated DTM

LiDAR (reference)
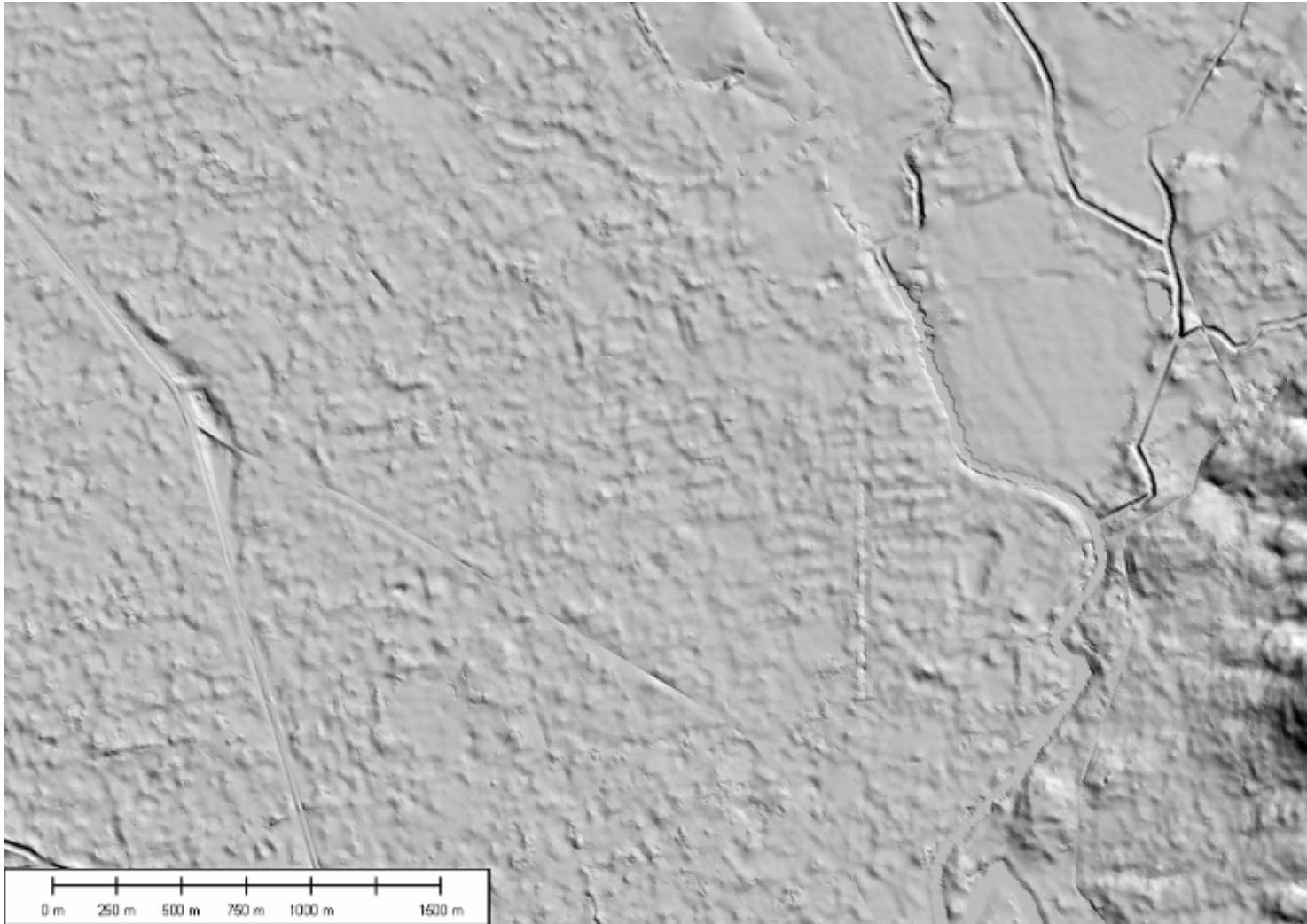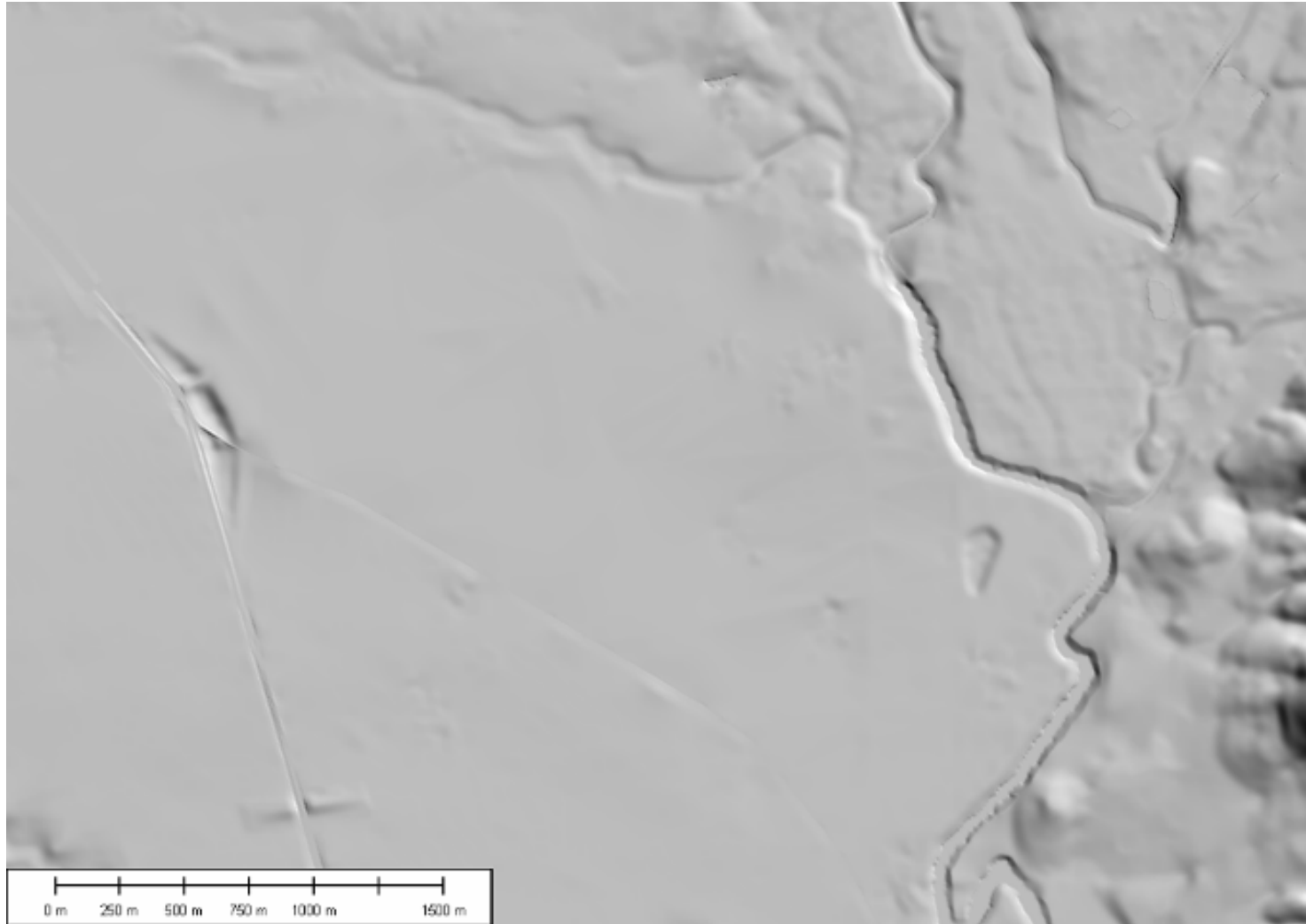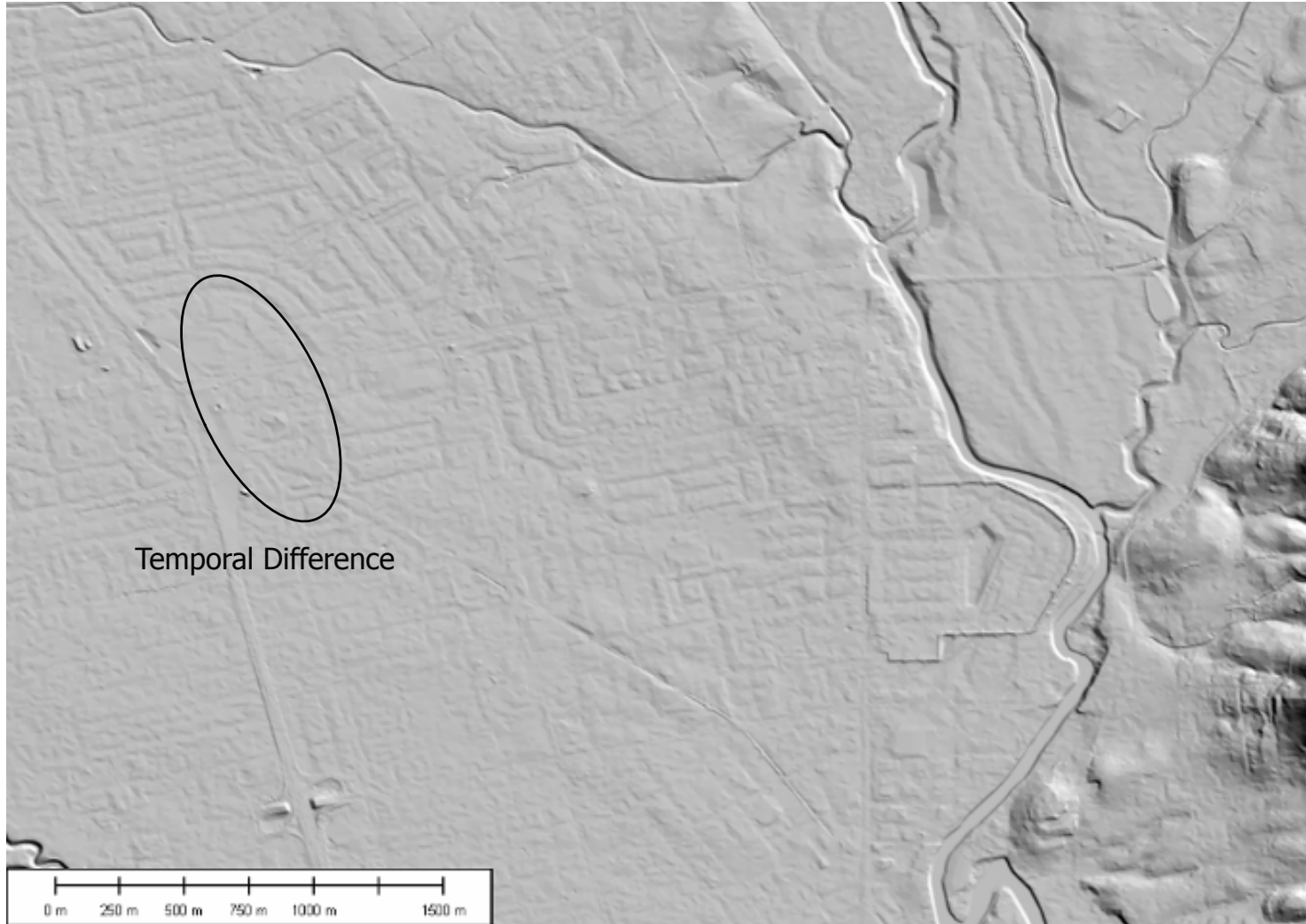
Urban Example ORI

DSM

Legacy DTM

Updated DTM

LiDAR (reference)

Temporal Difference

Questions?

Mauro Mason

Atlastech srl
Via Molveno, 5
35035 Mestrino – Padova
info@atlastech.eu
m.mason@aerodata-italia.com

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