



*Making*

## Quantarctica-friendly datasets

Norwegian Polar Institute, January 2021

Project website: <https://www.npolar.no/quantarctica/>

Part of Quantarctica's utility comes from its consistency and stability; layers are stored in common GIS formats, render quickly, are provided in the same coordinate system, and their metadata can easily be found in several consistent locations.

The Quantarctica project team is publishing the following guidelines for Antarctic data authors who wish to make their data available in a form that is easy for Quantarctica users to access, open, view, and analyse in their own Quantarctica/QGIS project environment.

### Summary

- Formats: ESRI Shapefile (vector) or GeoTIFF (raster).
- Projection/CRS: Antarctic Polar Stereographic (EPSG:3031).
- Export .qml files to retain layer styling and labeling.
- Export .qmd files to retain layer metadata for use inside QGIS.
- Include the metadata also in a plain text file (.txt).

## Vector (points, lines, polygons)

**Format.** ESRI Shapefile, commonly displayed as \*.shp. Note that a shapefile is actually multiple files that share the same name. Mandatory associated files: .shp, .shx, .dbf, .prj and .cpg.

**Projection.** Antarctic Polar Stereographic (EPSG:3031). Other Antarctic projections, such as "USGS Transantarctic Mountains," "South Pole Stereographic," or "South Pole Lambert Azimuthal Equal Area" are not accepted.

**Attribute table.** Individual features are encouraged to have at least one unique identifier in their attribute table, such as a name, ID, or station #, when applicable.

**Styling and labeling.** If the data provider wants to display the dataset pre-styled or pre-labeled (i.e. not just accepting the QGIS defaults) in Quantarctica, they will need to style and label the layer themselves. Users will then see these style and layer settings as long as .qml auxiliary files (see below) are provided.

**Metadata.** See the metadata section below for information on including layer metadata as .qmd and .txt files in the dataset folder.

## Raster (grid)

**Format.** GeoTIFF, file extension \*.tif. GeoTIFFs are TIF images which include georeferencing information in their file headers; thus, not all TIFs are GeoTIFFs. GeoTIFFs must be produced using GIS software.

**Projection.** Antarctic Polar Stereographic (EPSG:3031). NOTE: If you have re-projected your raster from a different map projection/coordinate system, then it is very likely the pixel resolution

has changed. The pixel resolution is left to the judgment of the author, and there is no perfect value to choose. We recommend a value that is high-resolution enough to show important details, but not so high-resolution that it misrepresents the resolution of the original dataset. Make a note of both the original and re-projected pixel resolution of your raster.

Other Antarctic projections, such as "USGS Transantarctic Mountains," "South Pole Stereographic," or "South Pole Lambert Azimuthal Equal Area" are not accepted.

**Optional: Compression.** Applying compression to raster files can significantly decrease filesize. The data provider should judge the pros and cons of using lossless or lossy compression.

To compress GeoTIFFs, we recommend using the `gdal_translate` tool, from the command line, the QGIS Processing Toolbox, or from QGIS in *Raster > Conversion > Translate (Convert Format)*.

Documentation for `gdal_translate` can be found here: [https://gdal.org/programs/gdal\\_translate.html](https://gdal.org/programs/gdal_translate.html)

Lossless compression (LZW; Deflate, PackBits, LZ77, RLE). Retains original pixel values and image quality. LZW is the most common recommended method. The Quantarctica data package often uses Deflate with `ZLEVEL=9` for slightly smaller filesize at the cost of more processing power required to display.

Lossy compression (JPEG2000, JPEG). Use when the original pixel values are not important (i.e. visible light imagery, scanned paper maps). Smaller filesize than lossless compression. Often has a "Quality" setting (0-100 or 0-10) when exporting. The data provider should judge how to set this. We recommend JPEG2000 compression over JPEG.

**Optional: Pyramids.** If your raster file takes a long time to render in QGIS, especially when panning and zooming around the map, it may make sense to create external pyramids for the image. Pyramids are reduced-resolution images representing the raster that display when zoomed out, so that QGIS doesn't need to constantly re-render the image at full resolution. Pyramids do not alter the original raster pixel values.

Build pyramids by right-clicking the layer in the *Layers Panel > Properties > Pyramids* (tab). We strongly recommend setting *Overview Format* to *External* so that the original GeoTIFF file is not modified. We leave all other settings up to the data provider's judgment. See more information on building pyramids in the QGIS user manual here:

[https://docs.qgis.org/3.16/en/docs/user\\_manual/working\\_with\\_raster/raster\\_properties.html#pyramids-properties](https://docs.qgis.org/3.16/en/docs/user_manual/working_with_raster/raster_properties.html#pyramids-properties)

You can also create pyramids in the command line using the `gdaladdo` command:

<https://gdal.org/programs/gdaladdo.html>

## Metadata

Metadata for each layer should be written in two locations: through the QGIS layer *Properties Metadata* tab, and in the dataset folder.

**QGIS layer metadata.** Right-click the layer in the *Layers Panel, > Metadata (tab) > Abstract* (box). Then edit and select *Save as Default* from the *Metadata* dropdown menu to create the `.qmd` file on disk.

**Text file in the dataset folder.** Create a plain-text .txt file inside the dataset folder with the same name as your layer filename, e.g. my\_layer.txt corresponding to my\_layer.shp.

### **Metadata specifications.**

We recommend including the following pieces of information in your metadata:

1. Layer title. In most cases, this will simply be the same as the name of the layer in QGIS, and is the choice of the author.

2. Abstract. A brief description of the dataset. The writing level should be appropriate for scientific users who may be outside your particular discipline. Include items such as the time and date of data collection, whether the dataset was observed or modelled, the instrument or platform that acquired the data, any important parameters or tuning, processing methods, averaging or binning and the units of the dataset.

For raster data, list the pixel resolution (both original and re-projected, if applicable).

For vector data, give a note about the accuracy and precision of the data. For example, point coordinates acquired with minute precision may differ from their actual locations by up to 1.8 km.

3. Citation(s). Citation (in APA format or similar) for the dataset. Whether this citation corresponds to the entry for this dataset in a data portal, or the scientific publication/journal article containing this dataset is up to the author.

4. URL. A link to the data portal/download location for the original dataset, and for the original publication, if not already included in the citation.

5. Published date

6. Download/Processing date

7. Author contact information. Name and email address.

For examples, see the Quantarctica data catalog at <https://www.npolar.no/quantarctica/>.

## **Optional: Layer styles and labeling**

Styling and labeling of Quantarctica-friendly datasets, are fully up to the data provider. Below, we describe some general guidelines for how layers in the Quantarctica data package are consistently styled and labeled, that we hope will serve as useful examples.

**Color ramp.** In addition to the color ramps provided by QGIS, we provide our customised, colorblind-friendly Quantarctica "rainbow" color ramp in the Quantarctica folder. To import this color ramp into QGIS for convenient use, navigate to *Settings > Style Manager > Import/Export* (lower-left dropdown menu) > *Import Item(s)* and select *Quantarctica\_ColourRamp.xml* from the *Quantarctica3* folder.

We also use the following color ramps for other types of data:

- Increasing/"low to high": Custom white-to-purple (rgb 255-255-255 to 255-0-255), white-to-orange (rgb 255-255-255 to 255-127-0), or similar.
- Diverging/"negative and positive values where 0 is important": Custom purple-white-orange with white at the 0 value (rgb 255-0-255 via 255-255-255 to 255-127-0).

- Elevation/bathymetry: Purple-blue-white (0)-green-yellow-red, includes very light blue value at -1 and very light green at +1 to create a clear break at 0.

Creating and modifying color ramps works similarly for raster and vector data.

More about creating and using color ramps can be found here:

[https://docs.qgis.org/3.16/en/docs/user\\_manual/style\\_library/style\\_manager.html#setting-a-color-ramp](https://docs.qgis.org/3.16/en/docs/user_manual/style_library/style_manager.html#setting-a-color-ramp)

**Labeling.** Quantarctica uses the following labeling settings by default for vector layers.

- Font: Calibri.
- Size: 10 pt.
- Text buffer: Enabled, size 1 mm.
- Drop shadow: Enabled, offset: 135°, 1 mm, 1.5 mm blur radius, 70% opacity, blend mode: multiply.
- Placement: *General settings* > *Cartographic*, 0.5 mm distance offset from symbol bounds.
- Scale dependence: If desired, you can specify a minimum and maximum scale for labels to appear at, in the layer *Properties* > *Labels* [tab] > *Rendering* [tab] > *Scale dependent visibility*.

More about labeling settings can be found here:

[https://docs.qgis.org/3.16/en/docs/user\\_manual/working\\_with\\_vector/vector\\_properties.html#labels-properties](https://docs.qgis.org/3.16/en/docs/user_manual/working_with_vector/vector_properties.html#labels-properties)

## QML Style file

Include a .qml file with your dataset to retain layer name, style and labeling information for vector and raster layers when a user opens the layer in QGIS. Users can then open your layer exactly the way you intend for it to be seen. Save a .qml by going to the layer *Properties* and from the *Style* dropdown button, select *Save as Default*.

You can examine datasets already included in the Quantarctica 3 data package to see ideas and standards for how to display and package your own Quantarctica-friendly data. If you have any questions about Quantarctica or providing Quantarctica-friendly datasets, send us an email at [quantarctica@npolar.no](mailto:quantarctica@npolar.no).

***Thank you for your contribution!***

The Quantarctica project team