

**SOLARGIS**

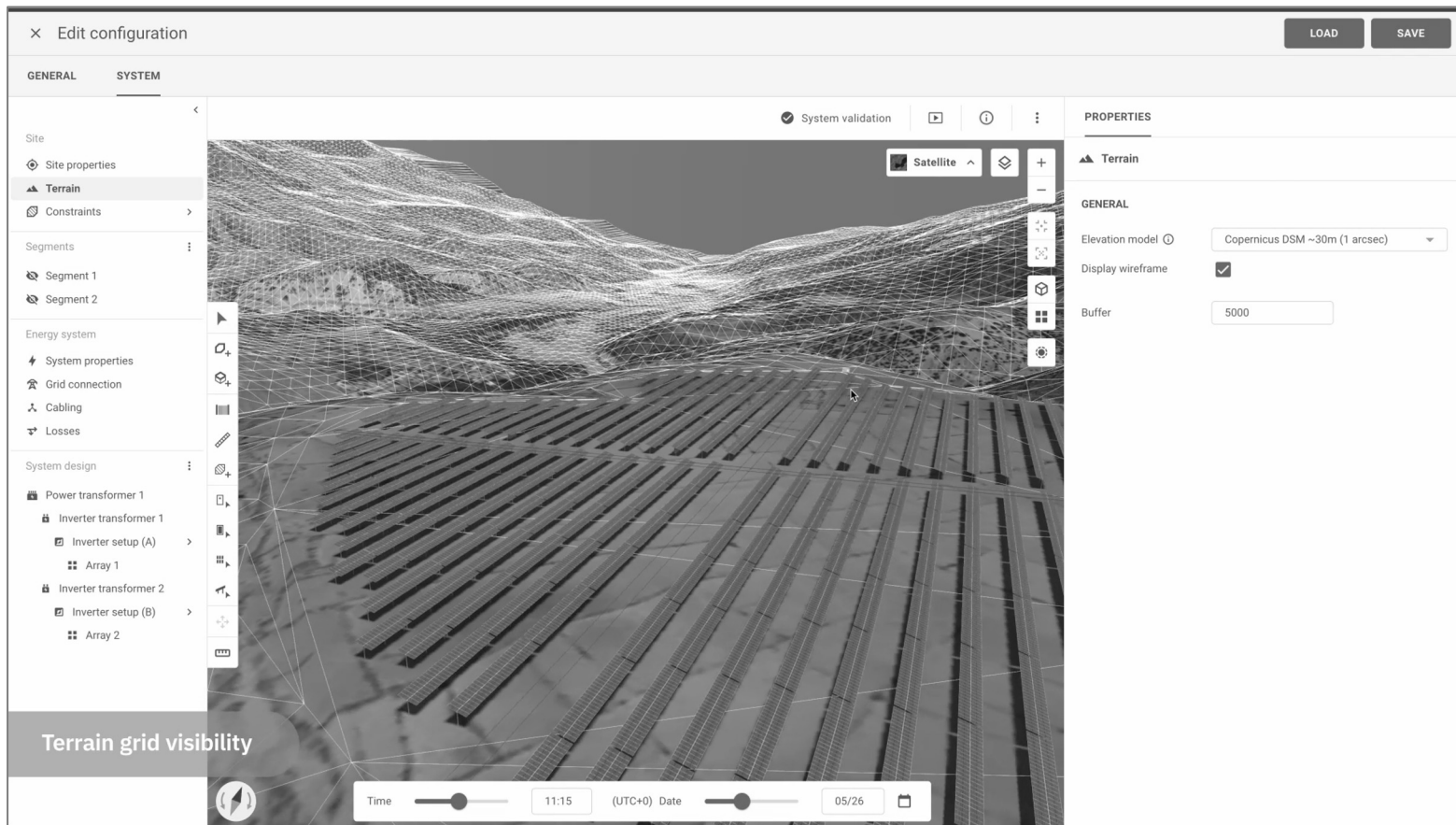
# Browser-Based, High-Fidelity PV Plant Modeling with High- Resolution Terrain

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Product Owner

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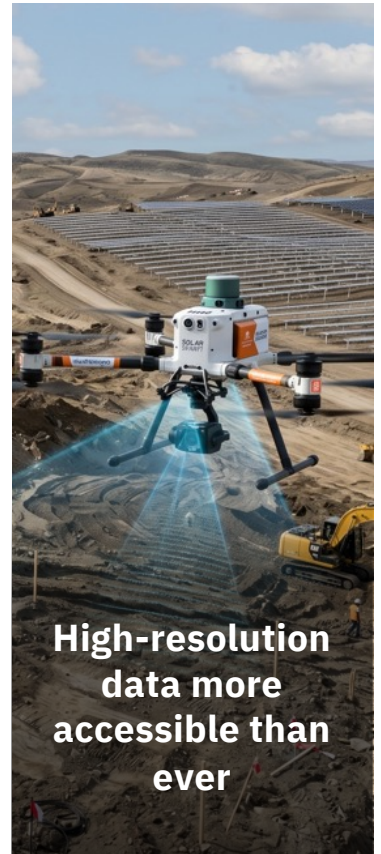
# Solargis Evaluate | web based one-stop-shop



Customers keeps asking

**"Can I upload my own terrain?"**

# Why custom / high-resolution terrain matters



## Custom terrain in web app is not easy

Everything that desktop GIS/CAD has built in, in webapp needs to be developed from the ground

# Web $\neq$ Desktop

Large file handling

Direct storage & GPU access

Full device performance potential

Competing for resources with other open tabs



## Custom terrain in web app is not easy

Spatial context must be **stable**  
- no LoD swaps for terrain, or the  
geometry jumps.



## Custom terrain in web app is not easy

Browser memory limits →

**~1 million  
triangles\***

**This is your “triangle budget”**

WebGL context loss occurs above this limit



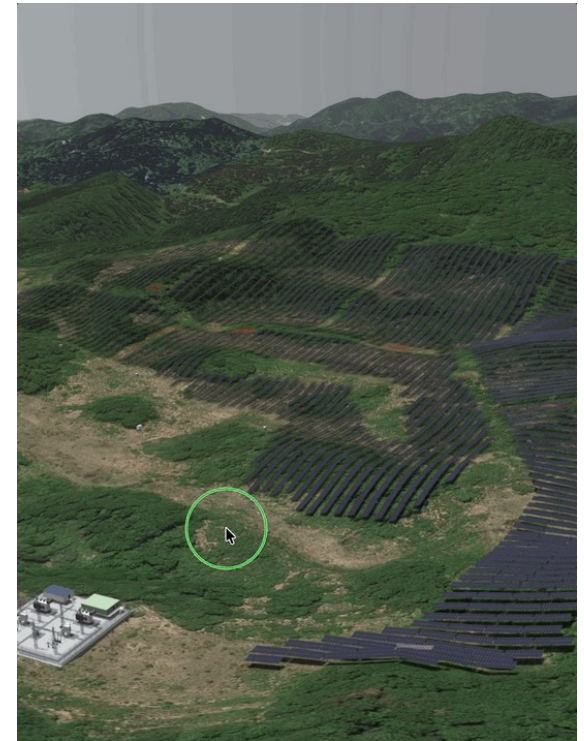
\* depends on the user device and running parallel services

## Custom terrain in web app is not easy

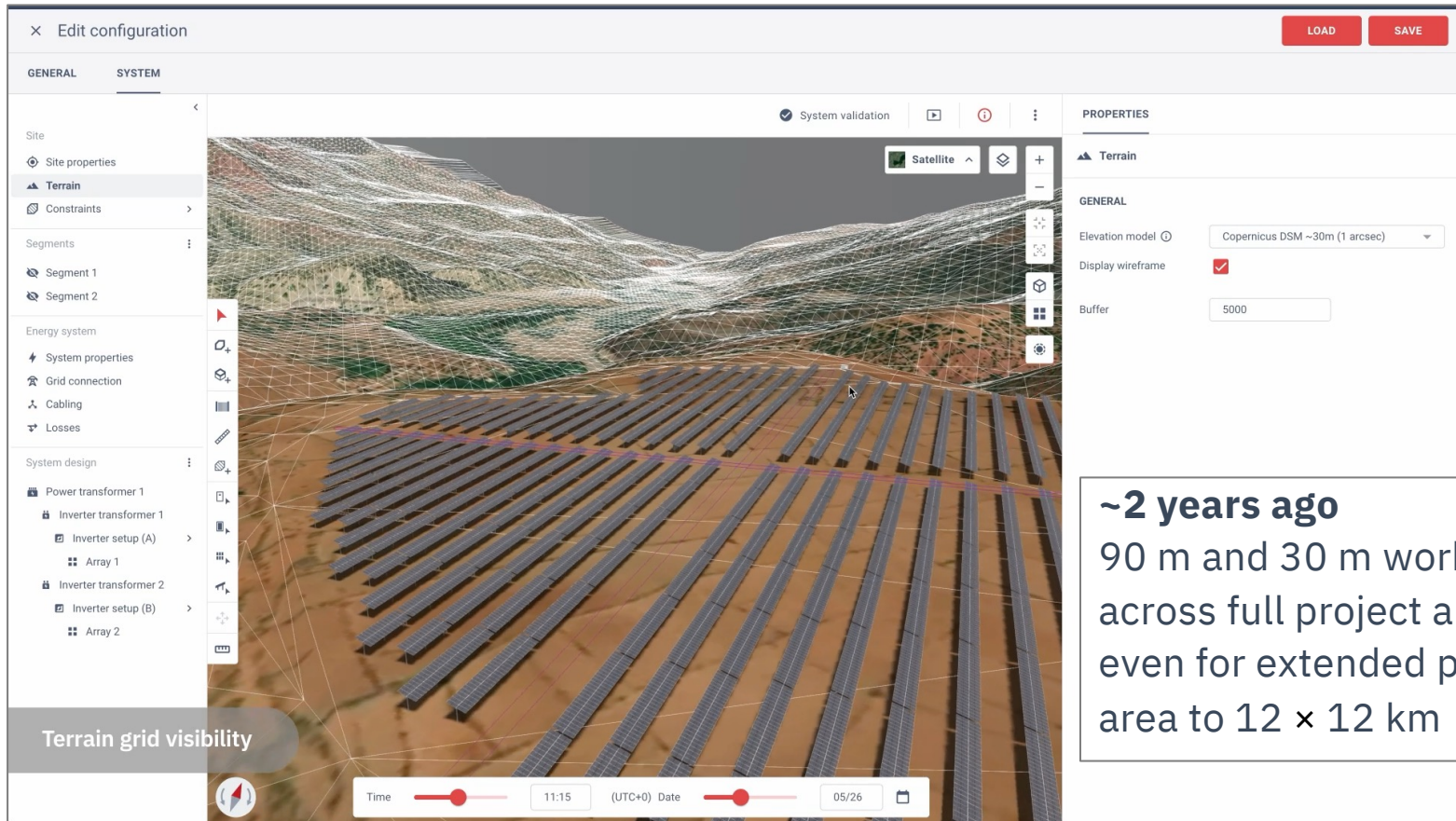
Smooth interaction needs

**>25 FPS**

sustained frame rate.



# We started with regular grids



## Experiments with 1m spatial resolution

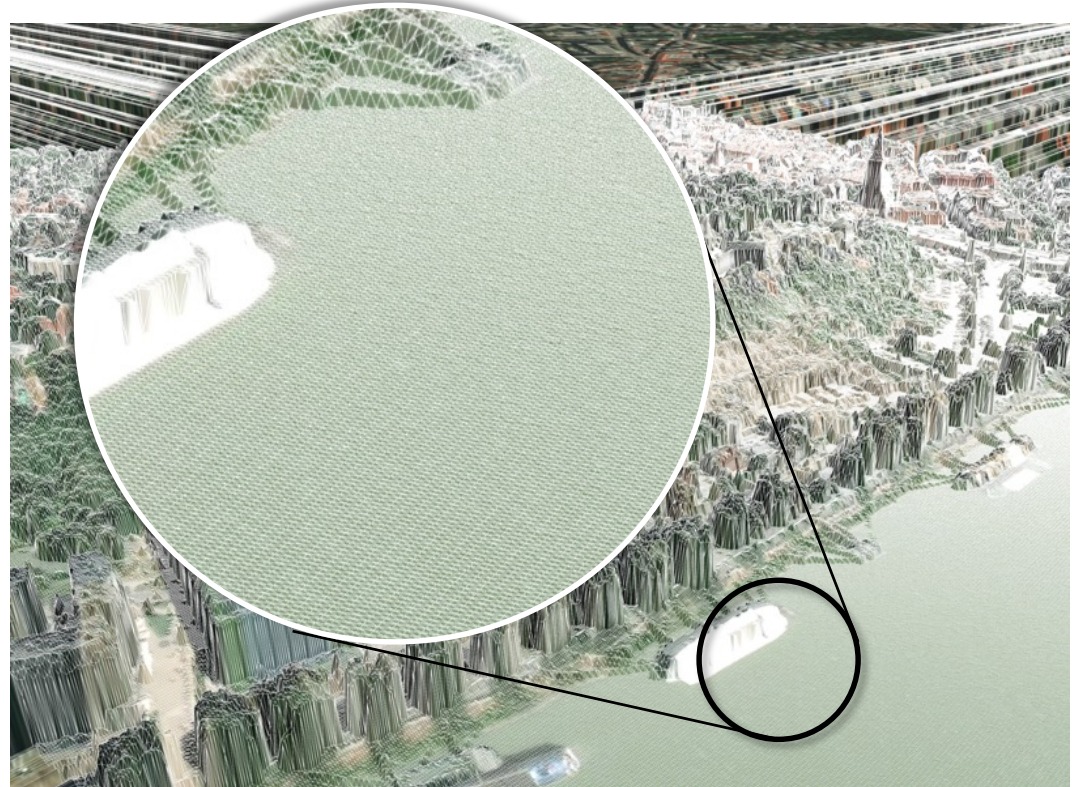
**1 m raster – only 1.5 × 1.5 km worked before instability**

*At full project size, the browser couldn't hold it – even without PV system*



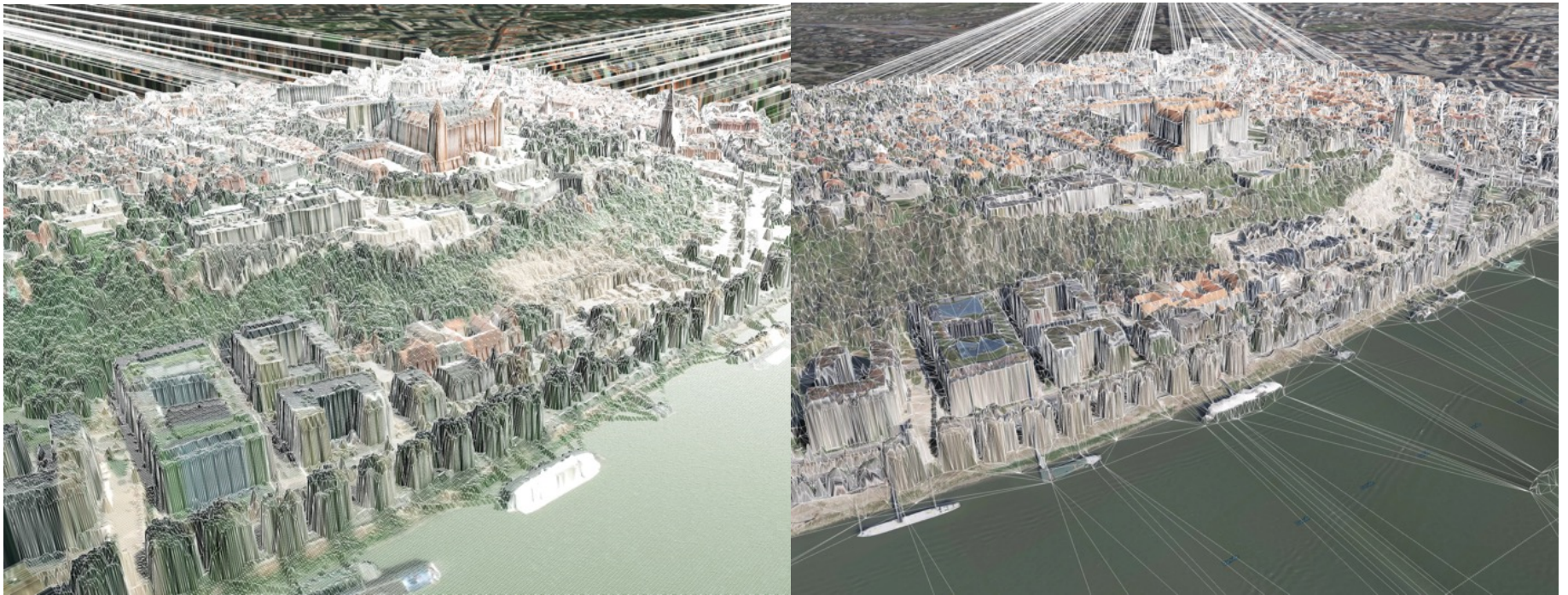
## The problem with regular grids

Same triangle density everywhere  
— flat fields “cost” as much as  
steep slopes



## Adaptive triangulation: detail where it matters

TIN preserves morphological edges — dense where terrain varies, sparse where it doesn't

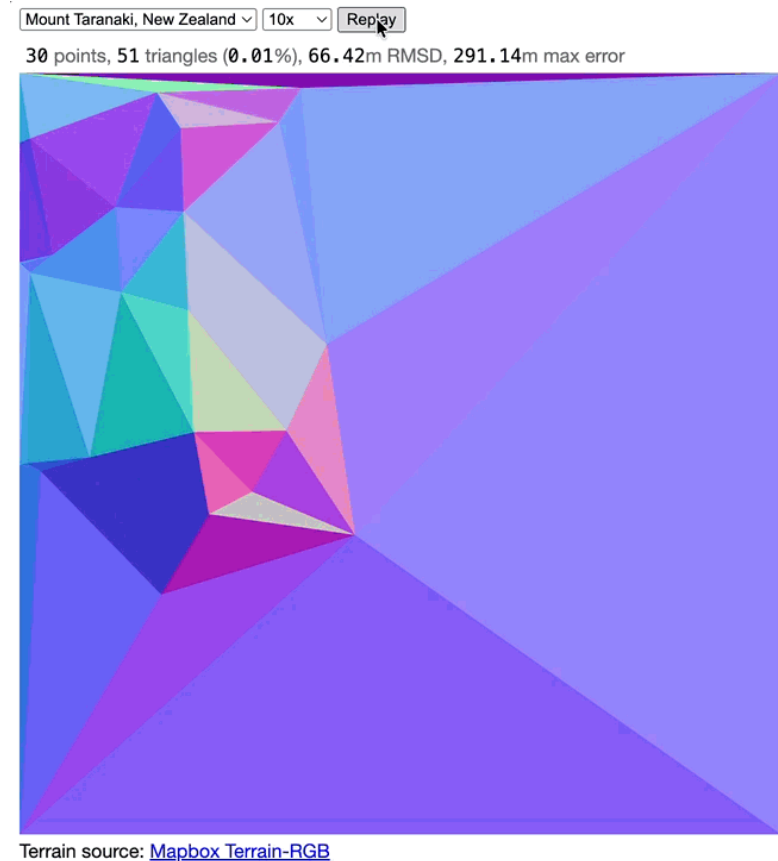


## We didn't write our own - Delatin works

**Delatin takes an elevation raster, returns an optimized TIN**

- *Open-source project by **MapBox** employee*
- ***JavaScript** version + **Python** port*
- *Two driving parameters*

Source: <https://github.com/mapbox/delatin>



## Two numbers shape every mesh we generate

# 300k triangles

- Set by 25 FPS browser floor
- Calibrated against legacy tested 30m grid baseline
- Hard limit – if reached before accuracy target
- Reserve for table geometry, supporting structures and other objects in scene

# 0.20 m max error

- Below typical PV construction tolerance
- Post grading is  $\pm 5\text{--}15$  cm
- Pile placement:  $\pm 1\text{--}3$  cm
- Below 0.2  $\rightarrow$  no yield improvement

# Adaptive triangulation: detail where it matters

**SOLARGIS EVALUATE** File View System Settings

Last saved 2026-04-08 22:30:59 Save

**PV system**  
Uetendorf, Bern, CHE  
**7.684MWp**  
DC installed capacity  
**\$3.21 mil.**  
CAPEX

Site  
Site properties  
**Terrain**  
Constraints 5 >  
Imports 1 >

Segments +  
Potential rental  
Segment 2  
Segment 3

Energy system  
System properties  
Cabling  
Losses

System design +  
Grid connection  
Inverter transformer 1  
Inverter setup (A)  
Inverters 2 >  
Array 1  
Inverter transformer 2  
Inverter setup (B)

**Terrain**

**General**  
Elevation model extended swiss dtm sample 1m epsg3857.tif 1.00 x 1.00m Change  
Display wireframe

**Slope Visualization**  
Mode **None** Single threshold  
Enable Single threshold to set slope breakpoint

**Albedo**  
Albedo Monthly 0.13 - 0.25 Edit  
Monthly terrain albedo values are same as provided by Solargis Prospect Professional. All edits are affecting only this Energy System.

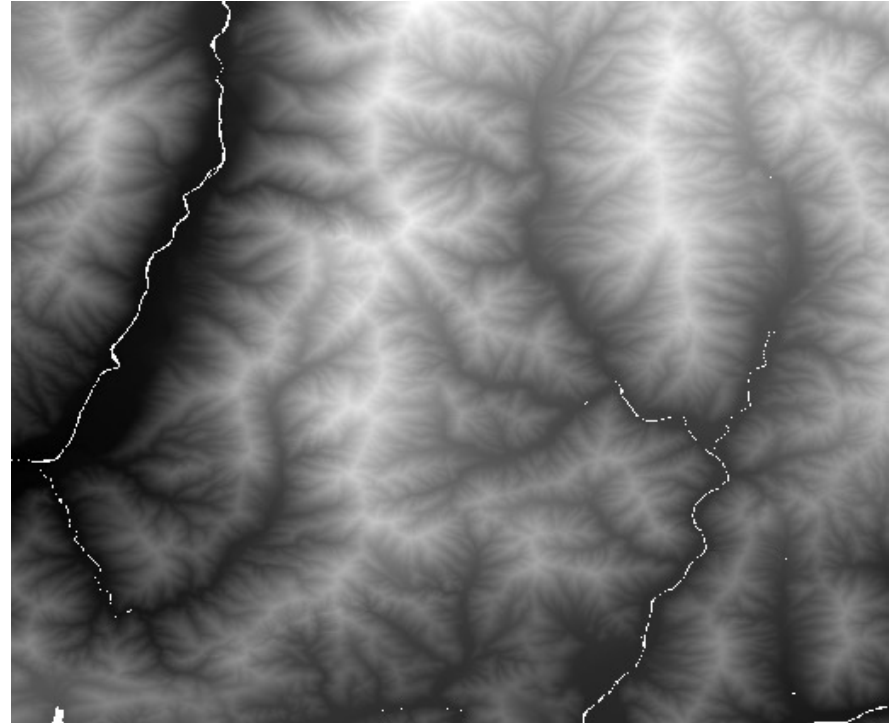
Time 11:05 (UTC+2) Date 07/01

**Next step**

**Getting customer terrain into the app**

## Getting customer terrain into the app

- We accept GeoTIFF
  - Single-band elevation
  - In meters
  - Max file size 250 MB
  - Max dimensions 20,000 × 20,000 px
  - Any pixel resolution that can fit into dimensions and file size
  - Unlimited scene area – will be clipped to project extent



## What can go wrong?

Invalid file format

Multi-band raster

Missing CRS

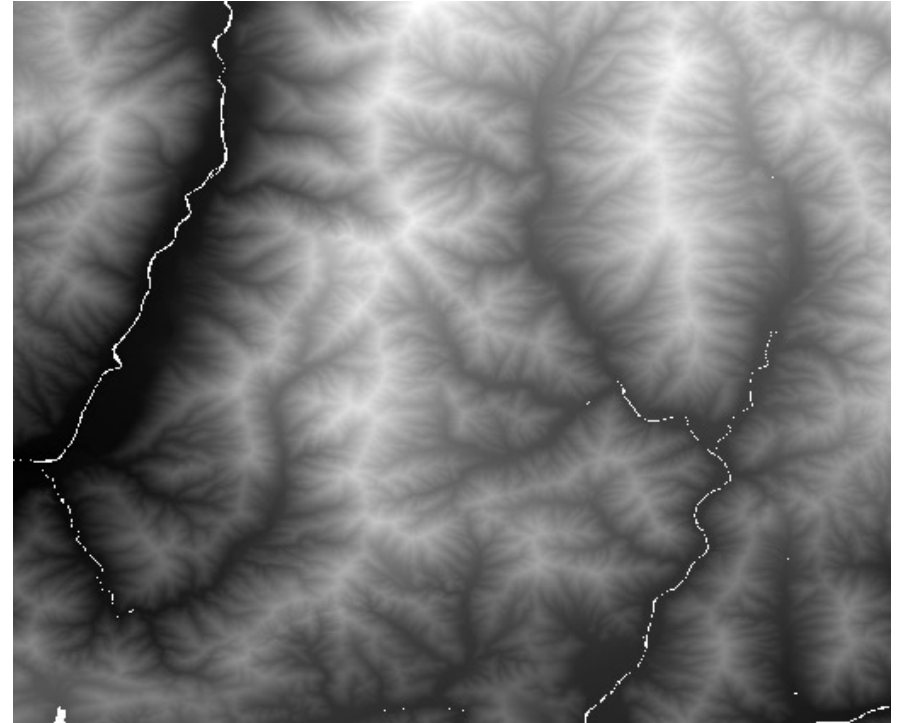
Unsupported CRS

No data values

Elevations out of range

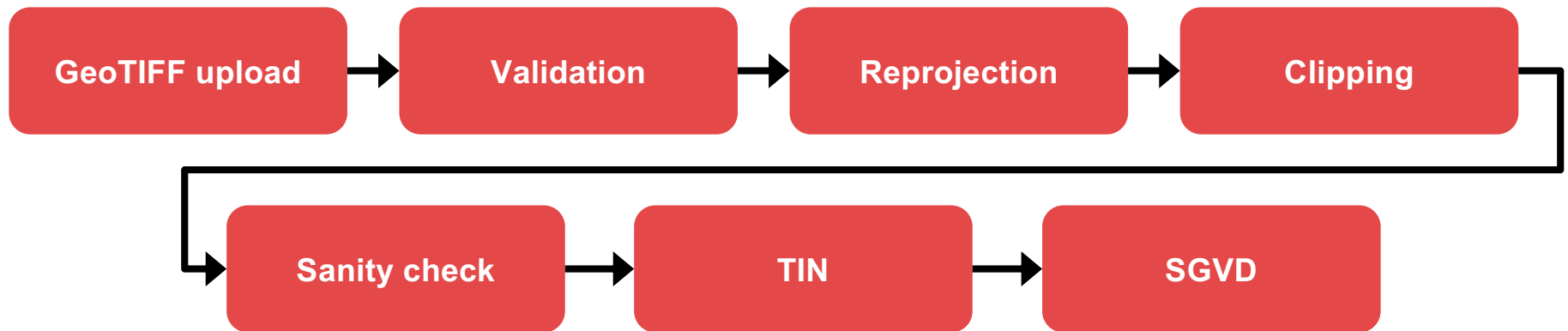
Out of project extent

Inconsistent values

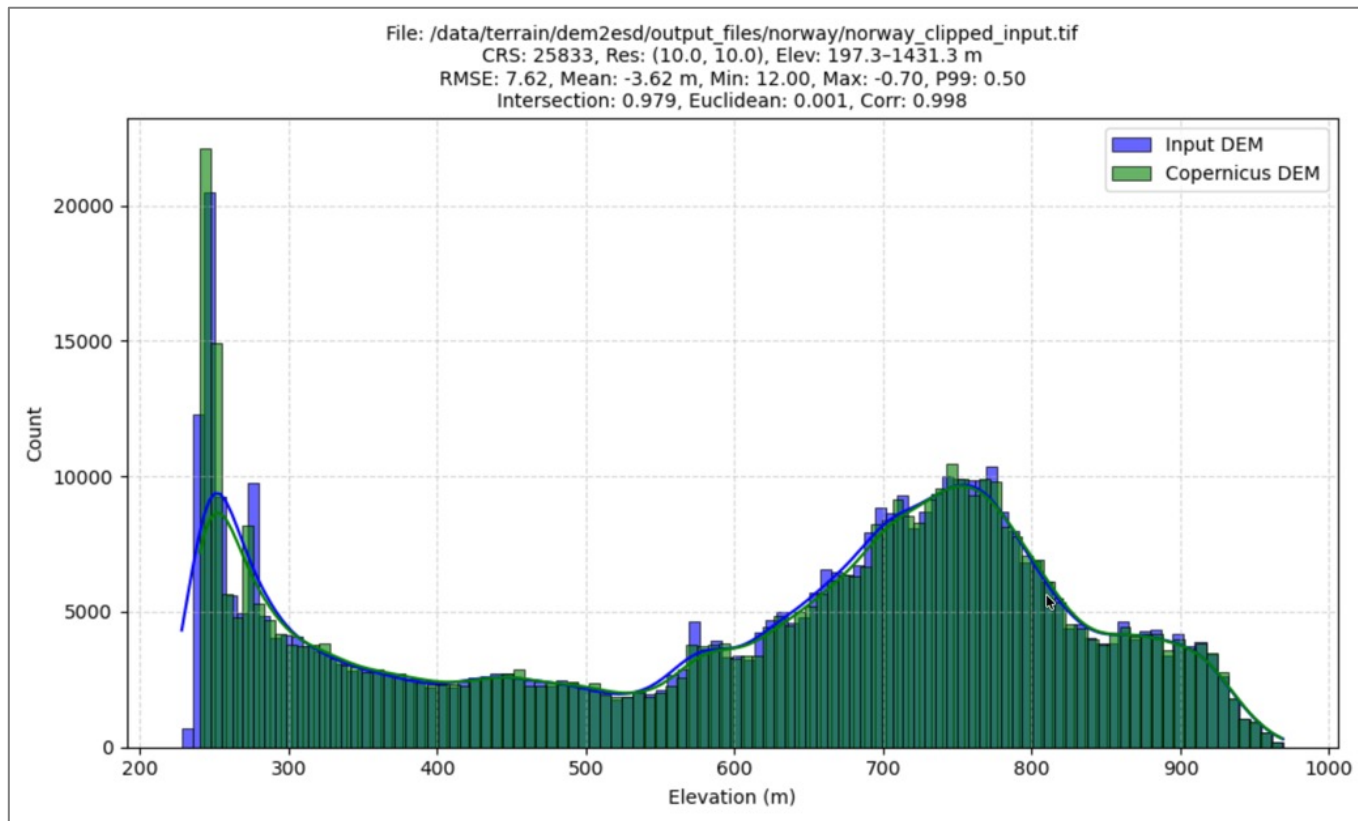


## Server-side processing pipeline

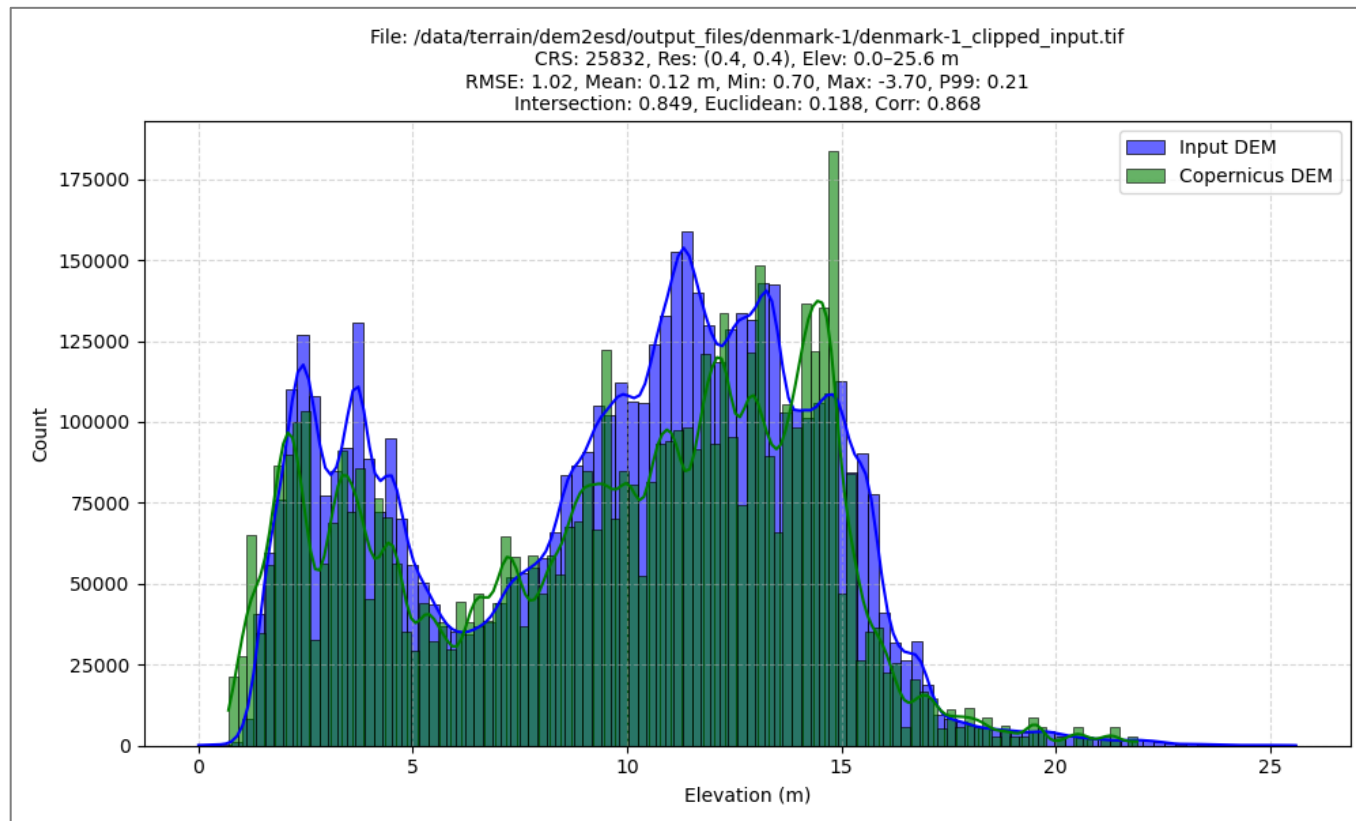
*Usual processing time ~1-5 minutes*



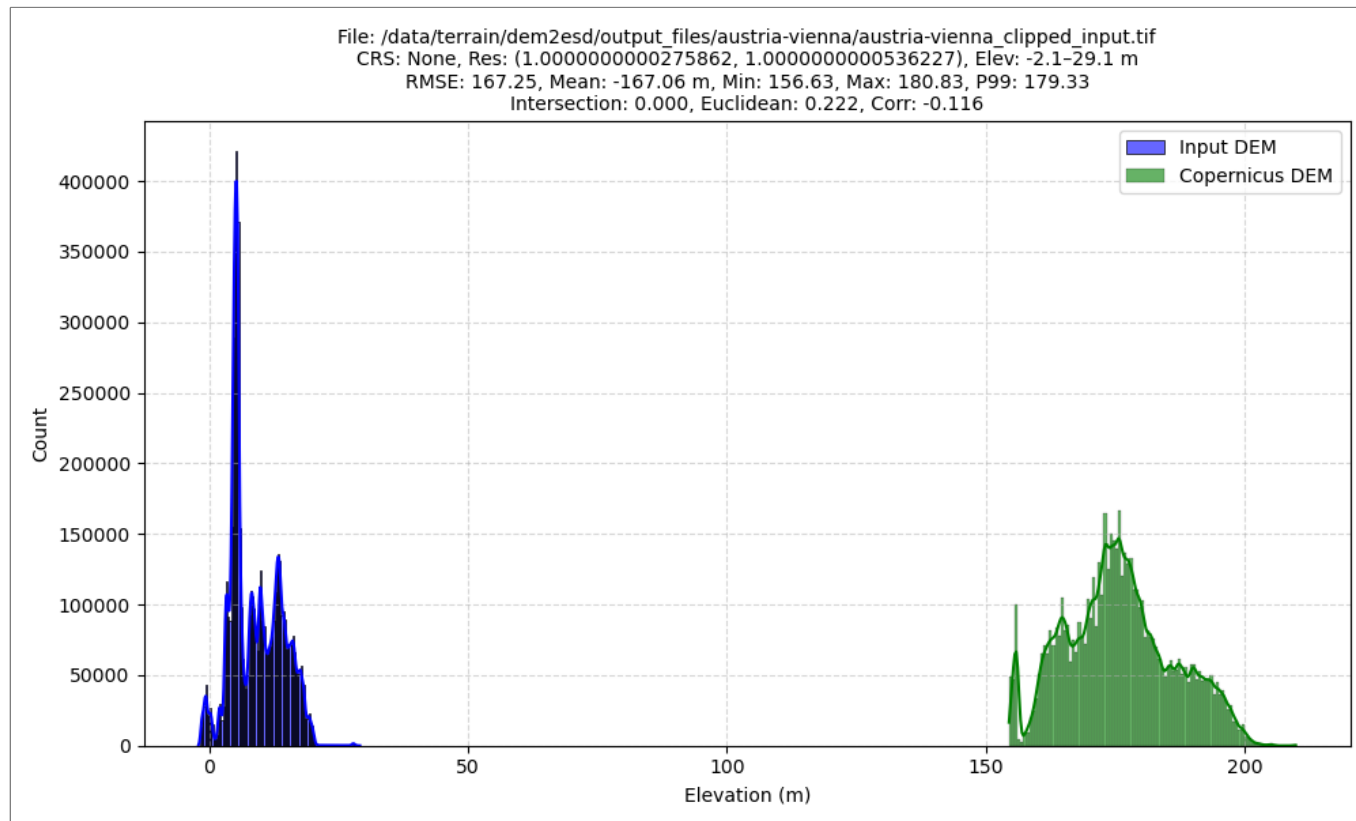
# Statistical comparison catches what structural validation can't



# Statistical comparison catches what structural validation can't

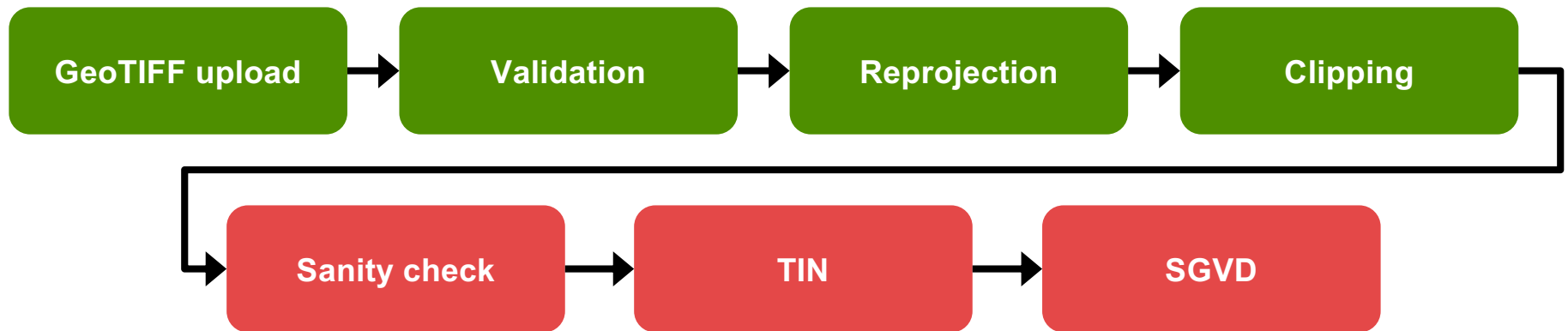


# Statistical comparison catches what structural validation can't



## Server-side processing pipeline

*Usual processing time ~1-5 minutes*



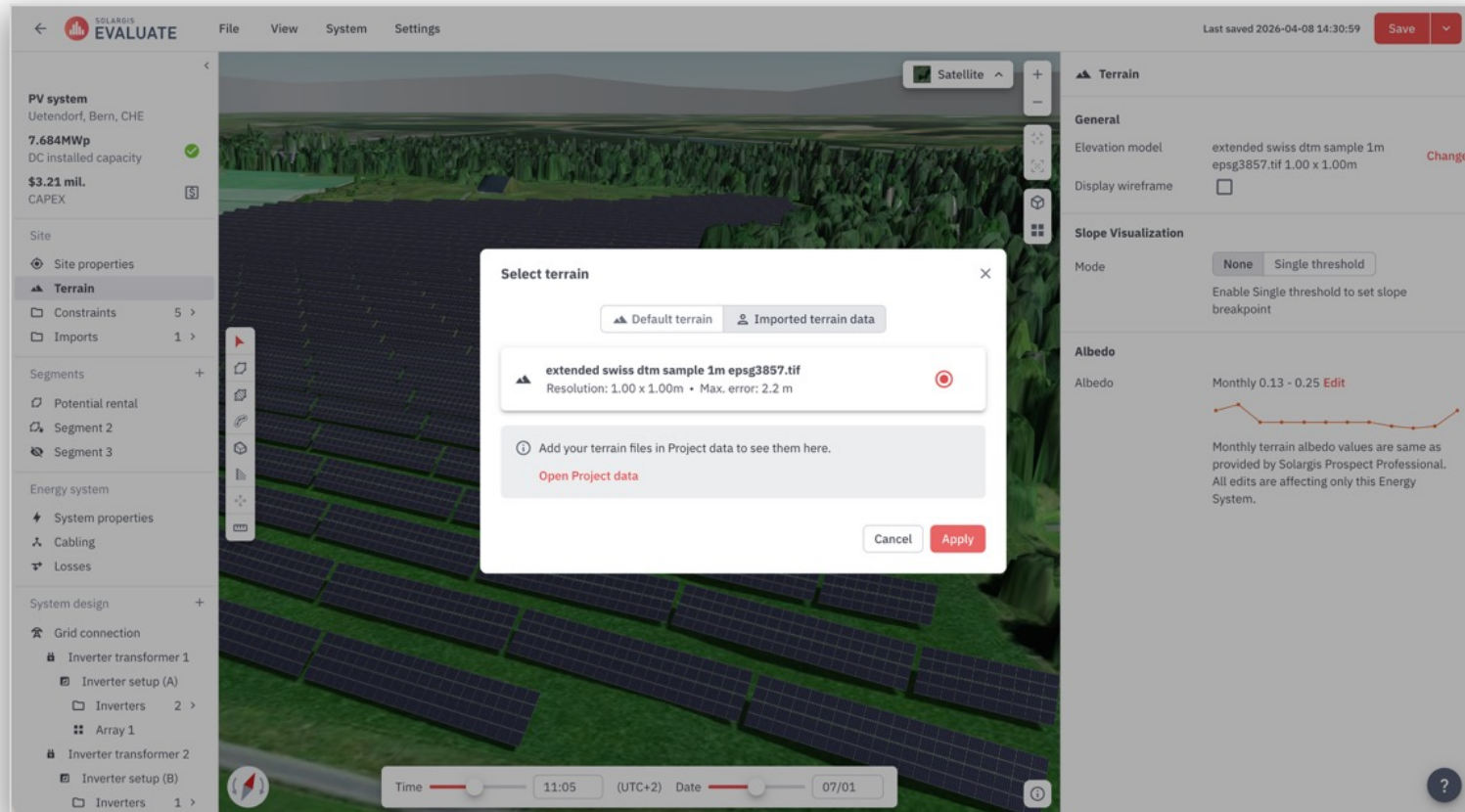
# The user gets an essential info

- Achieved max error
- Number of triangles
- Download optimized mesh
- Download original tiff

The screenshot displays the 'Project data' section of the SOLARGIS EVALUATE interface. The project is identified as 'Uetendorf, Bern, CHE' with a 'FULL EVALUATION' status. The interface is divided into a left sidebar with navigation options (Overview, Project, Energy systems, Analysis, Download, Datasets) and a main content area. The main content area is titled 'Project data' and has two tabs: 'Solargis data' and 'Imported data'. Under the 'Imported data' tab, there is a section for 'Custom terrain' which contains a table of 'Imported terrain data'. The table has four columns: 'Terrain name', 'Uploaded', 'Resolution', and 'Maximal error'. A single row is visible with a green checkmark in the first column, the name 'extended swiss...', the upload date '2026-04-07', a resolution of '1.00 x 1.00', and a maximal error of '2.21'. Below the table, there is an information icon and a note: 'Terrain name will appear in Energy system designer, reports, exports and system summaries.' Below this, there is a section for 'Upload terrain data (GEOTIFF)' with explanatory text and a list of requirements: 'Valid raster Geotiff file in a supported projection' and 'Files up to 250MB'. An 'UPLOAD NOW' button is present. At the bottom, there is a 'Terrain data consultancy' section with a 'REQUEST CONSULTANCY' button. The footer of the interface includes the copyright notice '© 2026 Solargis v 2.7.4' and the website 'Terms of Use • Solargis.com'.

Terrain name	Uploaded	Resolution	Maximal error
extended swiss...	2026-04-07	1.00 x 1.00	2.21

# Custom terrain appears in terrain selector



**Finally**

**Leveraging custom hi-res terrain in PV modelling**

# 3D cable routes and lengths

**Presentation 2.8**  
Japan, Terrain following  
**36.691 MWp**  
DC installed capacity  
**\$ 13.08 mil.**  
CAPEX

Site  
Site properties  
Terrain  
Constraints 12  
Imports 1

Segments  
Segment 1  
Segment 2  
Segment 3  
Segment 5  
Segment 4

Energy system  
System properties  
Cabling  
Losses

Time 11:43 (UTC+9) Date 07/03

**Edit cable routes**  
Drag midpoints to add vertices. Move existing ones to adjust the cable route. Right-click to delete unwanted vertices.

Cable length  
**329 m**

Cable source	Length [m]
Inverter transformer 2	361
Inverter transformer 3	520
Inverter transformer 4	920
Inverter transformer 5	572
<b>Power transformer 1</b>	<b>329</b>
Inverter transformer 1	352



# Near-shading by Digital Surface Model

The screenshot displays the SOLARGIS EVALUATE software interface. The main window shows a 3D terrain model with solar panels installed on a slope. The interface includes a top navigation bar with 'File', 'View', 'System', and 'Settings' menus. On the left, a sidebar lists project details: 'PV system' (Uetendorf, Bern, CHE), '7.684MWp' DC installed capacity, and '\$3.21 mil.' CAPEX. Below this, a 'Site' section includes 'Site properties', 'Terrain' (with sub-items: Constraints 5, Imports 1), 'Segments' (Potential rental, Segment 2, Segment 3), 'Energy system' (System properties, Cabling, Losses), and 'System design' (Grid connection). The right-hand control panel is titled 'Terrain' and contains sections for 'General' (Elevation model: extended swiss dtm sample 1m epsg3857.tif 1.00 x 1.00m, Display wireframe checkbox), 'Slope Visualization' (Mode: None/Single threshold, with a note to enable single threshold for slope breakpoint), and 'Albedo' (Monthly 0.13 - 0.25 Edit, with a line graph and a note that values are provided by Solargis Prospect Professional). At the bottom, a time and date control bar shows 'Time 20:47 (UTC+2)' and 'Date 07/01'. A 'Save' button is visible in the top right corner.

# Utilizing drone footage for rooftop projects

The screenshot displays the SOLARGIS EVALUATE software interface. The central 3D model shows a rooftop solar array with a 'Satellite' view button. The left sidebar contains project details: 'PV system' (Uetendorf, Bern, CHE), '7.684MWp' DC installed capacity, and '\$3.21 mil.' CAPEX. Below this are sections for 'Site' (Site properties, Terrain, Constraints, Imports), 'Segments' (Potential rental, Segment 2, Segment 3), 'Energy system' (System properties, Cabling, Losses), and 'System design' (Grid connection). The right sidebar shows configuration options for 'Losses', 'Auxiliary', 'Degradation', and 'Environment'. The 'Losses' section includes 'Day constant losses' (0,025% ~1.9 kW), 'Day proportional losses' (5 W/kW), and 'Night constant losses' (0,025% ~1.9 kW). The 'Auxiliary' section has an 'Input method' toggle between '%' and 'kW'. The 'Degradation' section shows 'Degradation first year' (2%) and 'Annual degradation' (0,5%). The 'Environment' section lists 'Soiling losses' (Solargis Model - Monthly 0.2 - 0.4%, 0 manual cleaning events per year) and a bar chart for monthly soiling losses (0% to 2% over 12 months). The bottom of the interface features a 'Time' slider set to 11:15 (UTC+2) and a 'Date' slider set to 07/16.

**“Can I upload my own terrain?”**

**Yes. And here’s what it took.**

# Thank you.

**Tomáš Sasko**

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[solargis.com](https://solargis.com)

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