An introduction to 3D analysis on point cloud data
3D点群データ解析入門

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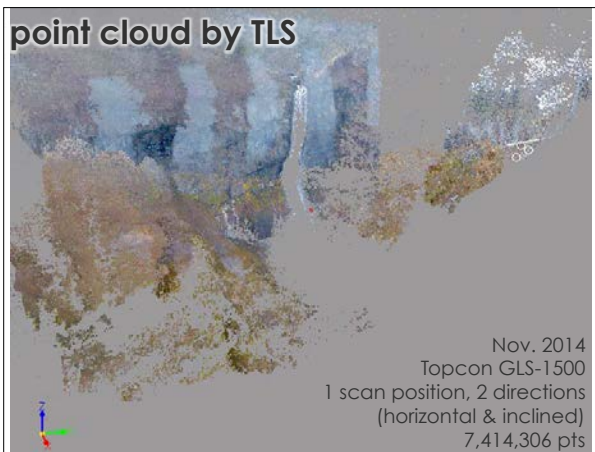
東京大学 空間情報科学研究センター
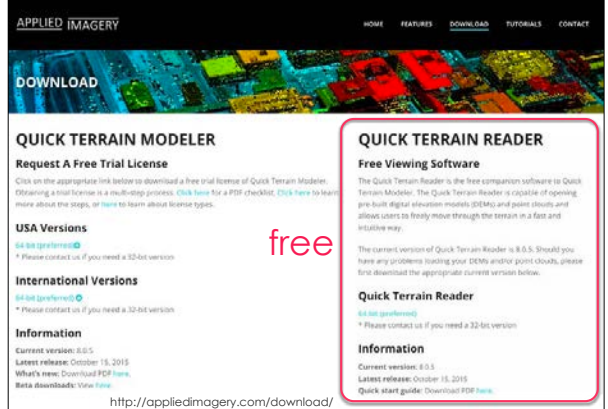Center for Spatial Information Science The University of Tokyo

地上レーザスキャナ　TLS

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Kegon Falls
日光華厳滝

華厳滝 Kegon Falls TLS x UAS

UAV flight at Kegon Falls

https://vimeo.com/111282633

point cloud by TLS

Nov. 2014
Topcon GLS-1500
1 scan position, 2 directions
(horizontal & inclined)
7,414,306 pts

point cloud viewer: Quick Terrain Reader
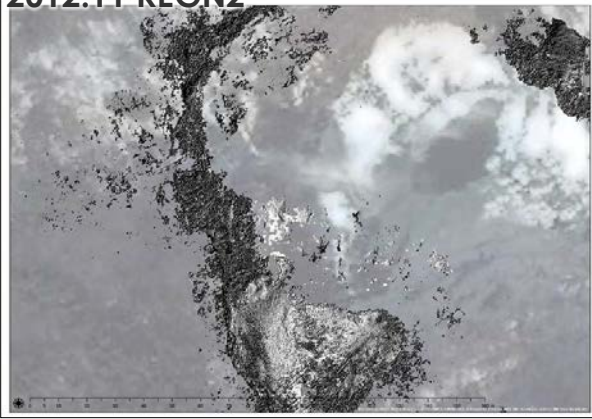

free

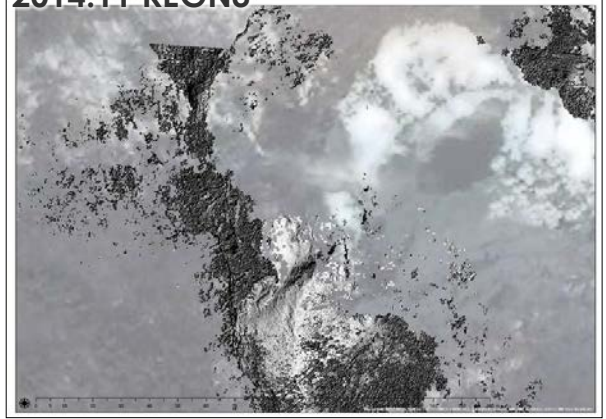http://appliedimagery.com/download/

visual comparison: 2012 to 2014

comparison by DEM (2D)

2012.11 KEGN2

2014.11 KEGN3

difference KEGN2 – KEGN3

mainstream
erosion by lower falls (Juuni-taki)?
gully (obvious)
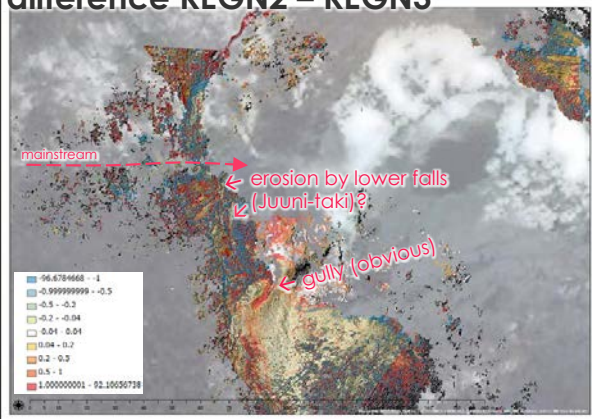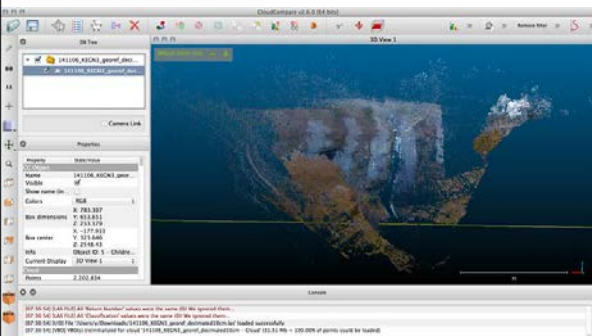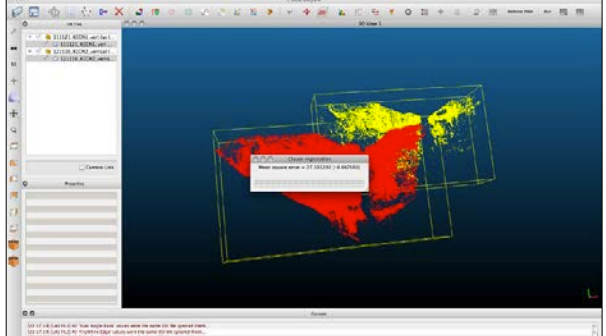
comparison by point cloud (3D)
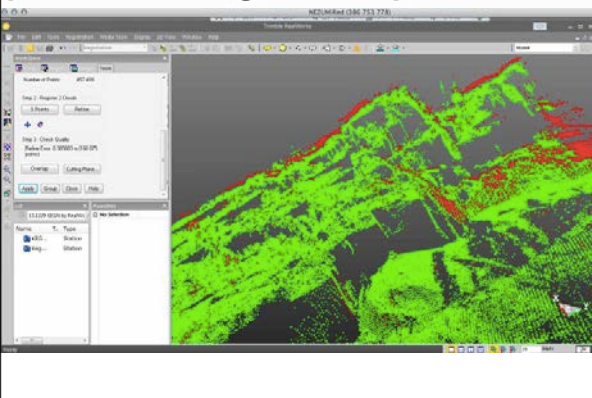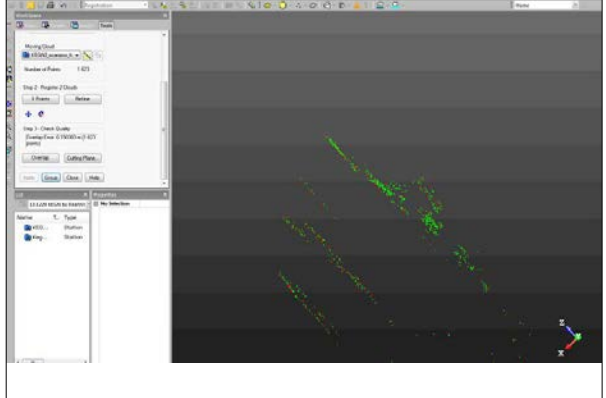

CloudCompare

free, works with Win and Mac

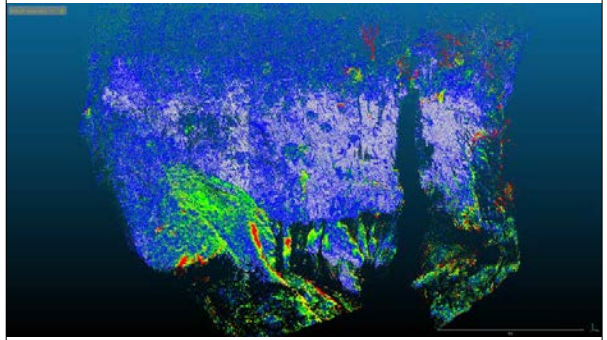point cloud alignment by CloudCmpare

point cloud alignment by RealWorks

point cloud alignment by RealWorks

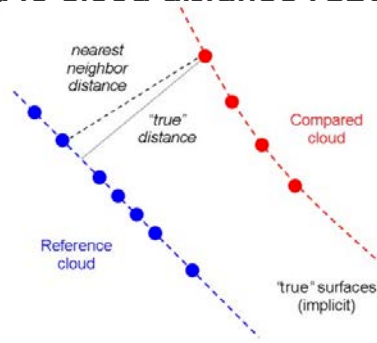## point cloud 2012

M3C2 distance 2012 → 2014

cloud to cloud distance (C2C)

nearest neighbor distance

"true" distance

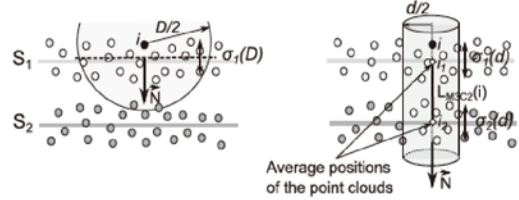Compared cloud

Reference cloud

"true" surfaces (implicit)

The default way to compute distances between two point cloud is the 'nearest neighbor distance': for each point of the compared cloud, CloudCompare searches the nearest point in the reference cloud and computes their (euclidean) distance.
http://www.cloudcompare.org/doc/wiki/index.php?title=Distances_Computation

M3C2 distance

a | Principle of the Multiscale Model to Model Cloud Comparison M3C2

Step 1 : Calculation of normal N at a scale D around the core point i.

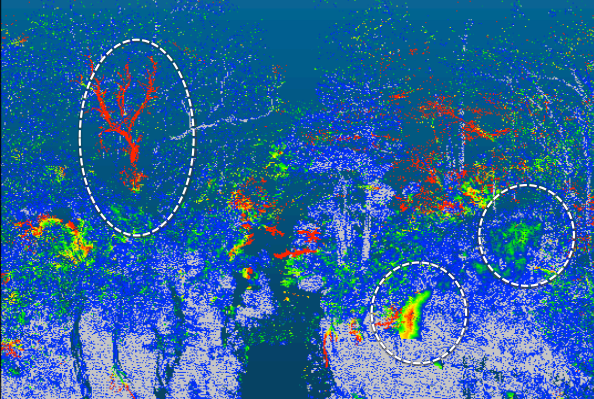Step 2 : Average distance between the two clouds measured at a scale d along N

Average positions of the point clouds

(Lague et al., 2012)

2012

2014

2012→2014

2012

2014

this process was detected ➡

Future collapse (200–300 y?)
Present
Before 1986 collapse
Platy joints
Columnar joints
Upper andesite
Upper agglomerate
Lower andesite
Lower agglomerate
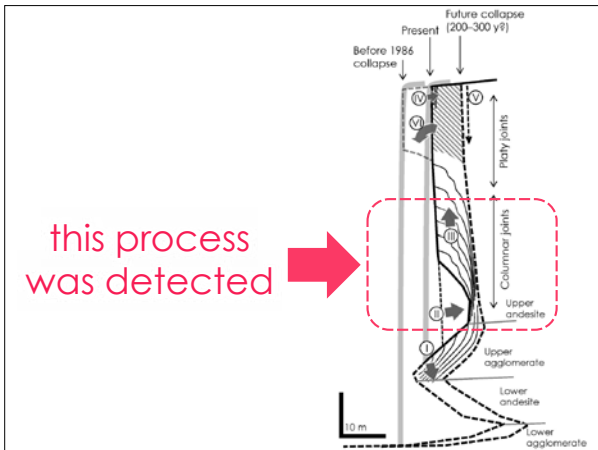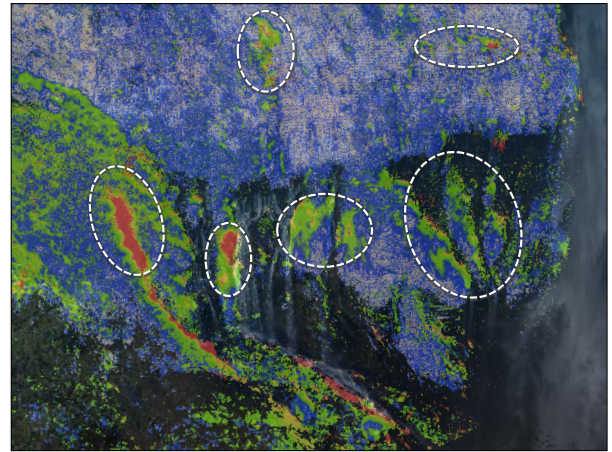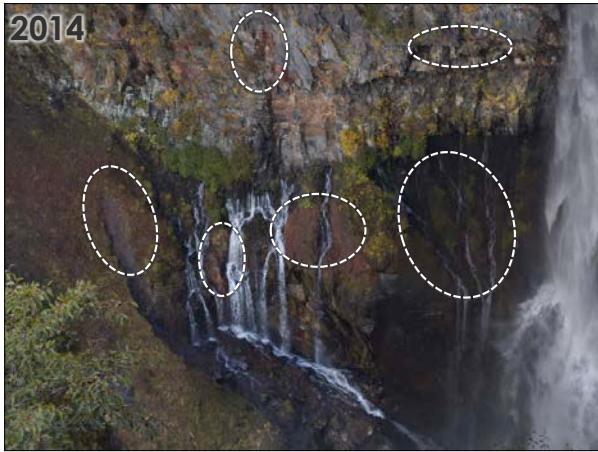10 m

potential of cloud-based analysis

- 3D shape comparison
  (as demonstrated)
  – C2C distance
  – M3C2 distance
- 3D shape characteristics
  – surface roughness
- material classification
  – CANUPO
- noise reduction

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