



Making **Quantarctica-friendly datasets**

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

Would you like to see your data widely used by the Antarctic community? Then make your data Quantarctica-friendly.

"Quantarctica-friendly" datasets follow a set of practical recommendations that allow end users to easily add and use the data in Quantarctica with a simple drag-and-drop workflow. These recommendations complement, rather than replace, normal data publication practices. Authors should continue to archive and publish their datasets through appropriate repositories and assign a DOI where applicable.

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), GeoTIFF (raster), or OGC GeoPackage (vector, 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 and OGC GeoPackage. 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, JPEG2000 and OGC GeoPackage. 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 file size. 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

Lossless compression (LZW; Deflate, PackBits, LZ77, RLE). Retains original pixel values and image quality. The Quantarctica data package often uses Deflate with ZLEVEL=9 and PREDICTOR=2 (integers) or 3 (float).

Lossy compression (JPEG2000, JPEG). Use when the original pixel values are not important (i.e. visible light imagery, scanned paper maps). This gives smaller file size than lossless compression. Often, the GIS software where you can export a raster to JPEG2000, 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 guide found in the *Quantarctica Software* folder.

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. Double-click the layer in the *Layers Panel*, and in the appearing *Layer Properties*, go to the *Metadata* tab, and *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.

To make datasets more *Quantarctica friendly*, we recommend providing metadata that follows the general structure used by QA4. A concise layer name, a non-specialist data abstract, a brief description of any processing or derivation steps, dataset access links and DOI information, and references to the publication(s) that should be cited alongside the data are particularly valuable. Although metadata practices vary between disciplines and exact adherence is not required, presenting this information in a consistent manner allows users to interpret, compare, and cite datasets more easily and creates a more seamless experience across Quantarctica data layers.

Optional: Layer styles and labeling

Styling and labeling of Quantarctica-friendly datasets, are fully up to the data provider. Nonetheless, the styling of QA4 data layers can serve as a useful example when designing your own data layers for use alongside other QA4 layers. 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 *Software* 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 in the QGIS user guide located in the Quantarctica *Software* folder.

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 in the QGIS user guide located in the Quantarctica *Software* folder.

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*.

Data archive

All Quantarctica-friendly datasets must have a DOI and archived in a permanent archiving location such as <https://zenodo.org/> and data centre associated with your National Antarctic Program. Non-permanent data archiving at a research group server for example is not acceptable.

Share your data as Quantarctica-friendly at QA4 website

Quantarctica project website lists Quantarctica-friendly datasets upon data author's request. If you like, please send us the data DOI, a thumbnail of the data presentation, and a short data abstract (see examples in data catalog at the Quantarctica website).

Thank you for your contribution!

The Quantarctica project team