A blended learning approach to structural field mapping: combining local geology, virtual geology, and web-based tools

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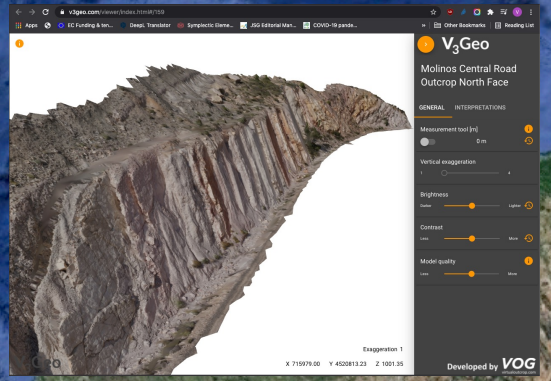
EGU2021-3581 Wednesday, 27 Apr 2021 11:51AM

Blended real + virtual field mapping classes

- Metamorphics in Mittlerhein and Ahr valley, sediments near Tübingen
- J-K sediments at Molinos, Spain

Georeferenced 3D outcrop models served via V3Geo.com



STRABOSPOT DATA DOWNLOAD

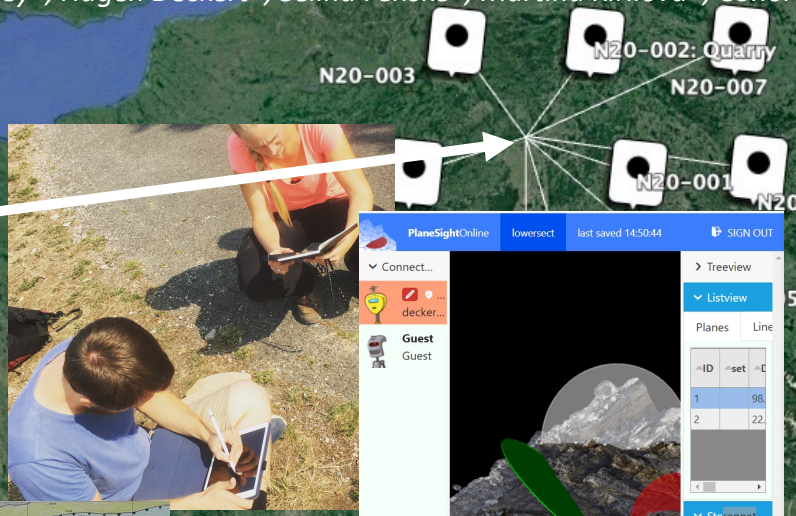


Image P231 Image M20-002

We are developing new web-based tools to measure structural orientations from 3D outcrop models

Students were given a massive dataset of field structural measurements, photographs, and real samples from Molinos

Good outcomes

- Some actual fieldwork could still be carried out!
- Students could compare real and virtual geology in some outcrops
- Enhanced uptake of digital methods by students
- Structure contouring was used much more than in real field classes

Things to improve

- Higher resolution DEMs needed than GE provides
- Students' structural interpretations were limited
- Insufficient field experience

Google Earth

32 U 439577.67 m E 5502385.77 m N elev 0 m eye alt 2298.83 km

DIGITAL MAPPING AT MOLINOS, SPAIN

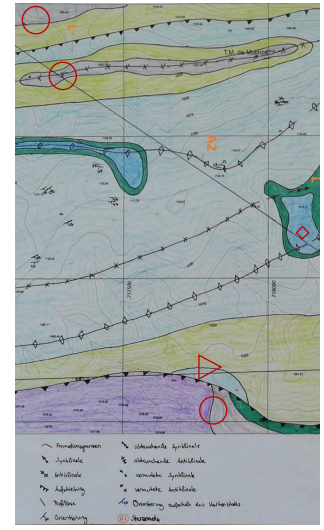
Contact sebastian.mutz@uni-tuebingen.de

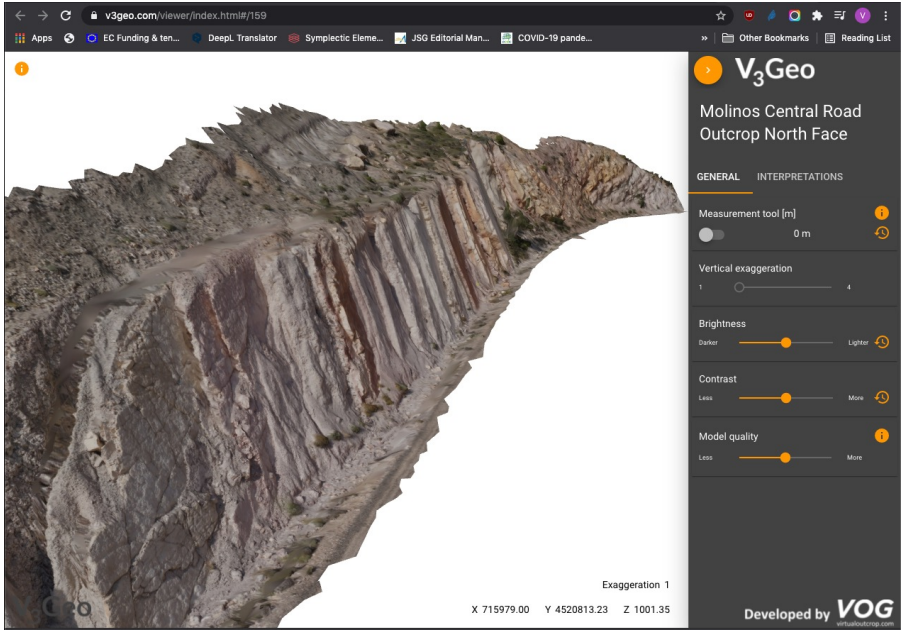
Tutors acquired structural measurements and photographs in the field employing StraboSpot and Fieldmove. We also gathered representative samples.

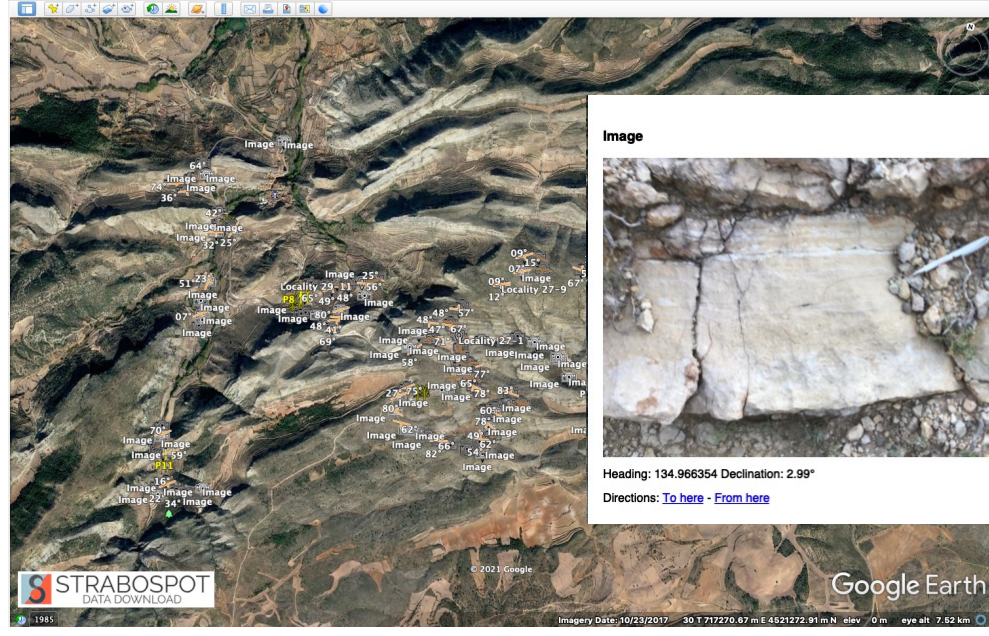
These were migrated to Google .kmz files and provided to students

- Sample photos
- Overview photos
- Supplemented by *georeferenced* 3D outcrop models served via v3Geo.com

We also led them to interpret geological units based on their distinct appearance in aerial images and on Google Earth. A higher resolution DEM in GoogleEarth would be valuable.







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IN PERSON MAPPING OF METAMORPHIC ROCKS IN THE AHRTAL AND MITTELRHEIN

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Contact virginia.toy@uni-mainz.de

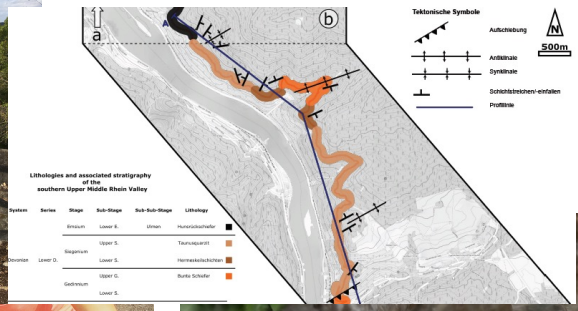
Students were mostly able to access field sites on day trips using public transport or by bicycle.

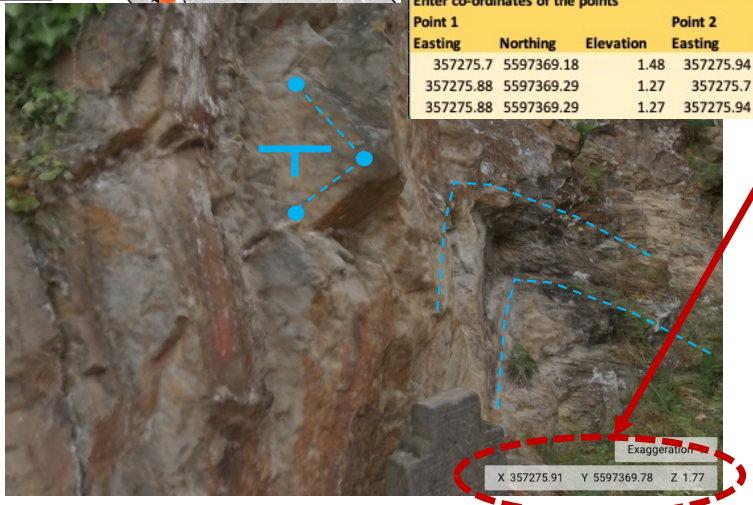
Students really appreciated learning about their local geology!

At Ahrtal, we visited sites where we also had 3D outcrop models, so students could compare their own real structural measurements to ones they derived from the 3D outcrop model.

We were stimulated to teach the students to use digital mapping tools to acquire field data, such as StraboSpot and Stereonet11 Apps. We observed these tools, and others we were unaware of, being used in combination with traditional paper and compass during the real mapping exercise.

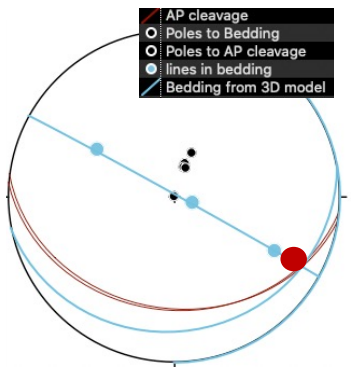
The foliated metamorphic rocks of the Mittlerhein, which are dissected by faults, and comprise lithologies that are challenging to subdivide, are not ideal for a student *mapping* exercise, but *are* excellent for structural mapping.





Co-ordinate system	Universal Transverse Mercator (UTM)	Zone 32U	*Units are metres*						Y	Nort	Geographic E	00/090
ONLY MODIFY / ENTER DATA INTO THE EMPTY PALE YELLOW FIELDS BELOW!!!									Z	- (el	Into the Earth (	90/000
Enter co-ordinates of the points											Output line orientation	
Point 1			Point 2						L2d=Line length	Line length (	Qua	Azimuth (deg)	Plunge (deg)
Easting	Northing	Elevation	Easting	Northing	Elevation	dX	dY	dZ	SQRT(dX^2+dY^	SQRT(dX^2+dY^2+		DEGREES(ATAN	DEGREES(ATA
357275.7	5597369.18	1.48	357275.94	5597369.31	1.65	0.24	0.13	0.17	0.27	0.32	1	118.4	31.9
357275.88	5597369.29	1.27	357275.7	5597369.18	1.48	-0.18	-0.11	0.21	0.21	0.30	3	301.4	44.9
357275.88	5597369.29	1.27	357275.94	5597369.31	1.65	0.06	0.02	0.38	0.06	0.39	1	108.4	80.6

Coordinates of 3 points on a plane ●
→ trend/plunge of linking lines - - calculated
→ stereonet plot
→ bedding orientation ⊤
→ beta plot
→ hinge line ● → map!



PLANESIGHT WEB

Web-based tools to extract structural data from 3D outcrop models and enable collaborative work. Online version currently in development. Contact deckert@igem-energie.de

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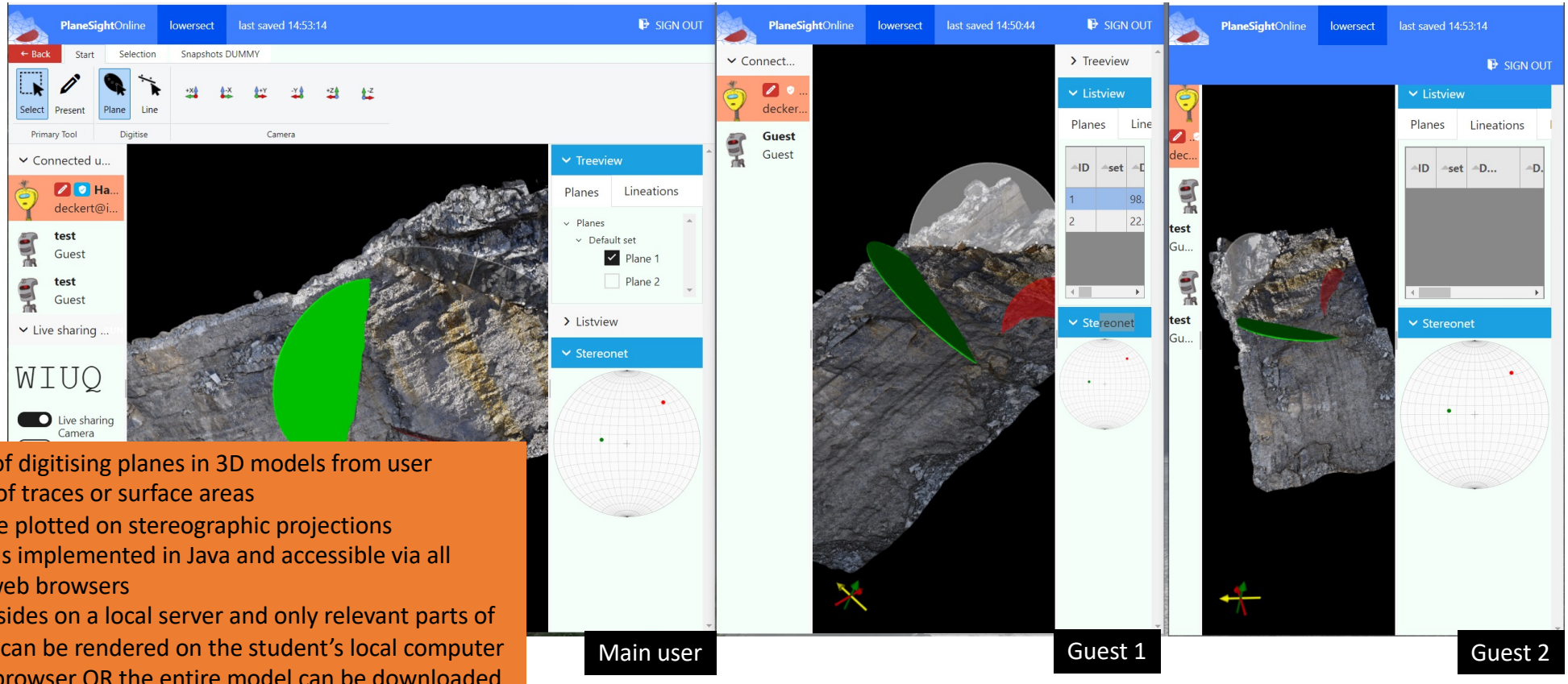


- Capable of digitising planes in 3D models from user definition of traces or surface areas
- Planes are plotted on stereographic projections
- Program is implemented in Java and accessible via all common web browsers
- Model resides on a local server and only relevant parts of the model can be rendered on the student's local computer via a web browser OR the entire model can be downloaded to their local machine
- The program functions in both 'demonstration mode' where students merely observe the teacher working on the model, and 'collaborative editing mode' where students can make and commit measurements back to the server

Main user /administrator.

- Loads the model.
- Invites guests to session.
- Has rights to digitise.
- Can hand over rights to another user.

Guests.

- Can see online, what the main user is doing.
- Can move/rotate model (no effect on other users).
- Cannot digitise planes/lines (only if permitted by admin).

DO YOU WANT TO PUBLISH YOUR VIRTUAL FIELDTRIP?

Making a virtual field trip or other teaching resource takes time. That's time you could have spent writing papers. Fortunately, you can still get credit and recognition for that time by publishing your work! Another benefit is that your work will be peer-reviewed, enhancing its quality.

You can (and should) submit your work to one of these journal special issues:

- Solid Earth/Geoscience Education "Virtual Geoscience Education Resources"
- Journal of Structural Geology "Virtual Structural Geology"

Logistics: You will need to write a manuscript describing your contribution, such as:

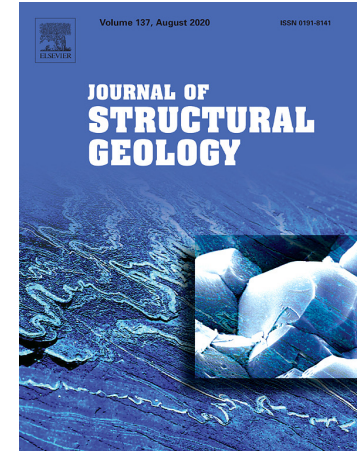
- Descriptions of the excursions themselves
- Descriptions of methods of delivery
- Research evaluating the educational outcomes of the work

Submission from ~Sept 2021 – mid 2022

Both special issues will have mechanisms for you to upload or link to videos, photos, google KMZ files, and we can advise you how to establish repositories for 'solutions'.

For further questions contact:

- Solid Earth /Geoscience Education: A. Prof. Marlene Villeneuve, Prof. Simon J. Buckley, Prof. Steven Whitmeyer
- JSG: Dr. Clare Bond, Dr. Sandra McLaren, A. Prof. Nicolas Barth



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