Geological mapping on TLS point cloud and fold modelling: The Dents-du-Midi massif (Switzerland)

Battista Matasci, Dario Carrea, Michel Jaboyedoff, Richard Metzger, Florian Humair, Antonio Abellan, Pierrick Nicolet

Institute of Earth Sciences, University of Lausanne
Terr@num, 35 bis rue de l’Industrie, 1030 Bussigny, Switzerland
Objectives

First part: *remote geological mapping*

- The Dents-du-Midi massif
- Terrestrial Laser Scanning point clouds Intensity
- A method to remotely map lithologies and geologic contacts in 3D using Coltop3D software

Second part: *fold modelling*

- Fold axis characterization based on TLS data
- Fold surface reconstruction with Matlab
The Dents-du-Midi massif

First part: remote geological mapping
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• Geology mapped by Elie Gagnebin in 1928
• Frontal part of the sedimentary Morcles Nappe of the Helvetic alpine realm
• Lower Cretaceous to Oligocene limestones

First part: remote geological mapping
Terrestrial Laser Scanning point clouds Intensity

- Terrestrial Laser Scanning with an Optech Ilris Long range
- 9 cm point spacing scan
- Polyworks
- Alignment on HRDEM (Swisstopo)

First part: remote geological mapping
Terrestrial Laser Scanning point clouds Intensity

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First part: remote geological mapping
Fold axis characterization based on TLS data

Second part: fold modelling
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Fold axis characterization based on TLS data

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Fold axis characterization based on TLS data

Fold axis plunging slightly to the NE:
043° / 13°

Coltop3D

Second part: fold modelling
Fold surface reconstruction with Matlab

Picked points along the stratigraphy

Fold axis: 043° / 13°

Second part: fold modelling
Conclusions

Advantages

• TLS: The possibility to collect a large number of measurements on inaccessible and vertical areas.
• Coltop3D: Fast and accurate way of mapping geological limits to build a 3D geological model
• Dynamic visualization of 3D geological information

Limitations

• Not completely remote method. Preliminary field work is necessary to characterize the rocktypes.
• This mapping method is still largely manual. Thus it can be applied only to relatively simple geological settings

Perspectives

• Complete correction of intensity data should be performed to improve the lithologies differentiation: according to the distance from the scanner and to the angle of intersection between the beam and the topography
• Automatic geological mapping
Thank you for your attention!!