

Geological compass

One of the important tools for a geologist in the field is a geological compass. A geological compass can be used to measure the direction (azimuth) and inclination of various structural elements in rocks, such as fault surfaces or foliations (structural surfaces in a rock given by the planar arrangement of minerals, according to which the rock can break in a plate-like or schist-like manner), folds or veins. The orientation of structural elements helps geologists interpret the various processes that led to their formation (e.g., in which direction this oriented pressure acted during metamorphism).



The data measured by a geological compass is written in the format **XXX/YY**, where:

XXX = azimuth of the direction to which the slope of the measured surface inclines, takes values from 0 to 359 (0° – north, 90° – east, 180° – south, 270° – west)

YY = inclination of the slope of the measured surface relative to the Earth's surface, takes values from 0 to 90 (horizontally – 0°, vertically – 90°)

- You measure an angle of a half-line in the direction of the greatest slope of the surface – just imagine the path that a drop of water would take to flow down the surface.

Example: On a rock outcrop, you want to measure a surface that inclines at an angle of 80° (i.e., it is an almost vertical wall) towards the northeast. In simple terms, if you lean your back against a wall, you will essentially be standing in a very slight backbend and your toes will be pointing northeast. If you measure this area with a geological compass, you should get a value of 45/80 (note: when the slope is oriented to the southeast, the first angle will be 135°, to the southwest 225°, to the northwest 315°).

Tips for the field:

- Always use common sense and before you start measuring, think about which direction the area is approximately inclined to.
- The measurements of different compasses may differ slightly, just as you will certainly not be measuring in exactly the same place as the teacher who prepared the tasks. Deviations can also be caused by unevenness in the measured area. Therefore, always try to measure on the flattest possible surface. The values you measure may be displayed 10–15° off from the numbers in the assignment. So always choose the option that is closest to your observation.

- If the value you measure does not even approximately match any of the options in the assignment, try adding or subtracting 180° to the azimuth value, or rotating your mobile phone 180° (sometimes it helps 😊).
- If the measured area is small, place your notebook or writing boards on it and perform the compass measurement on them.

Geological compass in cellphone/tablet

A simple alternative to a geological compass (especially suitable for students of other fields than geology) are mobile applications, such as:

- eGEO Compass GS (Android)
- FieldMove Clino (Android and Apple)

The **eGEO Compass GS** application is user-friendly, but the accuracy is not as good and it is more difficult to read the value, because the numbers are constantly changing at the slightest movement (the compass needle “shakes” – it is important to set the speed sensor to “Slowest” so that it is at least tolerably readable). **FieldMove Clino**, on the other hand, has more additional functions that you will not use during field exercises, and you need to click a little to get to the compass. However, the measurement itself is much more pleasant and “smoother”, you can even lock the measurement in a given position and then easily read the value. The problem is that the values are displayed in the opposite order, i.e., YY/XXX.

For the application with a geological compass to work, it is necessary to have a built-in magnetic field sensor in your phone (most smartphones should have one). We recommend that you test the functionality of the selected application at home. If the application does not work on your model, and you will not be able to ask your friends with a better cellphone for help, you can borrow a classic geological compass from the Institute of Geological Sciences, Faculty of Science, MU, after consulting with your teacher.

Nevertheless, we recommend that you also take a classic (non-geological) compass with you to check the direction – measuring with the application can sometimes be very confusing and it is good to be able to see in the field where the slopes are roughly heading and where the main directions are.



Measurement procedure – eGEO Compass GS:

- 1) Start the application, in “Settings” (three dots in the upper right) on the home screen, set the sensor speed to “Slowest” and save the settings.
- 2) Click on the DIPS button, write the project name (none or any text) and confirm.
- 3) A gray arrow of the geological compass in the shape of the letter “T” is displayed, which is formed by a longer horizontal line and a shorter perpendicular, which shows the slope of the surface.
- 4) Place the cellphone with the back cover on the measured surface and rotate it so that the bottom of the cellphone points down along the slope of the surface - the longer line from the “T” on the screen should be horizontal and approximately in line with the white arrows on the sides.
- 5) Read the value in XXX/YY format (azimuth/slope) from the frame above the arrow.

Measurement procedure – FieldMove Clino:

- 1) Launch the application, and a classic compass displays (see the figure on the left).
- 2) Click on the smaller circle in the lower right corner of the compass, which opens the geological compass (see the figure on the right).
- 3) The red arrow of the geological compass will appear, consisting of a longer line and a shorter perpendicular, which shows the slope of the surface.
- 4) Place the back cover of the cellphone on the measured surface and rotate it so that the bottom of the cellphone points down along the slope of the surface. The longer line of the red “T”-shaped indicator should be horizontal.
- 5) Once you have found the correct position of the arrow, click on the compass to lock it (the arrow will turn black).
- 6) Read the value in the format YY/XXX (slope/azimuth) from the boxes below the compass.

