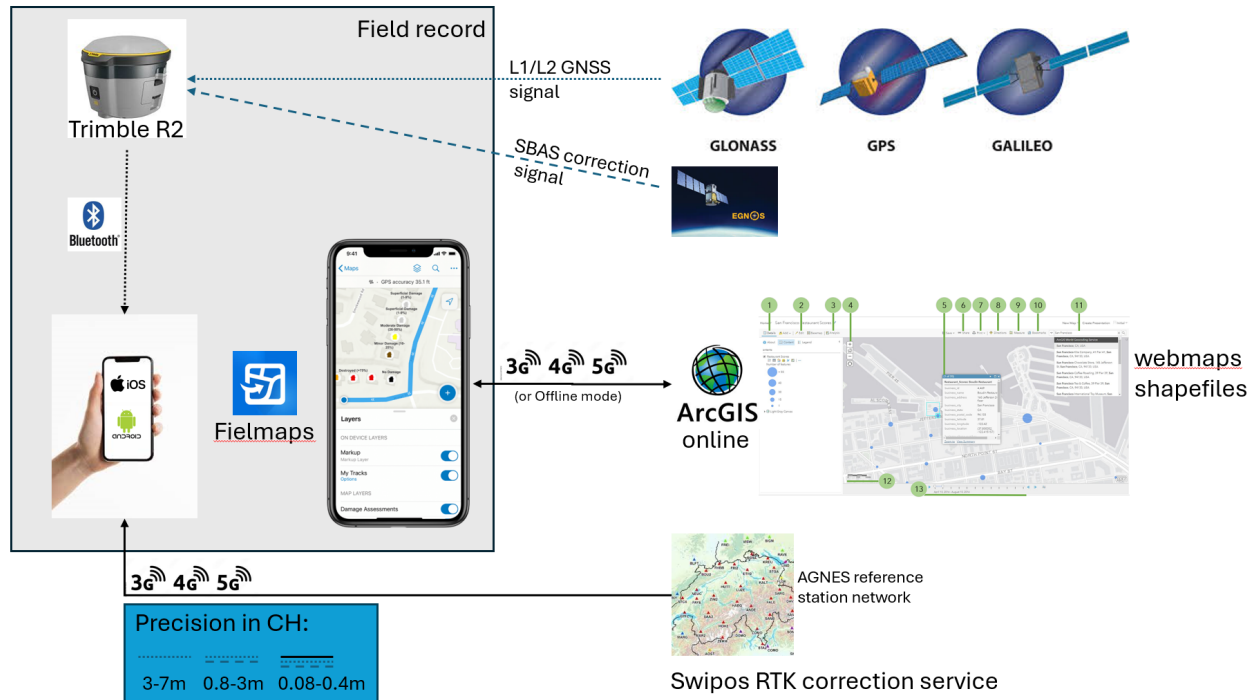


R2 & ArcGIS Field Maps with RTK corrections

Trimble R2 receives GNSS signal from all GNSS satellite networks (GPS, GLONASS, GALILEO) and is transmitted to ArcGIS Field Maps on your tablet/smartphone via a Bluetooth connection. The map and associated shapefiles where the data will be recorded should be prepared before going to the field on ArcGIS online. The precision of the GNSS signal can be improved using Real-Time Kinematic (RTK) correction service (0.08-0.4m) via a 4G GSM connection (check [Swisscom](#), [Salt](#) or [Sunrise](#) coverage) to the [Swipos](#) server, which uses a network of known ground stations to correct deviations of GNSS signals due to atmospheric conditions (needs GSM network). If no GSM network is available, a less precise (0.8-3m) satellite correction (SBAS) can be used.



Before going on the field (to do once at the beginning of the project, it's not a trivial step, please plan enough time):

1. Prepare a **web map** on Arcgis online:
 - a. Got to unil.maps.arcgis.com and connect using your SWITCH edu-ID Unil account
 - b. To create maps and layers on ArcGIS online and to modify layers (points c. and d. hereafter) you need special editing rights (standard rights allow you only to add values to existing fields in layers). This can be requested by email to alexandre.hirzel@unil.ch, briefly mentioning the goal of your project. Alternatively, Olivier can create the map and layers for you if you provide him with the name of the project, the layers to create, and the fields and type of data to record in the layers.
 - c. In the "Content" tab, you can create Feature Layers that contains the information you want on your map, or Feature Layers to collect and store data from the field:
 - i. Click to "New item" -> "Feature layer" to create an empty layer from scratch, or "New item" -> "Your device" to import an existing file (e.g. shapefile)
 - ii. In the Data tab of the Feature Layer, you can add fields to your Feature Layer and [define attribute lists and ranges](#) to simplify the recording of data on the field

- iii. It is possible to record automatically all the [GNSS metadata](#), including the Receiver Name and Horizontal Accuracy, by adding fields with dedicated field names (e.g. ESRIGNSS_RECEIVER).
 - iv. In the “Visualization” tab of the Feature Layer, you can select the default shape, color and label settings, and select the visibility and order of appearance of the fields in the field table
 - v. To be visible on ArcGIS Field Maps, the web map must contain at least one Feature Layer that has the “Enable editing” and “Enable Sync” options ticked in the “Settings” tab of the Feature Layer
 - vi. Don’t forget to save the Feature Layer to record your changes
 - vii. In the “Overview” tab of the Feature Layer, use the “Share” button to make the layer accessible to others in Field Maps. You have to assign the layer to a sharing group (e.g. “ecospat”). Members of groups can be managed from the “Groups” tab.
- d. In the “Map” tab, you can create a web map of your sampling area:
 - i. Use the “Add layer” button to add your Feature Layers.
 - ii. You can select a default basemap, although it can always be changed in Field Maps directly
 - iii. Save your map (folder with a blue dot on the left menu). The web map should now be visible in your “Content” tab.
 - iv. In the “Settings” tab of the web map (accessible by clicking on the map in “Content”, make sure that the “use in ArcGIS Field Maps Mobile” option is ticked
 - v. In the “Overview” tab of the web map, use the “Share” button to make the web map accessible to others in Field Maps. You have to assign the map to a sharing group (e.g. “ecospat”).
- 2. Install [ArcGIS Field Maps](#) and Trimble Mobile Manager on your [iPhone](#) or [Android](#) smartphone or tablet.
- 3. Turn on the R2 receiver (the power button must be green) and connect the receiver (e.g. R2, 6030...) to your smartphone or tablet in the Bluetooth settings. If your Bluetooth receiver doesn't appear in the list, make sure it isn't connected to another device. To disconnect your receiver from an Android device, in the device's Bluetooth settings, tap the settings icon next to the receiver, and tap “Unpair” or “Forget”. To disconnect your receiver from an iOS device, in the device's Bluetooth settings, tap the information icon next to the receiver, tap “Forget This Device”, and tap “Forget Device”.
- 4. For Android only: you need to enable the “Developer options” and activate the “Mock location” option for Field Map. [See detailed procedure](#)
- 5. Setup [swipos real time correction \(RTK\)](#):
 - In Mobile Manager, go to “Position source” and select the R2 device in the list
 - Go to “GNSS configuration” and fill the form as follow:

GNSS correction source

GNSS correction source: Custom local ▼

Server parameters

Protocol: NTRIP ▼

Server URL: www.swipos.ch

Port: 2101

Mount point name: MSM_GISGEO_LV95LHN95 ▼

GNSS source reference frame: Auto ▼

Server account

Username: B1046

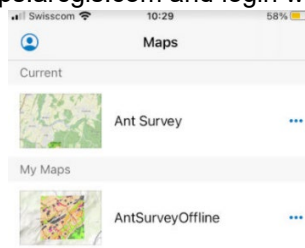
Password:

GNSS output

Detection mode: Auto ▼

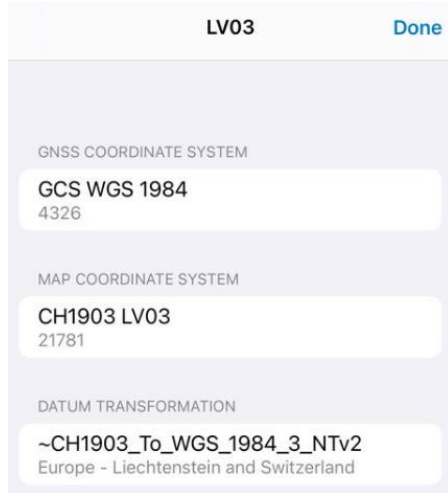
Geoid: Swiss Geoid 2004 ▼

- We have 5 accounts that can be used simultaneously on the field, use one of the followings:
 - o Login: B1042 / Password: 420820 / Organization: HS-UniVD-Geo
 - o Login: B1043 / Password: 746952 / Organization: HS-UniVD-Geo
 - o Login: B1044 / Password: 659987 / Organization: HS-UniVD-Geo
 - o Login: B1045 / Password: 115296 / Organization: HS-UniVD-Geo
 - o Login: B1046 / Password: 070922 / Organization: HS-UniVD-Geo
- For Android only: In the “Share location” tile, tap the switch to enable “Share positions” mode
- 6. For iOS only: [Set your receiver as the location provided](#) in Field Maps:
 - Start Field Maps with ArcGIS Online→Your ArcGIS organization’s URL→
unil.maps.arcgis.com and login with your Unil account



- In the profile icon , go to Location → Provider, press Add and select the R2 receiver. You will be prompted to browse to the Mobile Manager folder on the device.
- Make sure the R2 receiver is ticked
- 7. Note on projections: By default, maps in ArcGIS online use the Web Mercator (auxiliary sphere) projection, the standard on google maps. The projection of the map is defined by the projection of the layer used as basemap. Changing for a basemap in CH1903 LV03 thus allow to make relevés

in the Swiss coordinate system. To be able to visualize the maps on Field Maps, go to profile icon  , go to Location → Profile and add a new location profile with these parameters:



The screenshot shows the 'LV03' location profile setup screen in ArcGIS Field Maps. At the top, there is a title bar with 'LV03' and a 'Done' button. Below this, the screen is divided into three sections: 'GNSS COORDINATE SYSTEM' with a dropdown menu set to 'GCS WGS 1984' and a value of '4326'; 'MAP COORDINATE SYSTEM' with a dropdown menu set to 'CH1903 LV03' and a value of '21781'; and 'DATUM TRANSFORMATION' with a dropdown menu set to '~CH1903_To_WGS_1984_3_NTv2' and a note 'Europe - Liechtenstein and Switzerland'.

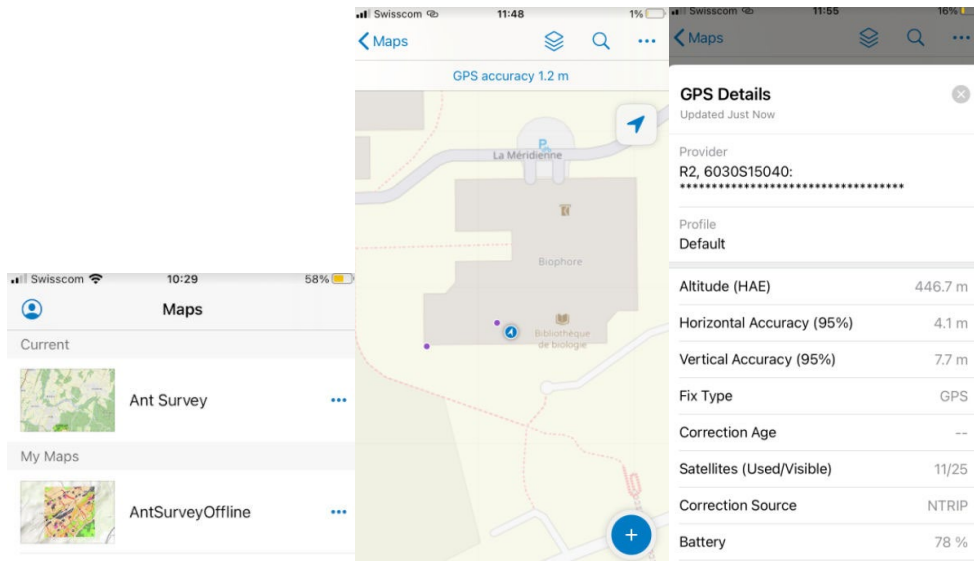
On the field:

1. Turn on the R2 receiver, check that it's recognized by Bluetooth, and open ArcGIS Field Maps with ArcGIS Online → Your ArcGIS organization's URL → unil.maps.arcgis.com and login with your Unil account. **For Android only:** start Mobile Manager and connect the R2 receiver (the GNSS signal will be mocked for all the applications). Select your map.
2. Check GNSS accuracy. With the swipos real-time correction, you should get close to 7 cm estimated accuracy in optimal situations. It is important to wait long enough for the signal to stabilize (~5 min for the first measurement of the day, about 1 min for the next points during the same day).

For IOS: By clicking on the GPS accuracy banner at the top of the map, you can check the settings of the GPS receiver, including the horizontal accuracy, the number of satellites, the source (should be NTRIP!) and the level of the battery of the receiver.

For Android: Field Maps uses the signal through Mobile Manager (mock signal) so the source is seen as "integrated" for Field Maps. Number of satellites, source and battery of the receiver should be checked on Mobile Manager.

If you don't have access to internet (e.g. 4G network not available), the correction Source should switch to [SBAS](#), with an accuracy up to 80 cm (typically between 1 and 2 meters). If the SBAS correction is not available, the accuracy is typically between 3 and 6 meters. Note that tree cover will further degrade the signal.



3. When the GNSS accuracy is acceptable, use the  to add a point to your shapefile.

Back at the office:

1. Go to unil.maps.arcgis.com, check the map, edit de fields if necessary, export to shapefile.