User-generated maps on the SignalShark and IDA2

The SignalShark and the IDA2 when equipped with the map display option allow the use of map materials based on OpenStreetMap (OSM). However, it is often useful to be able to use your own maps, aerial photographs, orthophotos, or satellite images which contain details of your own infrastructure. Narda uses the Slippy Tile Map System from OSM for the map display on the SignalShark and IDA2 analyzers. This allows for rapid display and is supported by many GIS programs. This means that many commercially available GIS programs, such as Global Mapper™, can be used to create map materials for the SignalShark and the IDA2.

The maps used in the analyzers consist of several image tiles that are based on the Slippy Map Tile System from OpenStreetMap. The image tiles are rendered from vector map material on a fast computer or server and stored in a specified folder structure on the microSD card of the SignalShark or IDA2. The SignalShark additionally allows you to save the map materials on the internal hard drive or on a USB stick or external drive, for example. The folder structure specifies the zoom level and georeferencing of the image tiles along with the file names.

When displaying a map section, the analyzer puts the required image tiles together like a mosaic to form the complete map. Depending on the zoom level, a very large number of tiles may be needed to allow the user to move around on the map freely. When planning a measurement campaign, the user determines the area in which measurements are to be made and only loads the tiles that are necessary for this area and zoom level on to the microSD card level to enable map material at the highest possible resolution to be used.

Map data structure on the microSD card

Basically, the map data (tiles) are saved on the microSD card according to the Slippy Map Tile System from OpenStreetMap. However, an additional base structure (shown outlined in red in figure 1) is used to improve management of the map data in the instrument.

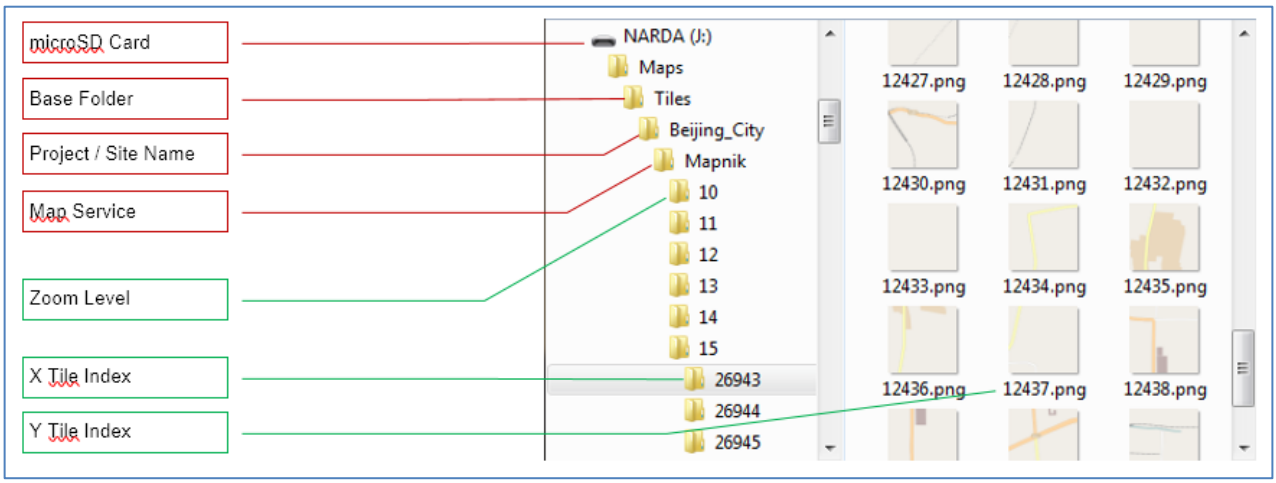

Fig. 1. Folder and file structure on the microSD card

The elements outlined in green represent the Slippy Map format, which is described in more detail below.

The corresponding copyright information must always be saved for all maps that are created. This is done by saving a text file in the "Map Service" folder that contains the copyright text in a short line. For example:
\\ Maps\Tiles\ Beijing_City\Mapnik\Copyright.txt

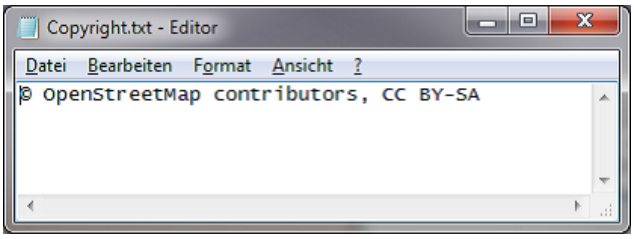

Fig. 2. Saved copyright information

The copyright text is shown along the right hand edge of the map in the display. **Please make sure that you also observe all the copyright requirements and usage rights specified by the map supplier.**

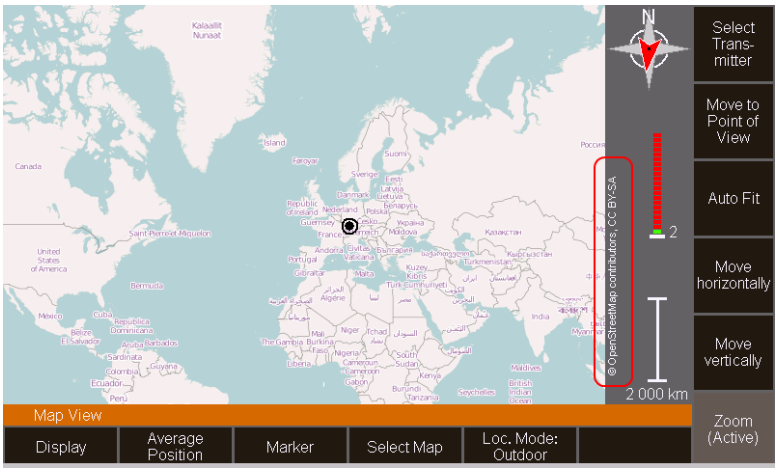

Fig. 3. Display of copyright text along the right hand edge of the map

The map system in detail

A vector-based Mercator projection map is rendered into a bit-mapped graphic and divided into tiles rather like a mosaic in order to generate map material for the analyzer. Each individual image tile has a size of 256 x 256 pixels and is saved in PNG format.

Zoom level 0 represents the entire world on one tile. An increase of 1 in the zoom level quadruples the number of tiles, which makes more details visible.

Fig. 4. Zoom level 0 (© OpenStreetMap contributors, CC BY-SA)

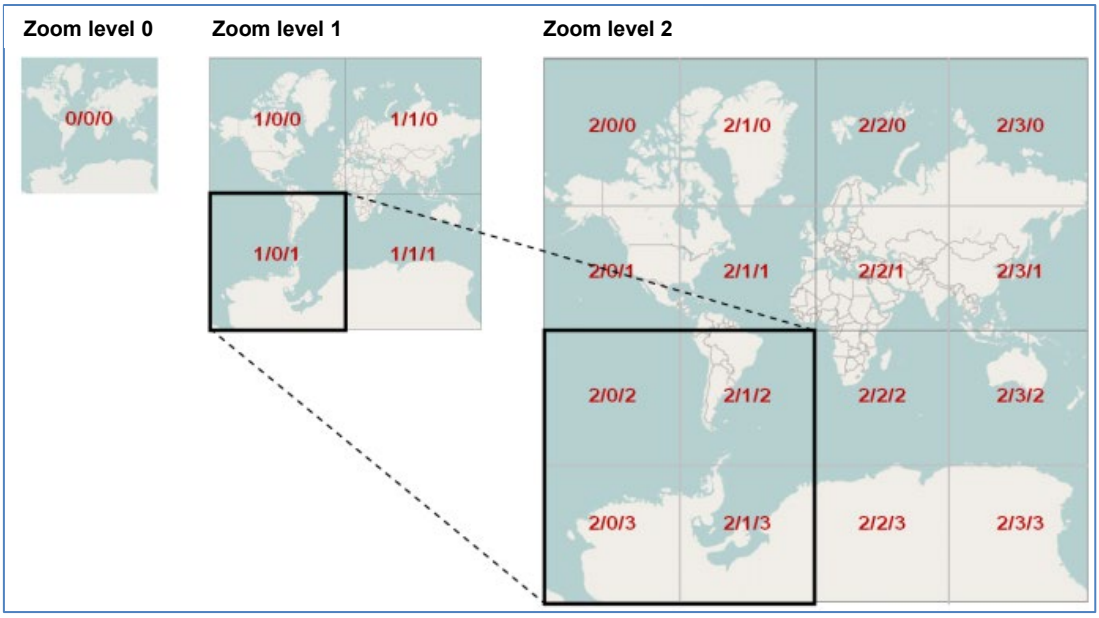

Fig. 5. Increasing the zoom level (© OpenStreetMap contributors, CC BY-SA)

Georeferencing and tile indices

The image tiles are georeferenced by specifying the zoom level and tile indices. The zoom level and tile index X are saved as the file name. The tile index Y corresponds to the file name of the image tile:

[Zoom level] / [X index] / [Y index].png

Narda analyzers use a value of 6,378,137 m as a constant for the radius of the earth.

Further details can be found on the OpenStreetMap website.

Example: Creating map material using Global Mapper™

The method described here uses the GIS program Global Mapper™ v21.1.0

Fig. 6. Global Mapper™ → Load map material

Loading and editing map material

First of all, the desired map material must be downloaded on to the PC. Global Mapper™ supports both bit-mapped graphics-based (image) formats as well as the rendering of vector-based formats. Some of the possibilities are:

- Load data from the hard disk.
- Use data from a database.
- Load maps from a server.
- Import aerial photographs that are georeferenced on import.

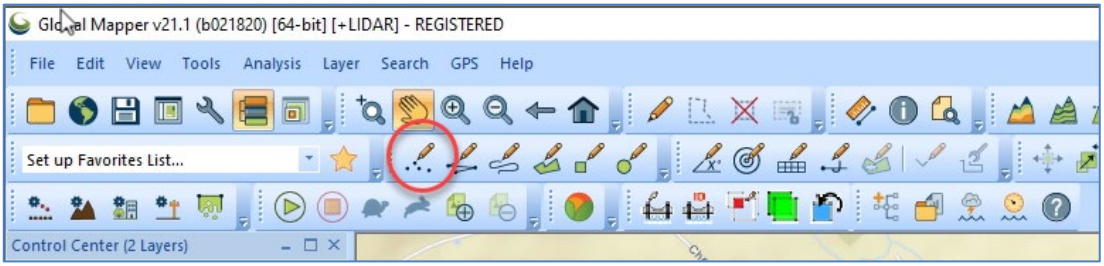

Fig. 7. Global Mapper™ → Create New Point \ Text Feature

Further details can be drawn on the map using drawing functions such as “Create New Point \ Text Feature”. In this way, you can draw in your own infrastructure on the map. In our example, four (imaginary) base stations have been drawn on the map.

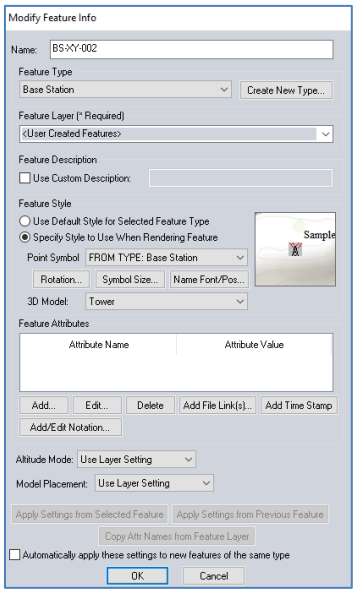

Fig. 9. Global Mapper™ → Drawing elements on the map

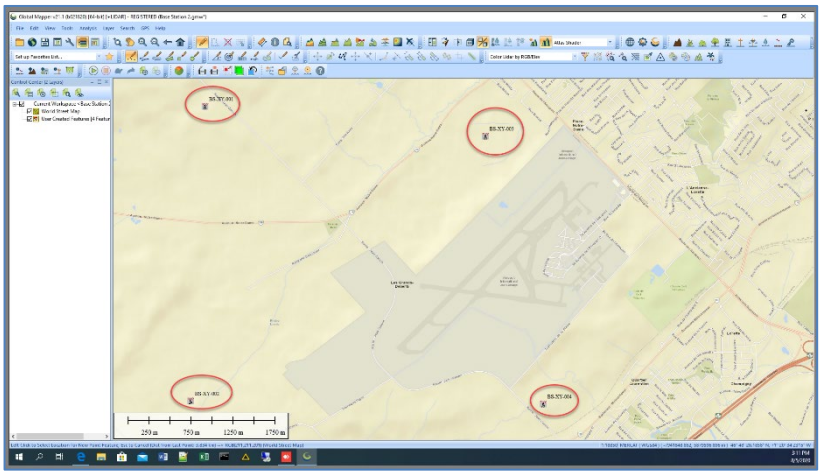

Fig. 8. Global Mapper™ → Map with four (imaginary) base stations

Exporting map material

The map material must be exported and saved on data media before it can be used in the analyzers. This is done by clicking on the following menu command in the main menu of the Global Mapper™ program:

File → Export → Export Web Format

Then, select the export format in the dialog window that opens:

OSM (OpenStreetMap) Tiles

Some further export settings can be made in the next dialog (OSM Tiles Export Options).

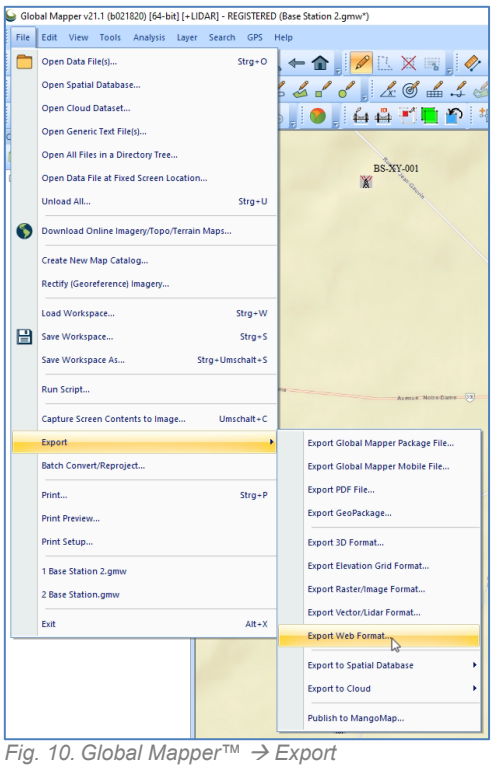

Fig. 10. Global Mapper™ → Export

“OSM Options” tab:

Data Set Name
The name of the map can be specified here.

Zoom Level Setup
To ensure that the quantity of data is not too much for the data carrier, the maximum zoom level and the number of smaller zoom levels can be specified here. Do not forget that doubling the zoom level means quadrupling the number of tiles (see “The map system in detail” on page 3).

Tile Image File Format
“PNG” must be selected here.

Transparency and additional options
The other settings on the “OSM Options” tab mainly concern the image display. Please note that tiles cannot be displayed transparently on Narda analyzers. The following settings have proven useful:

- Transparency: Opaque
- ADVANCED: Always Create 8-Bit Palette PNG Files
- ADVANCED: Export PNG for Transparent Tiles

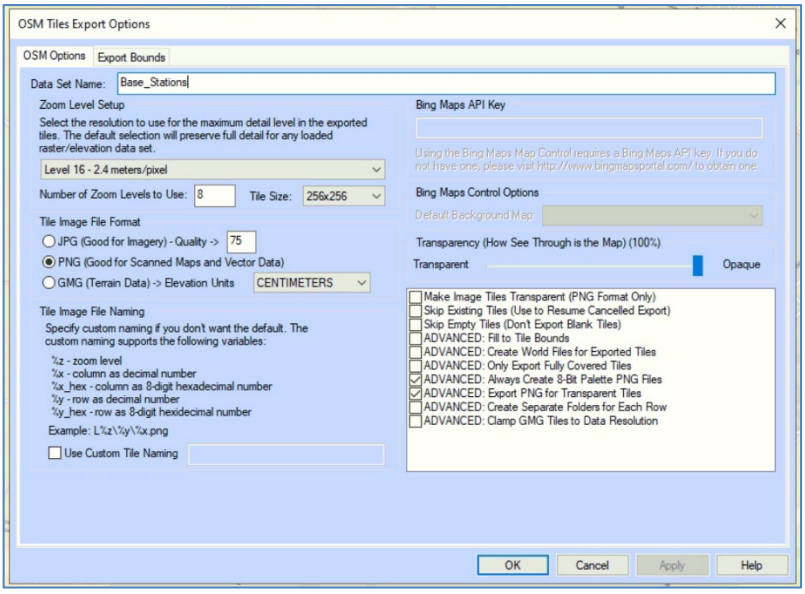

Fig. 11. “OSM Options” export settings

“Export Bounds” tab

The boundaries of the map section to be exported are specified here. In this example, the screen contents are specified as the limits.

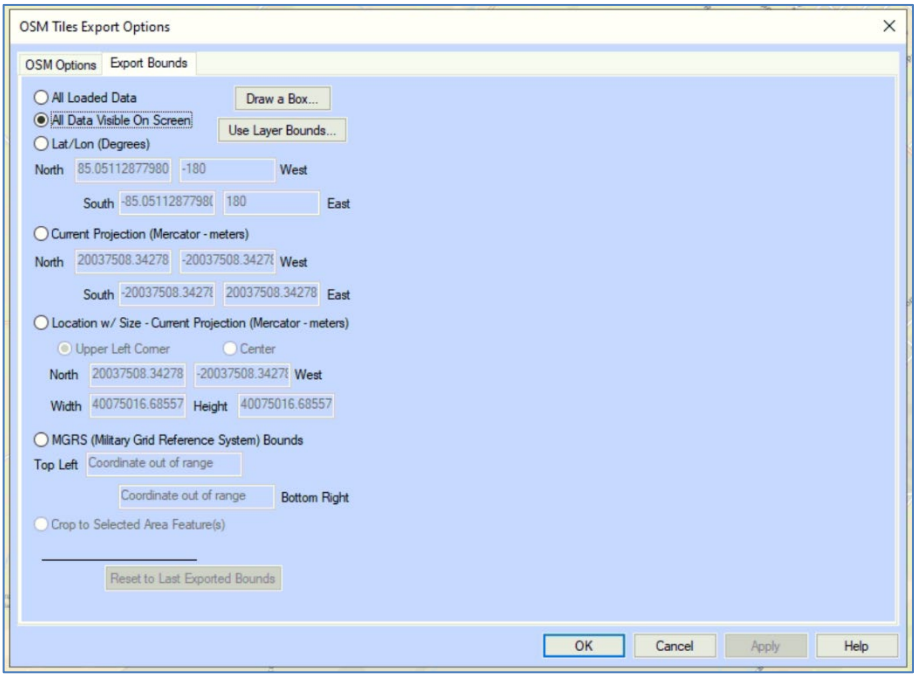

Fig. 12. “Export Bounds” export settings

When you click on “OK”, a new dialog window opens where you can specify the location to save the data. The structure used to save the data on the microSD card is shown on page 2.

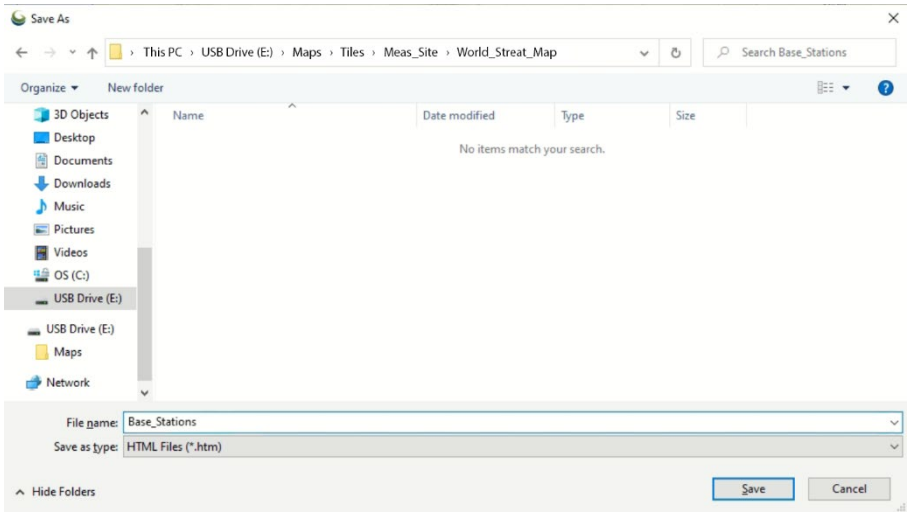

Fig. 13. Save As…

When you plug the microSD card prepared in this way into the analyzer, you can select the user-generated map in Map View (Direction Finding → Map).

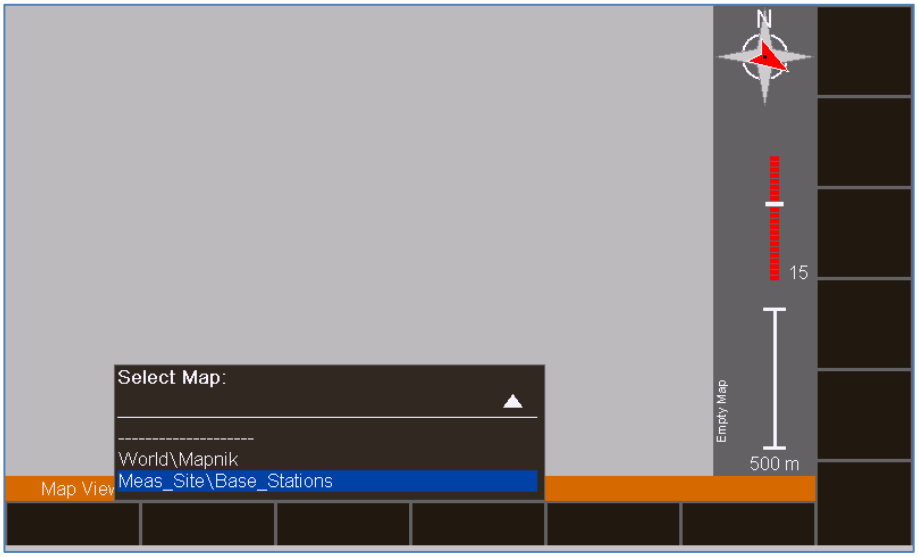

Fig. 14. IDA2 → Select map on device

You can then use the map. The menu on the SignalShark is similar. Here, too, the map is selected using the “Select Map” softkey.

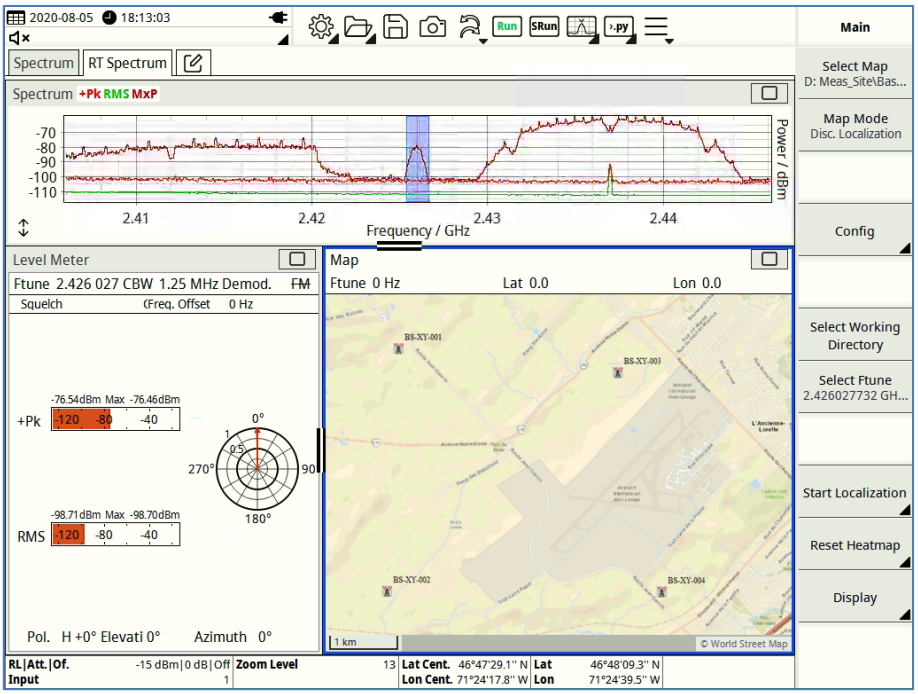

Fig. 15. User-generated map with base stations drawn in displayed on the SignalShark

You can now display bearings, heatmaps, etc. on your own maps or customized map materials.

Glossary

GIS	Geographic information system. GIS software enables the processing and display of geographical data.
Orthophoto	An orthophoto, orthophotograph or orthoimage is an aerial photograph or satellite imagery geometrically corrected such that the scale is uniform: the photo or image follows a given map projection [Wikipedia]
OSM	OpenStreetMap
Georeferencing	Georeferencing means that the internal coordinate system of a map or aerial photo image can be related to a geographic coordinate system. [Wikipedia] (Also called geocoding, geotagging.)
Tiles	Images that are put together like a mosaic to produce a complete map.

Further information

Mercator projection – Wikipedia https://en.wikipedia.org/wiki/Mercator_projection
Slippy map tilenames – OpenStreetMap – Wiki http://wiki.openstreetmap.org/wiki/Slippy_map_tilenames
http://en.wikipedia.org/wiki/Orthophoto
www.globalmapper.com/

Copyright information: The map sections used as examples from figure 7 onwards are provided by World Street Map.

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