

MOIRY VALLEY

virtual fieldwork

WORKSHEET 1

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University
of Worcester



Moiry Valley Virtual Fieldwork

Worksheet 1

Academic Level

Undergraduate (introductory) / School (advanced)

Pre-requisites

Students should have at least a basic understanding of glaciers and glacial geomorphology.

Themes

- » glacier retreat and landscape change
- » supraglacial environment and processes (e.g. debris, meltwater, crevasses)
- » landforms of glacial erosion
- » landforms associated with weathering and mass wasting in mountains
- » the impact of humans on the landscape

Resources required

PC, Mac or tablet with good internet connection. Some of the activities in Part 1 involve measuring lengths and areas by on-screen tracing of features on the *swisstopo* website. This is easier with a mouse, but these particular activities can be skipped if necessary. The same applies when annotating screenshots from the virtual field trip using the drawing tools in software such as PowerPoint, Word or similar.

Additional Information

This document is also available as a Word file, which makes it easier to adjust the academic level and worksheet length. Please contact the author for this.

A limited number of printed, full-colour, re-usable worksheets are available to support schools and colleges who teach A-level Geography students in the UK. Please contact the author for more details.

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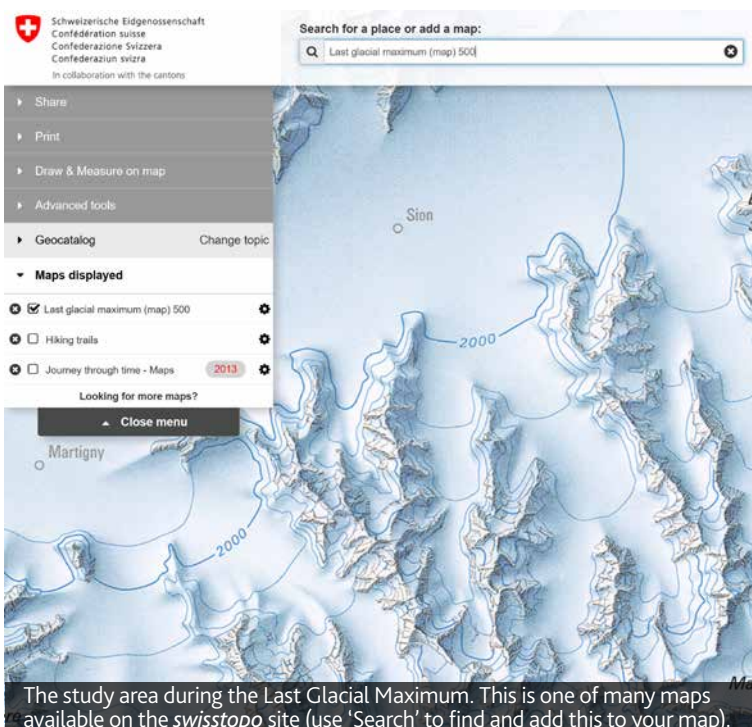
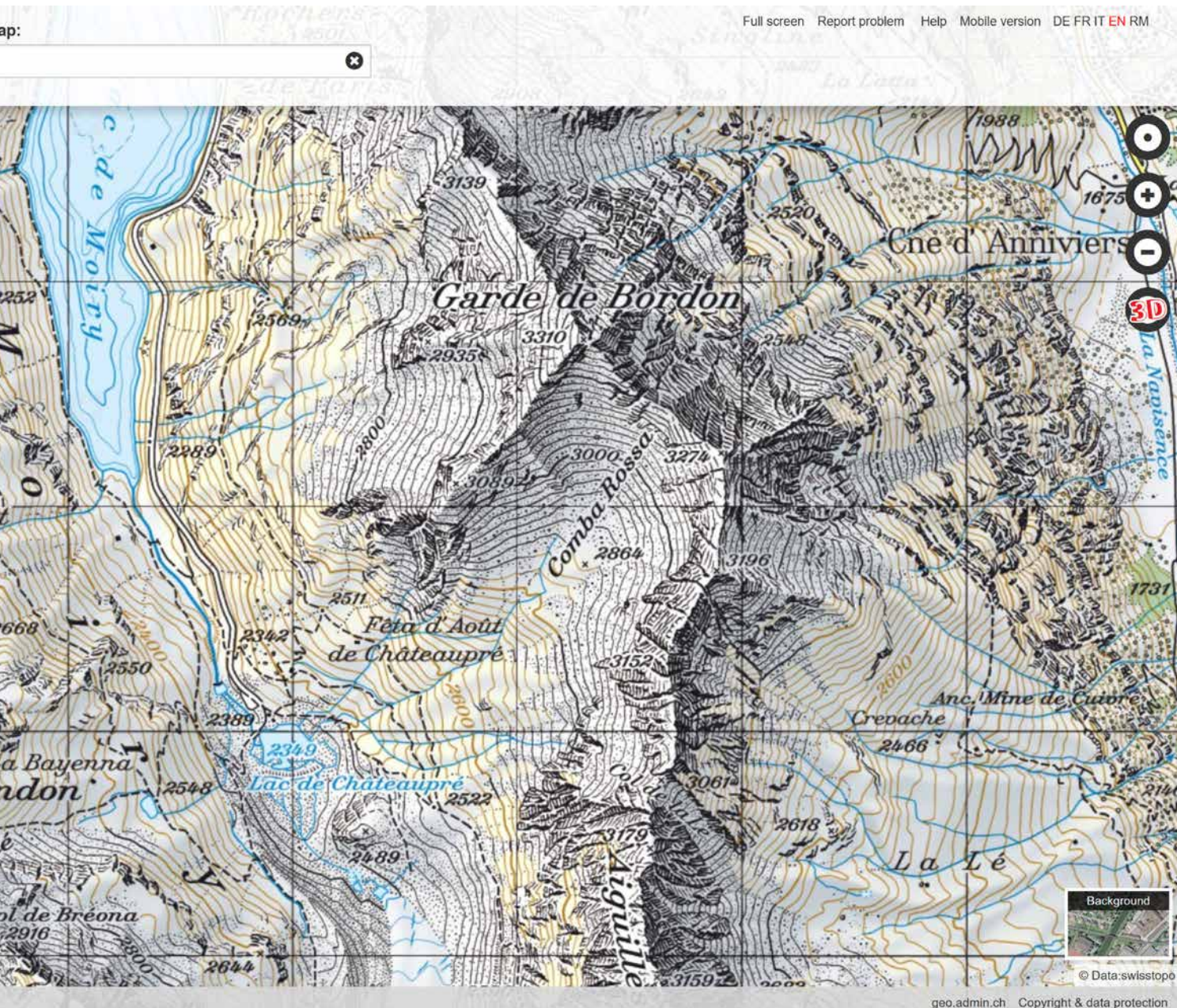
Last Updated

March 2019

vrglaciers.wp.worc.ac.uk/

The swisstopo site provides some basic measurement and annotation tools.

A range of historic mapping is available on the swisstopo site. Some of this is only visible at particular zoom levels (scales).



PART 1:

Pre-fieldwork preparation: working with swisstopo® maps

1) Go to: vrglaciers.wp.worc.ac.uk/

2) Select the Moiry Valley Virtual Field Trip

This part of the exercise uses the maps available on the excellent swisstopo website. Clicking on the swisstopo link (under 'Additional Information' on the Moiry Valley virtual field trip home page) will open the map at the correct location. It is worth taking a few minutes to familiarise yourself with the web page layout and tools available.

1. The Moiry Dam

1.1) Where in Switzerland is the Moiry Dam located?

1.2) Describe its topographic setting.

Draw a transect from the Rhône River at Sierre to the Moiry Dam, following the valley floor.

[swisstopo Menu > Draw and Measure on Map > 'Line']

1.3) Using the elevation profile generated from the completed transect, what is the elevation of:

(i) The Rhone valley floor at Sierre?

(ii) The Moiry Dam?

1.4) How far is it from Sierre to the Moiry Dam (following the valley floor)?

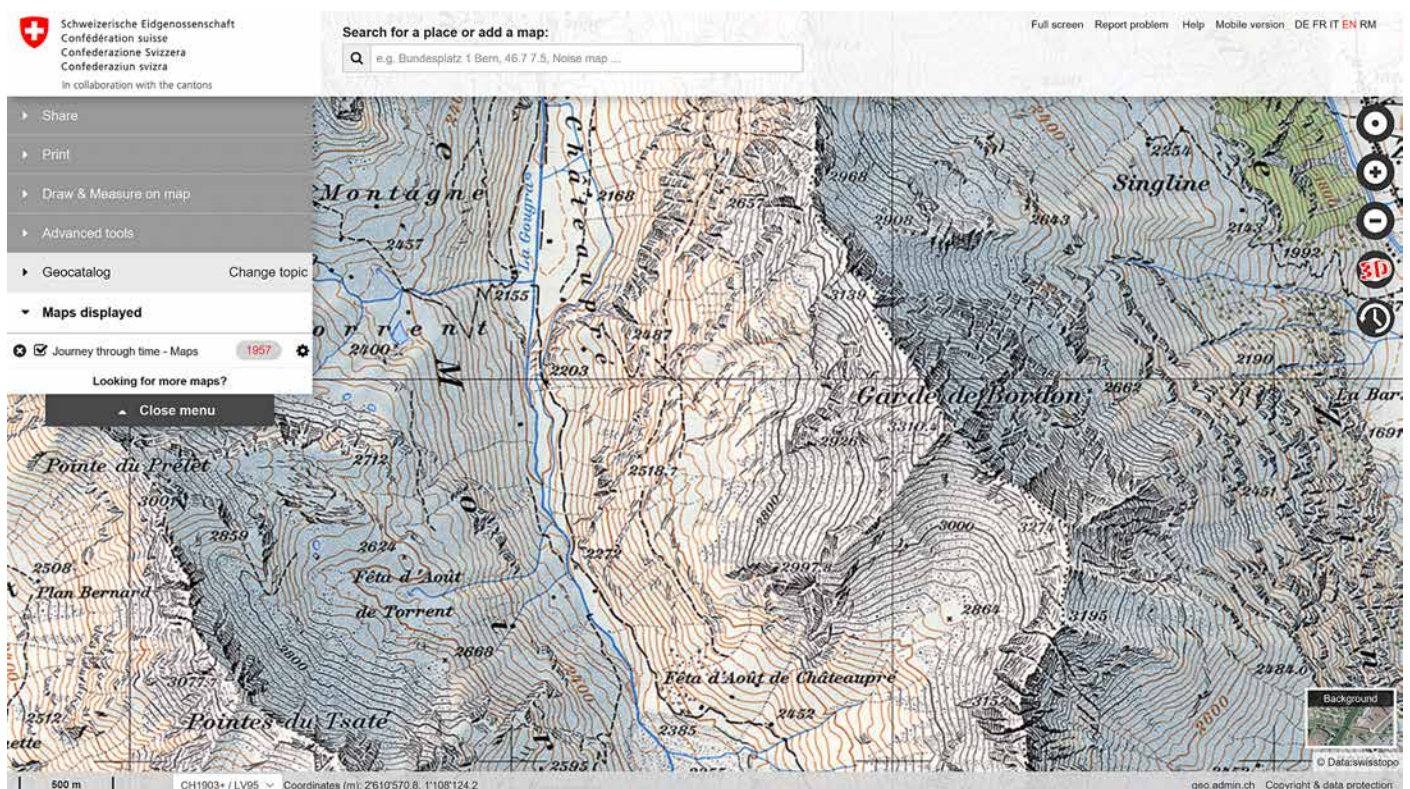
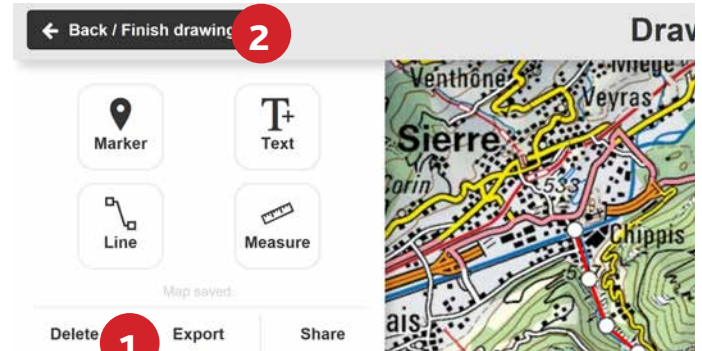
DELETE this drawing.

1.5) What is the elevation of the car park by the restaurant at the top of the dam?

1.6) What makes this a suitable location for a dam?

HINT: You may find it helpful to look at historic 1:50,000 maps of the valley. To ensure the 1:50,000 map layer is shown, zoom in or out as appropriate until the scale bar shows 500 m. Then, enable the 'Journey through time – Maps' layer (under 'Maps displayed'). Compare the maps from 1957 and 1958 – when the dam was completed and the map updated.

For the next part, ensure the 'Journey through time – Maps' layer is not showing i.e. there should be no tick-mark in the box.





2. The Moiry Glacier (Glacier de Moiry)

For the following questions and activities, please use the 1:25,000 map layer. This is visible when the scale bar in the bottom left hand corner is 200 m. You can adjust this by zooming in/out as appropriate. You should now be looking at the glacier.

2.1) What is the significance of the different colours used for the contours in this area?

2.2) Other than contours, what else is shown on the surface of the Moiry glacier?

2.3) What type of glacier is this?

2.4) What is the approximate elevation of the:

(i) glacier terminus (snout)?

(ii) the highest point?

Select the 'Draw & Measure on map' menu item (top left-hand-side) for the following activities.

2.5) What is the approximate length of the glacier?

HINT: Use the line tool, and draw from the highest point down to the glacier snout. Try and follow the middle of the glacier.

2.6) Describe the elevation profile (displayed at the bottom of the screen).

2.7) Describe the relationship between the surface gradient of the glacier and crevasse concentrations. Is this relationship what you would expect to see?

2.8) What is the approximate area of the glacier?

Use the measure tool and trace around the edge of the glacier. The area will only be shown for polygons, which means you will need to 'close' your line. This requires you to finish your drawing by double-clicking back at your starting point, which then displays the area. This may take several attempts.

HINT: Use the arrows to pan (move) around the map whilst you trace the edge of the glacier.

INTERACTIVE PANORAMAS

This is the default view when opening any virtual field trip. The left-hand pane, which fills most of the window, is the interactive panorama. It shows you what the ground-level view looks like. To the right is the map pane, although satellite imagery is shown as standard.

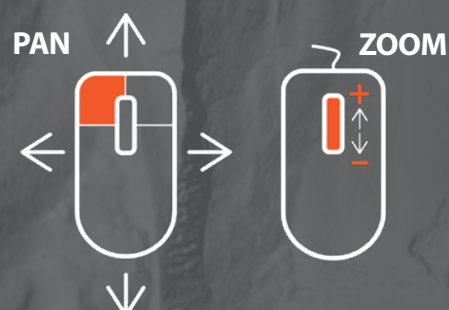


interactive panorama

map pane

PAN AND ZOOM

Keeping the left mouse button depressed, drag your mouse in the direction you want to face. You can look all around you, as well as straight up and straight down. If you want to zoom in or out, use the mouse wheel.



GO TO NEXT STOP

To navigate to the next stop, click on the yellow hotspot.

TOOL BAR

The tool bar at the foot of the main window can mostly be ignored. However, the 'Enter Fullscreen' button is worth knowing; it will make the virtual tour fill the entire screen, creating a more immersive experience. To get back to the default view, either press the Esc key or click the 'Exit Fullscreen' button. Note that the option to go fullscreen is not currently available on iOS devices.

MAP PANE

The right-hand pane shows your location and the direction you are facing. You can alternate between 'Map' and 'Satellite' views.

PAN AND ZOOM

You can pan and zoom around this imagery using your mouse.

NAVIGATION

You can click on any of the orange hot spots on the map pane in order to go directly to that panorama.

REMOVE THE MAP PANE

Click on the 'hide map' icon (the globe) on the menu bar.





PART 2:

Moiry Valley virtual fieldwork

You can access the virtual field trip by clicking on the 'Take me there!' link on the Moiry Valley home page.

A series of questions and activities follow, some of which require you to return to the *swisstopo* website. The numbers in orange circles refer to field trip locations, which are shown in the top-right corner of the main window.

1

1.1) What is the evidence that the water level in the reservoir is very low?

1.2) The imagery was captured in June, a time of year when many other reservoirs in the mid-latitudes of the northern hemisphere would normally be close to capacity. This is clearly not the case here. What do you think is going on?

1.3) Another way this reservoir differs from those you may be more familiar with is the colour of the water. Describe the colour, and explain what has caused this.

2

Hide the map pane on the right-hand side of your browser.

[click on the globe icon near the bottom of the main window]

On the western (opposite) slopes, you can see a clear lateral moraine that gradually decreases in elevation in a downvalley direction. This provides evidence for a more extensive Moiry Glacier in the recent past.

Take a screenshot of this scene, and paste it into PowerPoint, Word or any software that has drawing tools. Use the line tool to draw along the crest (top) of the moraine on the western slopes. If you can identify any other moraines, draw these too.

2.1) What is it about the morphology and surface of the moraine (s) that allowed you to identify it (them)?

Save this file, as you will need to return to it several times during this exercise.

2.2) This moraine dates from the Little Ice Age (LIA), and was formed around 1850-1860. As such, it is a very recent feature. If you had not been told this, what is it about its appearance that betrays its relatively young age?

Unhide the right-hand map pane, and ensure that the satellite imagery is visible.

[The map pane can be hidden and unhidden by clicking on the globe icon at the base of the main window]

2.3) Take a few minutes to compare the ground-level and satellite views of the moraine. What are the pros and cons of each for viewing the moraine?

a) Drag the slider that separates the panorama and map as far as you can to the left.

b) Take a screenshot, and add it to the file you created earlier (as a new slide or page).

c) Use the line tool to draw along the crest (top) of the moraine on the western slopes on the satellite imagery, and trace it around onto the eastern slopes. Do this only for the lower part of the former glacier extent.

2.4) How easy is it to identify the moraine on the eastern slopes in the field? Why do you think this is?

One of the advantages of undertaking fieldwork in Switzerland is that historic mapping is readily available.

Return to the swisstopo map, and ensure the 1:25,000 layer is visible (the scale in the bottom LHS must be 200 m).

Select 'Journey through time – Maps' and choose 1861 (this will require you to scroll down until you get to 1861). No earlier maps are available for this area; if you select a year prior to 1861, it defaults to contemporary mapping.

The map shown is an extract from the Dufour 1:100,000 map of Switzerland.

2.5) How accurate is this map?

HINT: Use the transparency feature so that you can see both the 'Journey through time – Maps' layer as well as contemporary mapping. Look at river channels and other features that are unlikely to have changed much in the last 150 years or so.

Select 1878, which displays an extract of the 1:50,000 Siegfried Map.

2.6) The glacier has retreated. How much has it retreated by, and has it retreated the same at its sides as it has at the terminus?

HINT: Use the line tool to measure length.

3

3.1) What feature does the path cross at this location?

3.2) Why is it located here, and what processes are involved?

In addition to the main LIA moraine on the western slopes, you now have a slightly better view of one or two moraines formed during glacier recession. These recessional moraines are short distances downslope from the main LIA moraine crest.

Take a screenshot of this view and paste it into the file you created earlier. Use whatever drawing tools are available to you to mark the recessional moraines.

There are older moraines on the western slopes, which probably date to around 12,000 years ago.

Use the previous screenshot and mark the position of these older moraines (assuming you have not already done so).

4

4.1) What is it about their position and appearance that tells you these moraines are much older than the LIA one?

Use the previous screenshot and mark the location and extents of talus (scree) accumulations (if possible, use polygons and a semi-transparent fill)

4.2) Describe and explain the distribution of talus in the landscape.

continued.../

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5

This location provides a better view of the feature discussed at Stop 3, as well as the lake south of the car park.

5.1) The lake is not a natural feature. Why has it been created?

5.2) What valley-floor fluvial features are visible from this stop?

7

EITHER:

Take a screenshot of the view to the southwest and paste it into the file you have been working on. Identify and annotate (mark) as many features as possible. Use text, lines, shapes and arrows as appropriate.

OR:

Using pencil and paper, produce a field sketch of the area to the southwest. Identify and annotate (mark) as many features as possible.

8

You can now see the LIA moraine on the eastern slopes.

8.1) The appearance of the eastern LIA moraine changes as it tracks downvalley. In what way(s) does it change, and why does it do so?

Take a screenshot of the view to the east and paste it into the file you have been working on. Identify and annotate (mark) as many features as possible. Use text, lines, shapes and arrows as appropriate.

8.2) You now have a better view of the bedrock outcrop immediately to your west. Compare this view to the one at the previous stop. How would you describe its morphology? What evidence is there for glacial erosion?

10

10.1) What evidence is there that the bedrock has recently been covered by ice?

Hide the map pane

Take a screenshot of the view to the south and paste it into the file you have been working on. Use text, lines, shapes and arrows as appropriate to identify and annotate (mark) as many of the following features as possible:

Moiry Glacier (outline); crevasses; ice fall; supraglacial meltwater channel; moulin; LIA moraines; proglacial lake; talus.

10.2) Determining the edge of a glacier is not always easy. Why do you think this is?

14

You are now standing beside the Moiry Glacier (but not on it).

14.1) Describe the surface of the Moiry Glacier. In what way(s) does it differ from the land beside it?

15

15.1) The surface of the glacier in the lower reaches has more debris on it than the middle and upper reaches. Why is this?

15.2) What role do you think the surface debris plays in glacier melt rates?

15.3) What supraglacial meltwater features can you spot?

16

16.1) Look at the meltwater channel to the west. In what way(s) is it modifying the surface of the glacier?

18

18.1) The LIA moraines on both sides of the glacier appear to be subject to ongoing modification. Why do you think this is, and what processes may be operating?

18.2) What role does the western LIA moraine play in the evolution of the present-day Moiry Glacier?

END



VR Glaciers & Glaciated Landscapes

Virtual fieldwork has a role to play in supporting class- and lab-based learning, teaching and assessment. It can be used in many ways, including the support of 'real' fieldwork – for which there is no substitute.



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