
nc5ng-python Documentation

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nc5ng-python is a project providing python libraries for import, analysis, generation, plotting, export, filtering, and manipulation of geodetic datum transformation data.

The source data for transformations come from the United States National Geodetic Survey *NADCON5* data and Fortran processing programs linked into python in the nc5ng.org project nadcon5-ng ([Home Page](#)) . Transformation grids can be provided from either source or built yourself (See: *Install Conversion Data*)

Installation instructions for nc5ng-python

1.1 System Installation

nc5ng offers common installation options for python distributions

Note: It is recommended to use a python virtual environment (`virtualenv`) to install this package and dependencies. Installing directly to a system python distribution can break certain system packages.

1.1.1 Requirements

- Python 3.x - `pip` and `virtualenv` (*Recommended*)
- Fortran (`gfortran`)
- GMT (4.x-6.x)
- GMT/Python (*Optional*) - GMT6.0 Required for “GMT/Python” (*Development Release Only*)

1.1.2 Python Package Index

Released versions of nc5ng can be installed directly from the PyPi by using `pip`

```
pip install nc5ng
```

Specific versions can be installed by specifying `nc5ng==VERSION`

1.1.3 Development Versions

pip can be used to install development versions of python packages by specifying the git repository, including branch or commit

```
pip install -U git+git://github.com/nc5ng/nc5ng-python@stable
pip install -U git+git://github.com/nc5ng/nc5ng-
↳python@8f482ba1ce6484ab18e6ccd88d6e251655cd61f2
```

Local Copies can be installed in editable mode for development

```
git clone git@github.com/nc5ng/nc5ng-python
pip install -U -e ./nc5ng-python
```

1.2 Docker Deployment

Docker images are provided to use nc5ng through container virtualization.

Pre-configured images are available from the [nc5ng-docker](#) project (Dockerhub), and base images with gmt tools are available from the [gmt-docker](#) project (Dockerhub).

For convenience, the docker image `nc5ng/nc5ng` contains a pre-compiled conversion for testing.

For more information on deployment and use please see the docker project pages.

1.2.1 Requirements

- `docker`
- `docker-compose` (*Optional*)

1.3 Install Conversion Data

Raw Source data is provided directly from the `nc5ng-core` package. However conversion data must either be built or downloaded seperately.

Conversion data are released publically on the [nadcon5-ng github](#) or upstream via National Geodetic Survey. For compilation please see the source library [docs](#) , [project homepage](#), and [github](#)

Conversion data can be placed anywhere and is referenced by configuration arguments used to load data.

2.1 *nc5ng.nc5data* Conversion Data API

PyPi Package: `nc5ng-core`

2.2 *nc5ng.gmt* GMT Wrapper API

PyPi Package: `nc5ng-common`

GMT Wrapper Library and Convenience Methods for `nc5ng`

2.2.1 GMT Options

GMTOptions form a loose wrapper on the GMT command line arguments and GMT/Python shorthands

It is a subtype of `dict` but has additional properties for creating appropriate GMT arguments

```
class nc5ng.gmt.GMTOptions (projection='M10.0i', region=[240, 190, 30, 80], frame=True,
                           insert=None, border=None, scale=None, dir_rose=None,
                           mag_rose=None, logo=False, area_thresh=None, lakes=None, res-
                           olution='c', land=None, rivers=None, borders=None, water=None,
                           shorelines=1, linear_lines=False, cpt=None, offset=None, er-
                           rors=None, color=None, symbol=None, pen=None, basemap=None,
                           coast=None, plot=None, **kwargs)
```

GMTOptions are decorated dictionaries to wrap GMT/Python Keyword options

GMTOptions takes keywords or other dictionary to construct gmt plot options for *basemap*, *coast*, *plot* via properties *GMTOptions.basemap*, *.coast*, *.plot*

GMT Options can be combined (copy-combine) by calling one with the other

```
p1 = GMTOptions(lakes=0) p2 = GMTOptions(**PLOT_OPTS['default'])
p3 = p2(p1) # override default by turning off lakes
```

Warning: GMTOptions do not track single letter GMT Arguments, because ambiguous double-mappings exist (e.g. -A means different things to *coast* vs *plot*).

Instead, single letter options can be overridden as keyword arguments to GMTPlotter

2.2.2 GMT Plotter

GMTPlotter forms a loose wrapper around `gmt.Figure` object, that constructs plots from embedded gmt options inside nc5ng objects (meta-api, `object.gmt_meta`)

```
class nc5ng.gmt.plotter.GMTPlotter (base_plot_options={'__class__':          <class
    'nc5ng.gmt.options.GMTOptions'>,          'area_thresh':
    1200, 'basemap': None, 'border': None, 'borders':
    ['1', '2'], 'coast': None, 'color': None, 'cpt': None,
    'dir_rose': None, 'errors': None, 'frame': True, 'in-
    sert': None, 'kwargs': {}, 'lakes': None, 'land': None,
    'linear_lines': False, 'logo': False, 'mag_rose': None,
    'offset': None, 'pen': None, 'plot': None, 'projection':
    'M10.0i', 'region': [240, 190, 30, 80], 'resolution': 'fine',
    'rivers': None, 'scale': None, 'self': {'color': None,
    'water': 'lightblue', 'errors': None, 'cpt': None, 'offset':
    None, 'linear_lines': False, 'basemap': None, 'land':
    None, 'kwargs': {}, 'borders': ['1', '2'], 'symbol': None,
    'scale': None, 'region': [240, 190, 30, 80], 'dir_rose':
    None, 'coast': None, 'insert': None, 'plot': None, 'bor-
    der': None, 'shorelines': 1, 'logo': False, '__class__':
    <class 'nc5ng.gmt.options.GMTOptions'>, 'lakes':
    None, 'pen': None, 'projection': 'M10.0i', 'mag_rose':
    None, 'resolution': 'fine', 'frame': True, 'rivers': None,
    'area_thresh': 1200, 'self': {...}}, 'shorelines': 1,
    'symbol': None, 'water': 'lightblue'})
```

Wrapper for GMT/Python Plotter

```
static plot_conversion (conversion, coverage='all', vector='all', plotter=None, **kwargs)
    Static Method to Plot an nc5ng.nc5data.Conversion
```

Plotting options are Applied in the order

1. GMTPlotter configured or default options
2. Conversion configured options `Conversion.gmt_meta`
3. Data Set Options `PointData.gmt_meta`
4. Keyword overrides (full option name)
5. Keyowrd overrides (single letter GMT Style arguments)

Parameters

- **conversion** – Conversion data

- **coverage** – Coverage files (no file extension), to plot. Can be list of names (coverage = ['cvacdlat', 'cvacdlon',]), single file name (coverage = 'cvacdlat'), None, or 'all'
- **vector** – Vector files (no file extension) to plot. Can be list of names, single file name, None, or 'all'.
- **plotter** – plotter to use, if None one will be created and returned

2.3 *nc5ng.types* Core Types

PyPi Package: nc5ng-common

3.1 Information

- *nc5ng.org* Organization Homepage : <https://www.nc5ng.org>
- *nc5ng-python* Project Homepage : <https://www.nc5ng.org/projects/nc5ng-python>

3.2 Related Projects

- *nadcon5-ng* Project Homepage : <https://www.nc5ng.org/projects/nadcon5-ng>
- *nc5ng-python-common* Project Homepage : <https://www.nc5g.org/projects/nc5ng-python-common>

3.3 Development

- *nc5ng* Organization Github : <https://github.com/nc5ng>
- *nc5ng-python* Project Github : <https://github.com/nc5ng/nc5ng-python>

CHAPTER 4

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