

Point cloud comparisons with CloudCompare

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Data collected with Erin DiMaggio (PSU) and David Feary (ASU)

Tutorial notes
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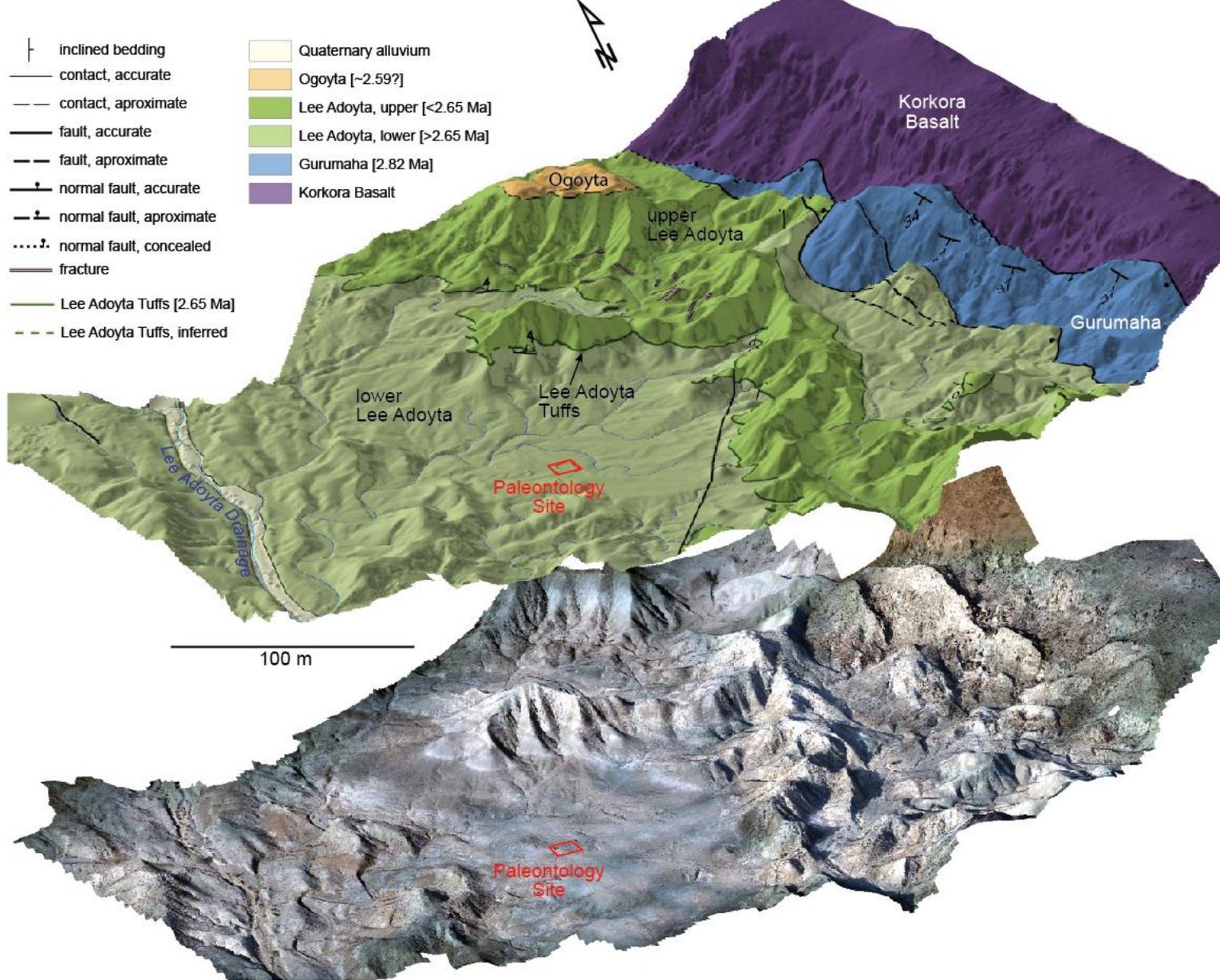
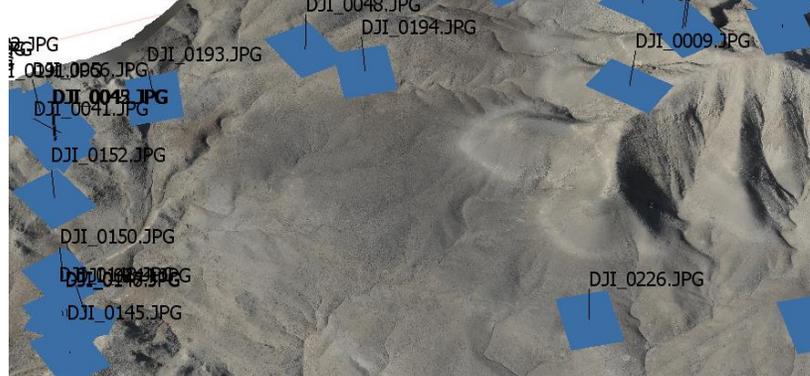


OpenTopography
High-Resolution Topography Data and Tools

Ground control dGPS



DJI Mavic Air images



Detailed geology of Lee Adoyta, Ledi Geraru Research Project Afar Ethiopia:

Rapid acquisition of imagery of deformed fossiliferous and tuff-bearing sedimentary rocks in the Afar region of Ethiopia provide 3D control for paleontological provenance and environmental reconstruction studies

Multiple acquisitions: how do the results compare?

DJI Mavic Air (Arrowsmith)

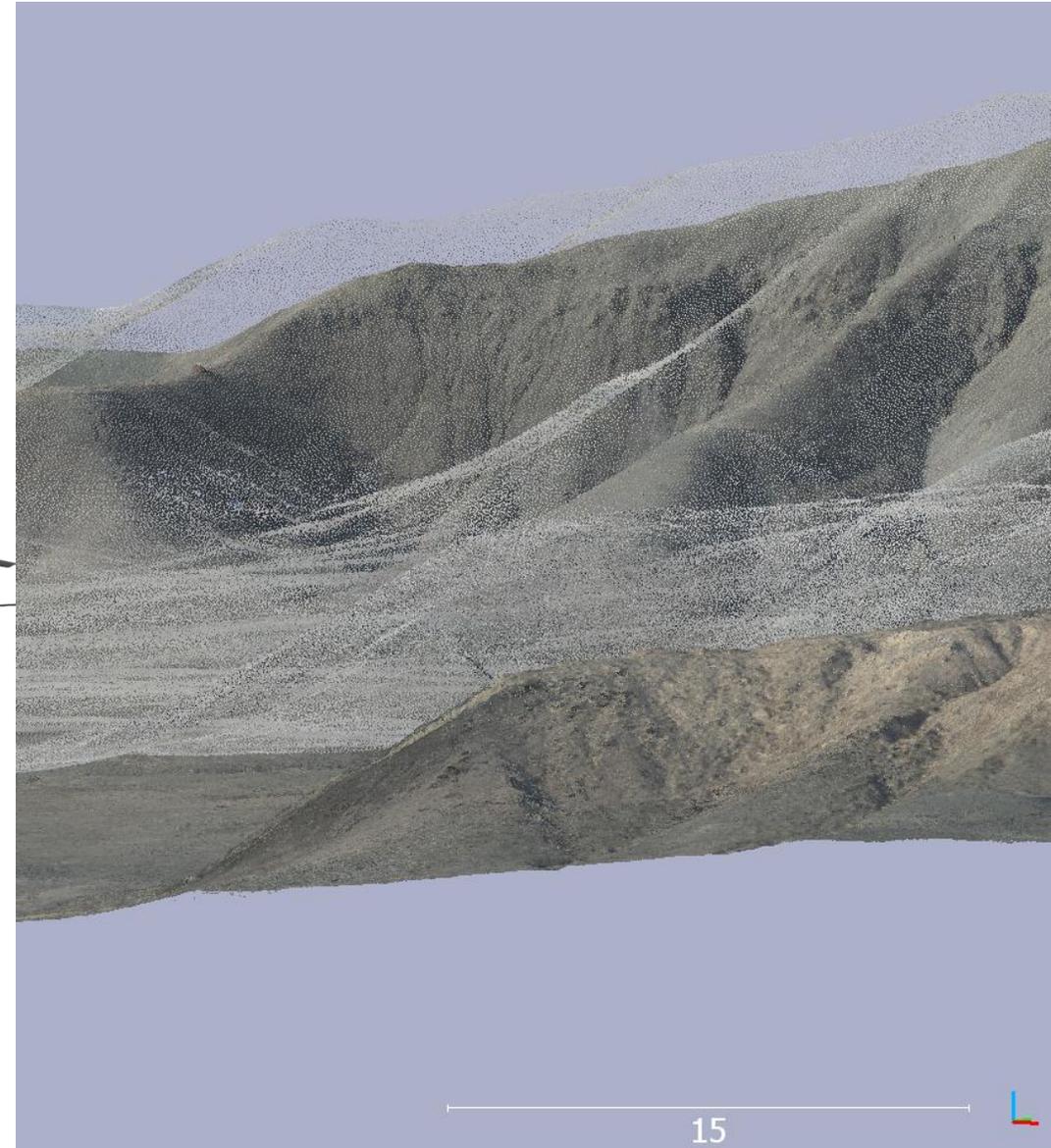


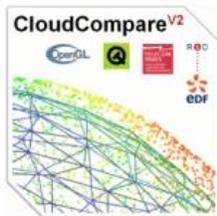
+dGPS georeferencing

DJI Inspire 2 + ZenMuse camera (Feary)



*On board GPS
positioning for cameras*





CloudCompare

3D point cloud and mesh processing software
Open Source Project

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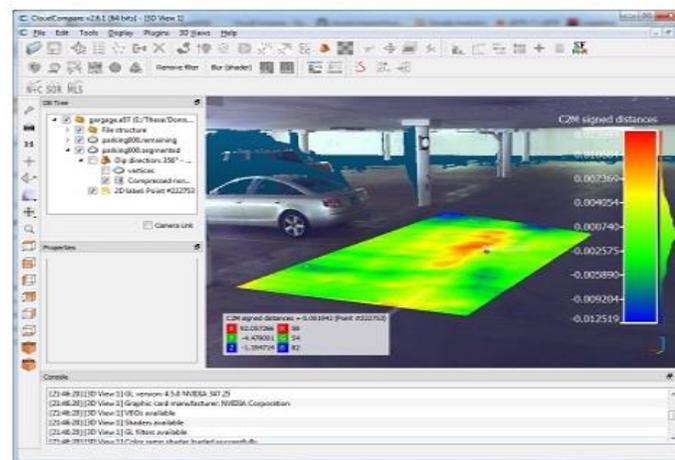
Welcome to the official website of the **CloudCompare** project.

Want to know when a new release comes out? Subscribe to the newsletter

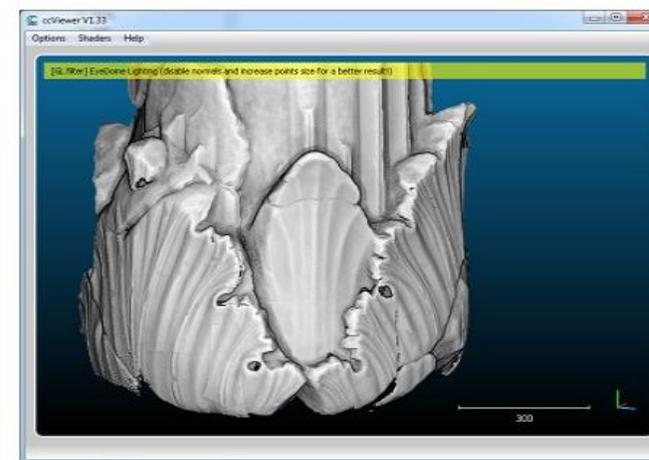
You can now follow us on [twitter](#)

CloudCompare 2020 Developers training & Workshop: March 11-13 2020

[Visit the event page](#)



CloudCompare (view, edit and process)



ccViewer (light viewer only)

Download the short course presentations of the 2nd Virtual Geoscience Conference 2016 (in English) [here](#)

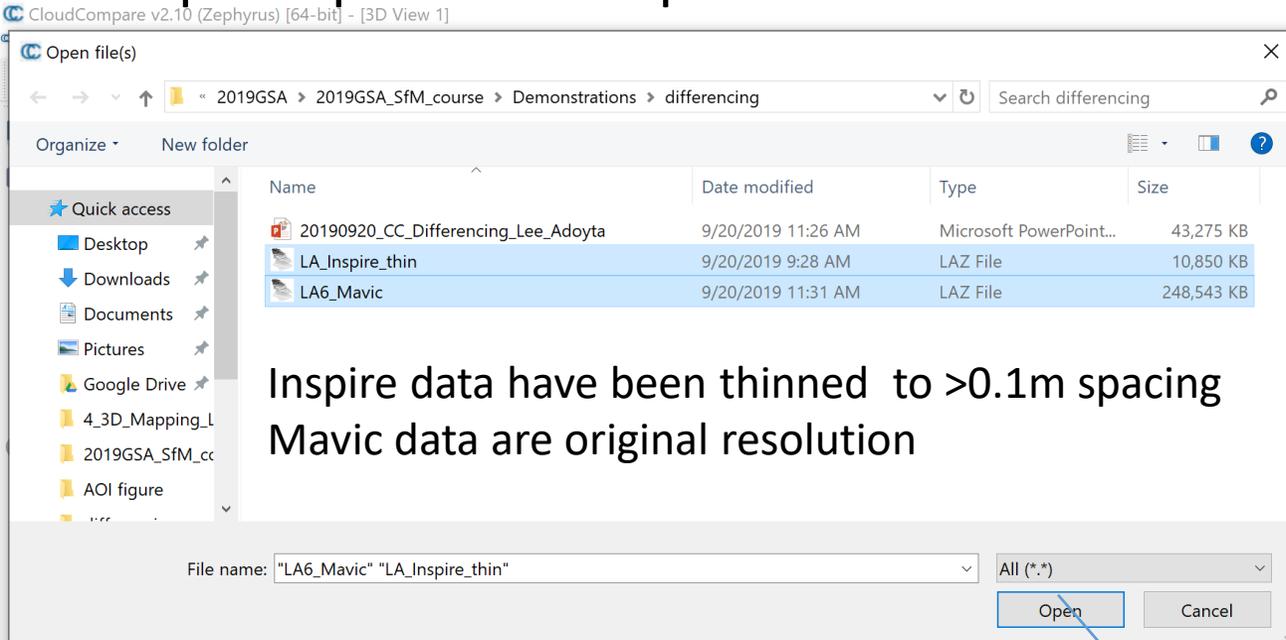
Télécharger le support de formation du congrès de la SFPT 2018 (in French) [ici](#)

CloudCompare and ccViewer currently run on Windows, MacOS and Linux.

You are free to use them for any purpose, including commercially or for education. This freedom is being defined by the [GNU General Public License \(GPL\)](#).

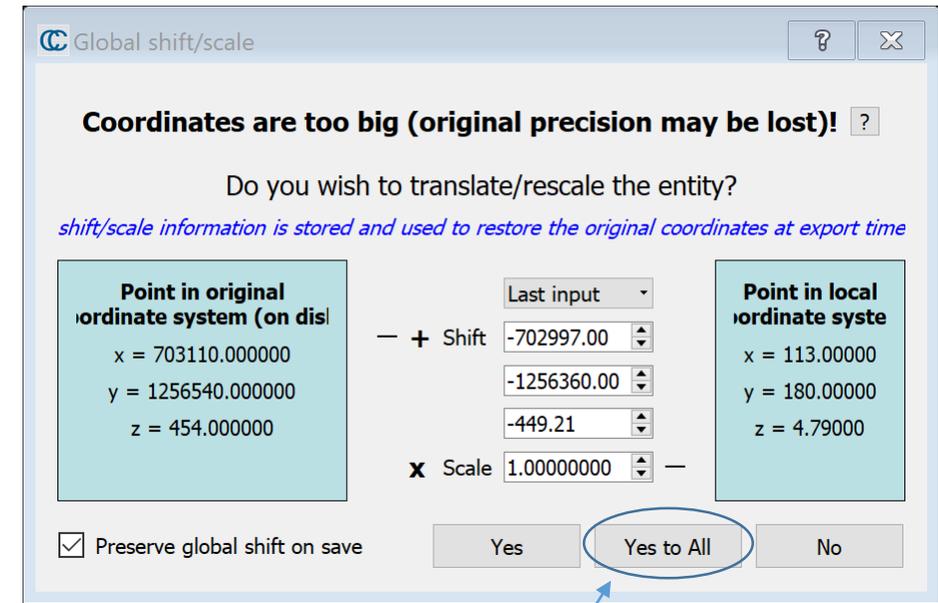
[CloudCompare home](#) - [cloudcompare.org](#) - [EDF R&D](#) - [contact](#)

Step 1: Open the two point clouds in CloudCompare

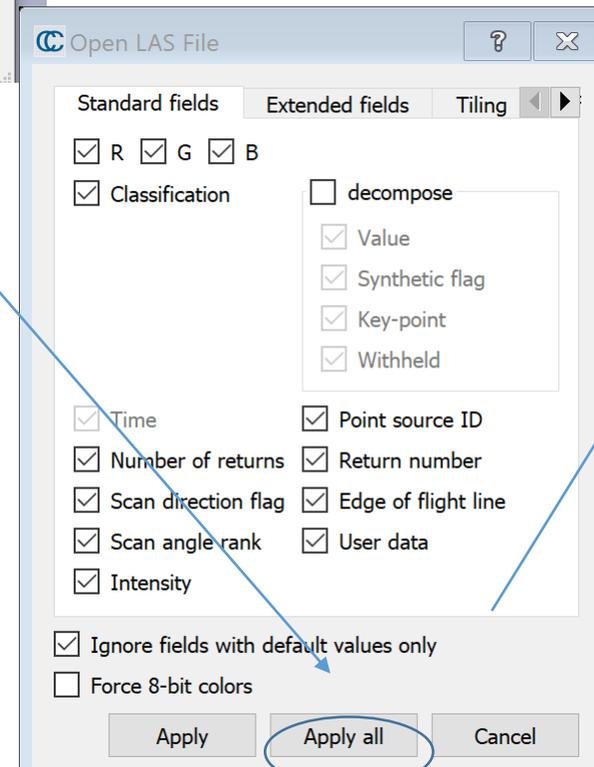


Inspire data have been thinned to $>0.1m$ spacing
Mavic data are original resolution

It is built for opening lidar-derived point clouds which may have many attributes with each point.



More accurate computations with a temporary local origin



Step 2: explore the data and interface

The screenshot displays a 3D point cloud visualization of a volcanic crater. The interface is divided into several panels:

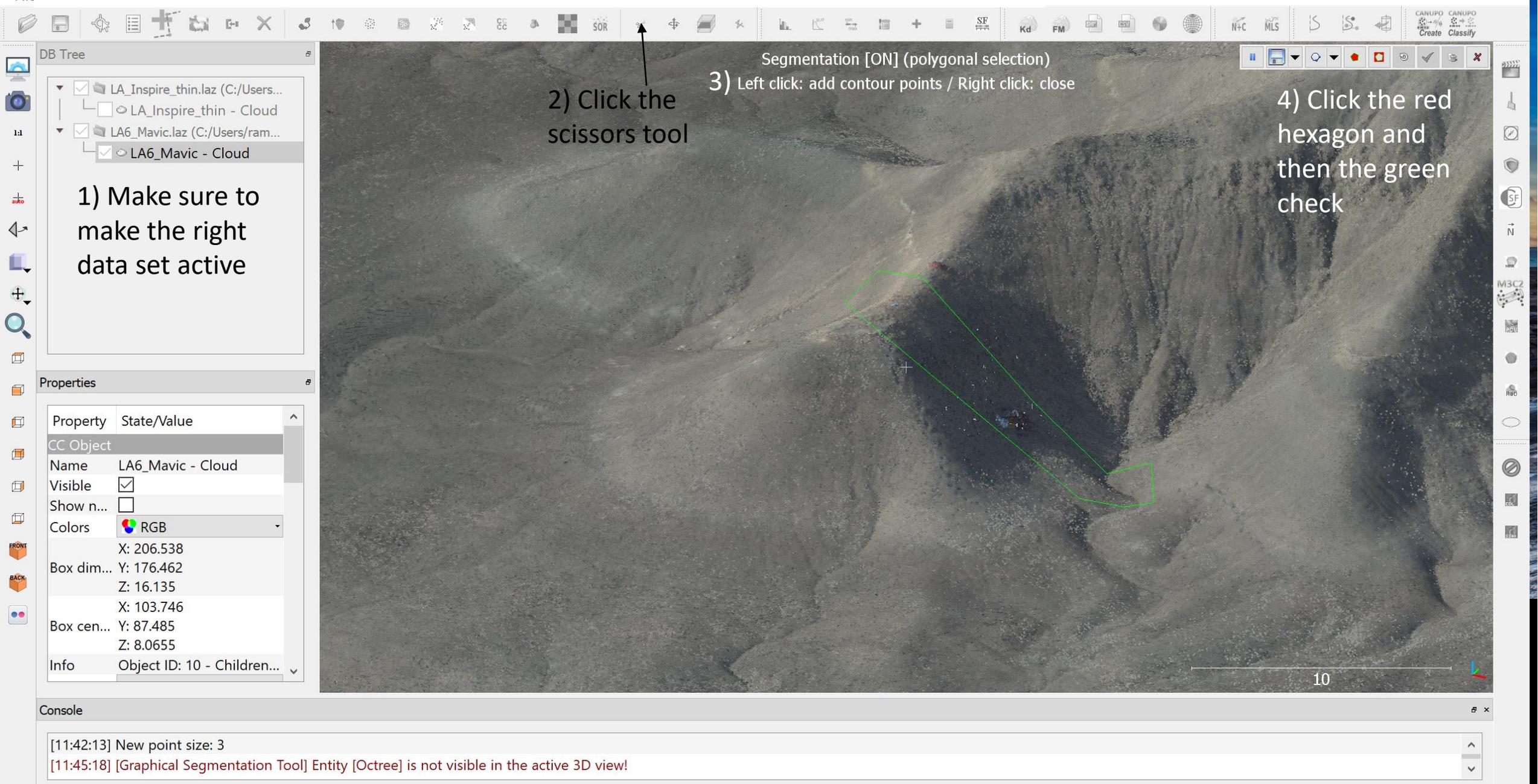
- DB Tree:** Shows a hierarchical list of data layers. A text box overlaid on this panel reads: "Make sure to make the right data set active". The tree includes:
 - LA_Inspire_thin.laz (C:/Users/...)
 - LA_Inspire_thin - Cloud
 - LA6_Mavic.laz (C:/Users/ram...)
 - LA6_Mavic - Cloud
- Properties:** A table showing the properties of the selected object, "LA6_Mavic - Cloud".
- Console:** A log window at the bottom showing system messages.

Property	State/Value
CC Object	
Name	LA6_Mavic - Cloud
Visible	<input checked="" type="checkbox"/>
Show n...	<input type="checkbox"/>
Colors	RGB
X: 206.538	
Box dim... Y:	176.462
Z:	16.135
X: 103.746	
Box cen... Y:	87.485
Z:	8.0655
Info	Object ID: 10 - Children...

Console log:

- [11:42:09] New point size: 2
- [11:42:13] New point size: 3

Step 3: Cut out the hill from both datasets (do each separately)



Step 4: Measure the distance between two common locations

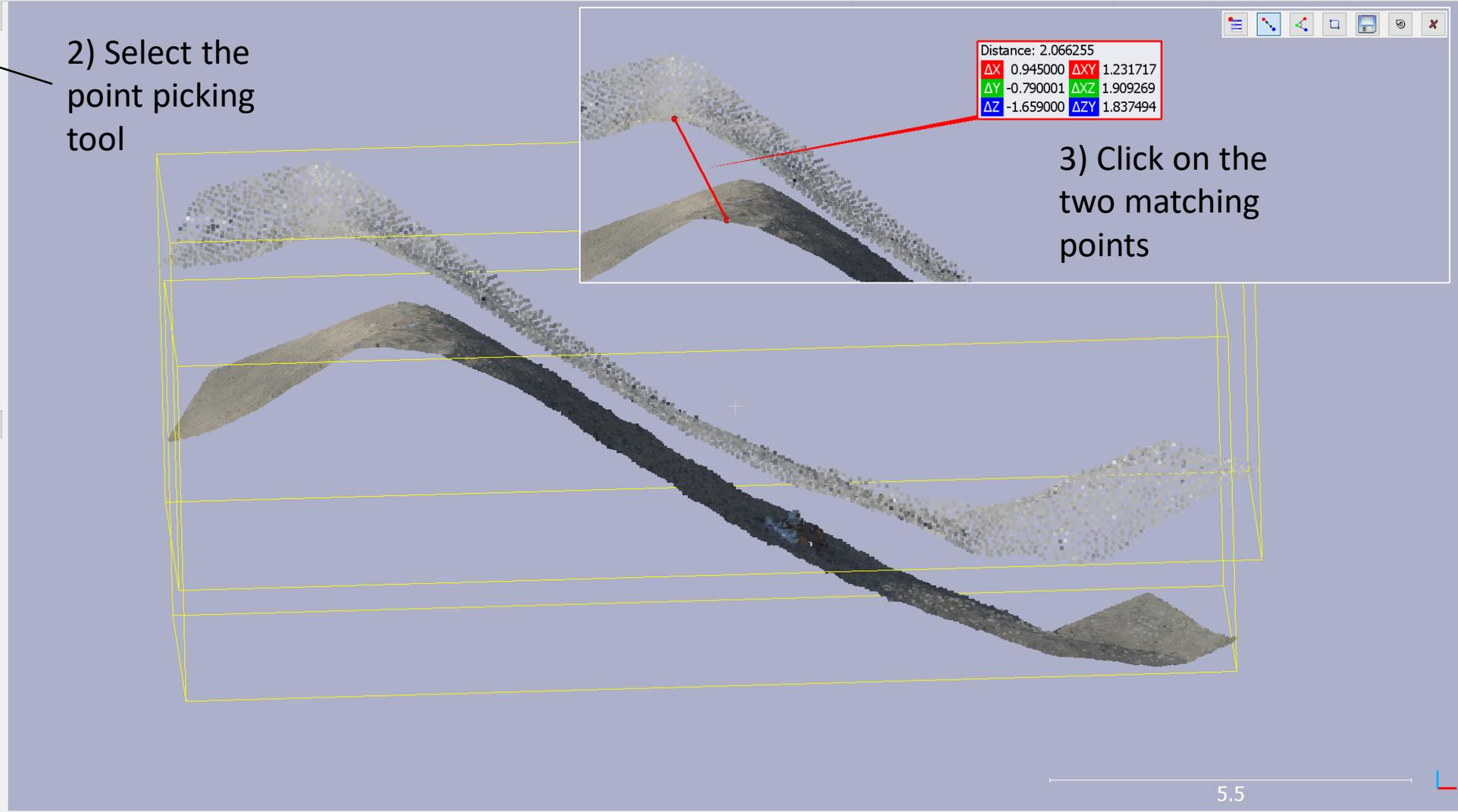


DB Tree

- LA_Inspire_thin.laz (C:/Users/ram...)
 - LA_Inspire_thin - Cloud.r...
 - LA_Inspire_thin - Cloud.r...
- LA6_Mavic.laz (C:/Users/ram...)
 - LA6_Mavic - Cloud.remai...
 - LA6_Mavic - Cloud.segm...
 - Octree

1) Shift click the two cut pieces

2) Select the point picking tool



3) Click on the two matching points

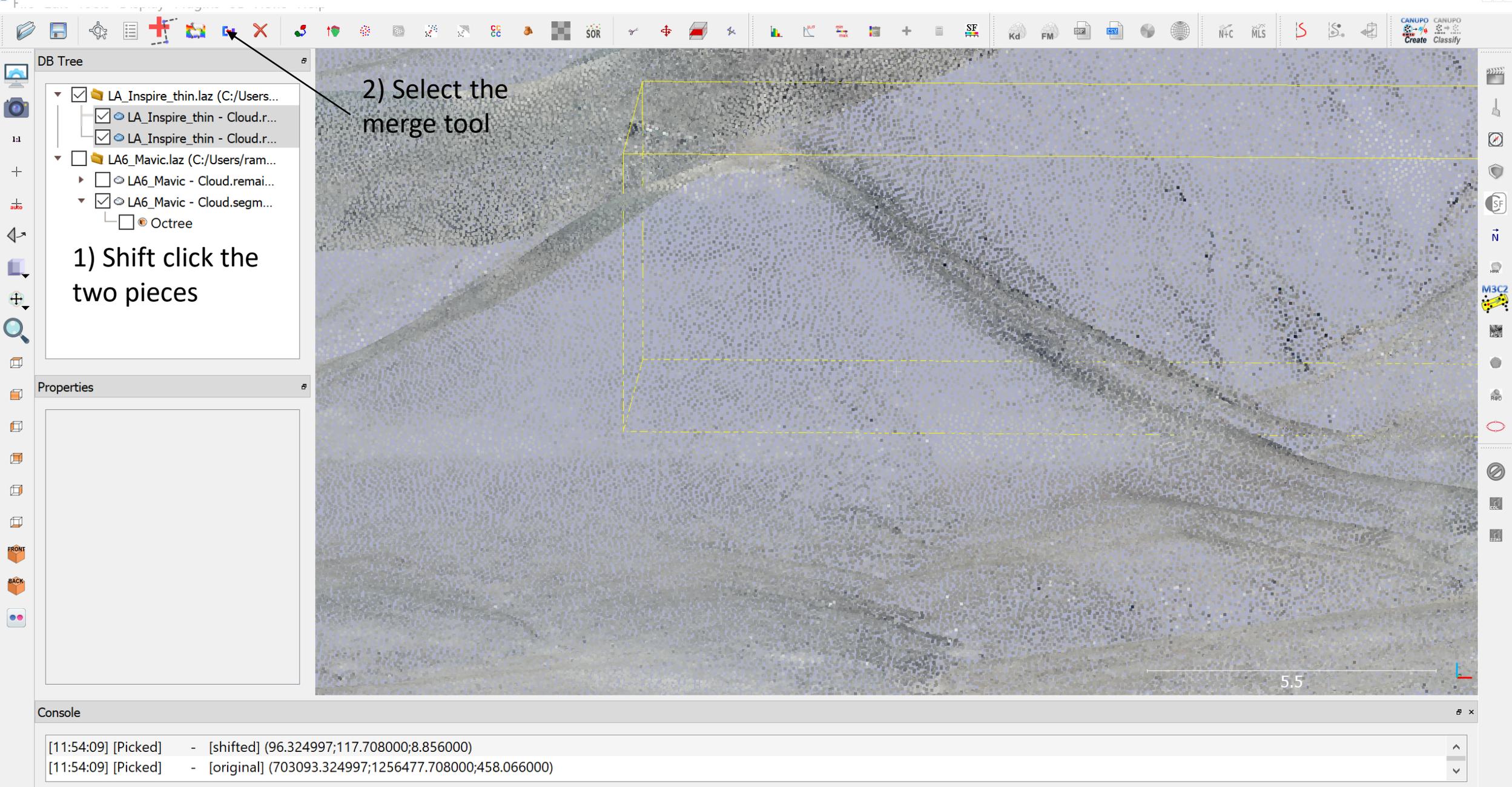
Properties

[Empty property list]

Console

```
[11:51:44] New point size: 4  
[11:51:45] New point size: 5
```

Step 5: Merge the data back together (do each separately)



Step 6: Thin the Mavic data



DB Tree

- LA_Inspire_thin.laz (C:/Users/...
- LA_Inspire_thin - Cloud.r...
- LA6_Mavic.laz (C:/Users/ram...)
- LA6_Mavic - Cloud.remai...

1) Select the Mavic data

Properties

Property	State/Value
CC Object	
Name	LA6_Mavic - Cloud.rem...
Visible	<input checked="" type="checkbox"/>
Show n...	<input type="checkbox"/>
Colors	RGB
X: 206.538	
Box dim... Y: 176.462	
Z: 16.135	
X: 103.746	
Box cen... Y: 87.485	
Z: 8.0655	
Info	Object ID: 10 - Children...

default point size --+
default line width - +

2) Select the subsample tool

Cloud sub sampling

Sampling parameters

method

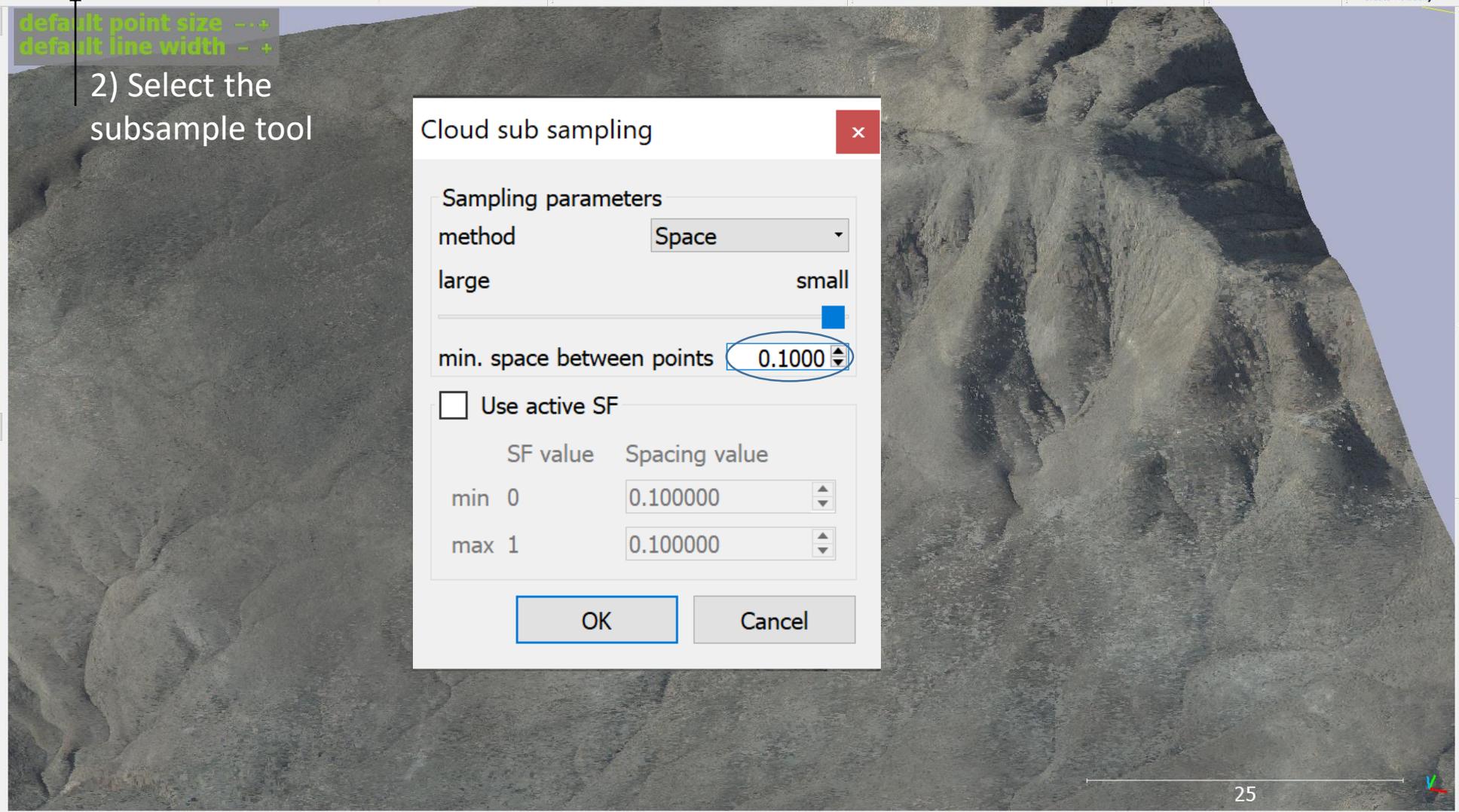
large

min. space between points

Use active SF

	SF value	Spacing value
min 0	<input type="text" value="0.100000"/>	<input type="text" value="0.100000"/>
max 1	<input type="text" value="0.100000"/>	<input type="text" value="0.100000"/>

OK Cancel



Console

```
[11:59:24] [LoD][pass 2] Level 10: 710291 cells (+390614)  
[11:59:24] [LoD] Acceleration structure ready for cloud 'LA6_Mavic - Cloud.remaining' (max level: 10 / mem. = 57.45 Mb / duration: 10.9 s.)
```

Step 7: Cloud to cloud distance between the two datasets



DB Tree

- LA_Inspire_thin.laz (C:/Us...
 - LA_Inspire_thin - Clou...
- LA6_Mavic.laz (C:/Users/r...
 - LA6_Mavic - Cloud.re...
 - LA6_Mavic - Cloud.re...

1) Select the two datasets

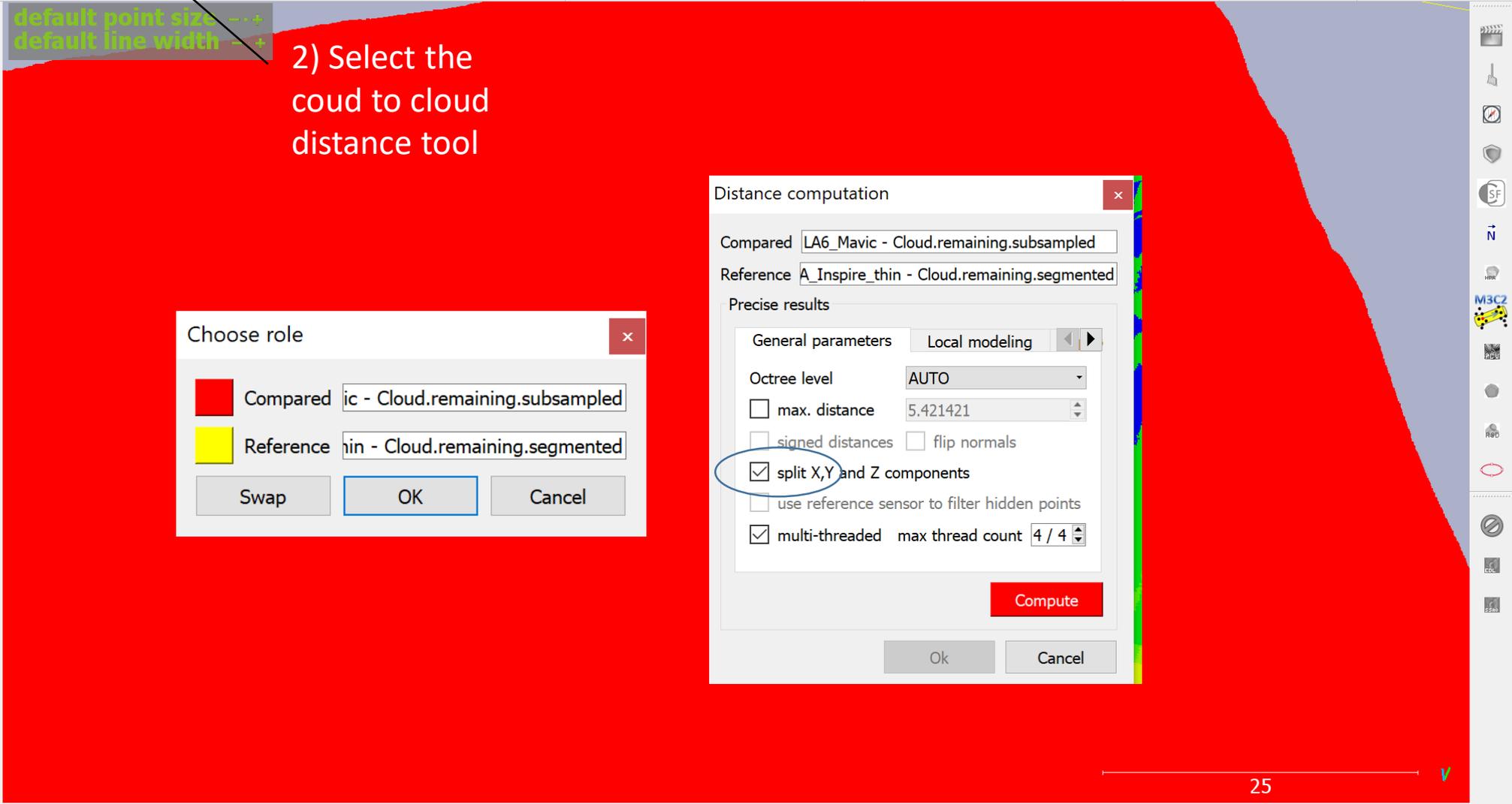
Properties

FRONT

BACK

Console

```
[11:59:24] [LoD] Acceleration structure ready for cloud 'LA6_Mavic - Cloud.remaining' (max level: 10 / mem. = 57.45 Mb / duration: 10.9 s.)  
[12:02:07] [Subsampling] Timing: 23.454 s.
```



default point size
default line width

2) Select the cloud to cloud distance tool

Choose role

Compared LA6_Mavic - Cloud.remaining.subsampled

Reference LA_Inspire_thin - Cloud.remaining.segmented

Swap OK Cancel

Distance computation

Compared LA6_Mavic - Cloud.remaining.subsampled

Reference LA_Inspire_thin - Cloud.remaining.segmented

Precise results

General parameters Local modeling

Ocree level AUTO

max. distance 5.421421

signed distances flip normals

split X,Y and Z components

use reference sensor to filter hidden points

multi-threaded max thread count 4 / 4

Compute

Ok Cancel

25

Step 7: Cloud to cloud distance between the two datasets

The screenshot displays the CloudCompare interface. The main 3D view shows a point cloud of a terrain, color-coded by distance. A histogram window titled "Histogram [LA6_Mavic - Cloud.remaining.sub...]" is open, showing "C2C absolute distances (1474827 values) [256 classes]". The histogram's x-axis is labeled "C2C absolute distances" and ranges from 0 to 4.8, with major ticks at 0.8, 1.6, 2.4, 3.2, 4, and 4.8. The y-axis is labeled "Count" and ranges from 0 to 12000, with major ticks at 0, 2000, 4000, 6000, 8000, 10000, and 12000. The histogram shows a distribution that peaks around 2.4 and tapers off towards 4.8.

The DB Tree on the left shows the following structure:

- LA_Inspire_thin.laz (C:/Us...
 - LA_Inspire_thin - Clou...
- LA6_Mavic.laz (C:/Users/r...
 - LA6_Mavic - Cloud.re...
 - LA6_Mavic - Cloud.re...

The Properties panel shows the following details for the selected object:

Property	State/Value
Info	Object ID: 37 - Child...
Current ...	3D View 1
Cloud	
Points	1,474,827
Global s...	(-702997.00;-125636...
Global s...	1.000000
Point size	Default
Scalar Fields	
Count	8
Active	C2C absolute distanc
Color Scale	
Current	Blue>Green>Yel

The Console at the bottom shows the following output:

```
[12:06:01] [ComputeDistances] Mean distance = 2.711134 / std deviation = 1.155215  
[12:06:01] [ComputeDistances] Result has been split along each dimension (check the 3 other scalar fields with '_X', '_Y' and '_Z' suffix!)
```