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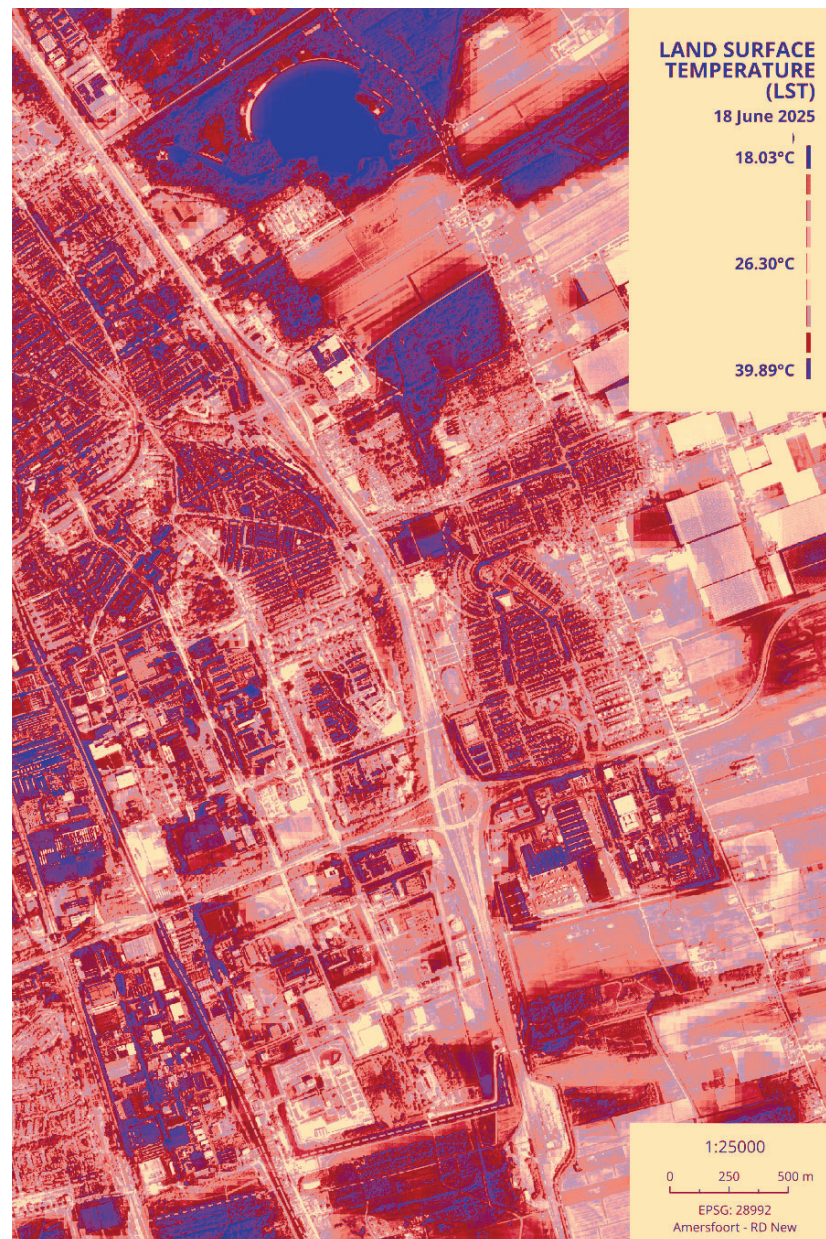
MAPPING LAND SURFACE TEMPERATURES

1 day



Introduction

With this method you can learn how to map Land Surface Temperatures within urban areas, by using open-source data and satellite imagery. This method is suitable for projects addressing urban, metropolitan or regional scale.



Learning objectives

The learning objectives for this method include:

- **Understanding** SAT mobility structures.
- **Understanding** Land Surface Temperatures.
- **Analysing** and calculating spatial results by modelling data.

Requirements

This method requires basic knowledge on spatial mapping and data literacy.

Digital software you will need are:

- **QGIS**: Use the latest Long-Term Release (LTR); free and open-source, no license required.
- **ArcGIS**: Use the latest stable ArcGIS Pro version; proprietary software requiring a paid license (often institution-provided).
- **R**: Use the latest stable release; free and open-source with no licensing costs.
- **Python**: Use the latest stable Python 3 version; free and open-source with freely available scientific libraries.
- **MATLAB**: Use a recent stable release compatible with required toolboxes; proprietary software requiring a paid license.

(Physical) tools you will need are:

- Computer that can load heavy programs
- A stable internet connection

Method approaches

- Data-driven
- Web-based applications
- Non-urban data
- Live-data based

Limitations

The limitations of this method primarily stem from the availability and accuracy of open-source data. The use of sensitive data can cause problems during the processing and sharing of results.

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Author(s)

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Method step-by-step

Step 1: Define the boundaries of your study area on the map.

Step 2: Download Landsat Satellite data by creating an account on the USGS Data Explorer portal. Select a tile (or multiple) using set criteria. For example, a hot day with a little amount of cloud coverage.

Step 3: Preprocess the data by clipping it to fit your defined study area. If needed, you can parse or transform the data. Depending on the area of interest, there might be the need to download and merge multiple tiles of data.

Step 4: Model the data.

1. The data downloaded in Step 2 includes a thermal band.
2. To make data analytically useful, it needs to be converted from raw sensor values into meaningful temperature units.
3. Use the Raster Calculator in QGIS (or other GIS software) to express each pixel as a temperature in degrees Celsius.
4. Once converted, classify the raster data by grouping these continuous values into a limited number of discrete categories (for example: cool, warm, hot, very hot), making spatial patterns legible and comparable. The choice of classification method directly influences which areas appear as hotspots on your map, so it is worth reflecting on that decision before proceeding.

Step 5: Visualise the map by highlighting hotspots or clusters. Apply a color ramp using a diverging color scheme.

For temperature maps, a common choice is blue (cool) - white (moderate) - red/orange (hot).

Step 6: Analyse the map by visually assessing it. A quantitative analysis can be done to support your findings.

Where are the hotspots in your study area?

Where are the coolest areas?

Is the heat pattern uniform across the city?

Step 7: Construct the final visualisation of the map. Include the main map, a legend with standard classifications to communicate your findings and a short caption paragraph with extra relevant information to support your map.