



Explore the landscape like never before

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GEOSCOPE

User Manual

Your mapping application to view, search, orient, measure, and interpret the landscape.

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I/ Objectives and Principles of Operation

Geoscope is a cartographic tool for iOS that allows users to identify geographical points in the landscape and precisely measure structural directions (faults, fractures, etc.) in the field.

The app also includes a photo-taking feature, automatically adding annotations such as the device's orientation (angle relative to geographic north), the location of the target point in the landscape, and the geographic cardinal directions.

Geoscope also enables site searches by name or category using georeferenced databases like *Open Street Map* or *Apple MapKit*. The application is interoperable with major navigation software such as *Apple Maps* and *Google Maps*, providing direct guidance to selected locations.

In summary, beyond simple map viewing, **Geoscope** brings together the features of several specialized tools into a single app:

- an interactive map viewer,
- a digital compass with drift correction,
- a GPS geolocation tool,
- a connected map search engine,
- and a field camera for taking georeferenced and oriented snapshots with automatic annotations.

This integration makes **Geoscope** a versatile solution, ideal for fieldwork, landscape analysis, geology, or symbolic orientation.

An Interactive Line of Sight

Geoscope uses a projected line of sight on the map, representing the real-world orientation of your iPhone or iPad. In real time, you can visualize the direction in which the device is pointing, both on the map and in the field. With this line of sight, you can identify landforms, peaks, geographic structures, towns, villages, and other notable landmarks—even at a distance.

Working like a horizontal or azimuthal alidade, this line also allows you to measure the angle — or *azimuth* — between geographic north shown on the map and the device's *line of sight*. This tool is especially useful for

field surveys, structural recognition, or targeting precise locations at a distance (Figure 1.1).

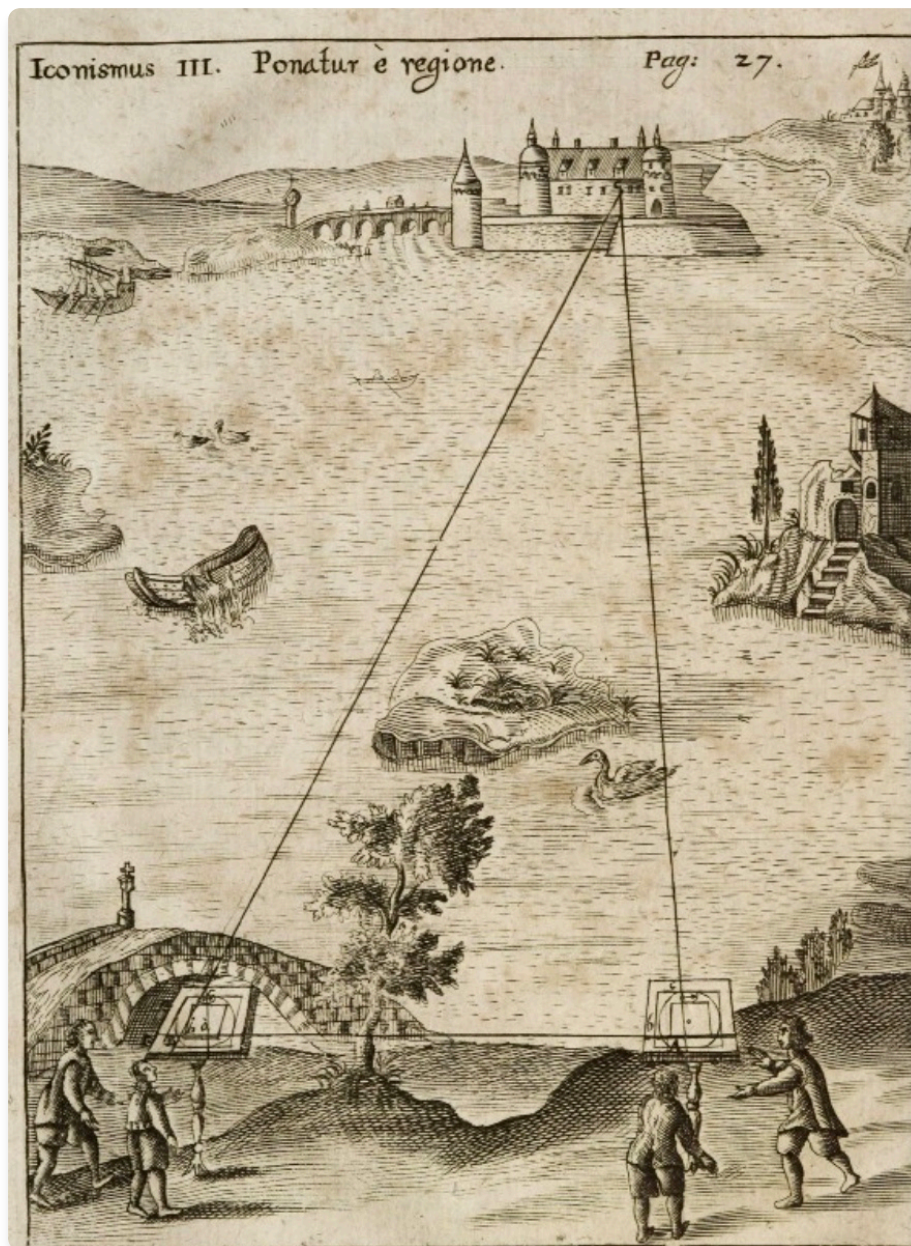


Figure 1.1: topography, lines of sight, and angle measurement using pantometers

An Innovative Concept

Unlike standard GPS or smartphone-based mapping apps, **Geoscope** has been specifically designed for landscape analysis in field settings. It

overcomes the limitations of conventional navigation systems, which provide only a fixed location without direct line-of-sight tools.

A Return to the Roots of Professional Topographic Methods

Geoscope draws inspiration from traditional topographic methods used by artillery operators and field surveyors, for whom mobile cartographic tools are often inadequate.

The line of sight allows for precise location marking and orientation measurement of lineaments both on the map and in the field (Figure 1.2).

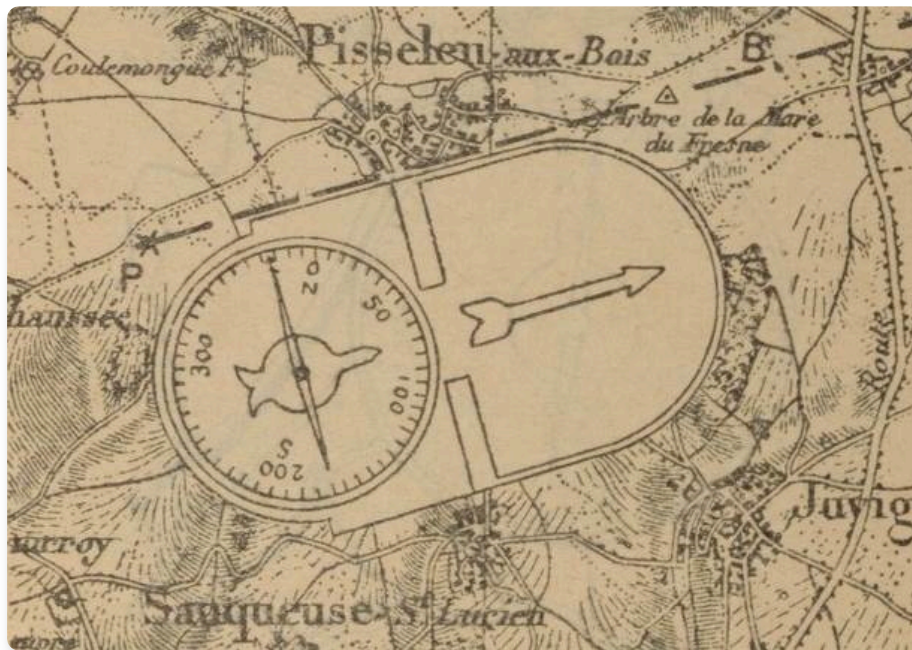


Figure 1.2: **Geoscope** revives the basic principle of traditional field mapping: a field compass is pressed directly onto the map, allowing the line of sight (or line of faith) to be drawn with a ruler. This technique relied on using uncreased topographic maps for precise work. The method also required accounting for the angular deviation between magnetic north (indicated by the compass) and geographic north shown on the map. This correction, called magnetic declination, varies by location and year and must be calculated using updated geomagnetic models. **Geoscope** automates all of these operations, greatly simplifying fieldwork.

A Complete and Interoperable Mapping Guide

Geoscope is also a full-featured mapping application, designed as a true atlas in your pocket. It provides access to complete topographic, geological, historical, and satellite maps from multiple international providers, along with convenient search and localization features.

Integrated with popular apps like **Maps**, **Google Maps**, or **Open Street Map**, **Geoscope** not only lets you view locations worldwide, but also search them with precision, explore various map types based on your needs (relief, satellite, heritage, geology...), and access data often reserved for specialized use.

II/ Installation

- **iOS Compatibility**

Geoscope is an app designed to run on Apple devices using iOS, whether on iPhone or iPad. The interface automatically adapts to the screen size and its orientation in landscape or portrait mode (Figure 2.1).

- **Download from the App Store**

Geoscope is available for free on the App Store as a basic demo version, allowing users to discover and test its main features.

- **Required Permissions**

On first launch, **Geoscope** will request access to the following elements of your mobile device to operate:

- Location
- Magnetometer
- Camera

- **No Registration Required**

The app does not require any account creation or registration. No personal data is collected or transmitted to any external server affiliated with its developer.

Geoscope fully respects your anonymity and privacy.

Some services (online maps, geolocation, etc.) may use Apple's infrastructure or external map tile providers, as is common for any app using MapKit or OpenStreetMap.

Apart from these necessary map-related calls, **Geoscope** does not collect, transmit, or analyze any user data. The app is designed with strict respect for privacy and anonymity.

- **In-App Purchases**

To unlock the full set of advanced tools (annotated photo capture, drift correction, sightline locking, reference point selection, etc.), purchasing the **premium version** is recommended.

Offered at a fixed price of €3.99, this full version also supports the ongoing development of the app.

By default, **Geoscope** works with maps provided by Apple (MapKit) or OpenStreetMap. For advanced use, **Geoscope** will offer an annual subscription of **€25.99** providing access to professional map layers, including:

- Topographic maps from IGN (France)
- And, depending on availability, specialized maps from other cartographic providers.

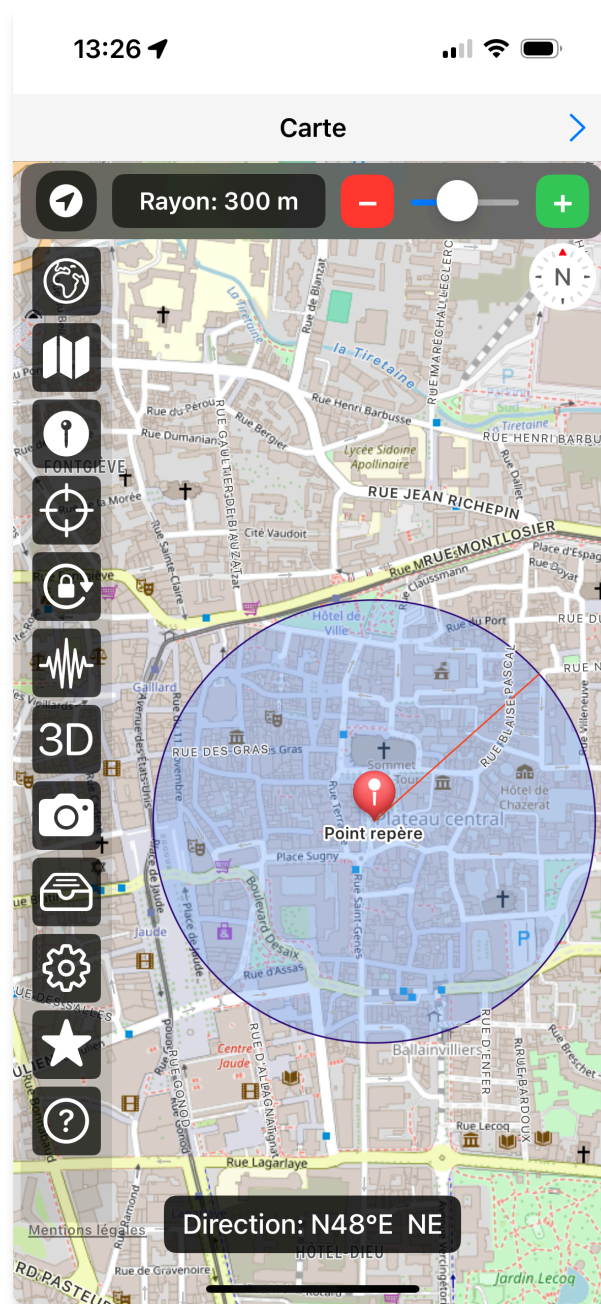


Figure 2.1: Geoscope on iPhone in portrait mode.

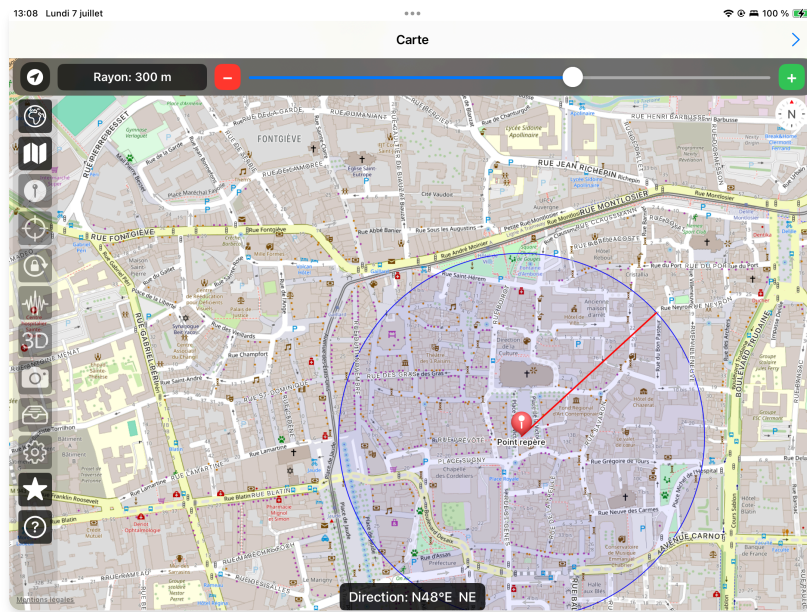


Figure 2.2: Geoscope on iPad in landscape mode.

III/ Maps

Geoscope relies on freely accessible tiled maps online from various providers. In addition to the standard backgrounds offered by Apple or Google Maps, the app provides access to detailed, high-quality topographic maps.

Often used in professional or educational contexts, these maps are available at multiple scales and in many countries, enabling precise work on relief, infrastructure, or natural elements according to the user's needs.

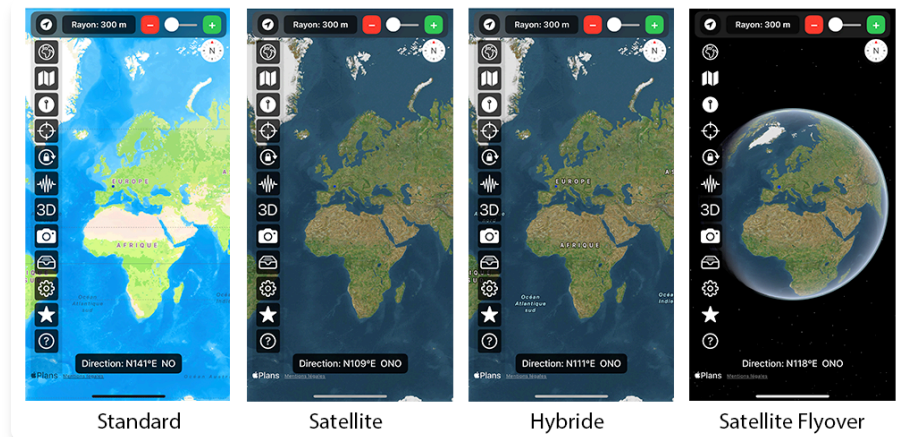
Note that some of these maps are licensed: their use requires payment of an access fee. In such cases, **Geoscope** pays these fees to the providers to allow their display within the app. This funding is covered by subscribing to the premium subscription, which grants access to all licensed maps.

1. Apple MapKit

Geoscope uses maps provided by Apple MapKit as the default base on iOS devices. These maps are optimized for smooth navigation and good readability, especially for mobile use (Figures 3.1 and 3.2).

Maps are available in four versions:

- **Standard:** a classic road map, clear and easy to read, showing roads, cities, relief, and main points of interest.
- **Satellite:** a high-resolution photographic view showing the terrain as it appears from space.
- **Hybrid:** the same satellite view enriched with place names, roads, and borders to facilitate orientation.
- **Satellite FlyOver:** an interactive 3D perspective view available in certain major cities, allowing you to fly over buildings and terrain with depth effects. At small scale, this mode lets you view the entire globe with the current day and night illuminated faces.



*Figure 3.1: Maps provided by **Apple MapKit** at small scale.*

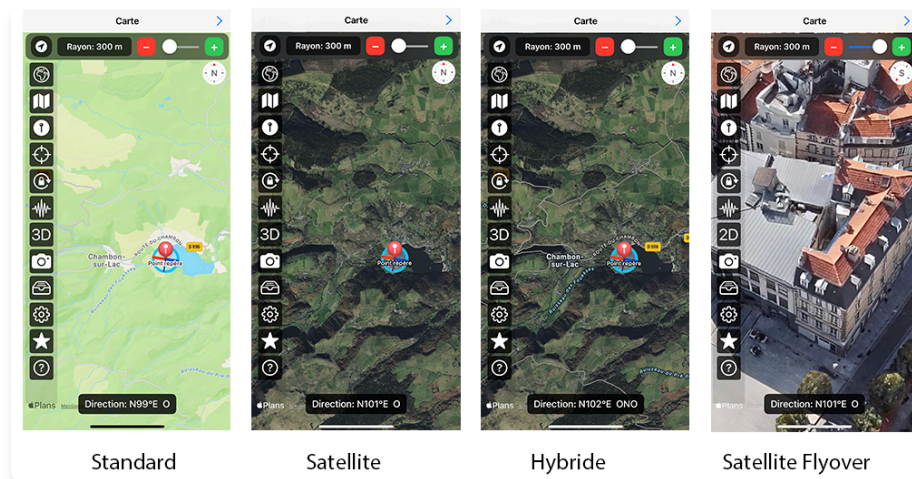
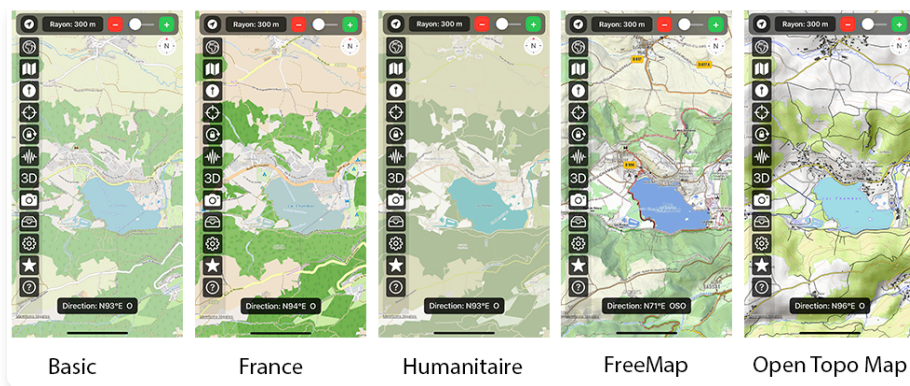


Figure 3.2: Maps provided by **Apple MapKit** at large scale.

2. Open Street Map

Open Street Map is a free, collaborative source of geographic data used in **Geoscope** to provide several map styles suited for different uses. These maps are particularly useful at large scale, allowing detailed visualization of terrain, roads, buildings, and points of interest (Figure 3.3).

- **Basic:** standard OpenStreetMap style showing roads, paths, buildings, and other infrastructure.
- **France:** style adapted to French cartographic conventions, offering better readability on the national territory.
- **Humanitarian:** highlights essential infrastructure (roads, hospitals, etc.), useful in crisis or disaster management.
- **Deutschland:** a version specific to Germany with local conventions.
- **FreeMap:** a free alternative map with lighter rendering, suitable for hiking.
- **Lidar Slovakia:** integrates Lidar data for fine relief visualization in Slovakia.
- **Open Topo Map:** a topographic map showing contour lines, altitudes, and relief, ideal for terrain analysis.



*Figure 3.3: Maps provided by **Open Street Map** at large scale.*

3. France

These maps are provided by the IGN France (National Institute of Geographic and Forest Information). They offer detailed coverage of French territory, especially useful for fieldwork, topographic analysis, and hiking. Several styles are available in **Geoscope**, adapted to different observation and navigation needs. They are accessible only through the **Geoscope** Premium subscription (Figure 3.4).

- **Version v2:** the basic version provided by IGN, with clear display of infrastructure, place names, and relief.
- **Ortho:** a high-resolution orthophotograph useful for precise visualization of landscapes, vegetation, constructions, and land use.
- **Scan 25:** the 1:25,000 topographic map, ideal for locating relief features, trails, contour lines, and precise geographic elements.
- **Terrain:** a simplified map highlighting only contour lines for clear relief reading.
- **DTM (Digital Terrain Model):** map generated from a Digital Terrain Model representing altitudes without anthropogenic elements, enhanced by shaded relief.

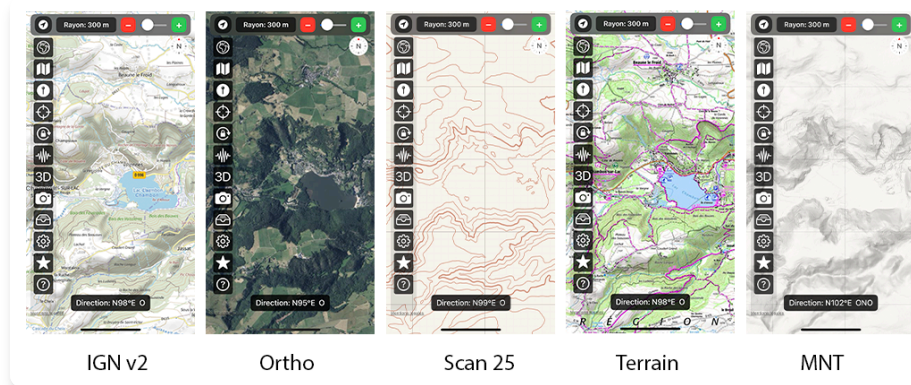


Figure 3.4: Maps provided by IGN France at large scale.

For specialized applications, other maps are available in **Geoscope** allowing more precise historical, legal, or morphological analyses (Figure 3.5).

- **Cadastre:** shows cadastral parcels with boundaries and numbers, useful for land, urban, or administrative studies.
- **Cassini:** reproduction of 18th-century maps made under the direction of César-François Cassini and his son Jean-Dominique Cassini.
- **Lidar DTM:** map based on a Digital Terrain Model derived from Lidar data, showing bare earth relief (without vegetation or buildings). Lidar (Light Detection and Ranging) is a remote sensing technology using laser beams to measure distances very precisely and model the ground surface or objects in 3D.
- **Lidar DSM:** map derived from a Digital Surface Model, including relief as observed, with vegetation and constructions.

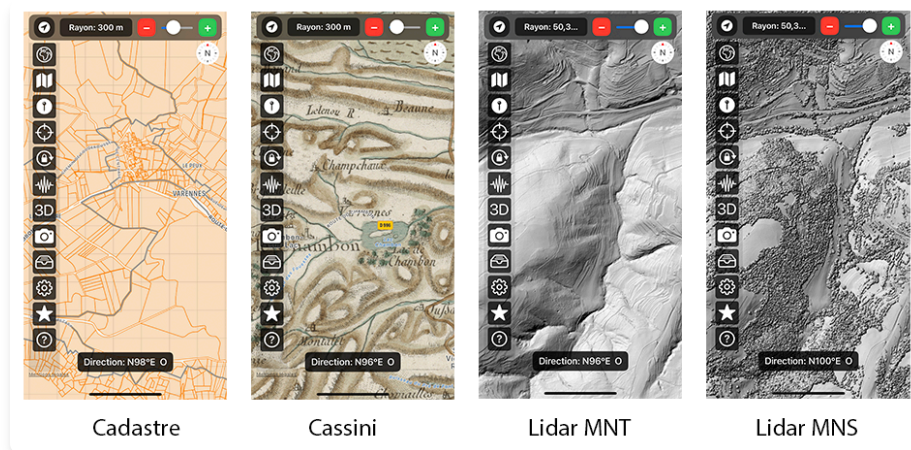


Figure 3.5: Specialized maps provided by IGN France at large scale.

Lidar technology is the most precise for detailed geomorphological and structural analyses, revealing micro-reliefs, slope breaks, faults, or anthropogenic remains hidden under vegetation. Unfortunately, coverage is not yet complete across French territory, with some areas still to be acquired or processed (Figure 3.6).

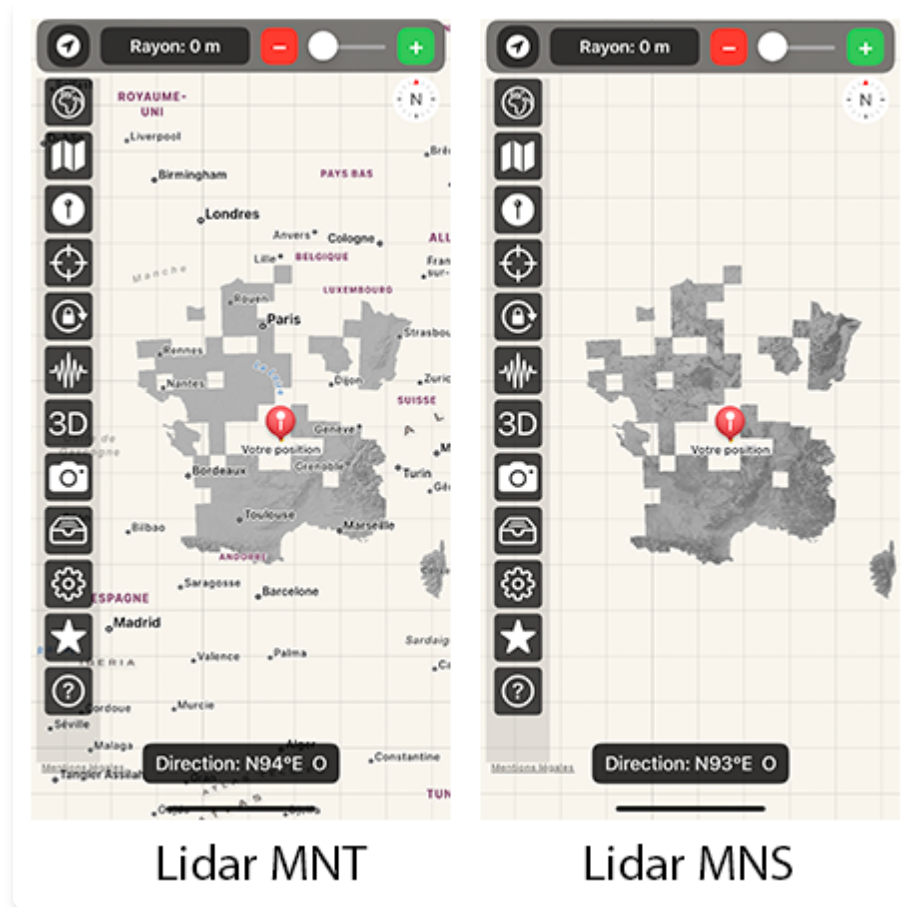


Figure 3.6: Lidar coverage in mainland France.

4. United States of America (USGS)

Maps provided by the USGS (United States Geological Survey) allow exploration of U.S. territory at various scales, with rich topographic, geological, and environmental information. These maps are mainly useful for studying areas in North America.

- **Imagery:** high-resolution satellite view.
- **Topo:** classic topographic map with contour lines, roads, rivers, and other physical landscape features.
- **Imagery Topo:** overlay of satellite imagery with topographic data.
- **Hydro:** specialized map focusing on the hydrographic network.

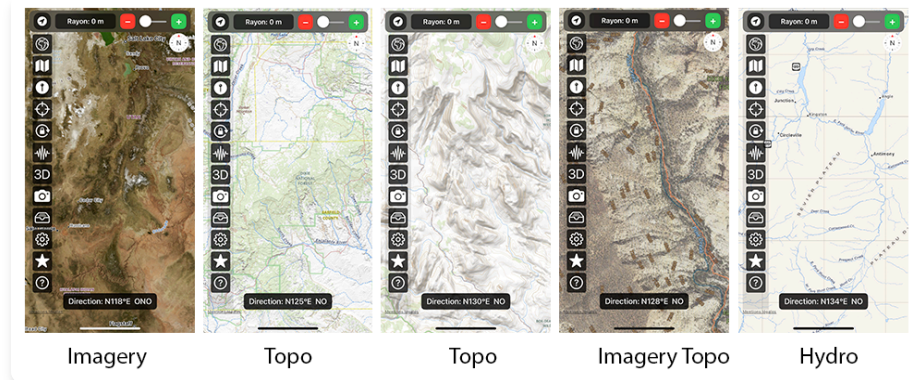


Figure 3.7: USGS maps available in **Geoscope**.

5. Switzerland (Swiss Topo)

Maps provided by SwissTopo, the Swiss federal office of topography, are renowned for their high precision and exceptional cartographic quality. They allow detailed visualization of Swiss territory (Figure 3.8).

These maps are available free without subscription.

- **Color Topo:** full-color topographic map with high detail on relief, infrastructure, and natural environment.
- **Photo:** high-resolution aerial orthophotograph, ideal for direct landscape reading.
- **Gray Topo:** grayscale version of the topographic map, suitable for subtle backgrounds or overlay analyses.
- **DTM:** Digital Terrain Model providing a 3D representation of relief, useful for morphological analysis and topographic profiles.



Figure 3.8: SwissTopo maps available in **Geoscope**.

Geoscope also provides access to geological maps offered by SwissTopo. They provide a precise and up-to-date representation of the Swiss subsurface, allowing analysis of rock formations, tectonic structures, and geological context at various scales, essential for scientific research, spatial planning, and natural resource management (Figure 3.9).

- **Geology:** detailed geological map showing rock formations, rock types, and their distribution in Switzerland.
- **Tectonics:** map highlighting major tectonic structures such as faults, folds, and deformation zones, essential for geodynamic studies.
- **Geology 1:200,000:** geological map at 1:200,000 scale, offering an overview of the regional geological context balancing detail and extent.

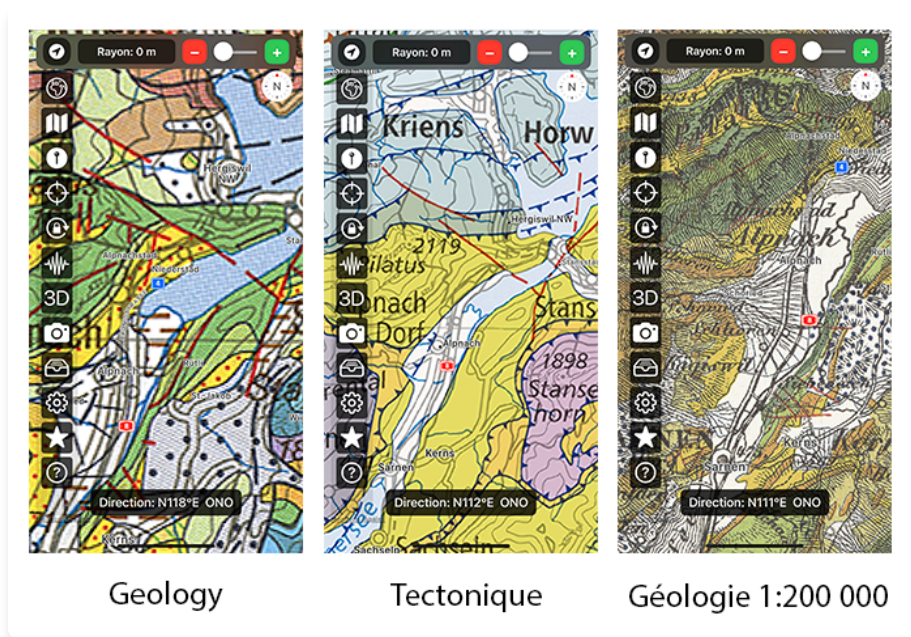


Figure 3.9: SwissTopo geological maps available in **Geoscope**.

Geoscope also provides access to historic topographic maps (Figure 3.10).

- **Siegfried Map:** topographic map of Switzerland published between 1870 and 1926 at 1:25,000 and 1:50,000 scales, offering precise detail of relief and infrastructure at the time.
- **Dufour Map:** historic Swiss topographic map from the mid-19th century (1845–1865) at 1:100,000 scale.

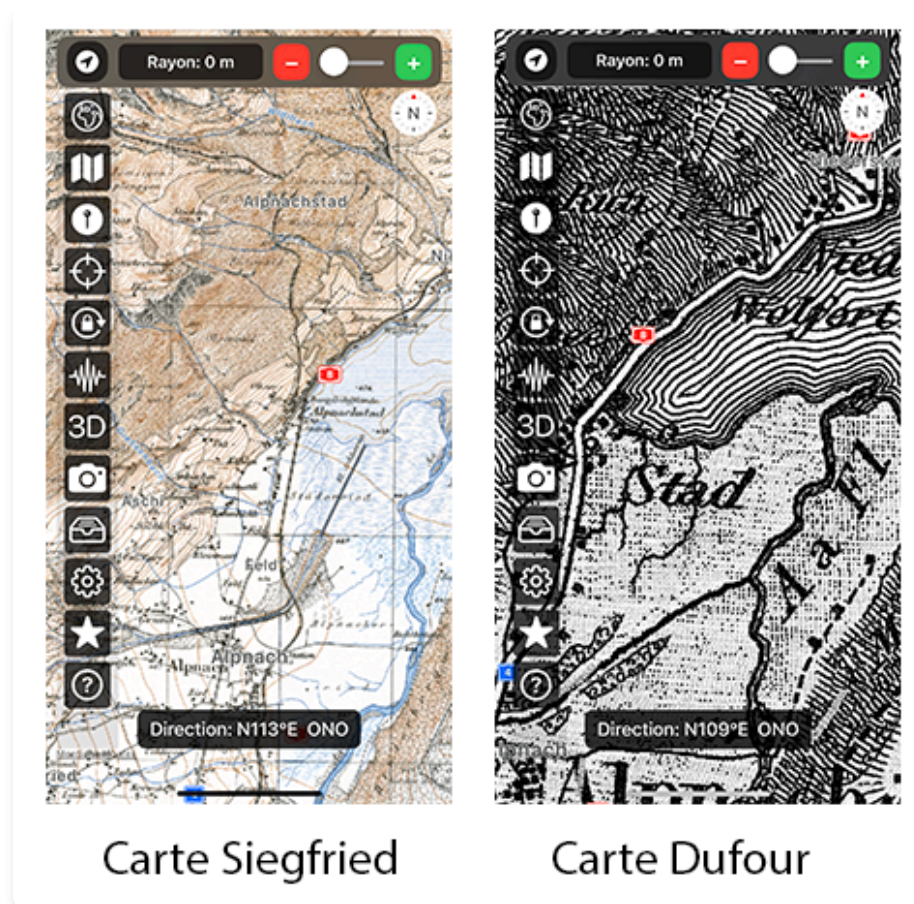


Figure 3.10: Historic SwissTopo topographic maps available in **Geoscope**.

6. Spain

The maps provided by the Instituto Geográfico Nacional (IGN) of Spain are a reference for representing the Spanish territory. Rich in topographic, administrative, and environmental details, they are produced according to high-quality national standards and cover the entire Spanish territory (Figure 3.11).

These maps are available free of charge via online tile services, with no authentication required.

- **Base:** a simplified base map offering a clear overview of the main geographic features (roads, towns, hydrography).
- **Topo:** a detailed topographic map derived from the *Mapa Topográfico Nacional*, including relief, contour lines, place names,

and infrastructure.

- **Relief:** a shaded map derived from the Digital Elevation Model (DEM), in black and white, highlighting terrain morphology.
- **Orto:** high-resolution aerial orthophotography covering the entire Spanish territory.
- **Admin:** an administrative map showing provincial, municipal, and territorial boundaries.

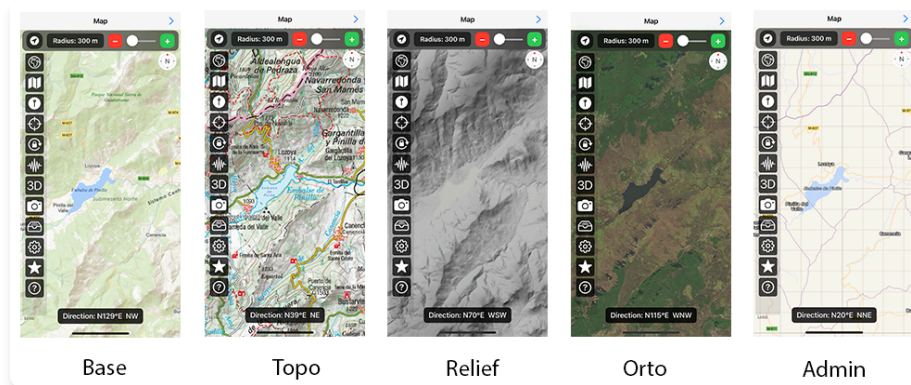


Figure 3.11: Topographic and administrative maps from the **IGN Spain** available in **Geoscope**.

7. ESRI

ESRI (Environmental Systems Research Institute) is a world leader in geographic information systems (GIS). It offers a range of global map layers used in many professional and educational applications. **Geoscope** integrates several ESRI map layers, especially useful for global-scale observation (Figure 3.12).

- **World Topo Map:** worldwide topographic map including roads, borders, place names, and physical information, ideal for an overview of terrain.
- **World Imagery:** high-resolution satellite imagery covering the planet, useful for observing landscapes, natural environments, and urbanization.

- **World Terrain Base:** simplified base map with terrain shading, designed to be combined with overlay data.
- **World Shaded Relief:** shaded relief representation of global terrain, highlighting continents and mountainous zones morphology.

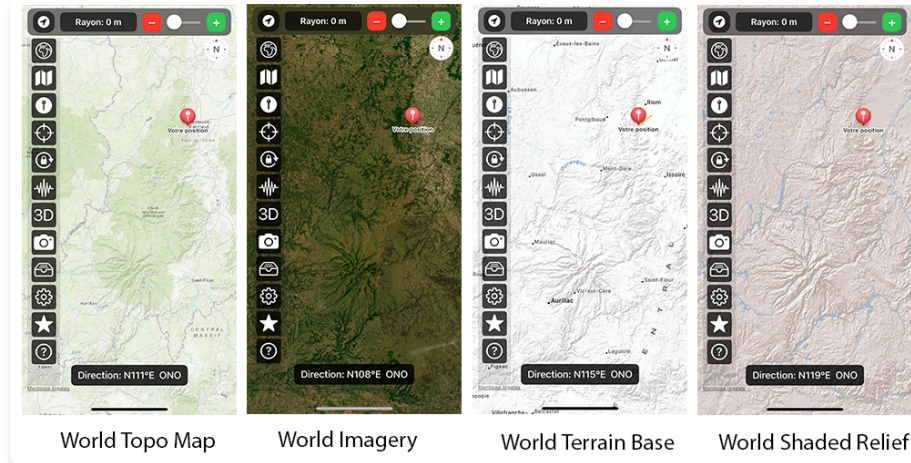


Figure 3.12: ESRI topographic maps available in **Geoscope**. View from northern Massif Central to Cantal.

Additional ESRI maps have been added (Figures 3.13 and 3.14). These include:

- **World Ocean:** specialized map for marine environments, showing depths with ridges and ocean trenches.
- **National Geographic:** cartographic style map designed by the National Geographic Society, offering an aesthetic and readable representation of physical and political data worldwide.
- **World Street Map:** detailed street and urban infrastructure map at a global scale, ideal for navigation or studying transport networks in urban areas.

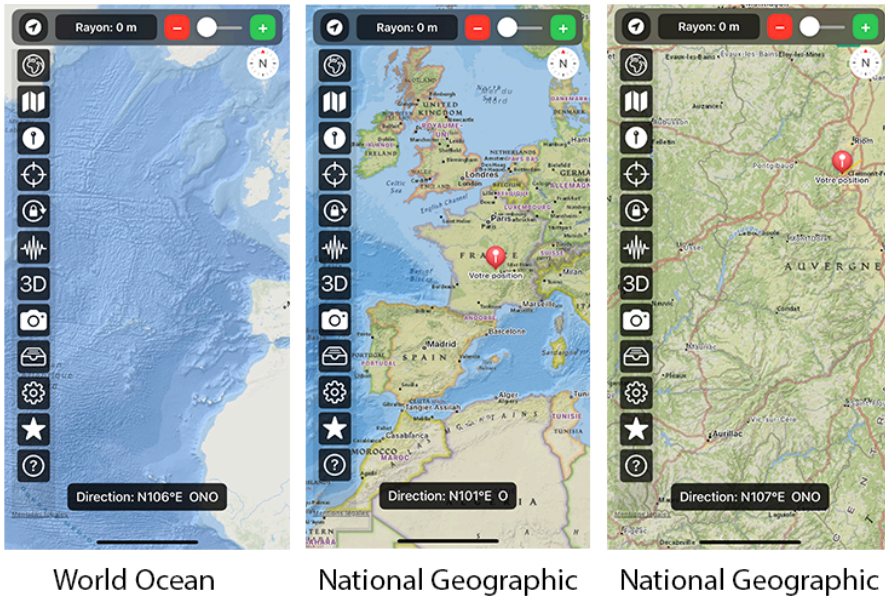


Figure 3.13: Other ESRI maps available in **Geoscope**.

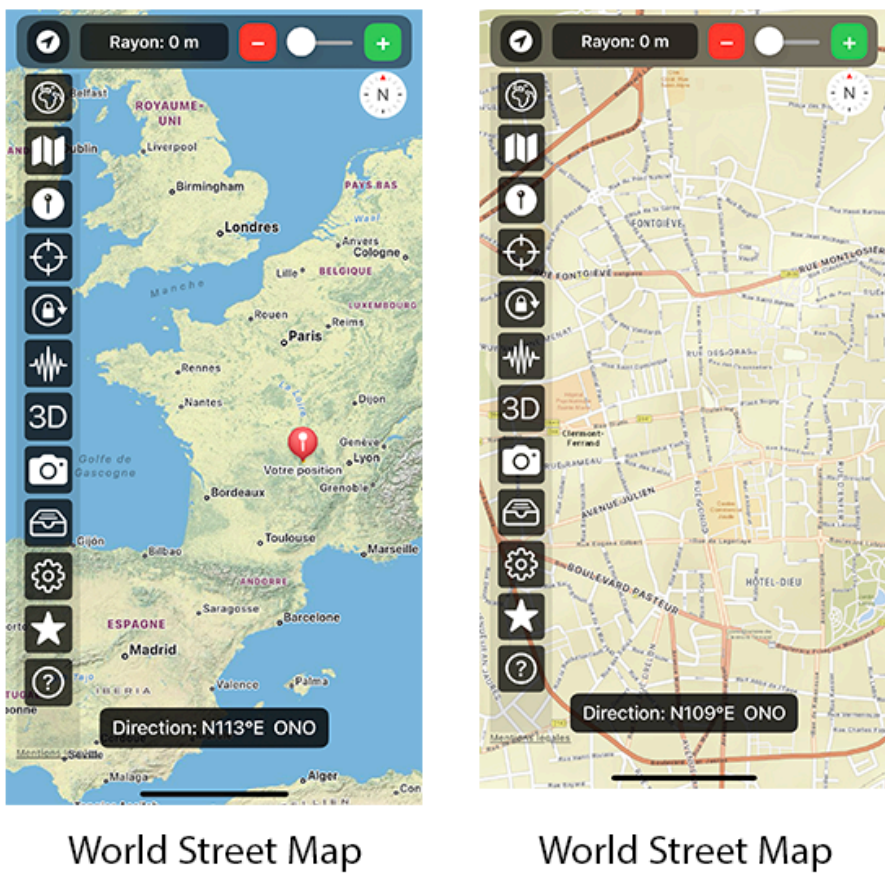


Figure 3.14: The **World Street Map** from ESRI available in **Geoscope**.

8. Belgium

Geoscope offers a wide range of old and recent maps from the Belgian National Geographic Institute (IGN Belgium), the country's official cartographic agency. This collection covers over a century of Belgian territorial evolution, with topographic maps and historic orthophotographs (Figures 3.15 and 3.16).

- **Base Map:** current map provided by IGN Belgium, with topographic details, transportation routes, and place names.
- **Base Map (BW):** black-and-white version of the base map with a sober rendering, ideal for annotations or overlaying information.
- **Ortho 1995:** historic orthophotograph of Belgium, useful for comparing landscape changes with current images.
- **Map 1989:** general-purpose topographic map representative of Belgium at the end of the 20th century.
- **Map 1981:** complete map of land use and networks in the early 1980s.
- **Map 1939:** pre-war map.
- **Map 1904:** very detailed old map.
- **Map 1873:** one of the first national topographic maps of modern Belgium.

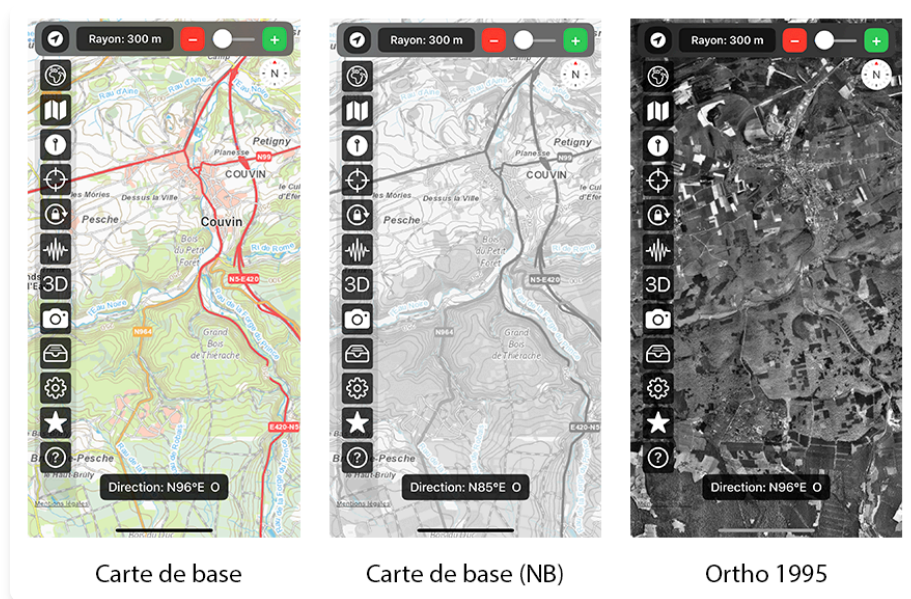


Figure 3.15: Belgian maps available in **Geoscope**.

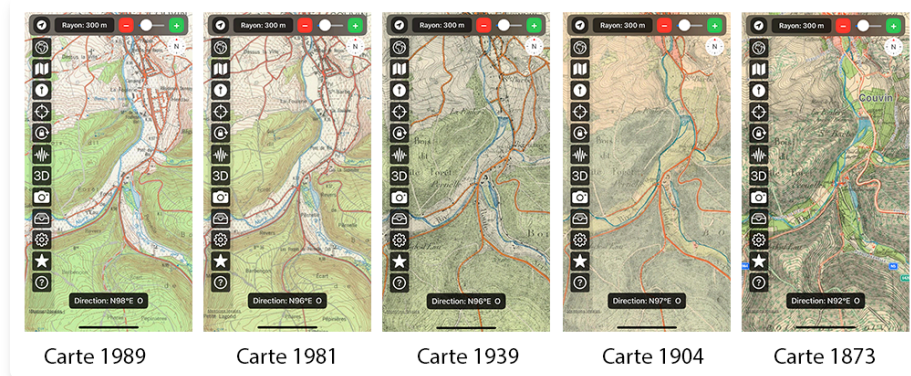


Figure 3.16: Other Belgian maps available in **Geoscope**.

9. United Kingdom

Geoscope provides access to several historic UK maps from the Ordnance Survey, the UK's national mapping agency (Figure 3.17), including:

- **Ordnance Survey 1900:** detailed early 20th-century map, ideal for studying rural landscapes and historic land use.
- **Ordnance Survey 1919:** post-World War I version, useful to observe territorial changes in early 20th century.

- **Ordnance Survey 1966:** map covering the period of major urbanization in the UK, with good detail on modern infrastructure.

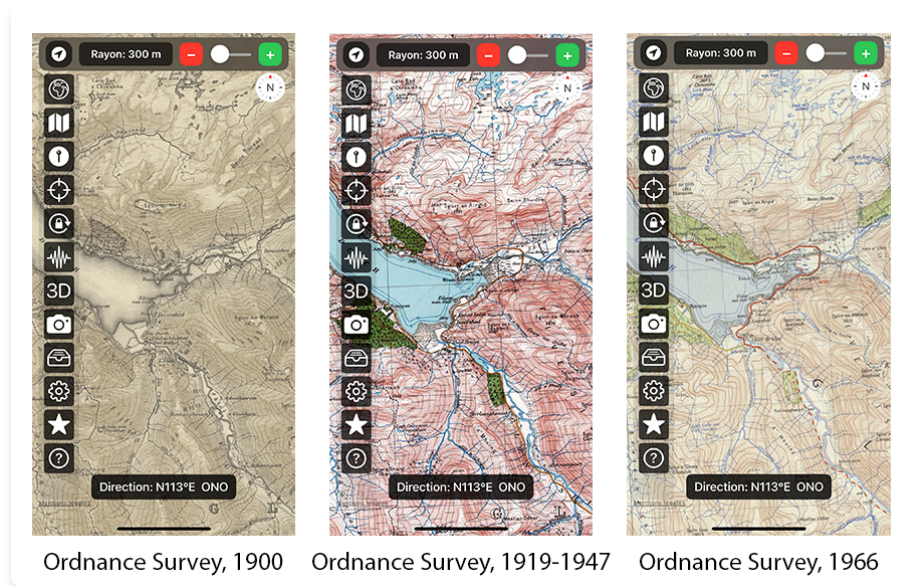


Figure 3.17: Historic Ordnance Survey maps available in **Geoscope**.

10. Google Maps

Google Maps provides several well-known map backgrounds integrated into Geoscope for their accessibility and popularity. Although widely used in navigation apps, some also offer geographic interest, notably for terrain observation and information overlay (Figure 3.18).

- **Normal:** classic road map with place names, roads, buildings, and points of interest.
- **Satellite:** high-resolution satellite imagery useful for spotting land use or site morphology.
- **Hybrid:** overlay of normal map on satellite imagery, with place names, roads, and other visible elements on image background.
- **Terrain:** simplified topographic map with shaded relief, well suited for quick reading of slopes and landforms.

These maps, while attractive and familiar, offer less precise topographic detail than specialized maps like IGN or SwissTopo, but can be useful for

initial approach or quick location.

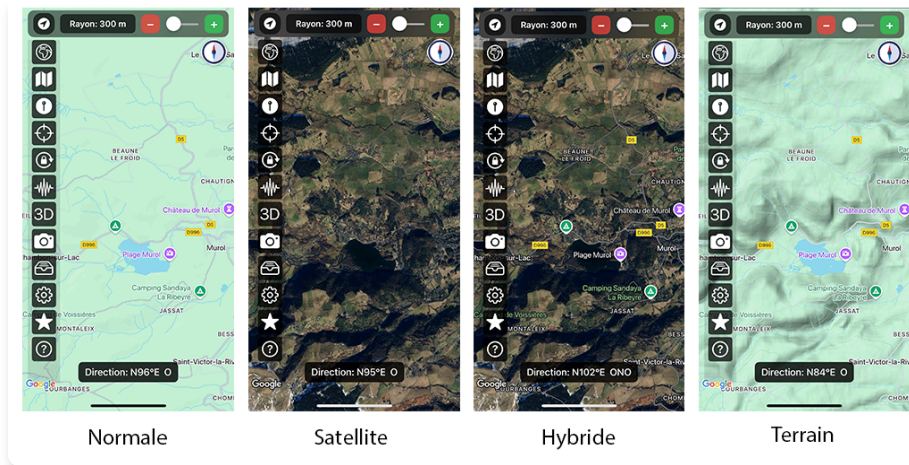


Figure 3.18: Google Maps available in **Geoscope**.

11. Thunderforest

Thunderforest offers online maps derived from OpenStreetMap data, featuring various thematic styles. Some of them provide excellent terrain readability, thanks to shaded relief, contour lines, and a color palette well-suited for landscape interpretation. These are particularly useful in **Geoscope** for fieldwork or geomorphological analysis (Figure 3.19).

- **Landscape:** colorful and high-contrast map with contour lines, shaded relief, and vegetation.
- **Open Cycle Map:** a bike-oriented topographic map, highly readable, showing trails, elevation changes, and natural features.
- **Outdoors:** map rich in natural details, ideal for hiking, topography, and locating points of interest.

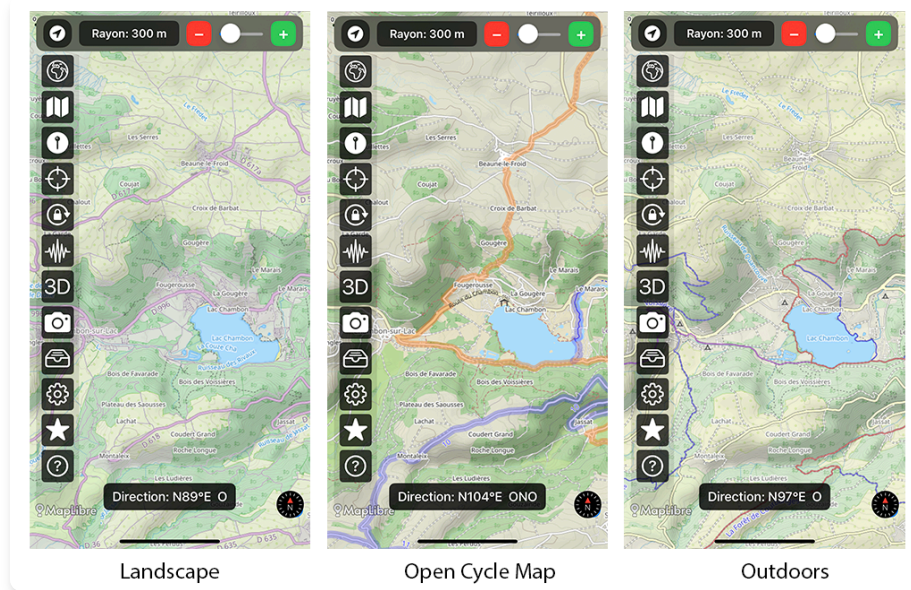


Figure 3.19: Thunderforest maps available in **Geoscope**.

Other styles offered by Thunderforest present a more schematic or simplified rendering, with flat color areas and little or no relief. They are more suited for urban or basic navigation purposes but less relevant for detailed geographic interpretation (Figure 3.20).

- **Transport:** map focused on public transport lines, with a simplified style.
- **Atlas:** clean and sober map without topographic information.
- **Mobile Atlas:** lightweight version for quick display on mobile devices.
- **Transport Dark:** dark background map suitable for night environments or LED displays.
- **Neighbourhood:** small-scale local map, useful for urban navigation.

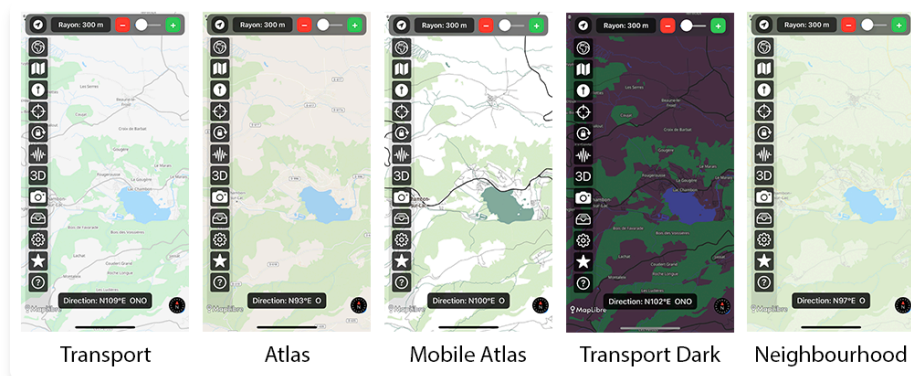


Figure 3.20: Other Thunderforest maps available in Geoscope.

12. MapTiler

MapTiler offers a variety of alternative basemaps based on OpenStreetMap data, with graphical styles adapted to different uses. Some of these maps feature an appealing aesthetic with well-defined contours, shaded relief, and good readability of natural elements, which can be relevant for the geographic and educational use of **Geoscope** (Figure 3.21).

- **Outdoor:** very readable map with paths, terrain, and forests, ideal for outdoor activities.
- **Ocean:** stylized marine map with bathymetry and coastal boundaries.
- **Backdrop:** neutral, light-background map, suitable as a base cartographic layer.
- **Winter:** winter style displaying snow-covered mountains and ski resorts.

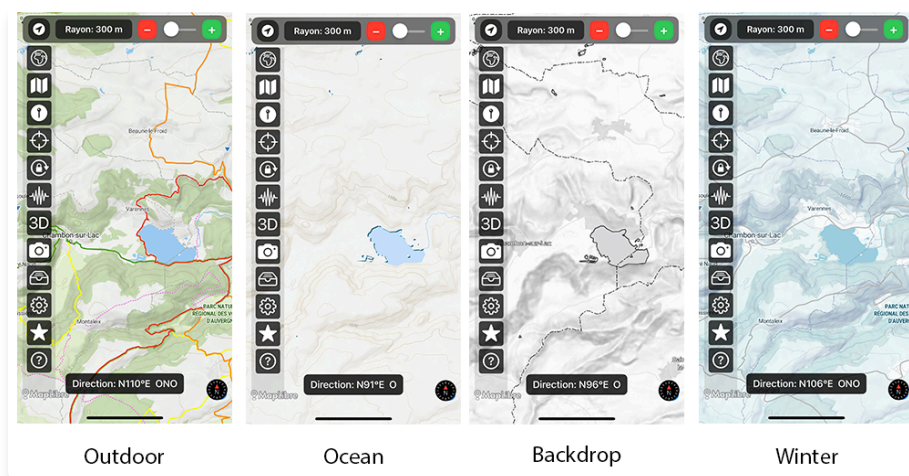
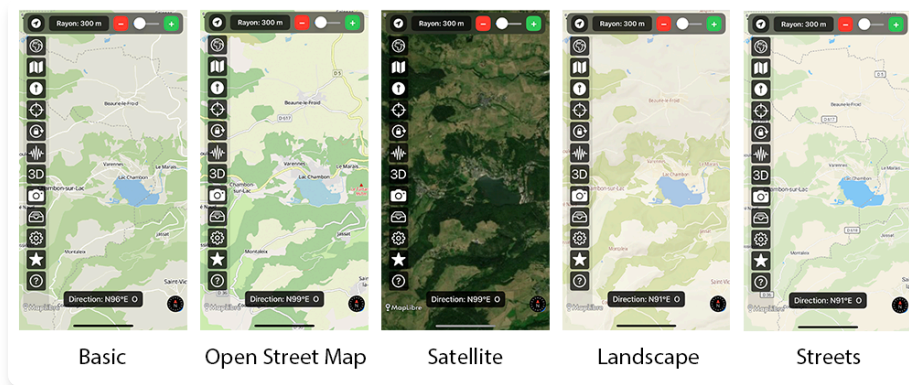


Figure 3.21: MapTiler maps available in Geoscope.

Other available maps consist of color fills without relief representation, making them less suitable for **Geoscope's** geographic needs, particularly for terrain or natural process interpretation (Figure 3.22).

- **Basic:** minimalist general-use map with few details.
- **Open Street Map:** standard OSM rendering without graphical enhancements.
- **Satellite:** raw satellite imagery without topographic annotations.
- **Landscape:** stylized colorful map but not precise enough for terrain analysis.

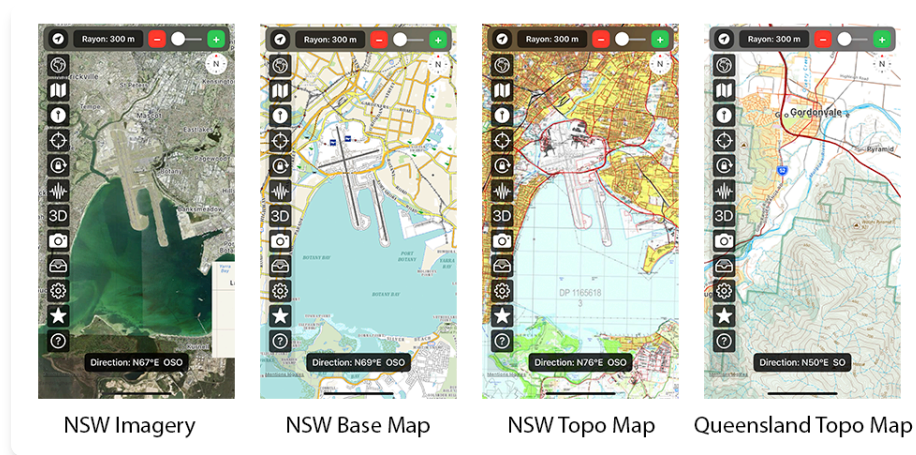


*Figure 3.22: Other MapTiler maps available in **Geoscope**.*

13. Australia

Several maps from Australian state mapping services are available in **Geoscope**, particularly for New South Wales (NSW) and Queensland. They allow for precise visualization of the Australian territory at various scales, including topographic basemaps, satellite imagery, and general-purpose maps (Figure 3.23).

- **NSW Imagery:** high-resolution orthophotos provided by the New South Wales government.
- **NSW Base Map:** general-purpose map combining roads, place names, and land use.
- **NSW Topo Map:** official topographic map with contour lines, hydrographic network, and natural features.
- **Queensland Topo Map:** Queensland topographic map, suited for reading terrain and navigating rural or mountainous areas.



*Figure 3.23: Australian maps available in **Geoscope**.*

IV/ User Interface

1. Navigation between the application pages

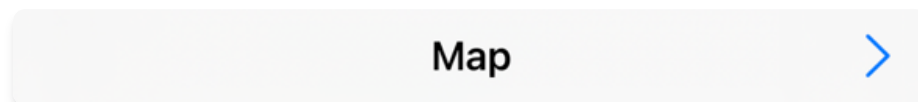
The **Geoscope** application offers a user interface composed of eight main screens, each corresponding to a specific feature:

1. **Interactive map:** displays the map with line of sight and a circular search zone.
2. **Place search:** queries the OpenStreetMap or Apple MapKit database to locate points of interest.
3. **Search results:** presentation of the results from the query.
4. **Photo:** camera preview with insertion of indications for cardinal points and a user-defined target location.
5. **Preferences:** configuration of the application settings according to user needs.
6. **Online help:** access to documentation and usage instructions.
7. **Premium version:** access to the Premium version including all application features and subscription to advanced maps via an

annual subscription (coming soon).

8. **About:** information about licenses and legal notices.

The different screens are accessible via the navigation bar located at the top of the interface (forward/back navigation arrows) or by swiping directly on the screen.



*Figure 3.1: the **Geoscope** navigation bar at the top of the screen.*

2. The interactive map

The interactive map is the main workspace of the application. It occupies the majority of the screen (Figure 3.2).

The user can zoom in or out to adjust the extent of the map view, as well as move by simple finger drag.

It is also possible to rotate the map using two fingers. To return to the classic orientation with north at the top, simply tap the compass icon which appears automatically when a rotation is active.

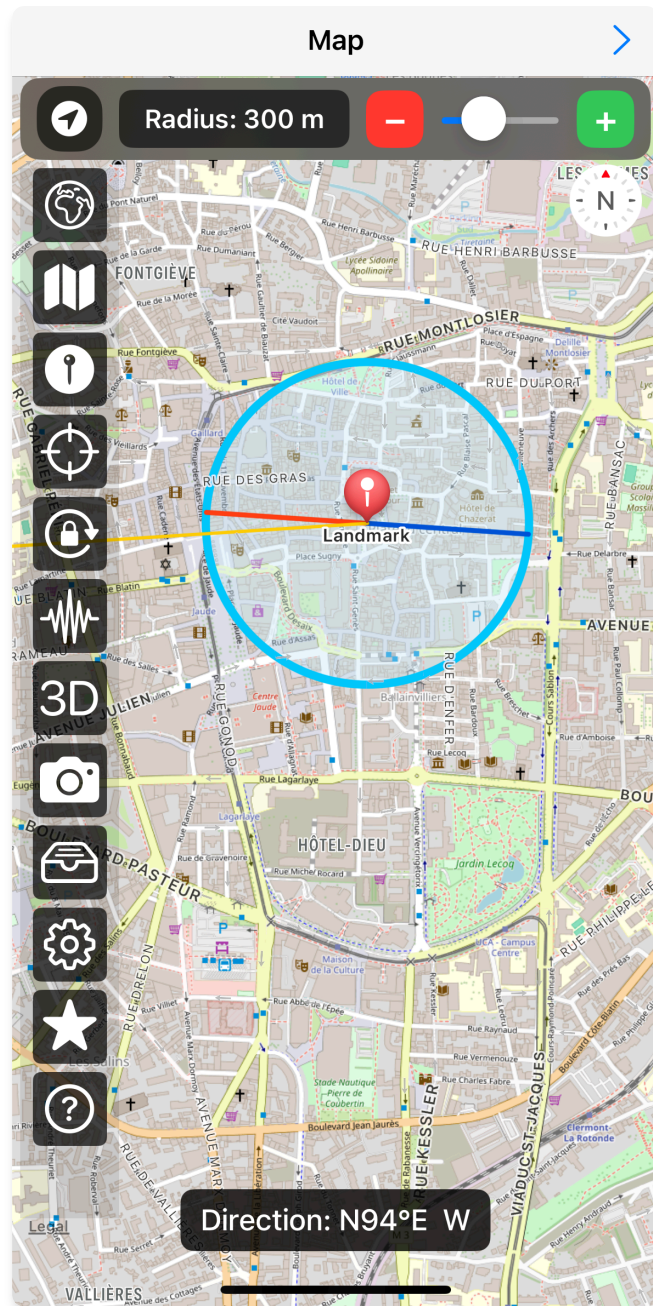


Figure 3.2: display of the interactive map on the first screen.

a) Lines of sight

Geoscope uses several types of lines of sight drawn on the map to identify points in the landscape. Their color and style can be configured in the **Preferences** page.

In the screenshot below (Figure 3.3), the red line is the main line of sight. It is the main axis oriented according to the principal orientation of your

mobile device, iPhone or iPad (portrait or landscape mode). Think of this line as a fictitious laser beam pointing to the place you want to identify on the map.

By successive zooming in and out on the map, you can precisely recognize the sites located along the line of sight.

Secondary lines can be useful in some circumstances:

- The line, here drawn in dark blue, is called the **antipodal line**, because it is oriented in the opposite direction to the main line. It can sometimes be more convenient to use than the main line.
- The line, here drawn in yellow, points to a user-chosen target. It can be useful to check the proper calibration of the device relative to a reference point. Its position remains fixed on the map, whatever the device orientation, unlike the lines of sight which constantly adjust.

These lines of sight, main and antipodal, thus form a kind of virtual compass laid over the map. They allow the actual orientation to be materialized.

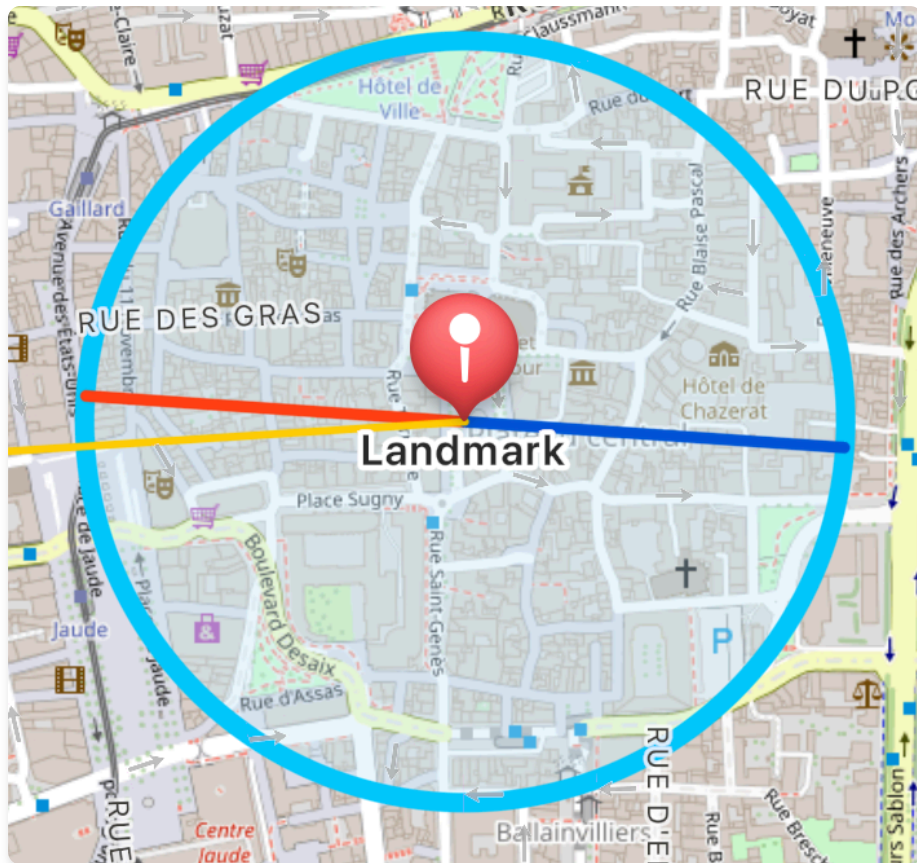


Figure 3.3: Lines of sight. Here, the red line is the main line of sight. The dark blue is the antipodal line and the yellow is a line of sight towards a reference target point. **Landmark** here designates the observation source point. The azure blue circle defines the circular search zone around the observation point. Note that all colors are configurable.

b) The search zone

The upper part of the interactive map allows dynamic adjustment of the size of the circular search zone around the reference point. This also allows adjusting the length of the lines of sight (Figure 3.3).

Two buttons (- and +) offer precise adjustment, while the slider allows fast and continuous modification of the radius of the circular search zone. The adjustment range automatically adapts to the map scale: fine variations in close-up view and larger variations in wide or global view (Figure 3.4).












Figure 3.4: Adjustment area for the search zone





c) Buttons on the side

A column of icons on the side of the screen provides access to several essential features (Figure 3.5).



Figure 3.5: Icons on the left side of the screen providing quick access to **Geoscope** features.

- The button  located at the top left toggles between two map display modes.
 - In **"north up" mode (north heading)**, the line of sight rotates according to the iPhone's orientation.
 - In **"heading up" mode (course heading)**, the line of sight always points to the top of the screen, in the direction followed by the iPhone or iPad, while the map itself rotates.
- The button  shaped like a **globe** allows changing the map provider.
- The button  shaped like a **folded map** allows selecting a map type among those offered by the chosen provider.
- The button  shaped like a **pin** toggles between the user's current location or another manually defined starting point.
- The button  shaped like a **target** allows choosing a reference target place via this screen: a line can be drawn on the map between the start point and this target point.
- The button  shaped like a **padlock** locks the position and the lines of sight for static map consultation.
- The button  shaped like a **wavy signal** recalibrates the compass magnetometer to eliminate possible electromagnetic interferences.
- The button  labeled **3D** toggles between an inclined view (**3D mode**) and an orthogonal map view (**2D mode**).
- The button  shaped like a **camera** gives direct access to the "Photo" screen displaying the annotated preview of the scene captured by the iPhone camera.

- The button  shaped like a **locker** displays information (geographic coordinates, altitude, name) of the source point and the point reached by the line of sight.
- The button  shaped like a **gear** gives direct access to the application settings.
- The button  shaped like a **five-pointed star** leads to the subscription screen for the full **Geoscope** version and to an annual subscription to paid Premium maps offered by major map providers (**feature coming soon**).
- The button  shaped like a **question mark** gives access to the online help screen. A long press on this button displays contextual help describing the function of the various buttons on the current screen.

d) The azimuth

The text area located at the bottom of the **Geoscope** interactive map permanently displays the current orientation of the line of sight relative to geographic north. This value corresponds to the azimuth, i.e. the angle between the north direction and the one you are aiming at, measured in the horizontal plane (Figure 3.6).

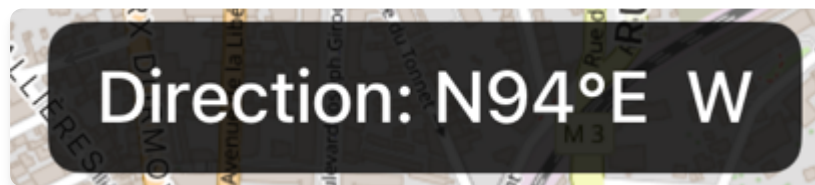


Figure 3.6: Azimuth indication at the bottom of the map

Geoscope offers two azimuth display modes, depending on the usage or field involved:

- **Classic mode** (used in most compass apps on iOS): The azimuth is expressed as an angle between 0° and 360°, measured clockwise

from north. For example, an azimuth of 90° corresponds to east, 180° to south, and 270° to west.

- **Mode used in structural geology:** The azimuth is expressed here between 0° and 180° , with explicit indication of the direction aimed at. For example, an azimuth of $045^\circ \rightarrow$ NE or $120^\circ \rightarrow$ SE. This method is widely used to describe the orientation of planes or fractures (faults, bedding, joints) in geosciences.

This dual display allows **Geoscope** to adapt both to general public use (navigation, positioning) and to scientific or professional use, notably for structural field surveys.

e) Contextual help

By pressing the question mark button, the application displays contextual help specifying the function of each button on the left border (Figure 3.7).

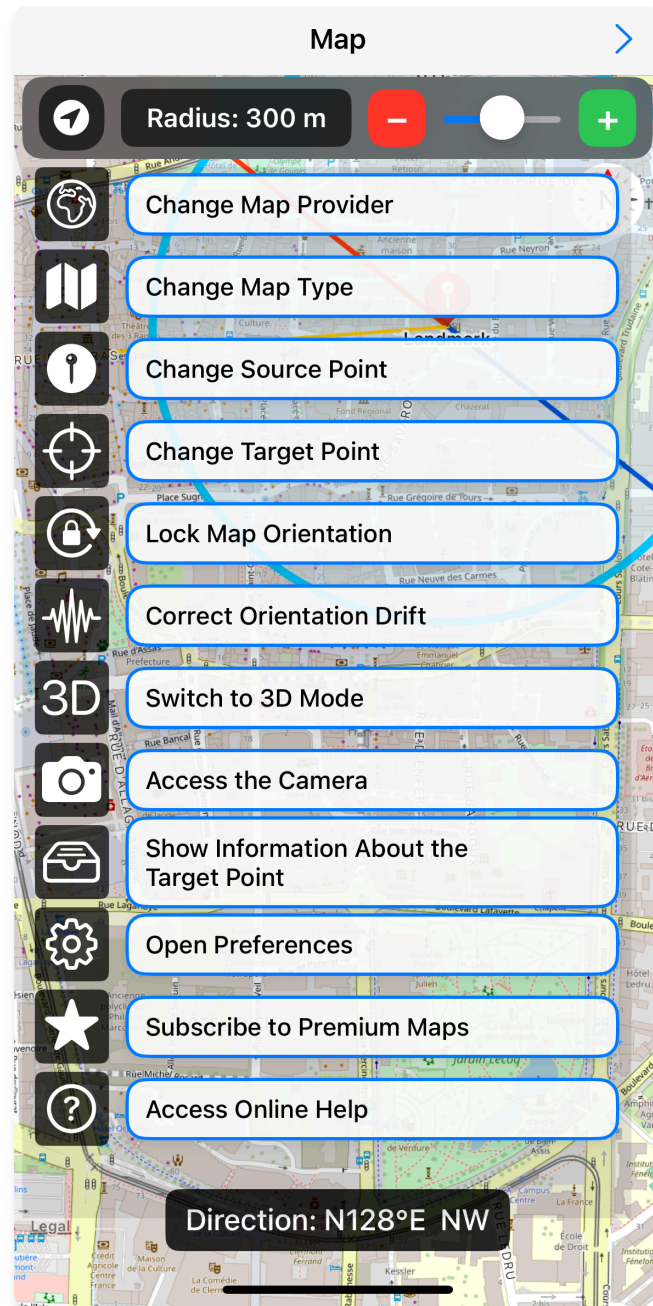


Figure 3.7: Contextual help

By long pressing a specific button, more precise help is provided (Figure 3.8).

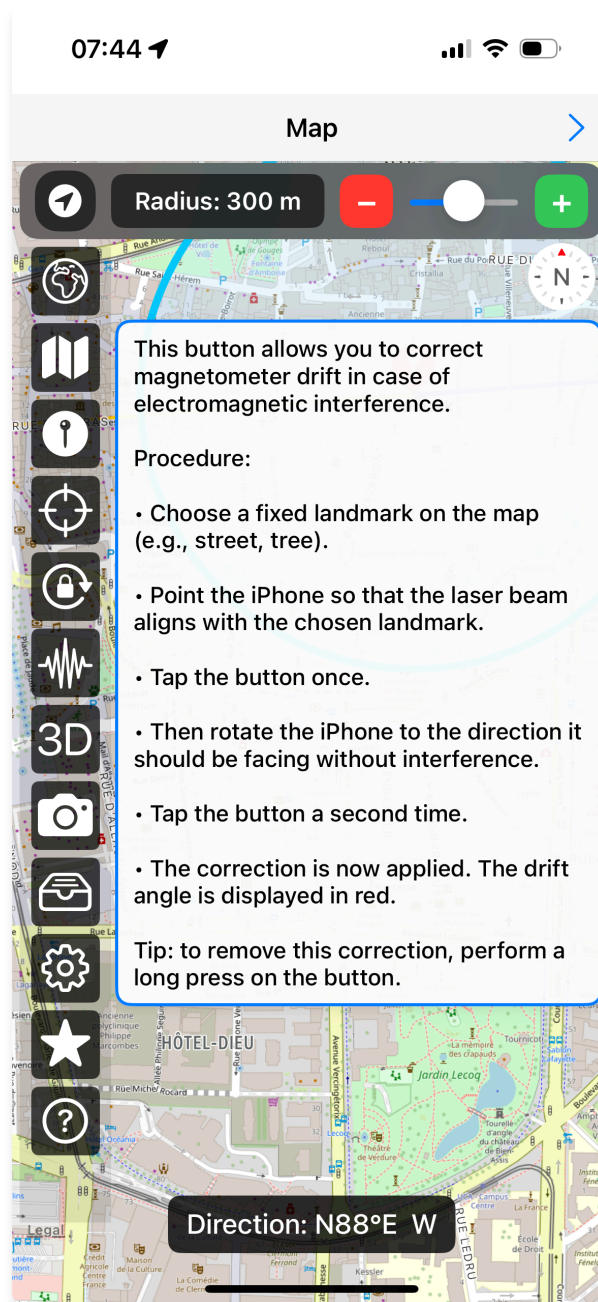


Figure 3.8: Contextual help on the "Drift correction" button by long press.

3. Querying georeferenced databases

The second screen of the **Geoscope** application allows sending queries to the OSM (OpenStreetMap) database or Apple MapKit to search for points of interest around the source point (Figure 3.10).

The upper part of this screen allows adjusting the circular search zone, already visible on the first screen (map view).

The radius of this zone can be dynamically modified using a slider, or more precisely by using the "+" and "-" buttons located on either side.

This zone defines the space within which points of interest will be searched around your current position or a selected point.

The size of the search zone is especially important for queries sent to the OSM (OpenStreetMap) databases.

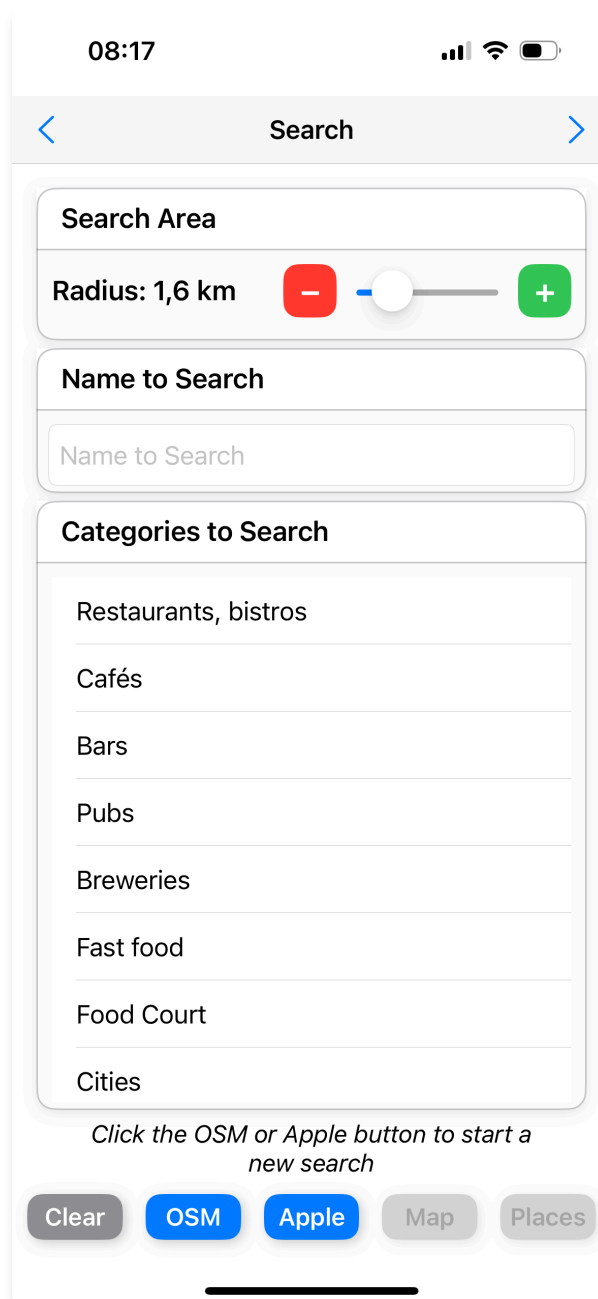


Figure 3.10: Place search

a) Using the OpenStreetMap database

Places to search are determined by selecting thematic categories in the lower part of the form (Figure 3.10).

The offered categories include topographic features (peaks, volcanoes, etc.), commercial establishments (restaurants, cafés, etc.), administrative places (town halls, schools, universities, etc.), cultural places (cinemas, theaters, etc.), sports facilities (fields, pools, etc.), medical facilities (hospitals, doctors, dentists, etc.) or others.

Once a category is selected, a checkmark appears next to its name.

Several categories can be selected for the same query.

To start the search, press the **OSM** button.

To reset selections and formulate a new query, press the **Clear** button.

b) Displaying results

After a query, an information message appears at the bottom of the screen indicating the number of places found (Figure 3.11).

The user can then continue by selecting either the **Map** button to view the results on the map of the first **Geoscope** screen, or the **Places** button to consult them as a list (third **Geoscope** screen).

If results are insufficient or irrelevant, it is possible to modify the query parameters, narrow or widen the search zone.

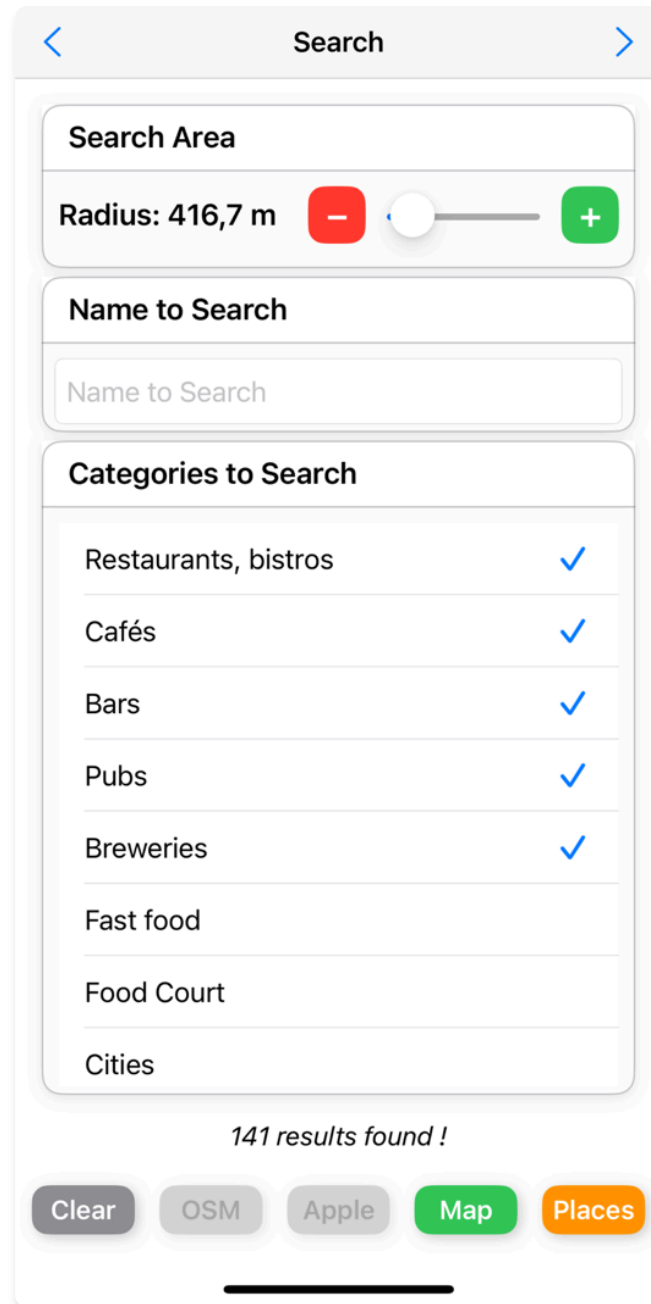


Figure 3.11: Display of search results from the OSM (OpenStreetMap) database

c) Using the Apple database

Search is done by name (Figure 3.12).

To do this, enter the name of the place to search for, then click the **Apple** button located at the bottom of the screen.

Results are displayed as a list on the third screen of the **Geoscope** application (Figure 3.13).

To access the results, either click the right arrow in the navigation bar at the top of the screen, or click the **Places** button at the bottom of the screen.

The results are also displayed as points on the map of the first **Geoscope** screen.

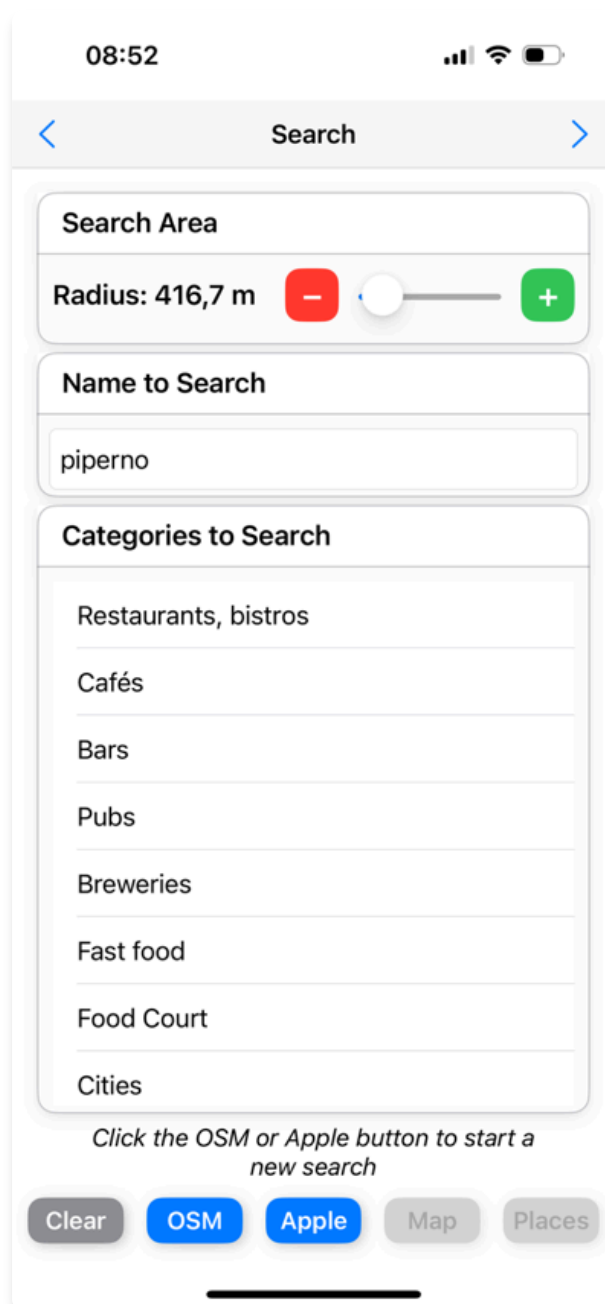


Figure 3.12: Entering the name of the place to search for a query to the Apple database.

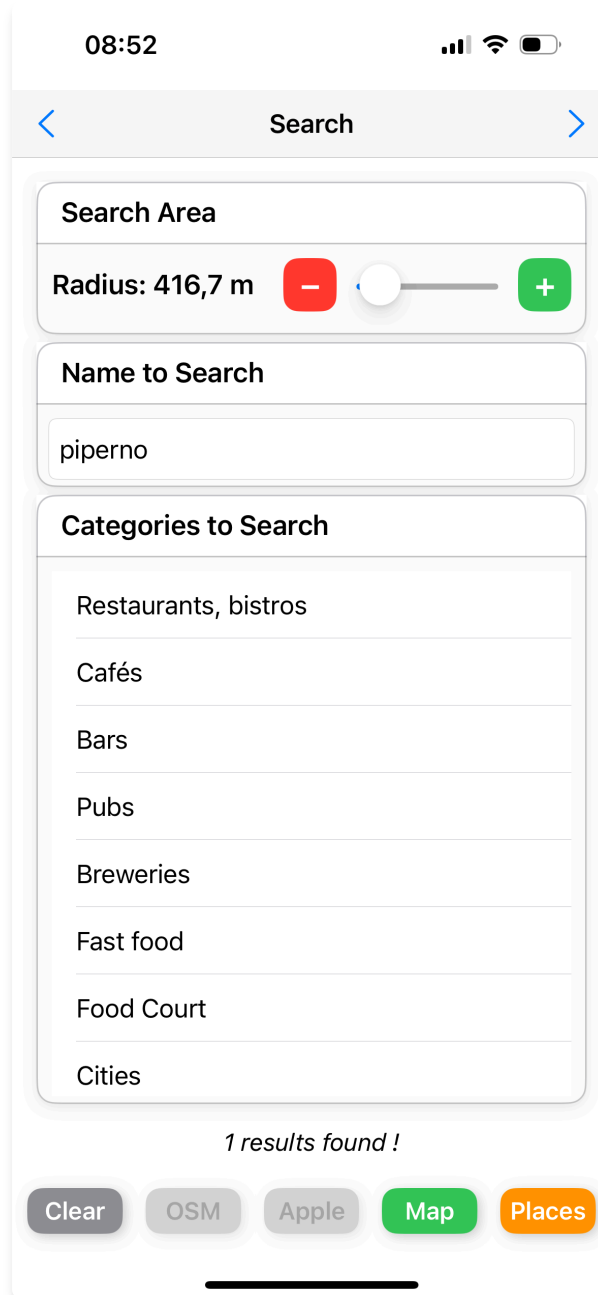


Figure 3.13: Query results.

4. Display of search query results

The third screen of the **Geoscope** application allows displaying search query results as a list (Figure 3.14).

The results are sorted alphabetically.

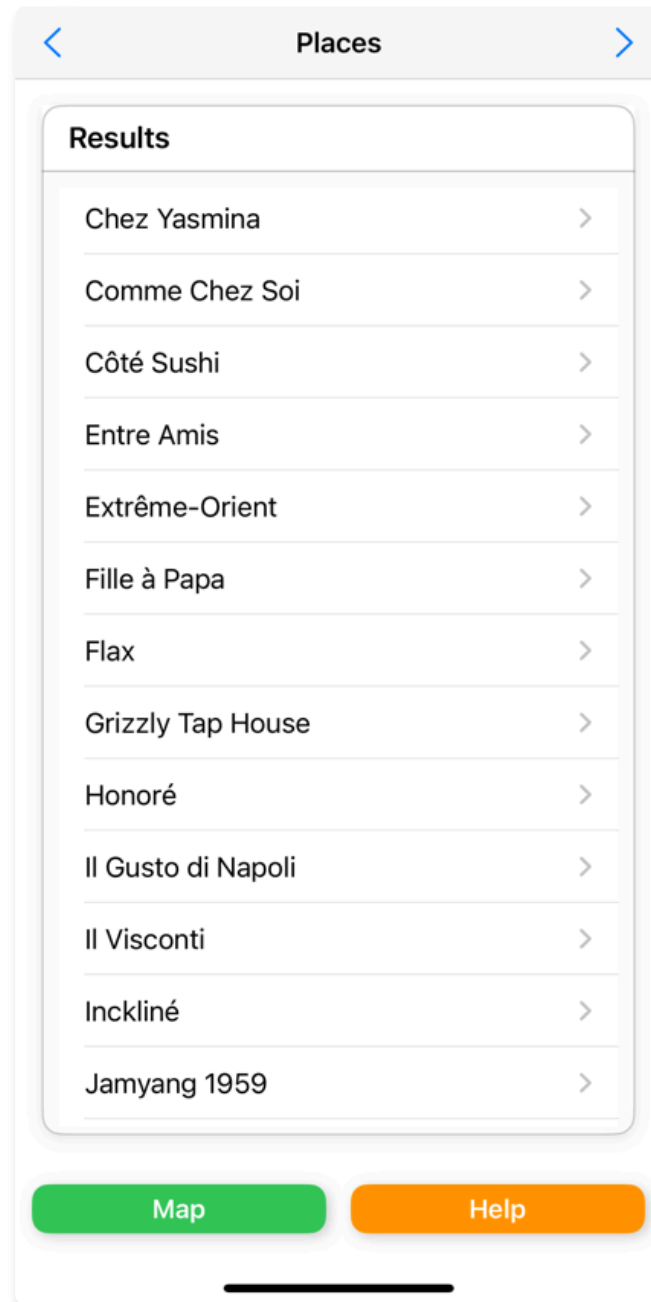
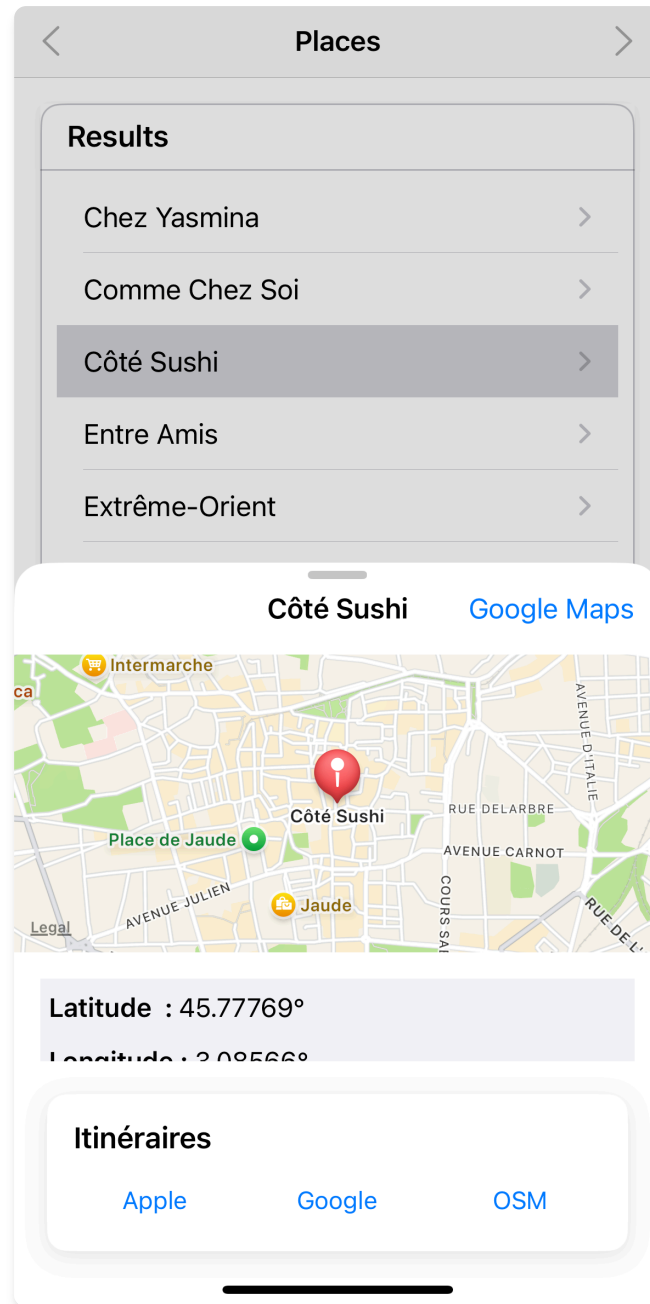


Figure 3.14: display of results for an **OSM** query.

By selecting an item in the list, a modal window slides up from the bottom of the screen. It shows detailed information extracted from the database.



*Figure 3.15: display of detailed information extracted from the **OSM** database.*

The **Geoscope** application can use third-party navigation apps such as **Apple Maps**, **Google Maps**, or **OpenStreetMap**. This is useful to establish a route to reach the selected place.

5. Defining a target reference point

The **Geoscope** application allows defining a target location used as a reference point (Figure 3.16).

This operation is done via the fourth screen of the application (Figure 3.16).

This screen consists of an interactive map and a selection of previously defined places.

The map can be freely manipulated: zoom in/out, move with one finger, rotate with two fingers.

The list below the map groups reference points saved by the user, facilitating quick changes of reference location.

The **Symbols** button opens, in a modal window, a predefined list of emblematic or symbolic places around the world.

The **Delete** button allows removing an item from the list of saved reference points.

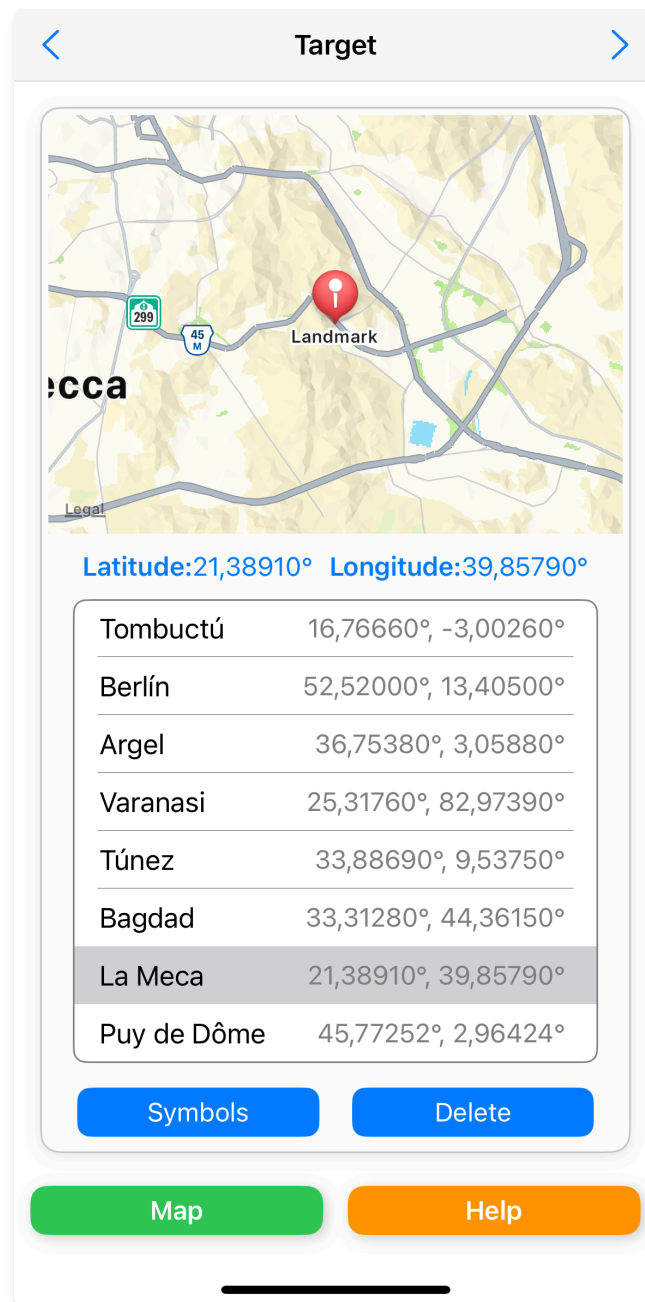


Figure 3.16: defining a target location

a) Manual selection of a reference point on the map

A simple click on a location on the map allows precise definition of a new reference point. Once selected, a modal window appears to let the user assign a custom name to this place (Figure 3.17).

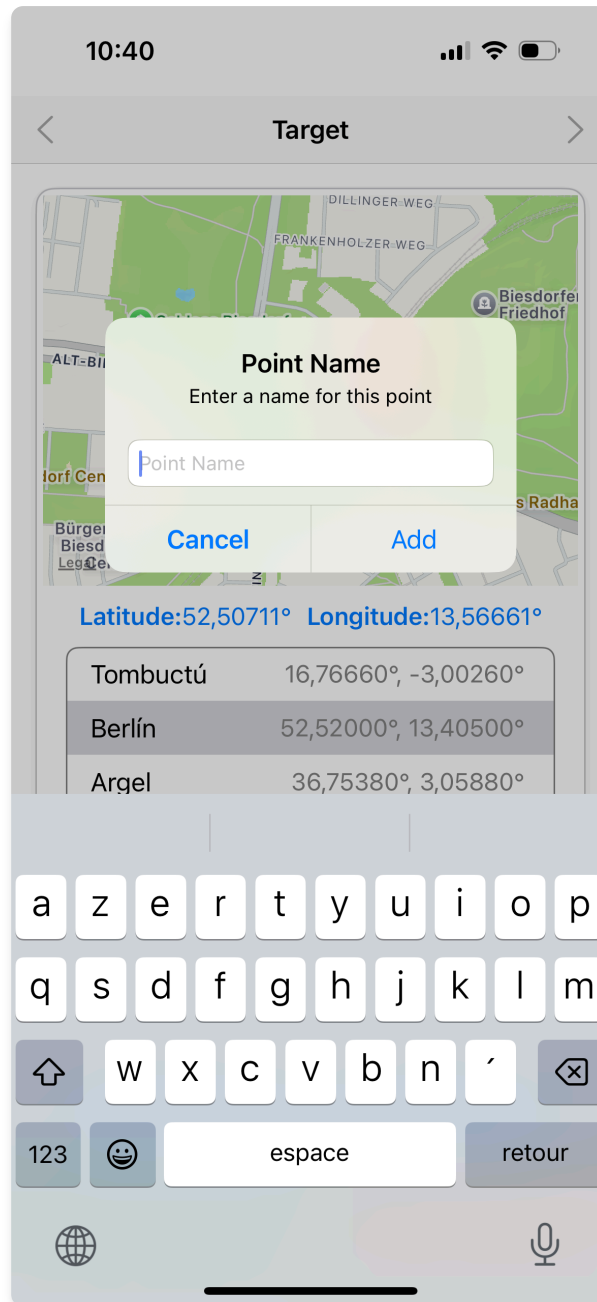


Figure 3.17: defining the name of a new reference point

b) Selecting a reference target point from the predefined list

The user can choose a reference target point from a list of emblematic places around the world already predefined in the **Geoscope** application (Figure 3.18).

Places shown in gray, accompanied by a padlock icon, indicate that they are already saved in the list of reference points (4th screen).

A simple downward swipe closes this modal window.

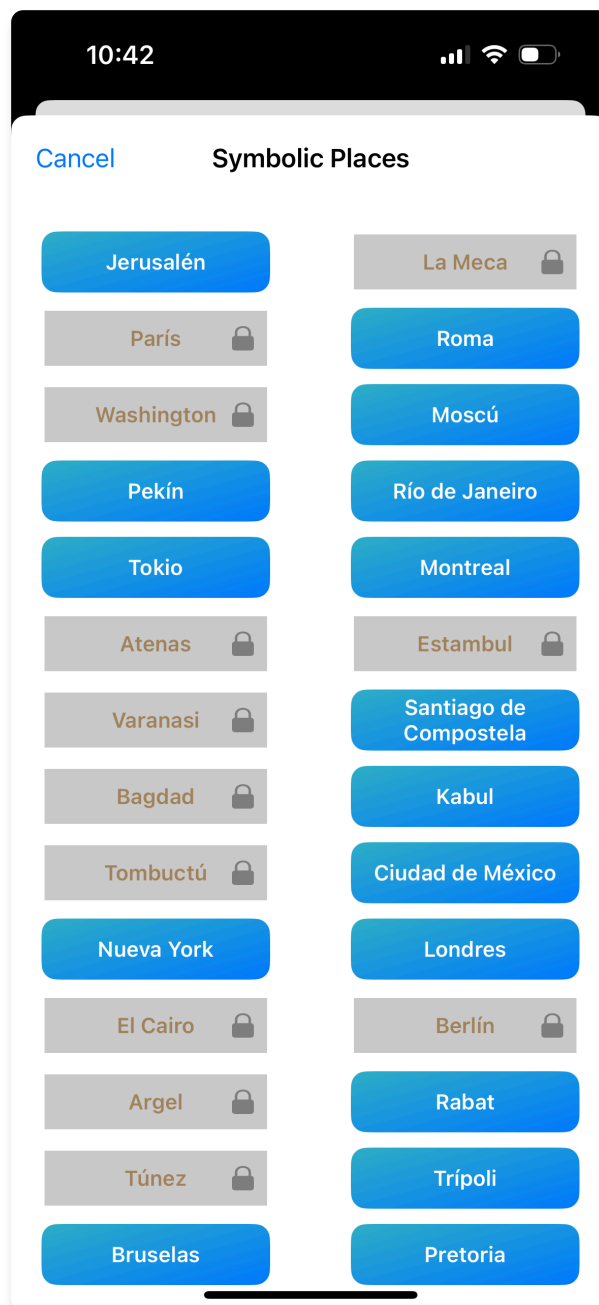


Figure 3.18: list of predefined emblematic places in the Geoscope application.

6. Taking georeferenced and oriented photos

The **Geoscope** application allows using the iPhone or iPad camera to orient oneself in the landscape and produce photographic shots annotated according to the device's direction (Figure 3.19).

The **Photo** button (reserved for the Premium version) allows saving the photographic shot enriched with annotations indicating the device's direction at the time of capture.

The choice of focal length (wide angle, standard, or telephoto) is done using the selector at the bottom of the screen.

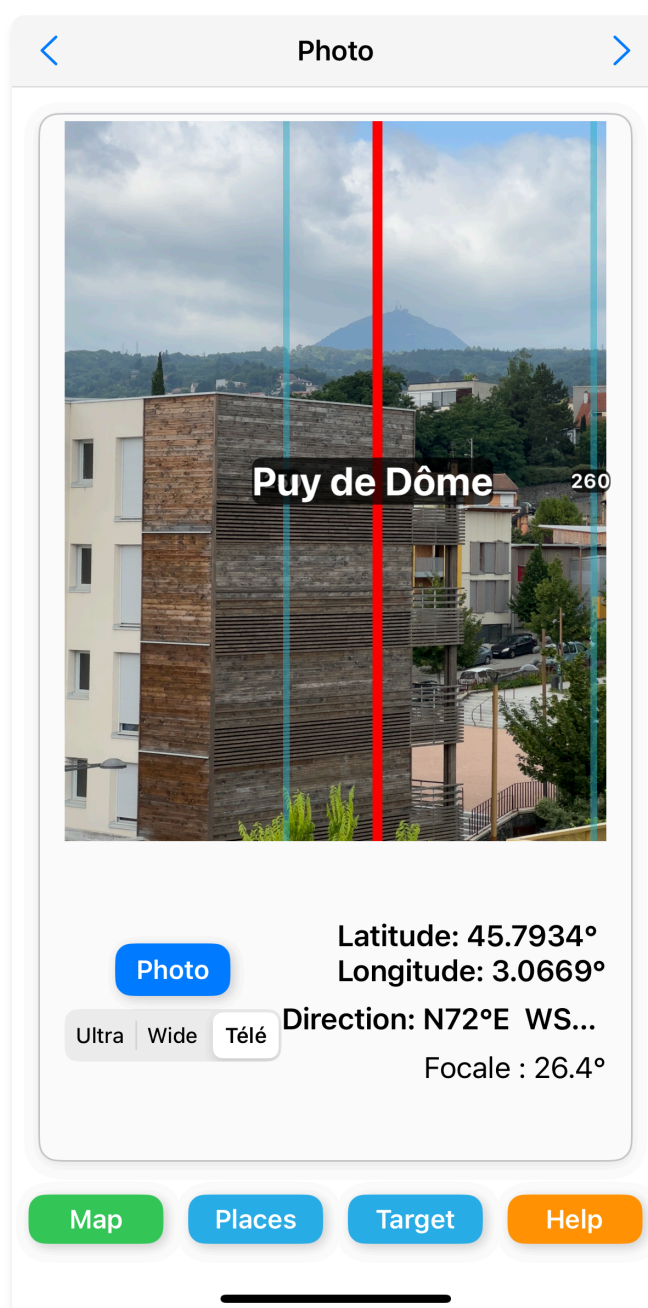


Figure 3.19: using the camera

7. Configuration of default settings

Many visual options of the **Geoscope** application can be set by default in the fifth screen. This concerns the following settings (Figure 3.20).

- choice of map provider,
- activation of light mode or dark mode,
- display of the compass in a corner of the map,
- display of the azimuth angle (measured between 0 and 360° or between 0 and 180°, with orientation direction),
- choice of map display mode (either "north up" or "heading up"),
- display of a warning at startup regarding magnetometer calibration,
- the angular setting for drift correction,
- display of the circular search zone,
- display of the antipodal line,
- display of the reference line,
- display of the cardinal lines, rotated by 90° compared to the main lines of sight,
- display of the tetragonal lines, deviated by 45° from the main lines of sight,
- display of the trigonal lines, deviated by 30° and 60° from the main lines of sight,
- beginner mode, recommended for new users,
- automatic clearing of the cache used for maps,
- button to manually clear the cache.

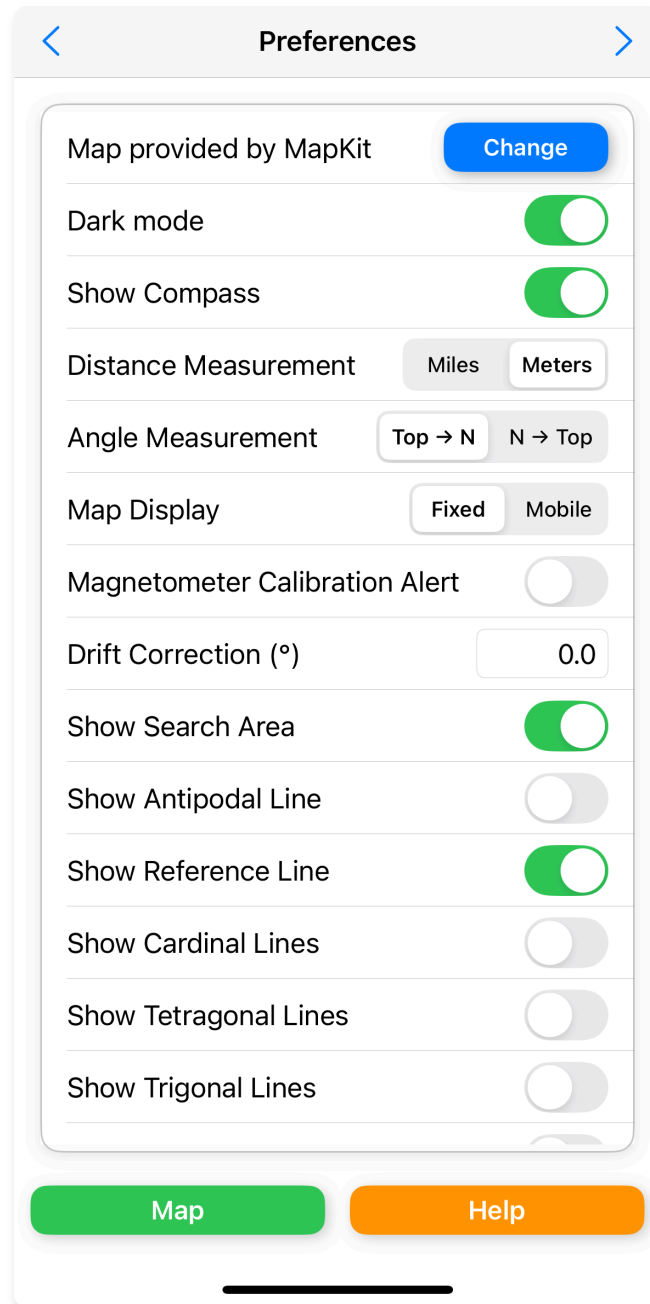


Figure 3.20: configuration of default settings.

8. User help

The sixth screen of the application displays a brief summary of **Geoscope**'s objectives (Figure 3.21).

The **Online Help** button provides access to the user manual.

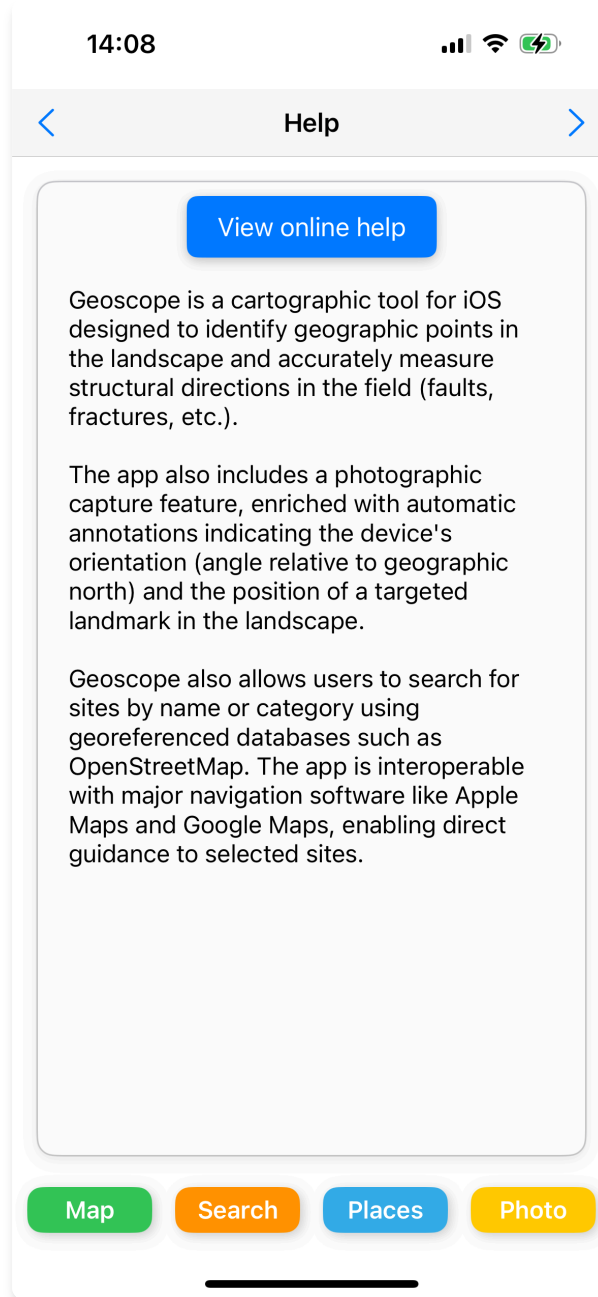


Figure 3.21: help.

9. In-app purchases

The seventh screen describes the in-app purchases (Figure 3.22).

Two distinct and complementary offers are proposed.

- **Premium Version** unlocking access to all advanced features (georeferenced photo capture, magnetometer calibration, locking the line of sight, etc.)
- **Premium Maps Subscription:** this annual subscription allows access to high-quality topographic maps, such as the IGN map printed at a 1:25,000 scale.

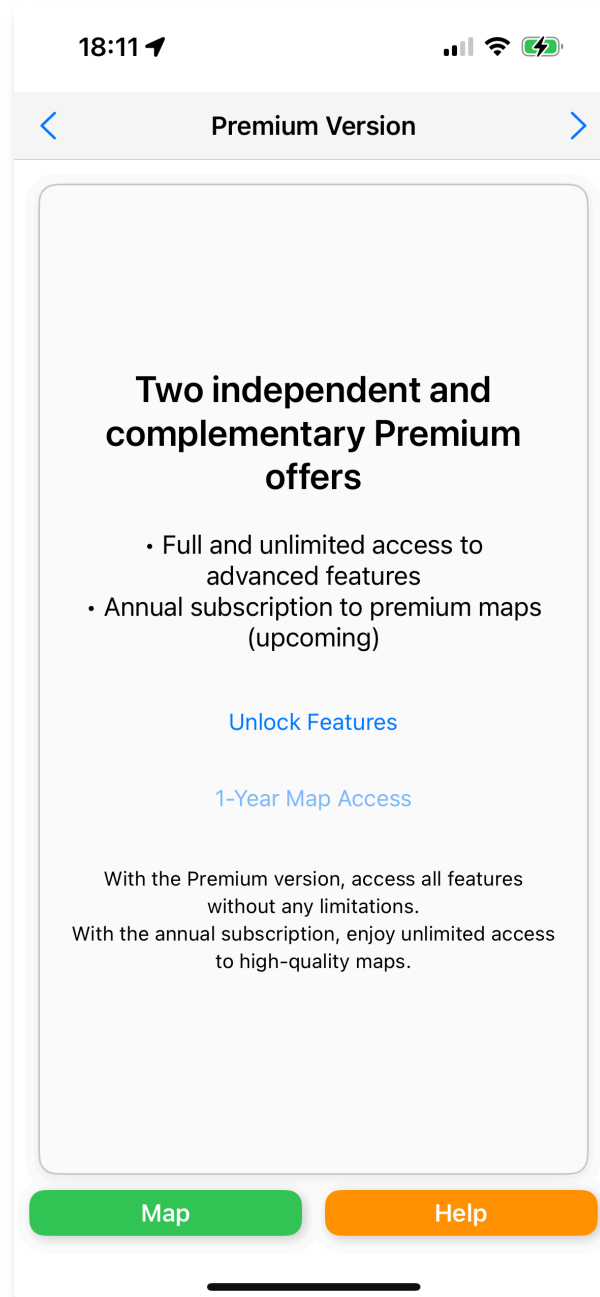


Figure 3.22: in-app purchases

IV/ Practical examples


This section illustrates concrete use cases of the **Geoscope** application, whether in a professional, educational, or leisure context. These examples help better understand the tool's potential in the field.

1) Reading a landscape panorama as on an orientation table

Exercise objective

Using the main line of sight, point your iPhone or iPad towards a mountain, volcano, village, building, or any other visible relief in the landscape, and identify that point on the map.

Procedure

- Position yourself on the map using the built-in GPS or nearby landmarks.
- Orient the device towards the observed relief.
- Observe the line of sight on the map.
- Note that accuracy depends on the magnetometer calibration and the GPS signal quality. Very precise orientation calibration can also be done using reference points close to the observed point (electric pylons, buildings, etc.).
- If needed, correct the magnetometer for possible electromagnetic interference as explained below in this paragraph.
- To facilitate reading on the map, press the line of sight lock button  if necessary.

- Adjust the length of the line of sight using the slider at the top of the map.
- Zoom in/out along the line of sight to identify the point spotted in the landscape.
- By adjusting the line of sight length, determine the straight-line distance between you and the studied point.

Illustration on a practical case

The following example shows how to analyze reliefs and occupation points in a landscape from a simple photographic viewpoint. The method can be done without using the device's magnetometer unless orientation angle measurements are required.

The photo below (Figure 4.11) was taken from a viewpoint near Randan train station in the Allier department (France). The exercise is to identify remarkable points in the landscape.



Figure 4.11: observation point at Randan train station (France)

The **Geoscope** application allows precise localization of this observation point on the map using GPS coordinates or simple visual spotting (Figure

4.12).

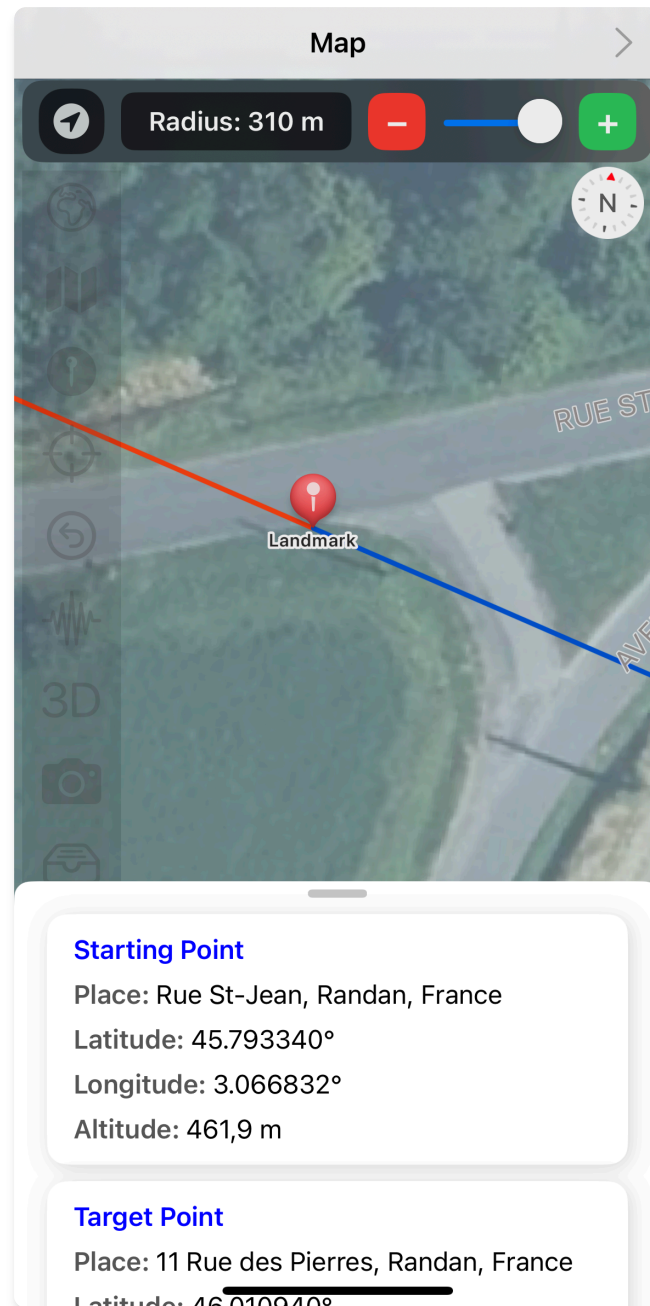


Figure 4.12: localization of the observation point on the **Geoscope** app

The next step is to choose a line of sight. To do this, we work on landmarks near Randan station such as these two poles alongside the railway line (Figure 4.13).

To get precise calibration, zoom in on these landmarks and rotate the device to align the line of sight with these markers (Figures 4.13 and 4.14).

Once this goal is reached, lock the line of sight to avoid involuntary movement.



Figure 4.13: choosing nearby landmarks in the landscape to properly calibrate the line of sight from the observation point (1: nearest pole in the foreground; 2: pole on the other side of the railway track).

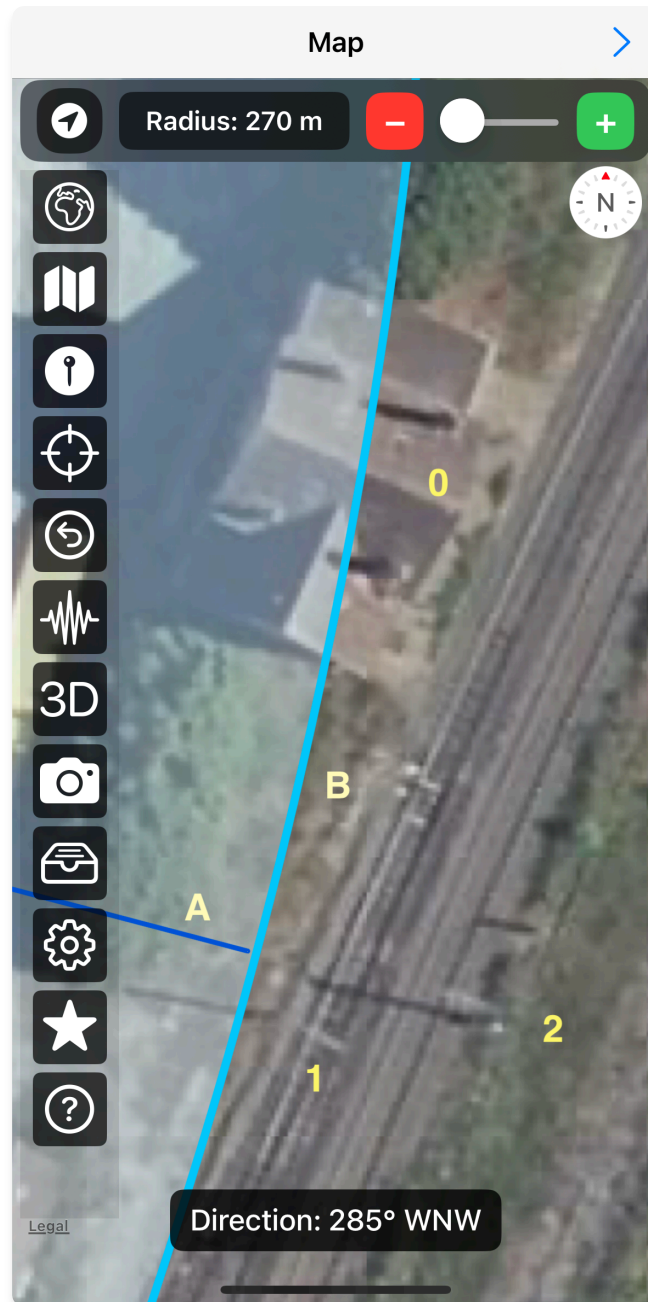


Figure 4.14: visualization of the two poles (noted 1 and 2) on the **Geoscope** app. The station is indicated by point 0. **Geoscope** shows we are 270 meters from the observation point. (A: line of sight. B: edge of the search zone)

With the line of sight now fixed, we can work along it, from the nearest to the farthest.

For this, we use the IGN 1:25,000 topographic maps.

The advantage of **Geoscope** is being able to work at high zoom on the map without losing the line of sight.

The relief in the foreground is easily recognizable with **Geoscope** and is located less than 1.8 km away. The distance is shown at the top of the screen and is measured by adjusting the circular search zone (Figure 4.15).

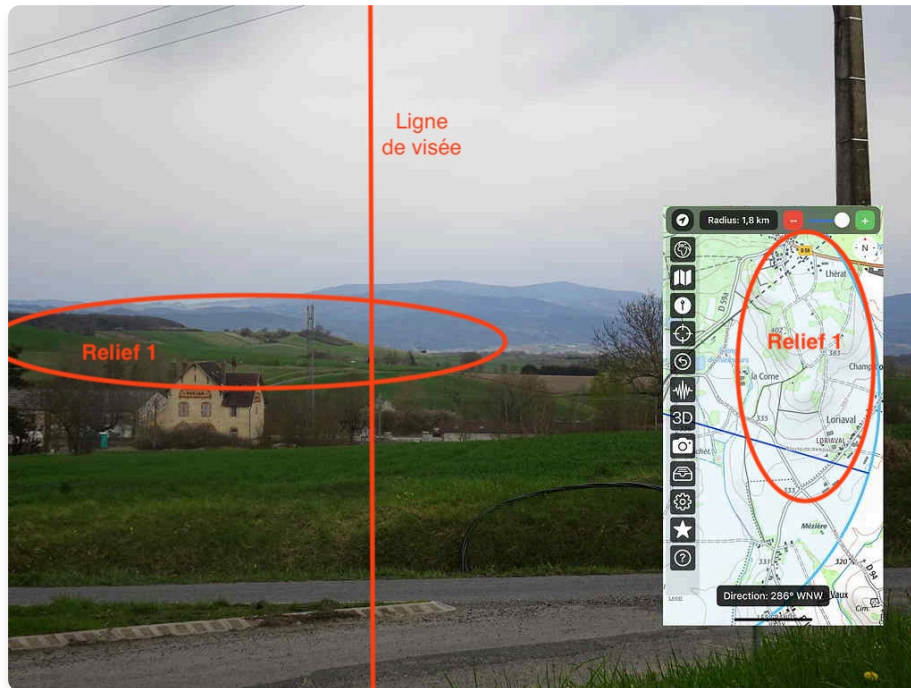


Figure 4.15: recognition of the relief in the foreground on the left side of the photo.

Next, we can examine the middle ground with a small settlement visible to the right of the line of sight. **Geoscope** informs us this is Puy-Guillaume (Figure 4.16), located at 10.6 km.



Figure 4.16: *identification of Puy-Guillaume in the middle ground*

Distant parts of the panorama are more complex to analyze, but no worries, the **Geoscope** app provides tools to decode the panorama. The goal is now to identify the high mountain standing out in the background. To do this, the trick is to slightly shift the line of sight to the right, relying on a new nearby landmark, which is the elongated building next to the station (Figure 4.17).

Still locking the line of sight, the aim is to find the highest relief that can block the horizon line. By scanning the map view in **Geoscope**, one quickly finds the **Puy de Montoncel**, reaching 1,287 meters and located nearly 27.4 km from our viewpoint (Figure 4.18).

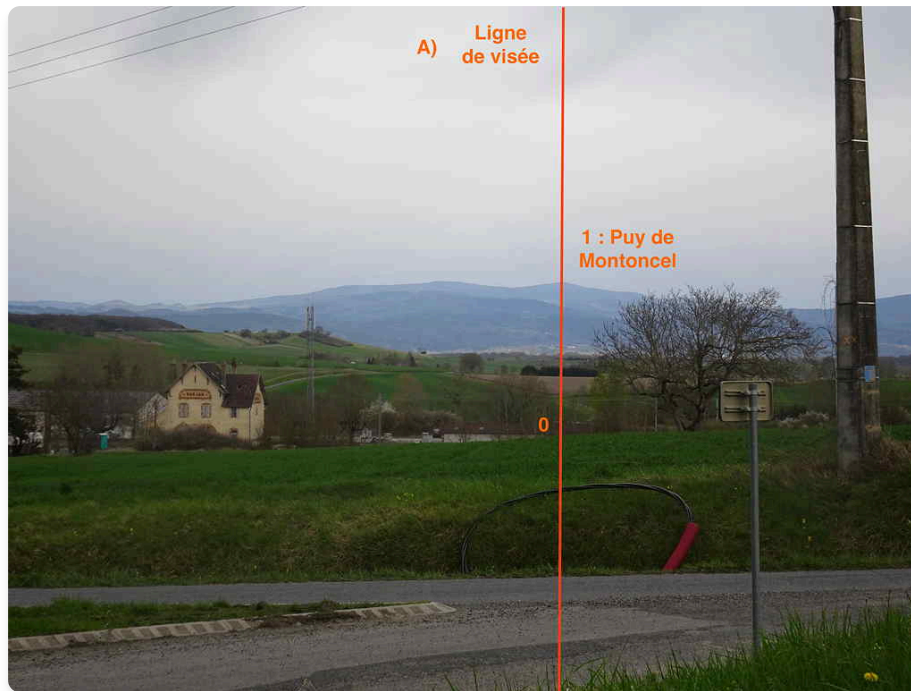


Figure 4.17: recognition of the mountain (Puy de Montoncel) in the background (0: chosen reference point in the foreground; 1: relief to identify in the background, Puy de Montoncel)

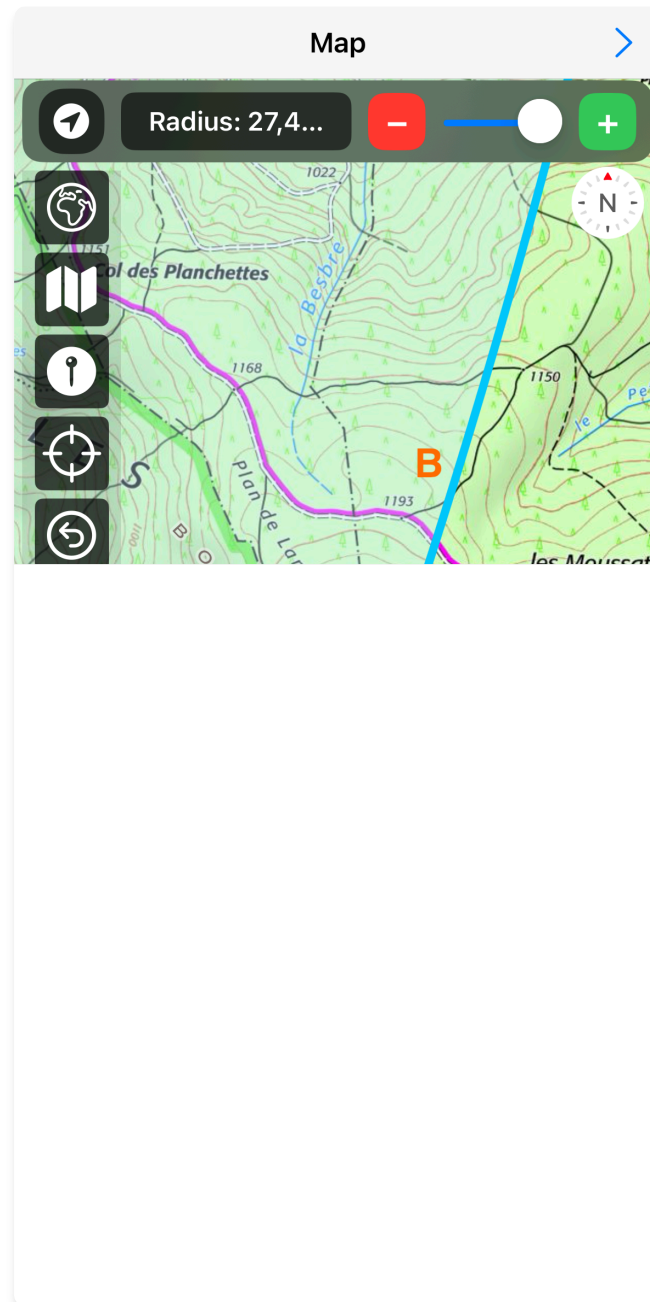


Figure 4.18: the line of sight crosses the relief of Puy de Montoncel (A: Line of sight; B: Extension of the search zone).

d) Another application example: recognizing the volcanoes of the Chaîne des Puys

This example illustrates a new use of **Geoscope** in a field mapping exercise on a real case: recognizing the volcanic edifices of the Chaîne des Puys.

The Chaîne des Puys is a series of volcanoes aligned north to south over about 40 kilometers in the Massif Central, west of Clermont-Ferrand. These volcanoes, mostly formed less than 100,000 years ago, show great diversity of shapes: cones, domes, maars, or lava flows. As they are numerous, sometimes close or superimposed, they can be difficult to recognize in the field. **Geoscope** helps identify them more easily by combining map, orientation, and GPS location to avoid errors and better understand the organization of this volcanic chain.

Figure 4.19 provides an overview of the horizon line (southern part of the Chaîne des Puys) to be analyzed using **Geoscope**.



Figure 4.19: horizon line on the Chaîne des Puys to analyze.

To identify the Puys, the method is always to:

- Work sector by sector to scan the entire horizon.
- Start with easily identifiable points in the landscape.
- By zooming on the map, move along the line of sight and identify sites near this line.
- Repeat the operation in other directions.

Figure 4.20 shows the sequence of steps in reading the left part of Figure 4.19.

- **Locate yourself.** The first step is to position precisely on the map (point **(1)** in Figure 4.20). The observation point is located at **les Brouchilles**, near the village of Pessade.
- **Define a line of sight.** A first line of sight naturally imposes itself: the one directed toward the **summit of Puy de Dôme**. Thanks to **Geoscope**, we learn this iconic summit is located **16 km** from our position (point **(2)** in Figure 4.20).
- **Identify the volcanoes on the line of sight.** The easiest is to start with the volcanic edifice in the **foreground**. On our line of sight, **Geoscope** unambiguously identifies the **Puy de Pourcharet**, located **8.5 km** from the observation point (point **(3)** in Figure 4.20).
- **Spot the slightly shifted edifices.** Just before the Puy de Pourcharet and slightly **shifted to the right**, we distinguish the **Puy de Montgy**, easily recognizable. This volcano constitutes a good **secondary landmark** for future observations.
- **Explore the volcanoes aligned behind the foreground.** Continuing from Puy de Pourcharet, a **series of volcanoes** stretches up to the foot of Puy de Dôme. By focusing on those **shifted to the left** from the line of sight, **Geoscope** indicates the presence of **Puys de Montchié and Salomon**, located about **13 km** away (point **(4)** in Figure 4.20).

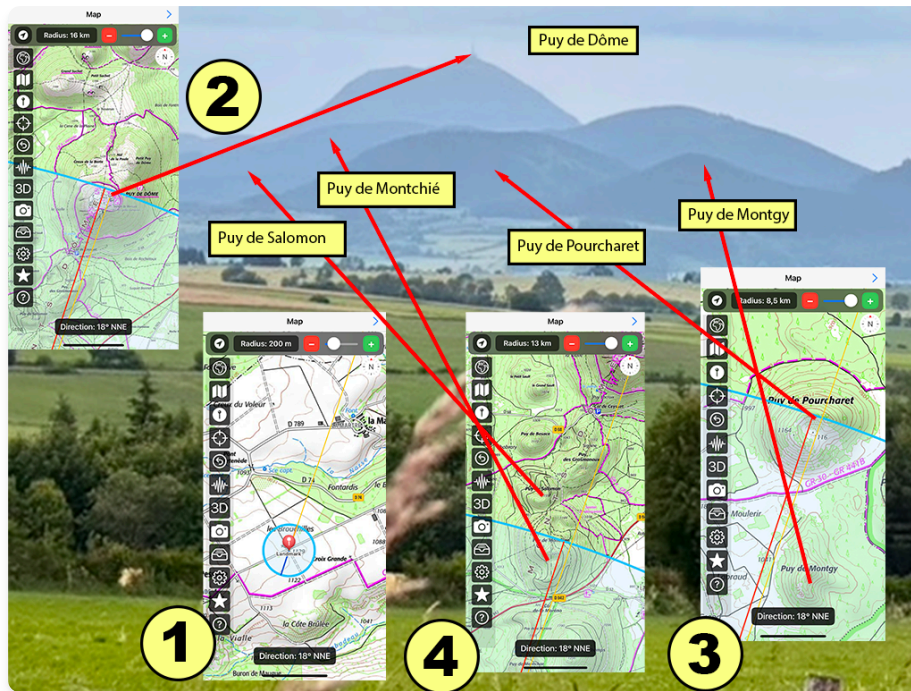


Figure 4.20: First decoding of the panorama with **Geoscope**. Point (1) indicates the location of the observation point at Pessade. Point (2) indicates the distant target point, Puy de Dôme. The chosen line of sight is established between these two points. Point (3) indicates the reliefs recognized in the foreground (Puy de Montgy and Puy de Pourcharet). Point (4) indicates reliefs recognized at the foot of Puy de Dôme (Puy de Montchié and Puy de Salomon).

Figure 4.21 shows the steps followed for the central part of the panorama.

- First, relying on the previously recognized landmark of Puy de Montgy, and using **Geoscope**, we pass our new line of sight extending to the dominant relief in the background. This is the **Puy de Laschamp** located 11.7 km from our observation point (point (1) in Figure 4.21).
- To the right of Puy de Montgy are the two small cones of Puy de Montjurer and Puy de Montchal, easily recognizable in the foreground.
- Let's pass our line of sight between Puy de Montjurer and Puy de Montchal. This line of sight will hit in the background the imposing scoria cone Puy de Mercoeur (point (2)), located 9.9 km from our observation point.

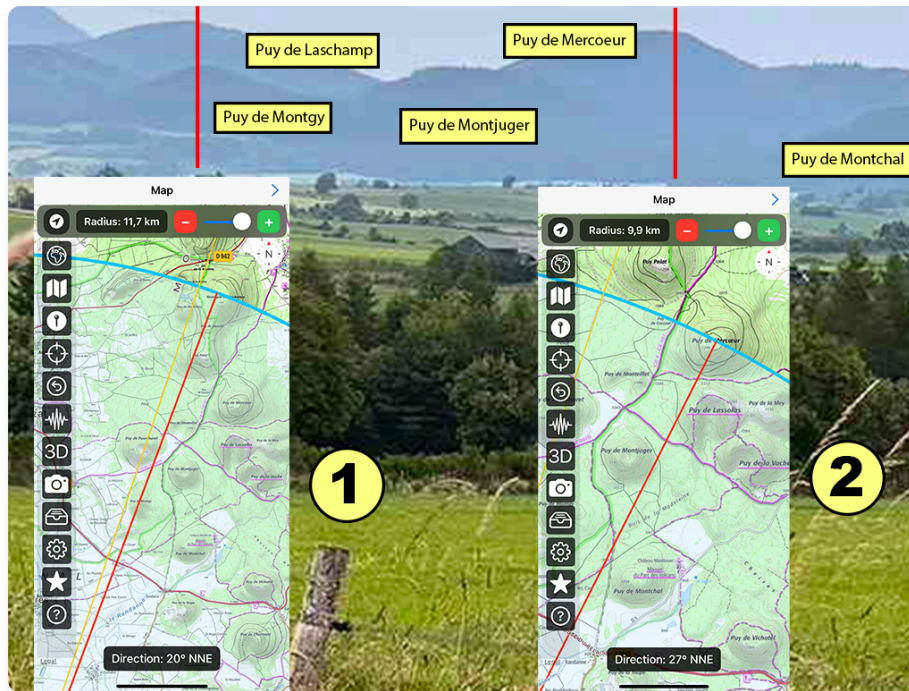


Figure 4.21: Reading the central part of the panorama. The red lines indicate the two lines of sight used: line (1) passes through the summit of Puy de Montgy and line (2) passes between Puy de Montjurer and Puy de Montchal.

Finally, Figure 4.22 explains the final steps in identifying the right part of the panorama.

- We establish a new line of sight passing through the summit of Puy de Montchal. In the background, this line intercepts Puy de Lassolas and its breached crater at a distance of 9 km (point **(1)** in Figure 4.22).
- Then, for verification, we can finish with a line of sight on Puy de la Toupe (point **(2)** in Figure 4.22). To the left of this line of sight is Puy de la Vache.

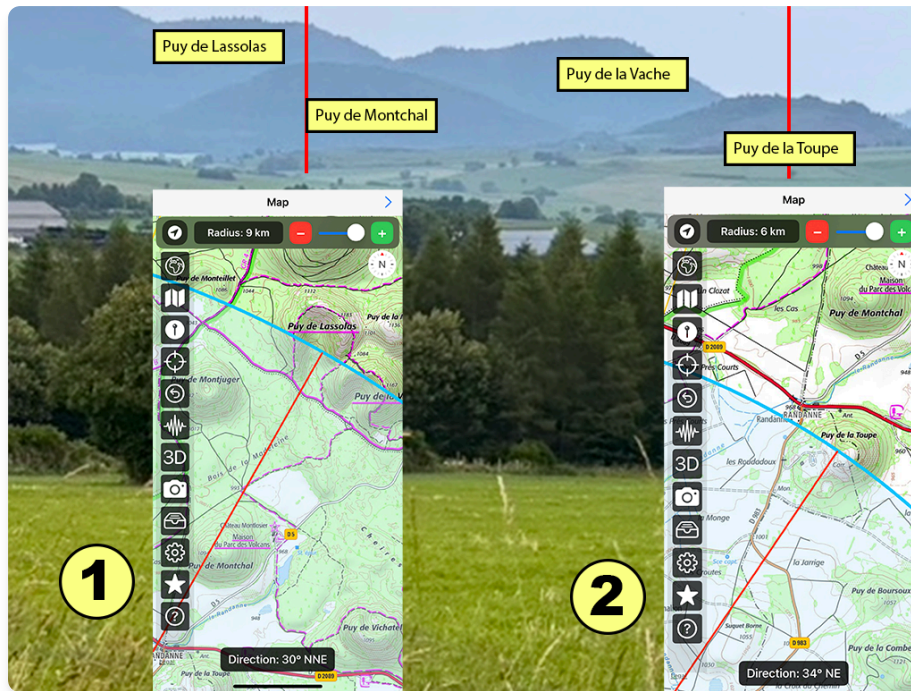


Figure 4.22: Reading the right part of the panorama. The red lines are the lines of sight used. Line (1) passes through the summit of Puy de Montchal and allows recognition of Puy de Lassolas in the background. Line (2) on Puy de la Toupe passes to the right of Puy de la Vache.

In summary, **Geoscope** is the ideal tool to analyze a landscape as if you had a mobile orientation table.

Voici la traduction en anglais en respectant le formatage markdown demandé : ````markdown

2. Taking Georeferenced and Oriented Photographic Shots

In the professional world — notably in geology, geography, archaeology, or architecture — it is often essential to document field observations with enriched photographic shots. Two key pieces of information are then required: **scale** and **orientation**. While scale can generally be indicated simply using a reference object (such as a geological hammer, a ruler, or a marker of known size placed in the field of view), until now, there was no

reliable method to precisely inscribe orientation directly on the photo itself.

Geoscope fills this gap by automatically adding annotated vertical bars on the photo that indicate the orientation of the shot. These bars correspond to azimuthal directions, oriented according to the angle relative to geographic north and measured clockwise from north (0°). The bars are graduated every 10° , and their spacing varies visually: they are not equally spaced on the photo because they result from the projection of a spherical vision cone onto a 2D plane. This distortion is normal and reflects the fact that the further you move from the central axis of the image (the focal center), the more the azimuthal directions visually diverge from each other. Thanks to this representation, a photo taken with **Geoscope** becomes a true oriented scientific document, allowing rigorous analysis of the direction of an outcrop, a wall, or any other observable element in the field. The main cardinal directions — North, East, South, and West — are represented by thick red lines, clearly visible on the photo. In addition, fine blue lines, drawn every 10 degrees, mark the intermediate directions. This combined display allows you to visually locate the exact orientation of each element of the photographed landscape (Figure 4.23).

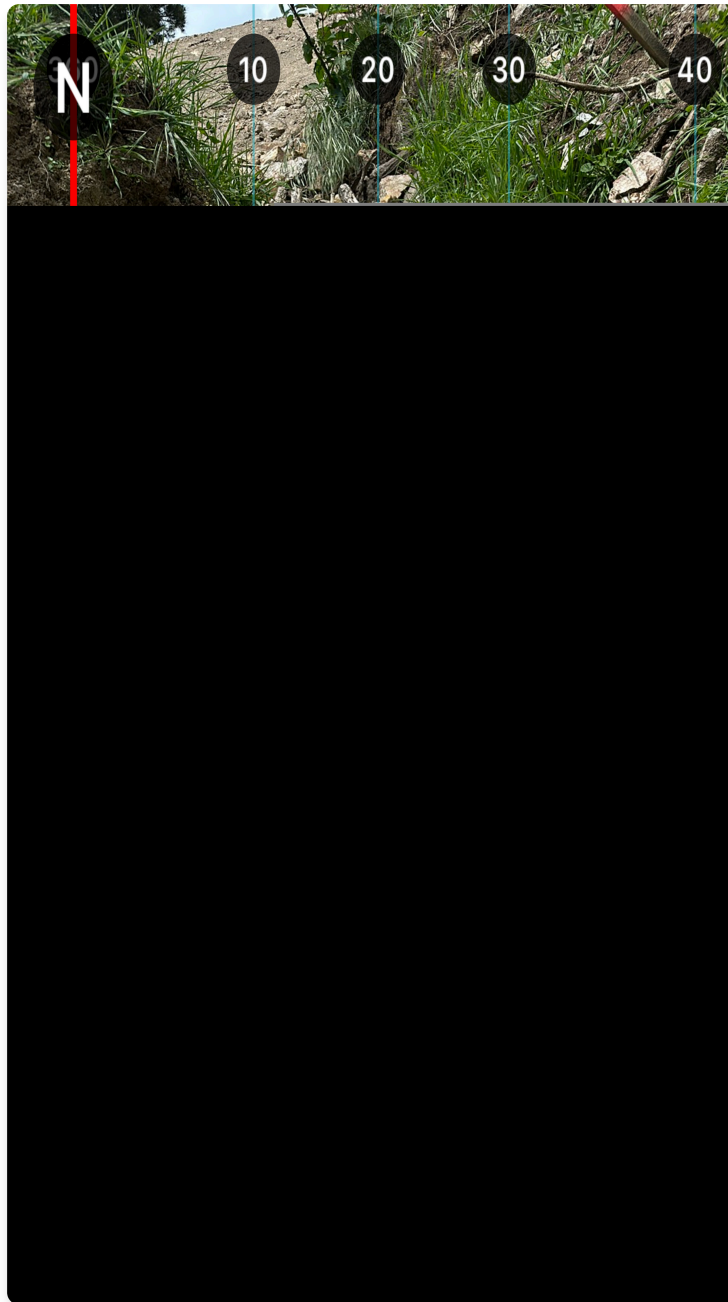


Figure 4.23: Example of a geographically oriented photo captured by Geoscope

3. Locating Symbolic or Geodynamic Places or Directions

Some places — whether personal (birthplaces, memorial or cultural sites) or scientific (geological reference points) — may hold special importance.

Geoscope allows you to precisely locate and visualize the direction of these sites relative to your current position or place of residence.

The most emblematic example is the Kaaba in Mecca, whose orientation is essential for practicing Muslims wishing to perform their prayers facing the holy site.

From another perspective, some sites play a major role in the functioning of the Earth's crust — hotspots (like Iceland or Réunion), oceanic ridges, or major crustal faults. **Geoscope** also allows users to orient themselves toward these key structures for educational or scientific purposes.

To display a direction toward a symbolic place, one can use one of the methods below relying on the waypoint feature of the application:

- Use the dedicated waypoint definition screen.
- Choose a site from the predefined list of symbolic places (Mecca is included by default).
- Or manually define a point on the map by touching the screen.
- A sightline pointing toward this waypoint is then drawn on the map.
- This waypoint is also projected onto photos taken with **Geoscope**, thus offering a kind of augmented reality combining orientation and visualization.

a) Visualization of Terrestrial Structural Directions

Because the Earth is a sphere (or more precisely, a slightly flattened ellipsoid at the poles), the true direction linking two distant points does not follow a straight line on a flat map, but rather a geodesic line on the globe's surface. However, most maps — especially those based on the Mercator projection — distort distances and angles over large areas, making the interpretation of geodynamic stresses inaccurate on these supports.

Geoscope is an iOS tool allowing precise visualization of tectonic stress directions or geophysical influence lines over long distances, taking into account the Earth's actual curvature. By projecting these directions directly on the map, **Geoscope** faithfully reproduces the orientation of forces (for example, those linking France to Iceland or to the Mid-Atlantic Ridge).

This approach is essential for disciplines interested at the lithospheric scale or in global interactions: plate tectonics, seismotectonics, volcanism, geophysics, or geomagnetism. Thanks to **Geoscope**, it becomes possible to represent a dynamic that is difficult to understand otherwise as concrete directional movements in the field.

For example, Iceland, located on the Mid-Atlantic Ridge and fed by a hotspot, generates an abnormally thick oceanic crust forming a vast volcanic plateau. This excess thickness exerts a load on the Eurasian plate, inducing large-scale tectonic stresses. In Western Europe, this stress notably results in a NNE-SSW oriented compression, well expressed in metropolitan France (Figure 4.24).



Figure 4.24: Visualization by **Geoscope** of the direction to Iceland (2500 km from the observation point), which corresponds to a major geodynamic orientation in metropolitan France. This direction reflects the main axis of horizontal stresses exerted in the Earth's crust and which are responsible for part of the current earthquakes in French territory.

Similarly, metropolitan France lies in the continuation of the major transform faults segmenting the Mid-Atlantic Ridge (Figure 4.25). These structures, generally oriented N120–130°E, continue on land as major crustal faults, such as the Armorican shear zones that extend to the Massif Central (Figure 4.26).

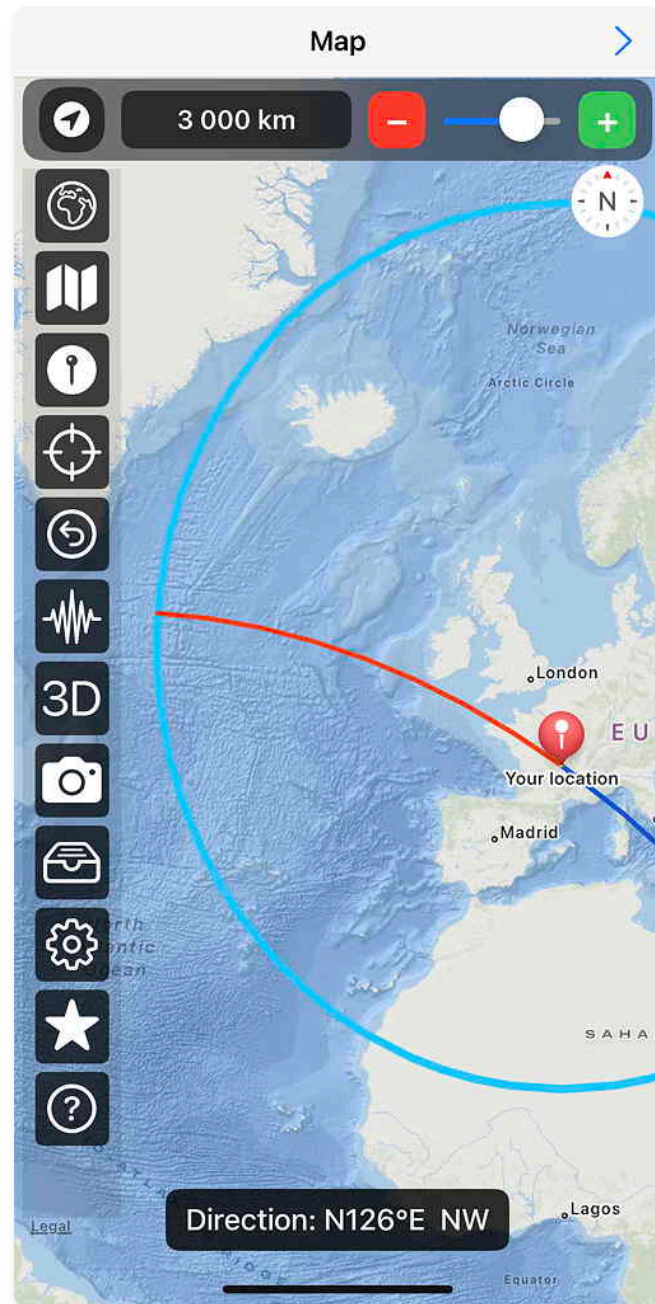


Figure 4.25: Visualization on **Geoscope** of the transform faults and lineaments in the oceanic part of the Eurasian plate (3000 km from the observation point), as well as their extensions into the continental domain.

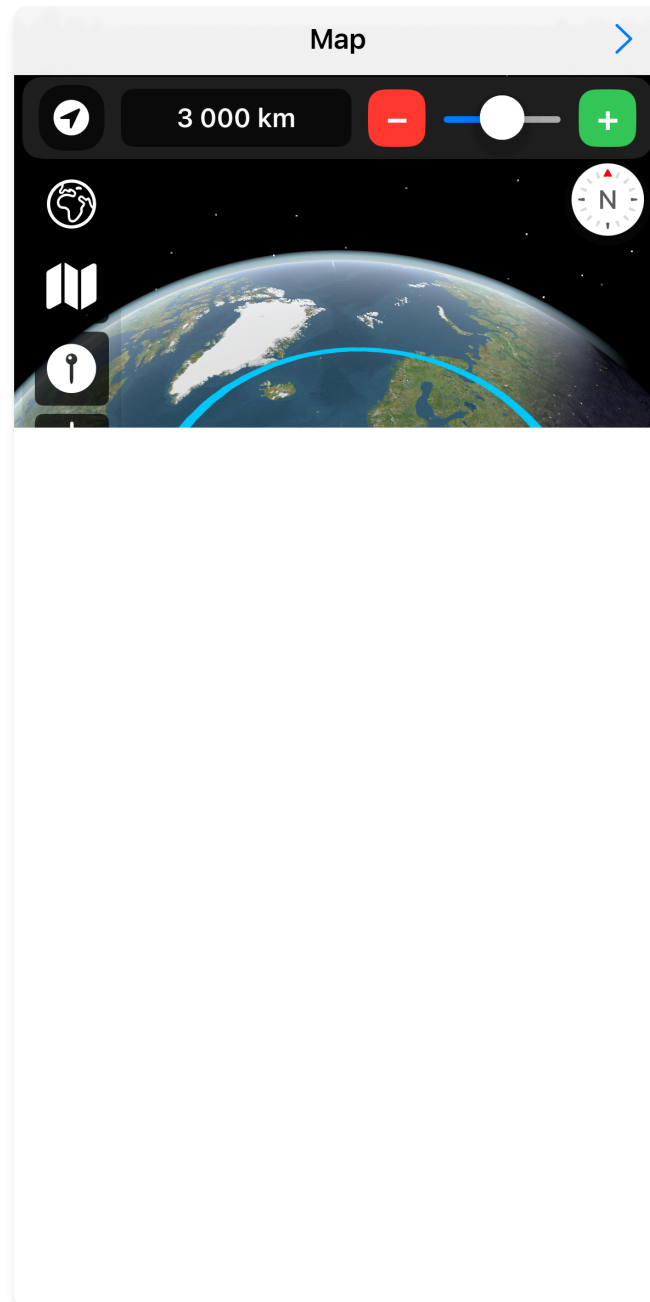


Figure 4.26: Same as Figure 4.25, but in 3D view.

b) Determination of the Direction to Mecca

To date, **Geoscope** is the only mobile iOS application allowing precise determination of the direction toward a symbolic place such as Mecca, taking into account the user's actual position, the calculation of the geodesic line, and especially local electromagnetic disturbances.

Indeed, the standard compasses integrated into iOS devices cannot correct the magnetometer from these electromagnetic disturbances. In urban environments, these can be particularly strong for multiple reasons (air conditioning, metallic elements, electrical networks, electronic systems, etc.). These electromagnetic disturbances vary and distort the indicated direction. Therefore, before any measurement, it is necessary to ensure the compass direction is accurate by checking it on nearby objects, and if needed, to apply the procedure explained in this paragraph.

Furthermore, **Geoscope** precisely determines the direction of distant points by taking into account the Earth's sphericity. The direction toward a distant place can only be accurately determined by calculating the orthodromic line, that is, the shortest path between two points on the Earth's surface. This line, also called the *great circle*, cannot be represented by a straight line on classic maps (such as Mercator projection).

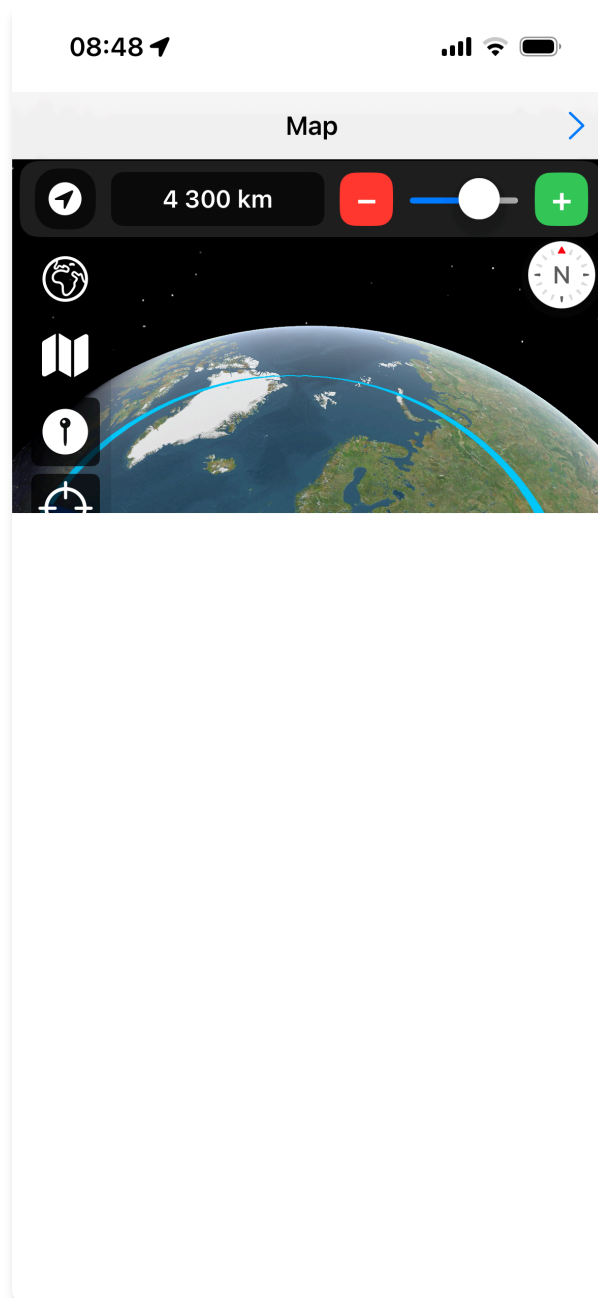
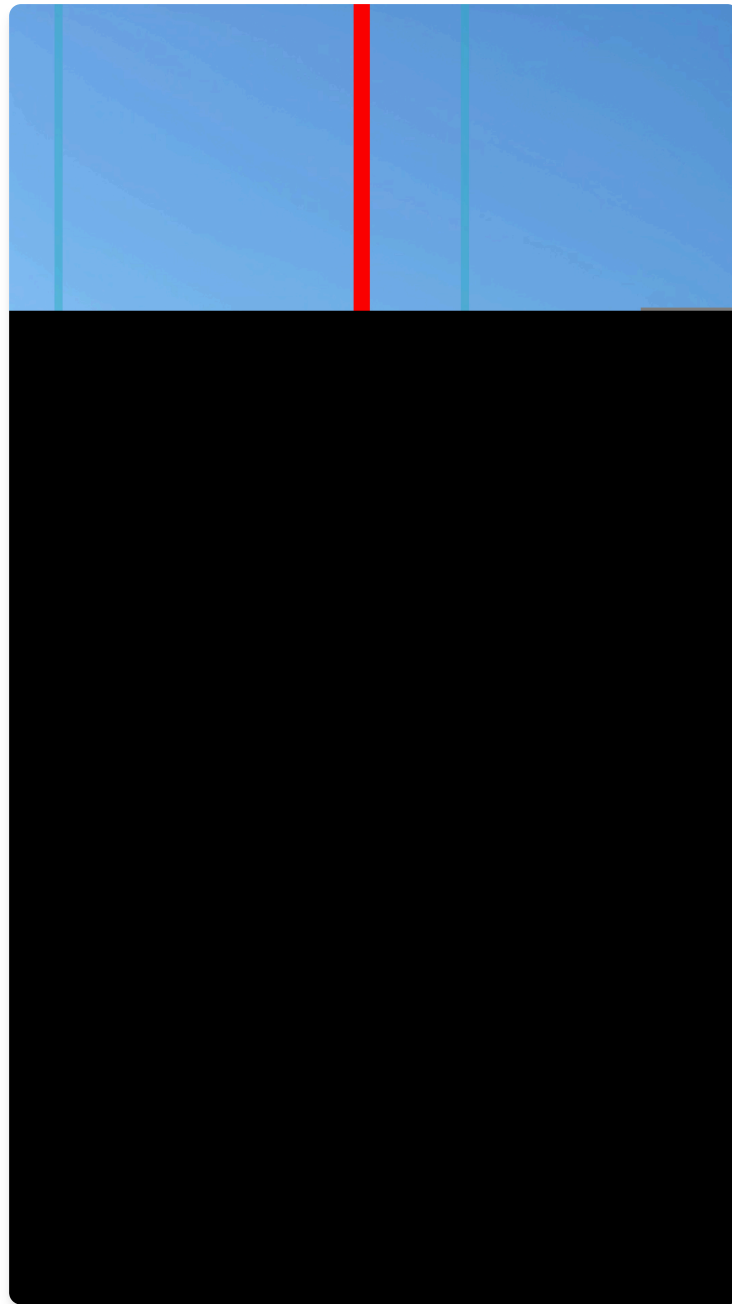


Figure 4.27: Determination by **Geoscope** of the geodesic line connecting Clermont-Ferrand to Mecca. The azimuth is N 134° E. The distance from the observation point is about 4300 km at this scale.



*Figure 4.28: View of the direction to Mecca in augmented reality using the preview camera on **Geoscope**.*

4. Drawing Geodesic Lines

Geoscope allows you to draw a geodesic line between two points. A geodesic line is the shortest path on the Earth's surface, taking its curvature into account (like flight routes). This type of line corresponds, for example, to the trajectories followed by airplanes on navigation charts.

Unlike a straight line drawn on a flat map, the geodesic follows the Earth's spheroidal surface, which makes it particularly useful for accurately representing directions or distances over long ranges.

- Choose a starting point (your current position by default).
- Orient your mobile device in the desired direction.
- Select a large search radius (several thousand km).
- Observe the calculated trajectory on the map.
- To view the geodesic line on the globe in 3D, choose *Apple* as the map provider and select *Satellite Flyover* as the map type.



Figure 4.29: Drawing geodesic (or orthodromic) lines on a sphere.

Geoscope also allows locating the antipode of the observation point, i.e., the point diametrically opposite on the Earth's surface. This purely playful operation lets you explore exotic locations, often in the ocean, and better visualize the Earth's curvature at the global scale.



Figure 4.30: Searching for the antipode of the observation point. The blue circle frames this antipode.

5. Recognition of Geological Faults

The **recognition and identification of faults** is an essential step in a geologist's work. This field of study, part of **structural geology**, seeks to understand the organization, orientation, and evolution of deformations in the Earth's crust. Faults represent zones of **weakness** where **erosion agents** act more easily, and where **water flow**, both at surface and depth, can be strongly disturbed.

Geoscope offers a valuable tool to identify these **zones of faults and fractures** based on preparatory map work. This method is especially effective in **granito-metamorphic** basement domains, where faults and joints form a **dense network of lineaments** often well expressed as intersecting segments. The goal is to identify as many of these alignments as possible, which can then be verified and completed by **field observations**. By identifying the **different structural directions**, it becomes possible to establish a **coherent organization of the fault network**, and deduce the **main tectonic stresses** acting in the region. One can then distinguish faults active in **shear**, those in **extension** (normal faults), and those in **compression** (reverse faults). At the local scale, these structures often arrange according to **well-known structural patterns**, such as the **Riedel model**, which helps describe and understand fault kinematics in a shear regime.

The procedure on **Geoscope** is as follows:

- Orient the device along the fault direction.
- Note the azimuth displayed on the sightline.
- Associate this information with an annotated photo if needed.



Figure 4.31: Location of a secondary fault north of Lake Chambon.





Figure 4.32: Recognition of the Muroi-Col de la Croix Morand fault.

6. Electromagnetic Disturbances and Magnetometer Calibration

Some anthropic environments (cars, buildings, electrical cables) can disturb the magnetic sensor. The same applies to certain natural sites characterized by electromagnetic disturbances (faults, underground water flows, hydrothermal systems, etc.).

Geoscope offers tools to correct or temporarily disable local magnetic drift.

- Go to the main screen displaying the map.
- Identify a direction (a street) or a point in your nearby environment.
- Notice that the iPhone or iPad does not indicate the expected orientation and that magnetometer calibration is needed (Figure 4.33).
- Turn the device toward the direction it should indicate on the map by pointing at the reference point (Figure 4.34).
- Click the button  .
- Rotate the device again by pointing it toward the reference point on the terrain (Figure 4.35).
- Click the button again  .
- The magnetometer is now calibrated (Figure 4.36).

- The angle of drift correction is shown in red in the azimuth display area (Figure 4.36).

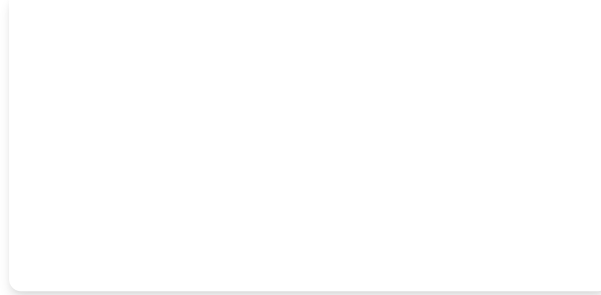



Figure 4.33: Recognition of a situation where the magnetometer is poorly calibrated. The device is oriented parallel to the road called "rue de l'Éminée," but the main sightline (in red) is strongly deviated from this direction. The goal is to correct this deviation detected by **Geoscope**.



Figure 4.34: First, rotate the device to align the main sightline on rue de l'Éminée. Then press the correction button  once.

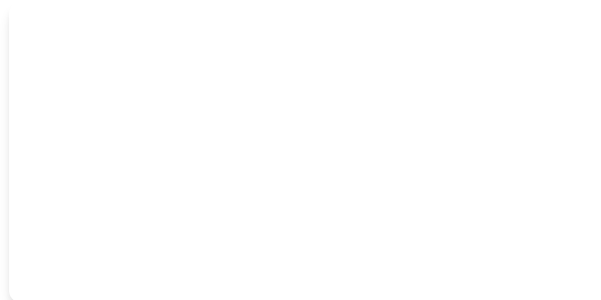





Figure 4.35: Then return the device to its initial position, parallel to the road. The main sightline is still not corrected, but **Geoscope** indicates by a thin red line the future direction that will be shown after correction. At this stage, press the correction button again  .



Figure 4.36: After pressing the correction button again  , this is how the map appears on **Geoscope**. The device is now well oriented parallel to the road and the sightline is well aligned along the road. But this time, **Geoscope** indicates at the bottom of the screen that a drift correction is performed. The correction angle is shown in red.

To remove the drift correction, simply press and hold the correction button  .

It is also possible to specify a default angular correction. To do so, go to the Preferences page and enter a numerical value in the Drift Correction (°) field. Warning: this correction will be applied systematically. Do not forget to reset this value to 0° in environments without electromagnetic disturbances.

8. Having Fun with Geoscope

Geoscope can also be used for fun, even from home, by exploring the main geographic directions associated with your place of residence (Figure 4.37).

By drawing geodesic lines starting from your front door, windows, or main axes of your home, you can determine which cities, regions, or countries lie along the opening lines of your house. A simple and enjoyable activity to discover and learn geography!

The application is also useful for professionals who need to design orientation tables and visualize sightlines from viewpoints or mountain summits.



Figure 4.37: Learning geography with **Geoscope**

V/ Troubleshooting and FAQ

- **I'm in an area without network coverage. How can I use Geoscope?**

Geoscope relies on map data delivered via the network. In mountainous areas, without a 4G or 5G signal, it won't be possible to download new maps. However, **Geoscope** uses a cache that stores data locally. Before heading out into the field, prepare your trip by preloading maps at a small scale. Once in the field, these maps will remain accessible thanks to the cache.

To delete the stored data, go to the **Preferences** page and tap the *Clear Cache* button. Also, make sure the *Automatic Cache Clearing* option is not enabled before heading out into the field.