Forest Mapping Management Ges.m.b.H.
CEO Wiltraud & Ing. Hermann Novak

EuroSDR - project

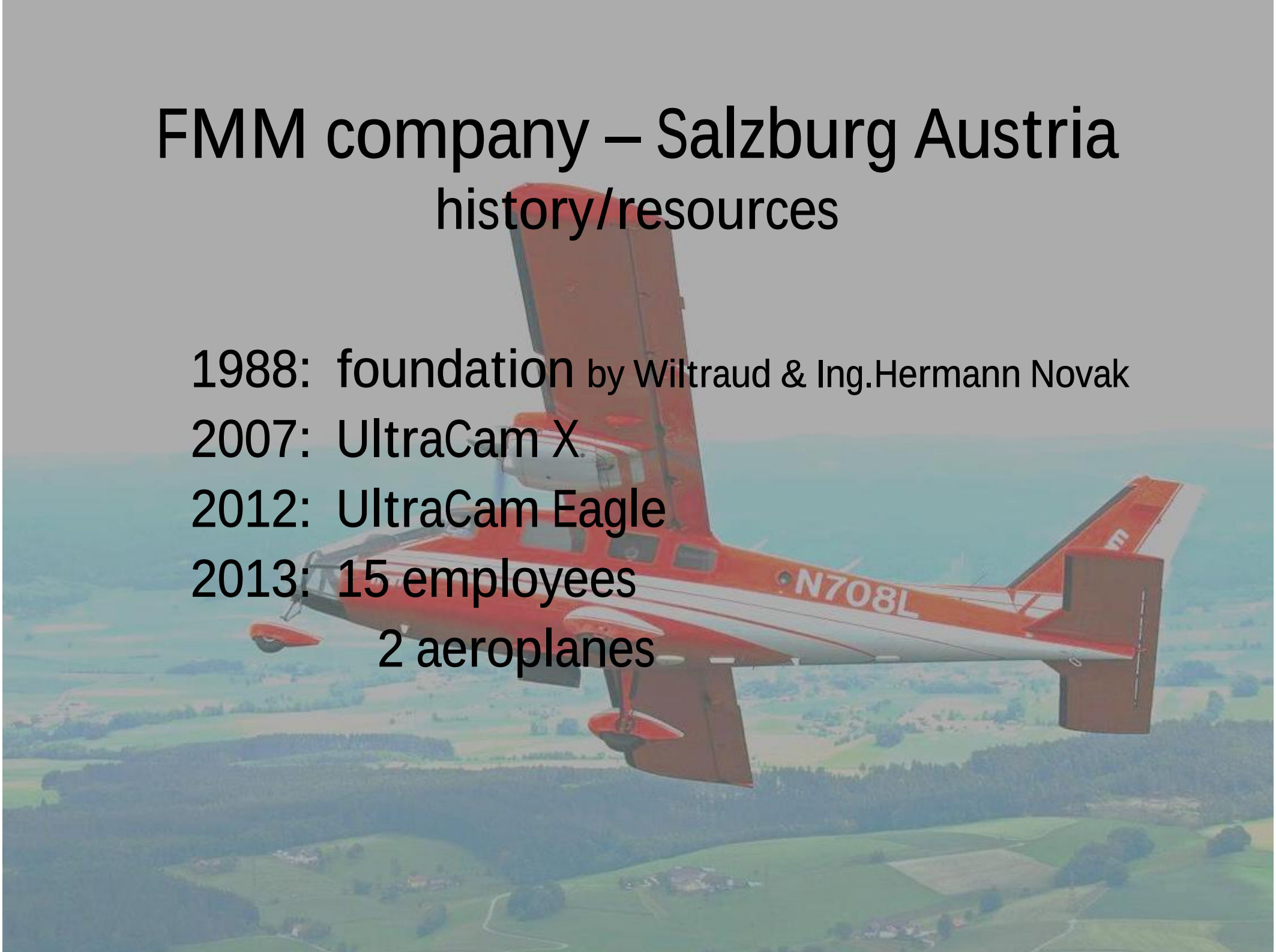
Benchmark on Image Matching

13th/14th of June 2013

DI Bernhard Brunner

FMM company – Salzburg Austria

history/resources



1988: foundation by Wiltraud & Ing.Hermann Novak

2007: UltraCam X

2012: UltraCam Eagle

2013: 15 employees

2 aeroplanes

FMM company – Salzburg Austria

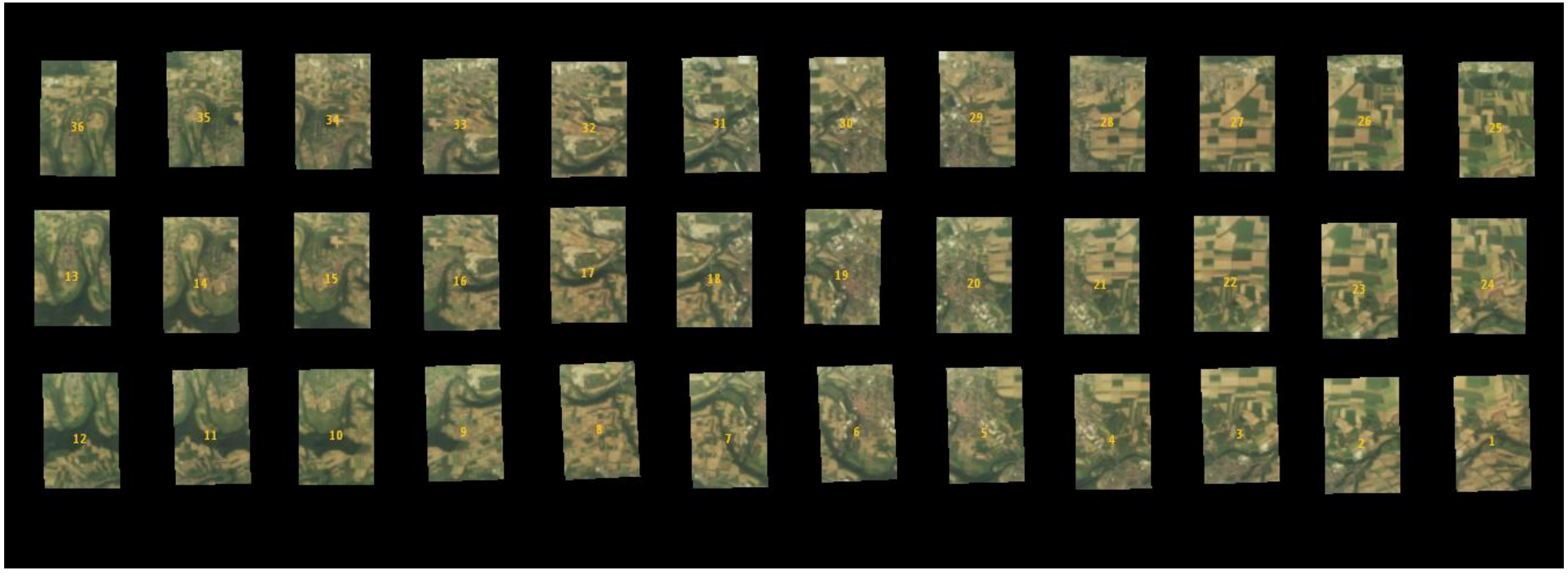
services

- forestry management
- photoflights for official and private customers
- airborne laser scanning
- true ortho and dsm production
- fleet management

Vaihingen/Enz – test area

Test-dataset : 36 UCX – images (GSD 20cm)

flight height about 2800 m AGL



UCX: 9420*14430/ f=100.5mm
/pix=7.2µm

FOREST MAPPING MANAGEMENT

Software and workflow

Microsoft UltraMap V3.1 with Modules:

0) „Lvl02“-data required

1)UltraMap AT

valid calibration files

here: ready made eo-data

tiepoint matching

bundle-adjustment with BINGO

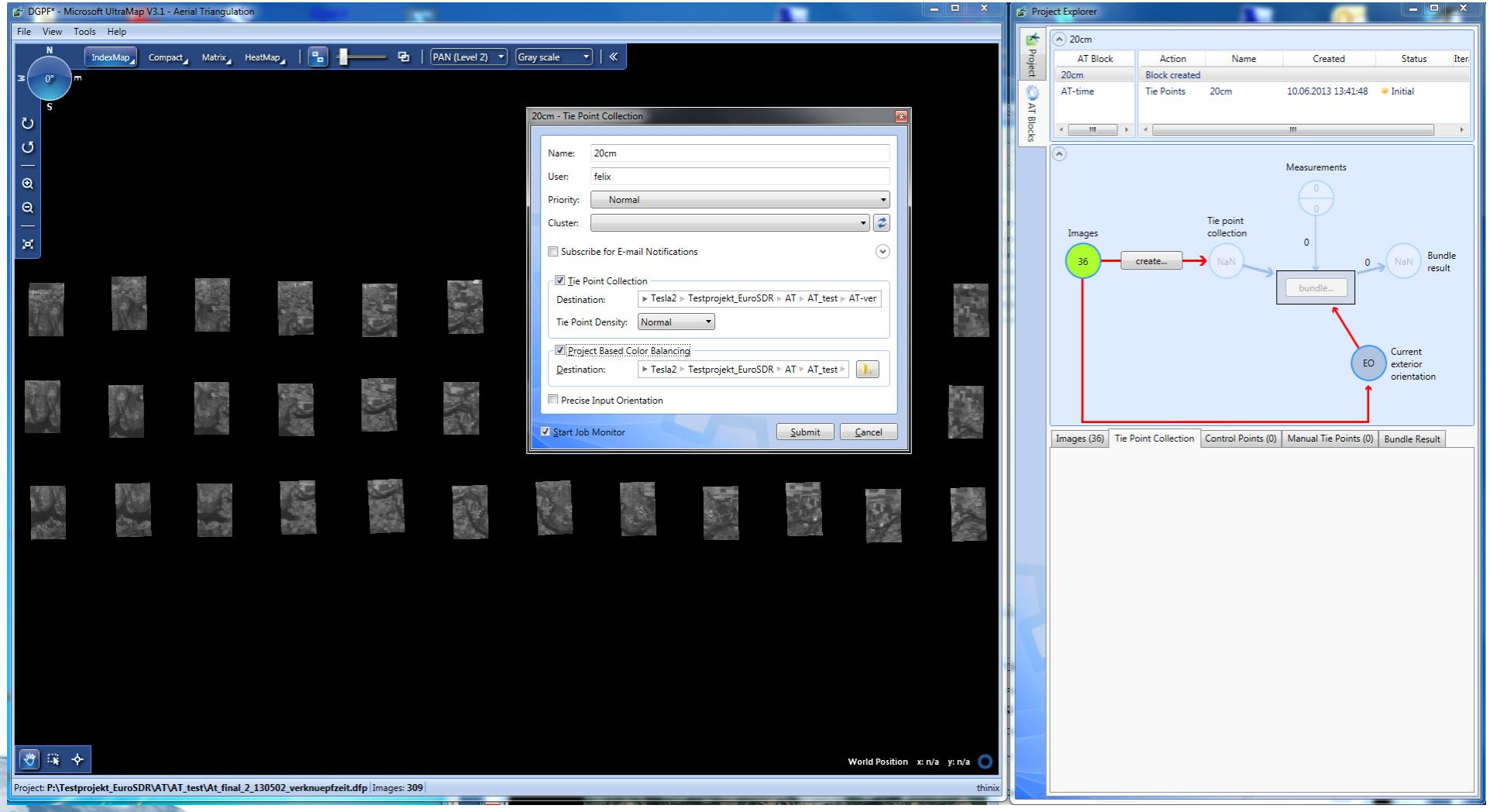
2) UltraMap Radiometry

color adjustment (especially for DOP)

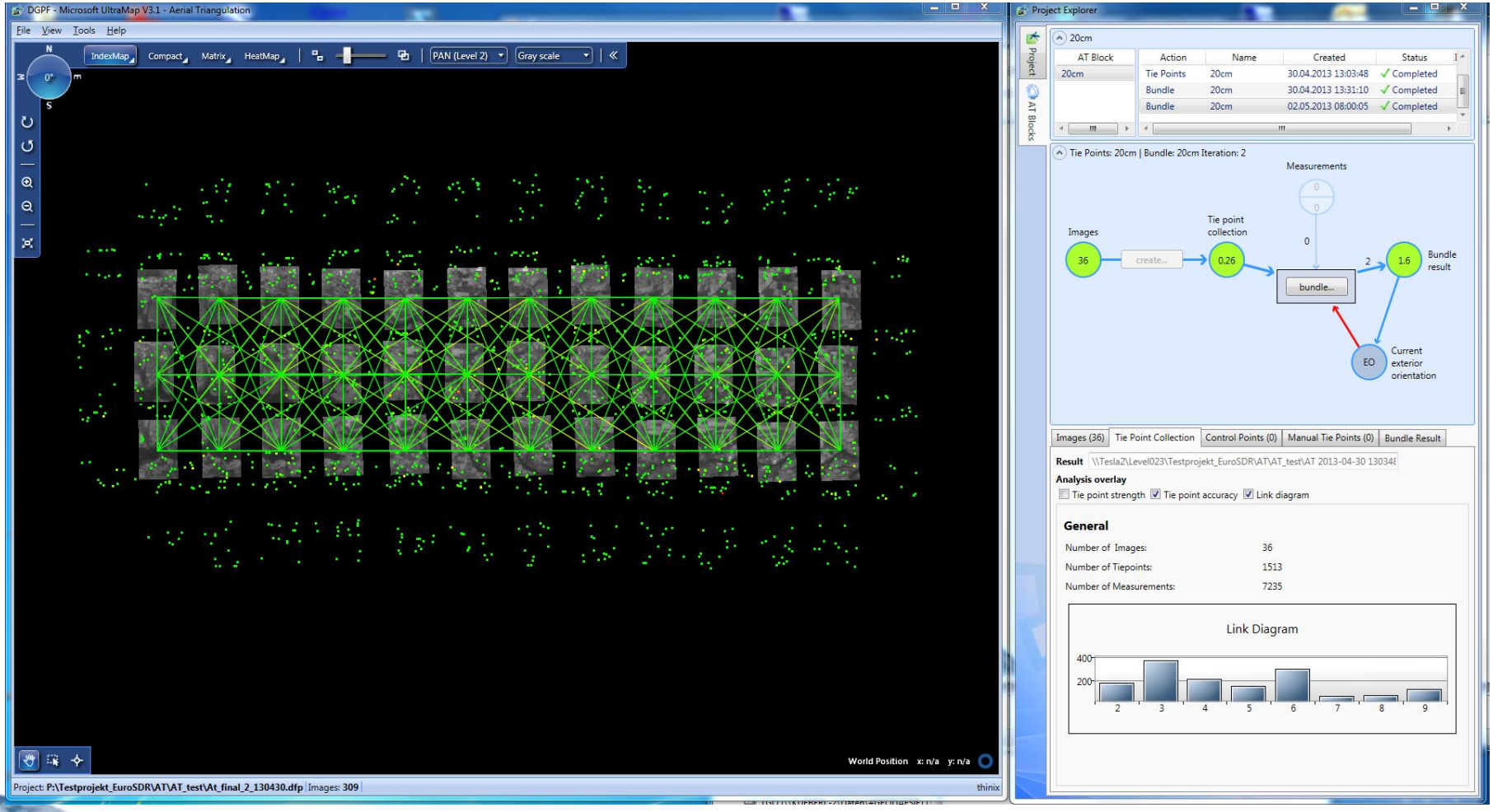
3) UltraMap OP

DSM and Ortho-production with AT and colouradj.

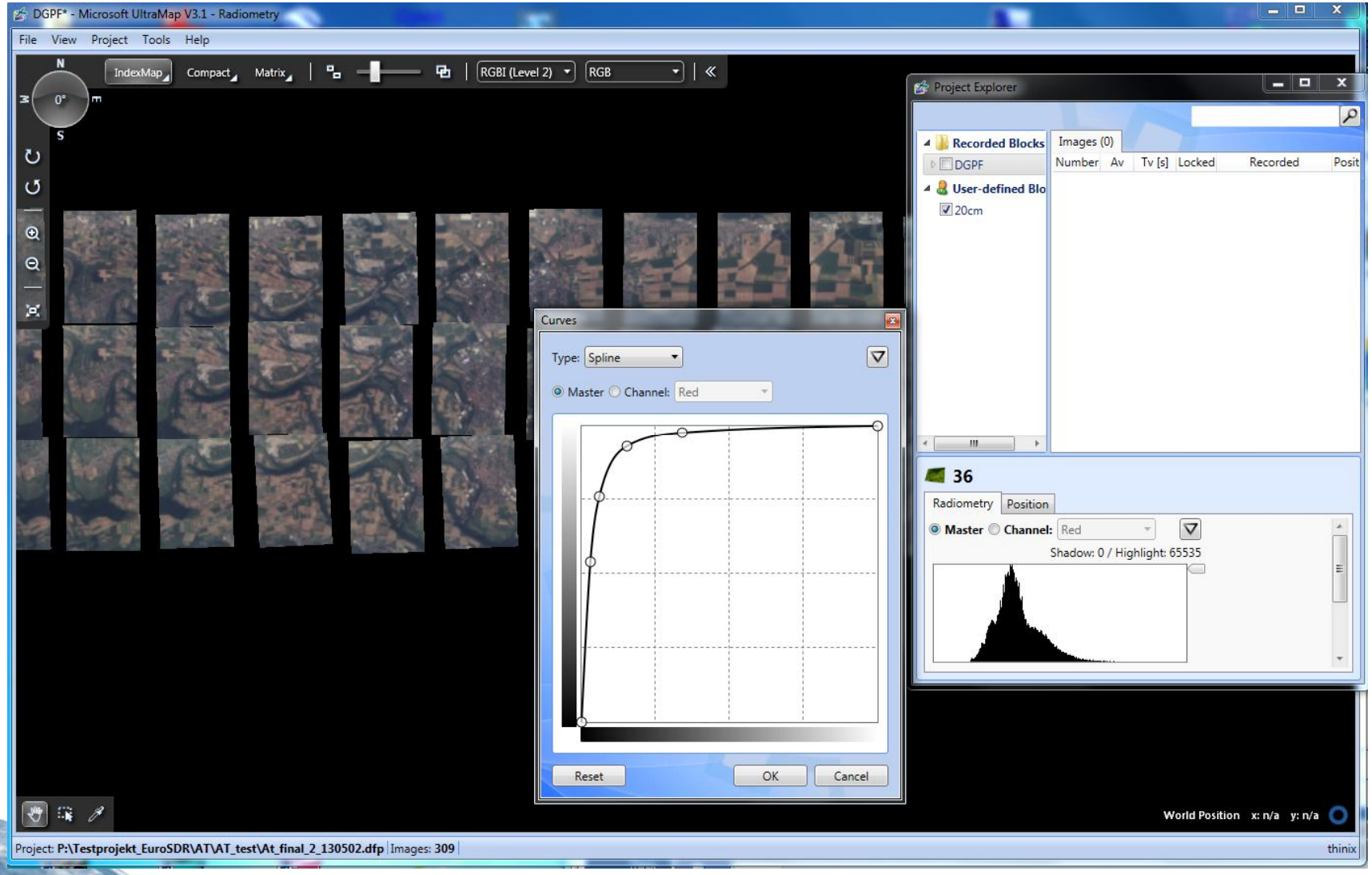
1) UltraMap AT – tiepoint collection



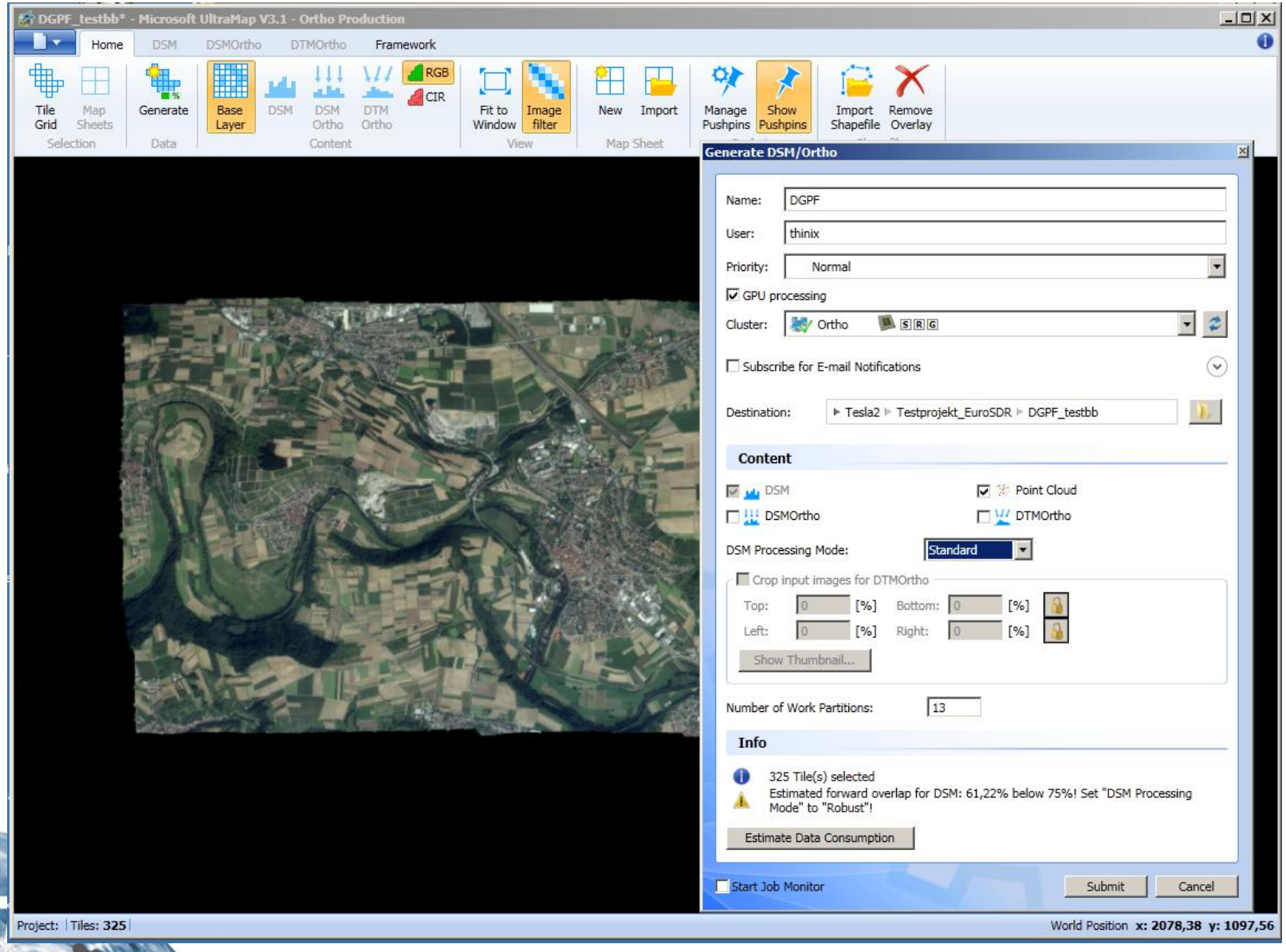
1) UltraMap AT – bundle adjustment



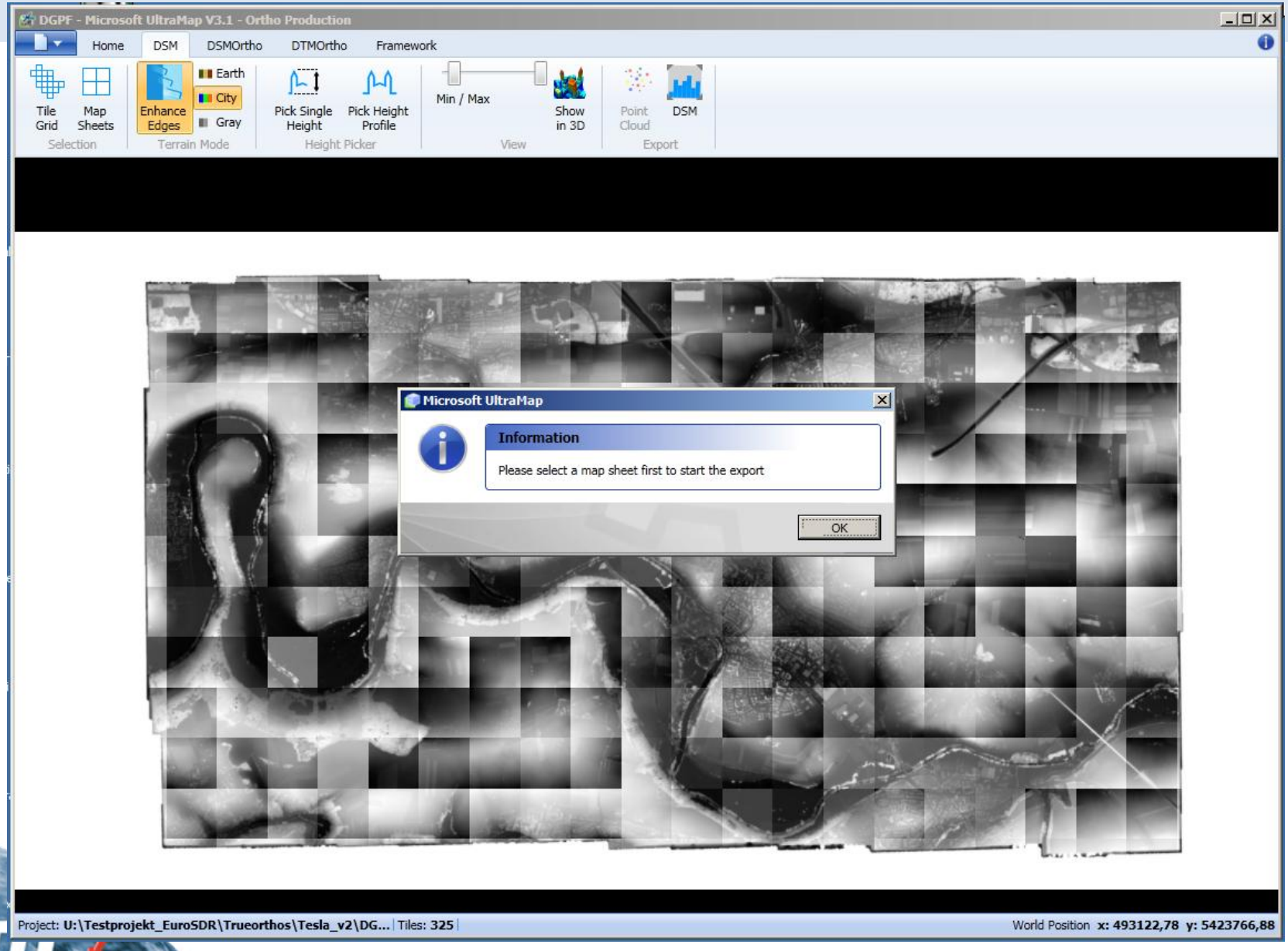
2) UltraMap Radiometry



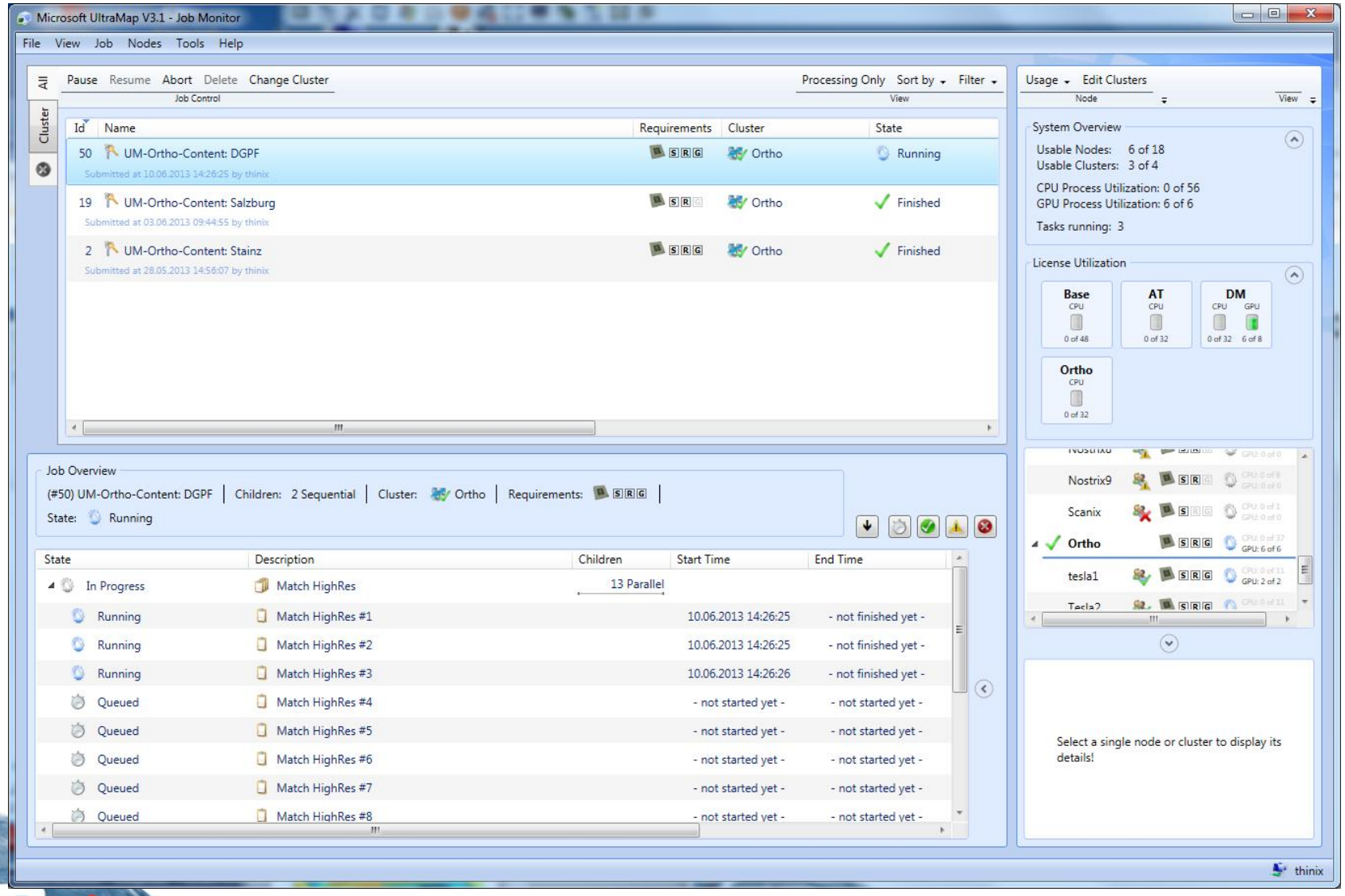
3) UltraMap OP – dsm production



3) UltraMap OP - export

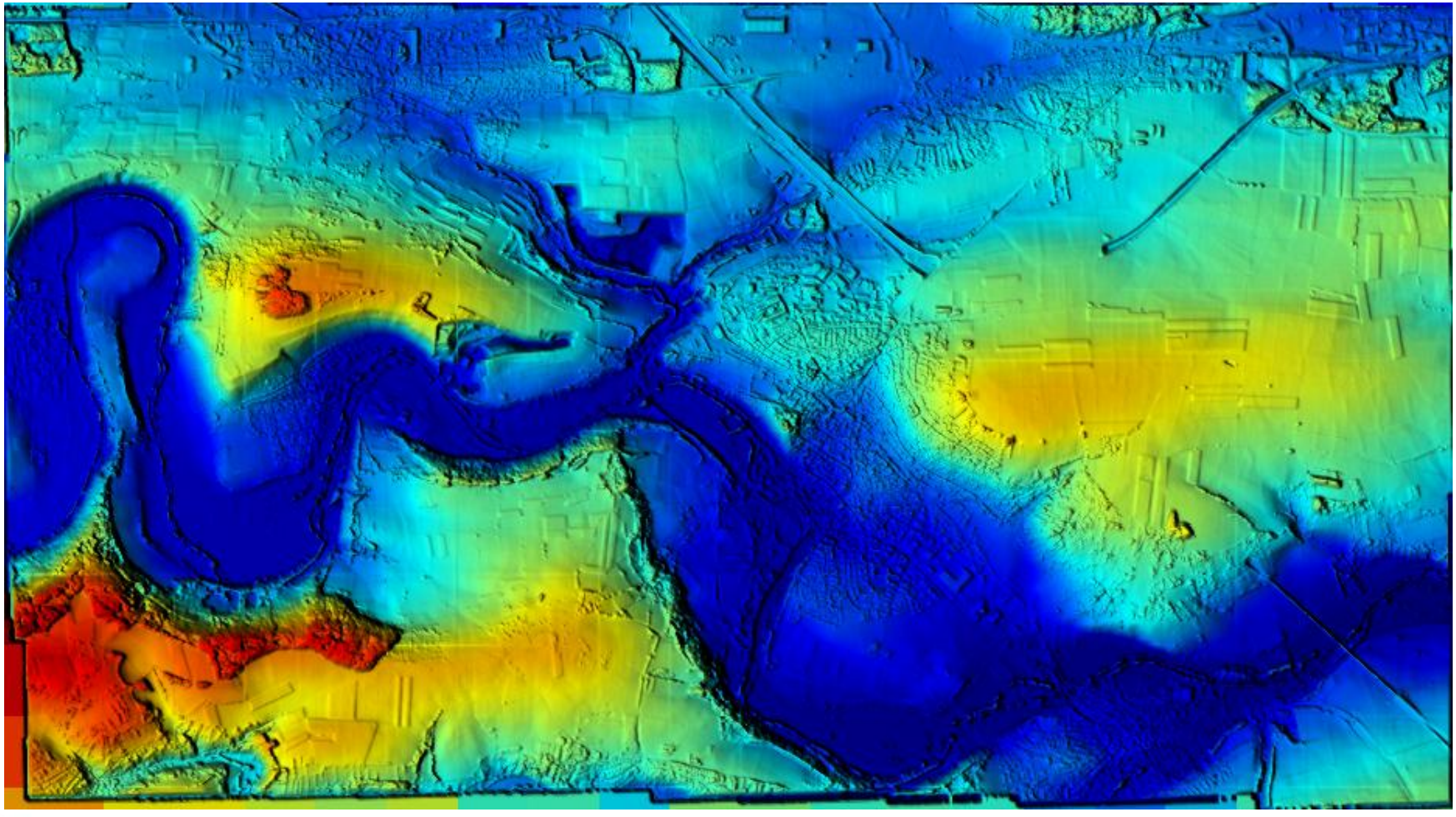


UltraMap – distributed processing

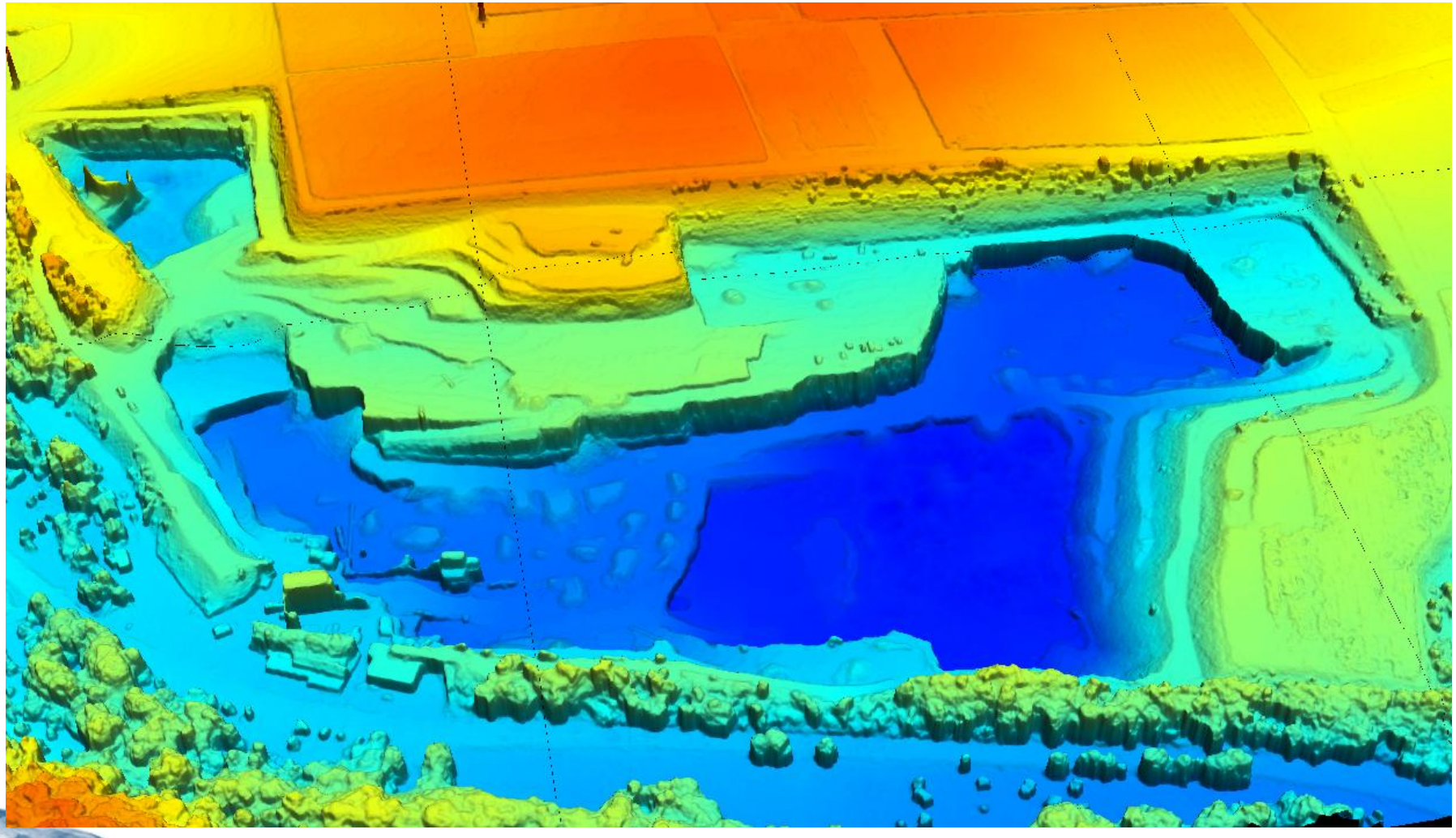


FOREST MAPPING MANAGEMENT

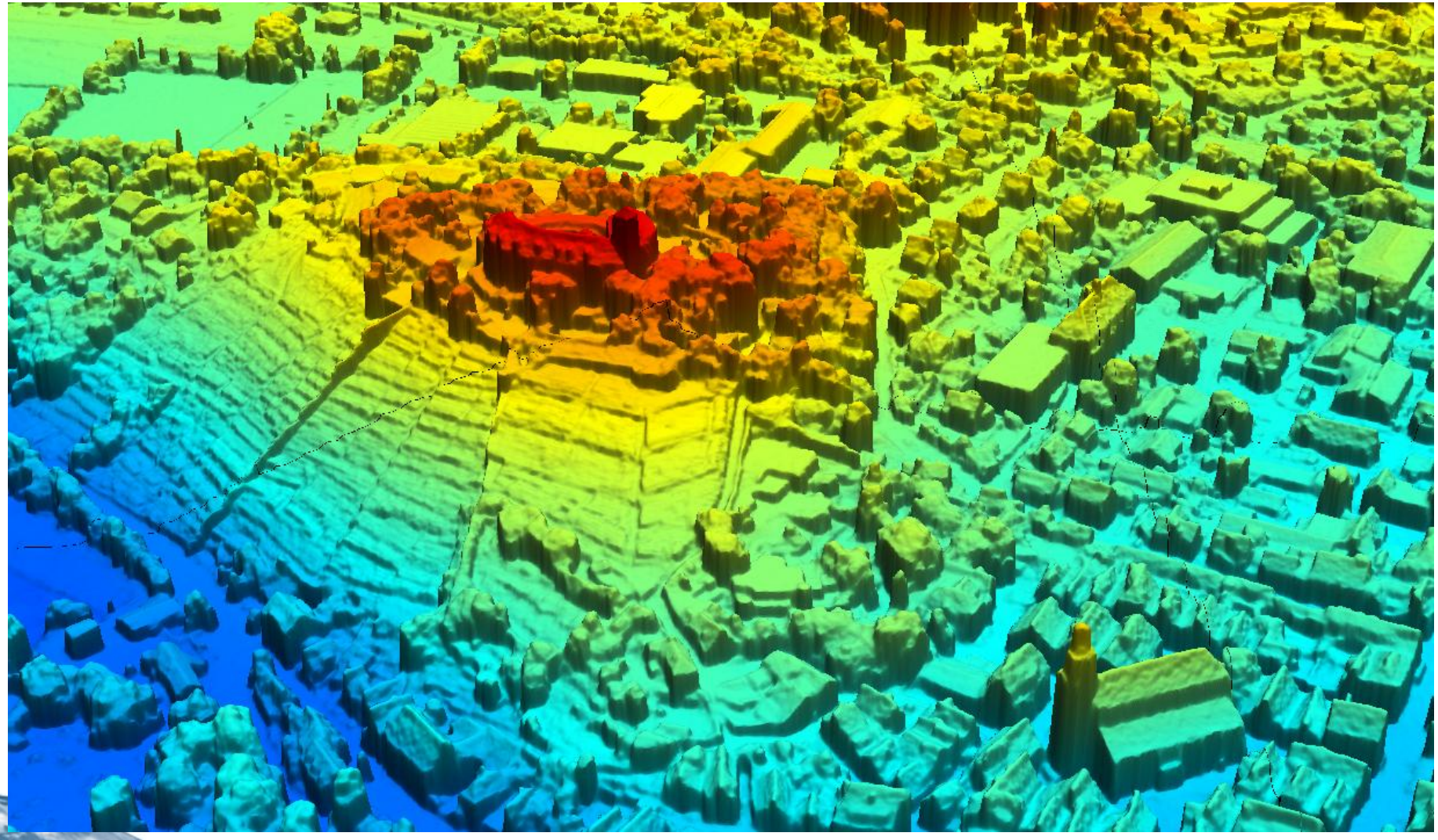
Resulting DSM (8km*4.5km)



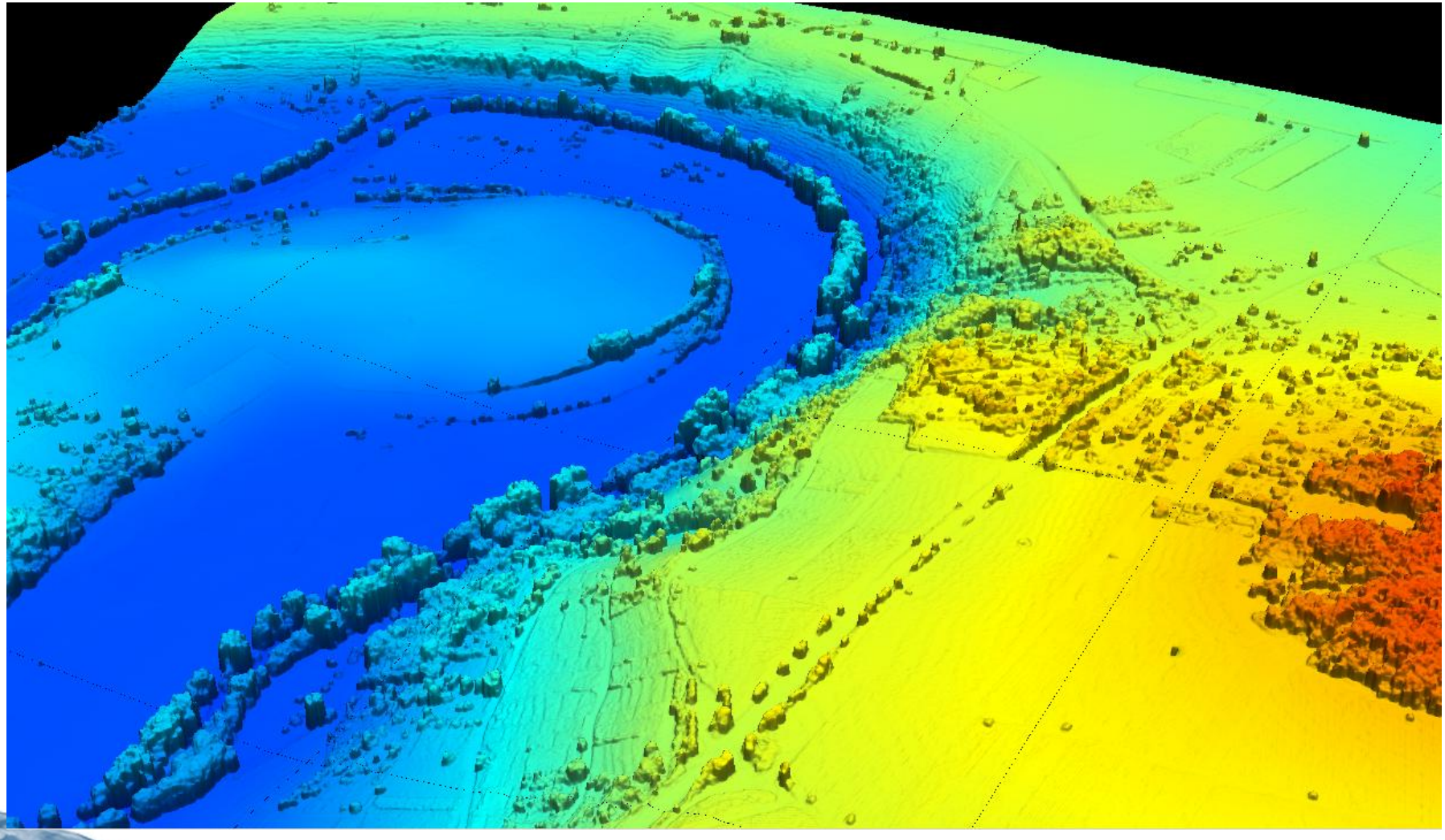
DSM-Example: quarry



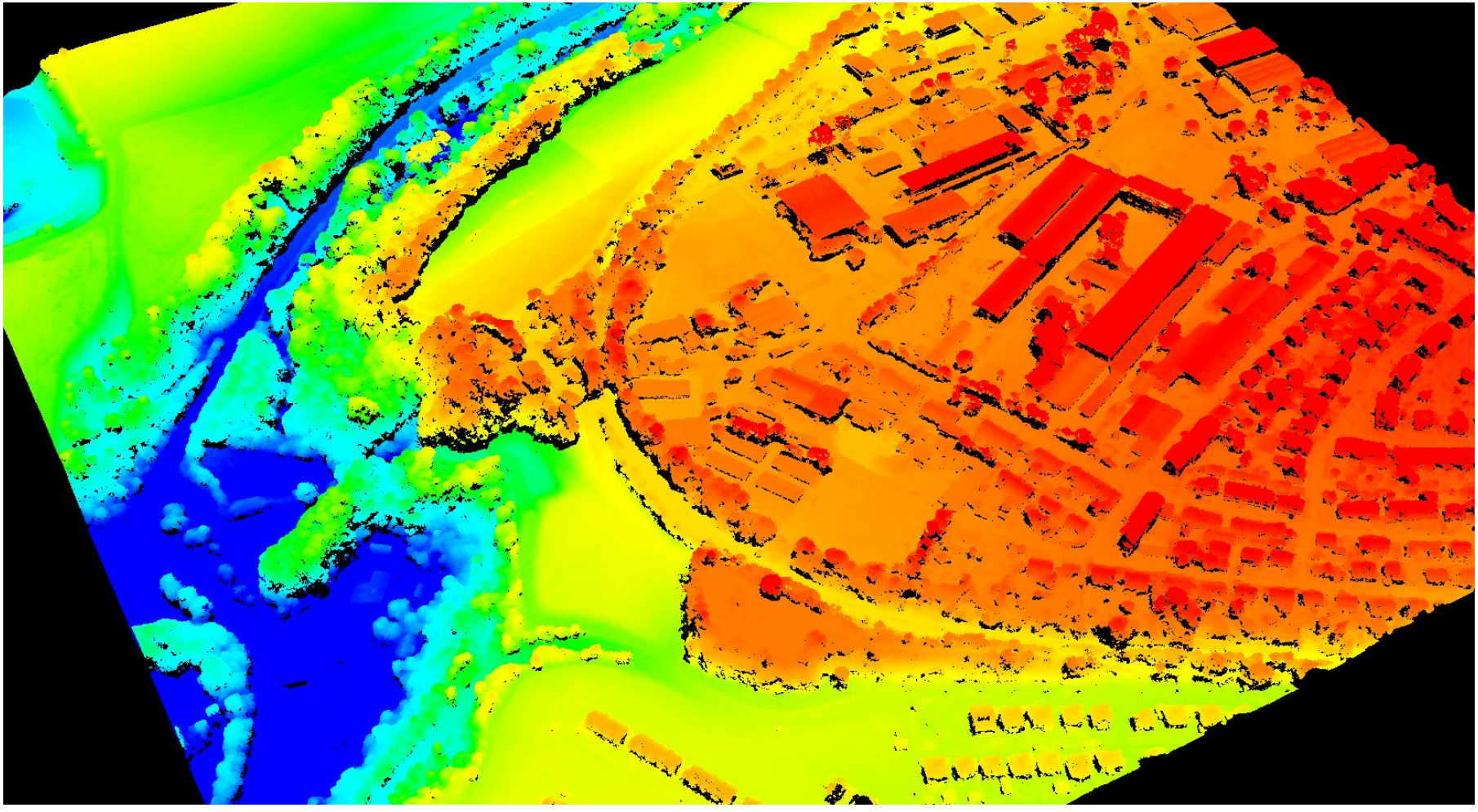
DSM-Example: part of city



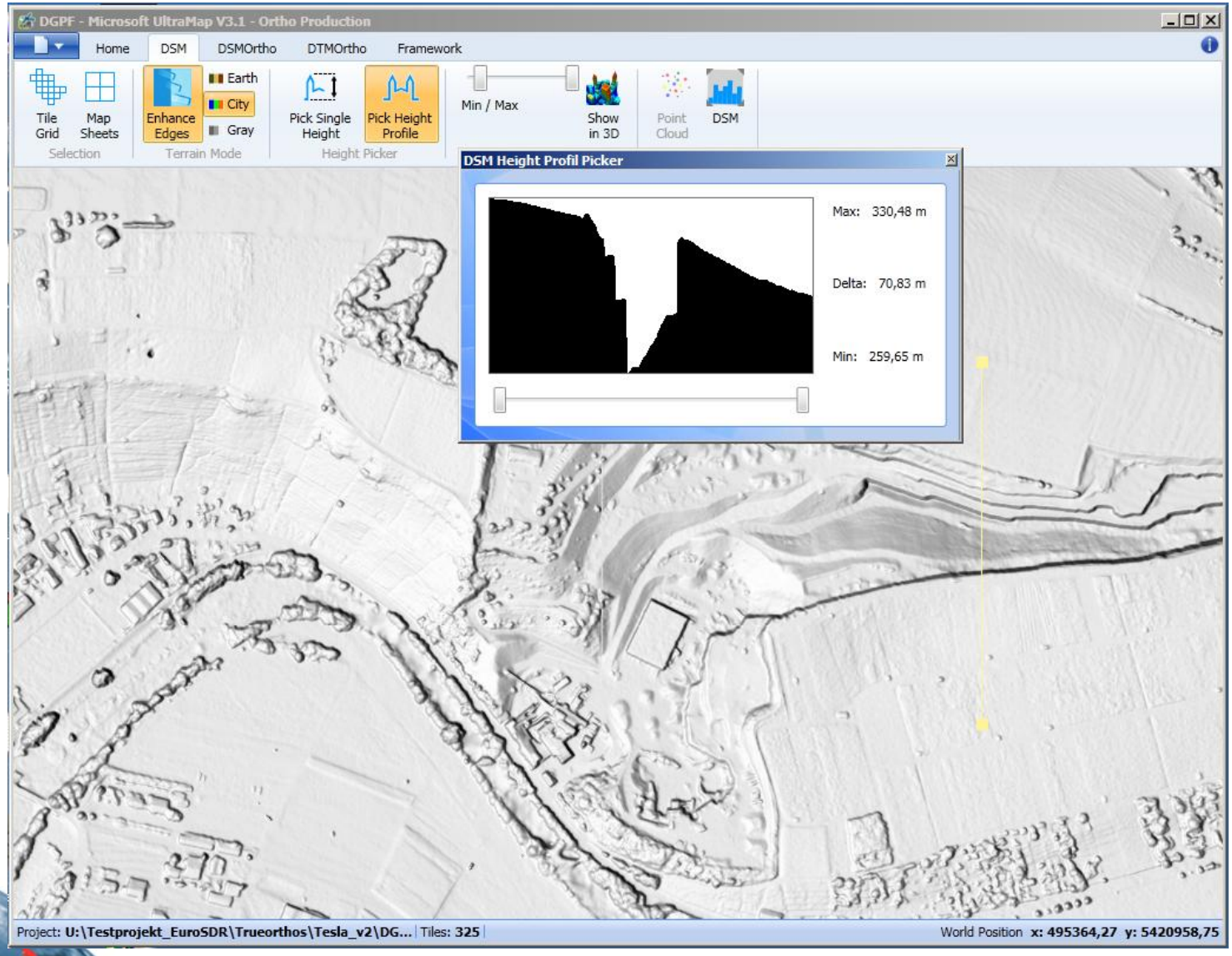
DSM-Example: hills & river



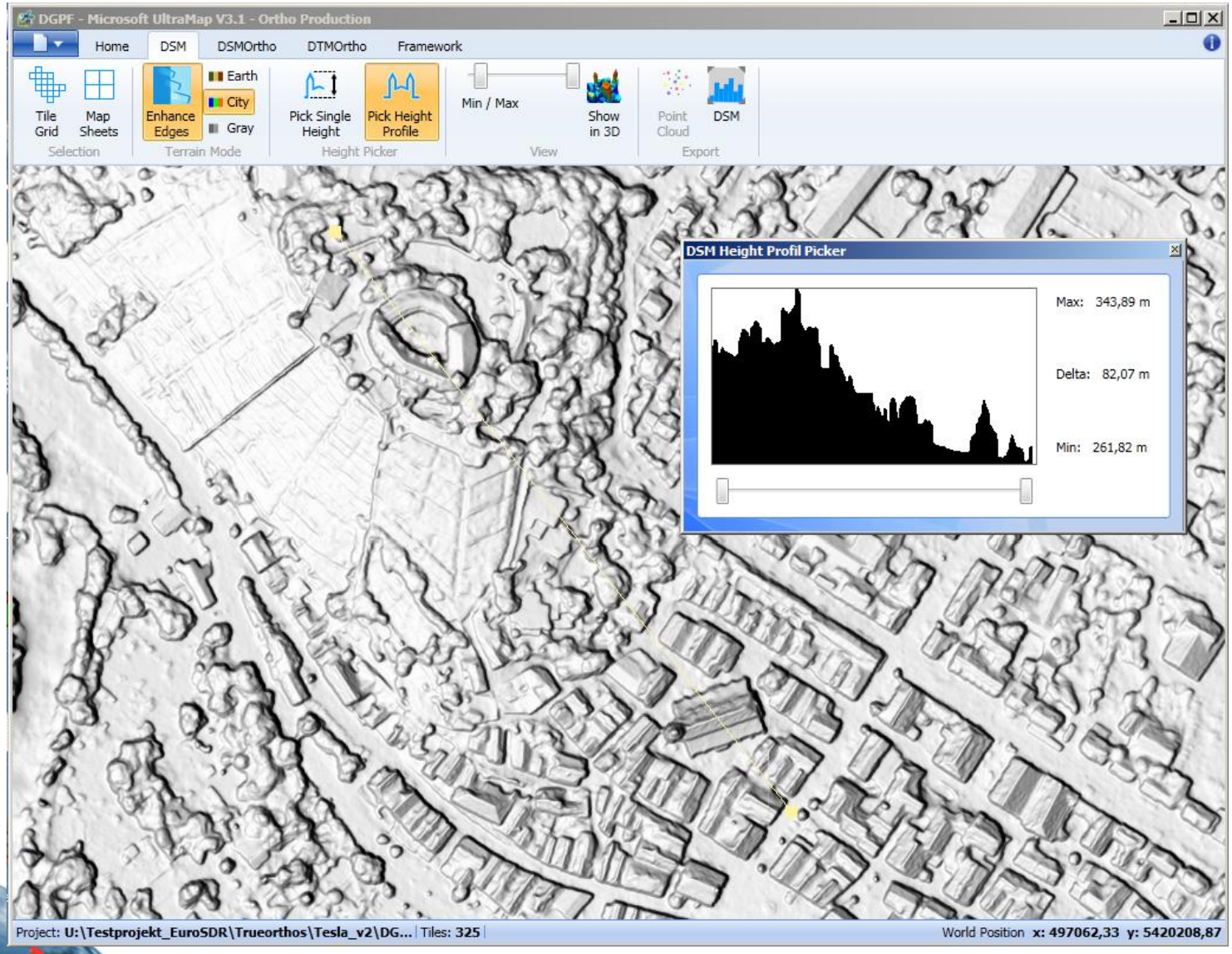
Point cloud-example



Profile –example 1



Profile –example 2



DSM-matching method

1) Range-image computation using image pairs
   (Image based correlation methods are used)

2) Range-image fusion with optimization

3) Representation as 2.5D(DSM) or 3D (point-cloud)

Processing – time for 36 images

Data-ingest …. About 35 min copying lvl02 images to server
(from lvl00: copying 1min from rec
processing lvl02 10min)

AT (tiepoints) … 13 min
AT (bundle) … 1 min (but several iterations)

DSM … 27 min (Tesla)
Output (DSM or pointcloud) … 2 min

(DSM-Ortho … 34 min)

IT environment / computer system

32 Xeon E5-2630/i7 cores - 2,3 GHz

64 Gbyte RAM (DDR3 DIMM 1600MHz) each workstation/server

5 GPU`s (1 Tesla K10, 4 Tesla M2090)

IT environment / storage system

RAID – System (SAS Mega-Raid Controller)

Speed: 7200 RPM

Size: 104 TB

IT environment / network

LAN - Network

Transfer speed : 1 Gb

Competence of operator

Flight design – overlap (ideal 80% / 70%)

Quality of aerial images (free of shadows/clouds..)

Quality of AT

Problems

Many parallel processes -> overload of network (sometimes)

Crash of coordinator -> complete reprocessing of projects

Errors in DSM -> no editing possible at the moment

Summary

Complete workflow with UtraMap (acquisition of images -> DSM)

Scaleable system (licenses / hardware)

Highly automated workflow (important block design/overlap)

Very detailed and accurate DSM (about GSD)

Sometimes problems with missmatches (lakes/rivers)