On-demand, virtual fieldwork
Virtual field trips to both present-day glacial environments and deglaciated ones – whenever you want! And all for free!

Supporting, not replacing, 'real' fieldwork
Virtual fieldwork can be used in many ways, including the support of 'real' fieldwork – for which there is no substitute.

Easy to use
It will run on most mobile devices (including iPads), as well as PCs and Macs. All you need is internet access and a browser. No need to install software or browser plug-ins.

Flexible use for schools, colleges and universities
Resources are provided without integrated interpretation, so they can be used flexibly at a range of academic levels. Guidance for teachers and lecturers is provided in the password-protected forum.

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The topic of glaciers and glaciation is sometimes perceived by students and teachers as being more difficult than others associated with more familiar environments, such as rivers and coasts. Nevertheless, well-designed fieldwork in areas with glaciers and/or glaciated landscapes can make all the difference to their understanding and enjoyment of it.

Unfortunately, fieldwork to these environments rarely takes place at the same time as students learn about them in class. Sometimes, fieldwork does not take place at all. Through its on-demand, simulated fieldwork to glaciers and glaciated landscapes, this resource provides a solution. However, it does not remove the need for real fieldwork.

VR Glaciers and Glaciated Landscapes is very much a work in progress, and will remain so for the next 18 – 24 months, but the core resources are available now for trial and feedback purposes.

Finally, I am grateful to the following organisations for funding this project to date: University of Worcester (Institute of Science and the Environment Learning and Teaching Fund), the Quaternary Research Association, and the British Society for Geomorphology.

Des McDougall
University of Worcester

VR Glaciers and Glaciated Landscapes is a new resource that provides on-demand, simulated fieldwork to glaciers and glaciated landscapes. Its primary role is in supporting class- and lab-based teaching of glaciers and glaciation in schools, colleges and universities.

Academic level

The core virtual fieldwork resources are provided without interpretation, which means that they can be incorporated into the curriculum at any level — school, college and university. Additional guidance on interpretation and suggested use will, in due course, be added to the password-protected forum.

Locations

The locations for the project are the Helvellyn Range, Keskadale and Mosedale (all in the English Lake District) and the Moiry, Ferècle, Arolla and Lötschental valleys (Swiss Alps). Other locations will be added over the coming year.

All the panoramas are marked in Google Maps, and downloadable geolocation data allows integration with Google Earth, ArcGIS and other location-aware software.
A MORE INTERACTIVE APPROACH

The virtual fieldwork approach is a more interactive and engaging approach than simply presenting static images, and provides the basis for a range of learner activities and challenges. Some examples are listed on the right.

<table>
<thead>
<tr>
<th>FEATURE</th>
<th>BENEFIT</th>
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<tbody>
<tr>
<td>High-quality, full-screen 360° interactive panoramas (‘panospheres’).</td>
<td>This provides an immersive experience. You can look all around you, and zoom in on features of interest.</td>
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<tr>
<td>Closely-spaced, linked panoramas so it is possible to proceed through the landscape.</td>
<td>Provides a sense of scale and orientation. Helps you to understand how the landscape changes from one location to the next.</td>
</tr>
<tr>
<td>Integration with Google Maps, and geolocation data available for use in Google Earth and other GIS software.</td>
<td>This allows you to compare ground-level views with imagery acquired from satellites, aeroplanes, drones etc.</td>
</tr>
<tr>
<td>Can be viewed on any modern device with an internet connection, including phones and tablets. There is no requirement for any browser plug-ins or other proprietary software.</td>
<td>Easy to use.</td>
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» landform and landscape interpretation exercises
» field sketching
» ‘field-checking’ of geomorphological maps (produced using orthoimagery and elevation datasets in a GIS)
» student-produced field guides (as a form of assessment)
» preparation for real fieldwork (whether or not to these specific locations)
» follow-up to fieldwork, or when real fieldwork does not take place for some reason (e.g. poor weather, illness)
Not sure where to start? The virtual fieldwork ‘home’ page provides an overview of everything on offer, and includes links to all the resources. Alternatively, you can navigate directly to the virtual field trip of your choosing via the drop-down links on the menu bar.

The best place to start learning about glaciers and glaciated landscapes is surely in present-day glacial environments, such as the European Alps. These three virtual field trips show you what glaciers look like – no imagination required, unlike the case for deglaciated environments!

The Lake District is widely regarded as a textbook example of a glaciated landscape. Although there is plenty of interesting glacial geomorphology to see in the area, its interpretation is often far from straightforward. The main virtual field trip is the Helvellyn one, which includes a range of interesting landforms over a large area.

If you are interested in using the virtual field trips for teaching, whether in schools, colleges or universities, please consider joining the forum. Members are encouraged to develop and share teaching resources.
USING THE VIRTUAL FIELDWORK RESOURCES

Select the virtual field trip you want from the drop-down list below ‘Virtual Fieldwork’ on the top navigation bar. Each virtual field trip home page is organised in the same way.

1. At the top of each virtual fieldwork ‘home’ page is Google Satellite imagery, with the first point of the virtual field trip marked. You can PAN and ZOOM using your mouse.

2. The main text provides an overview of the virtual field trip, including some of the features that are visible. More details are provided in the password-protected forum for teachers and lecturers.

3. Virtual Field Trip button opens a new tab on your browser. See page 6.

4. Location data for use in Google Earth, ArcMap etc. See page 7.

5. Online GIS from swisstopo (not for UK sites)

6. Mass balance and length data for Swiss glaciers

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Moiry Valley (Valais, Switzerland)

Overview
This virtual field trip provides an opportunity to explore the landscape between the upper car park and the glacier, as well as some locations on the ice itself. There is also a site further down valley, at the Moiry Dam, which provides additional context.

What can be seen?
A number of topics can be considered using this virtual field trip, including:

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

The imagery was acquired in June 2017

Further developments:
This resource will be developed further over the next 12-24 months, with additional routes, video and the inclusion of 3D models of small landforms.

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Additional Information
Geolocation data for each step in the virtual field trip:

- Google Earth file (.kml)
- Spreadsheet (.csv)

Useful websites:

- Swisstopo (Access to current and historic mapping, as well as other data, from the Swiss national mapping service. TIP: You can drag KML files onto the map)
- Swiss Glacier Monitoring Network (Length variation measurements for the Moiry 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.

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.
GEOLOCATION DATA

Google Earth file (.kml)  Spreadsheet (.csv)

Each virtual field trip includes coordinate data for each stop, provided in both .kml and .csv file formats for maximum flexibility. Although the locations for each stop are shown in the map pane, you may wish to view these locations in Google Earth or some other GIS software / service (e.g. QGIS, ArcGIS online). Links to the files are in the ‘Additional Information’ section on each virtual field trip home page.

DOWNLOAD
To download the files, simply click on them. They will download to the default location, which is typically the downloads folder.

Google Earth
Both files can be dragged into Google Earth, but the native .kml file is easier to use. The location of each stop is shown. This is a great way to relate ground-level view with remotely-sensed imagery. You can also do some landform mapping!

swisstopo
https://map.geo.admin.ch

This is a comprehensive, online GIS service run by the Swiss national mapping service. The link on each virtual field trip home page loads the swisstopo website at the correct location. You can explore the maps, including those produced in the nineteenth century when glaciers were at or near their maximum Little Ice Age extents. These maps can be compared with the present-day landscape using the virtual fieldwork resources.

VIEW VIRTUAL FIELD TRIP LOCATIONS
Drag-and-drop the .km file from your computer onto the swisstopo web page. Each stop will then be displayed, including site numbers (see screenshots to right).

Other GIS software / services
The spreadsheet (.csv) file format has been provided for use in GIS software such as ArcMap and QGIS, as well as online GIS services (e.g. ArcGIS online).
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.