Subset, Conversion, and Calculations on NARCCAP Example Data Using OpenClimateGIS

Contact: OpenClimateGIS Support <ocgis_support@list.woc.noaa.gov>

- Background
- Implementation
- Outstanding Issues
  - RegCM3 Model Spatial Reference
  - Rotated Pole Spatial Reference
  - Subset to NetCDF
  - Missing Projection Information
  - Masked Fields
- Performance Report
  - Methodology
  - Results
- Summary
- Appendix A: NARCCAP Dataset Descriptions
- Appendix B: Projection Metadata as Determined by OpenClimateGIS

Background

This report describes the results of a use case applying OpenClimateGIS[1] (OCGIS) to a sample North American Regional Climate Change Analysis Program (NARCCAP)[2] dataset provided by Dr. Seth McGinnis at NCAR. The NARCCAP example dataset was provided via FTP. Basic descriptions of the NARCCAP data files analyzed in this report are located in Appendix A.

The use case structure is as follows:

1. For a city centroid within the NARCCAP analysis domain, select the nearest NARCCAP model output for each AOGCM-RCM/timeslice combination.
2. For the selected NARCCAP data's time series, compute a set of standard descriptive statistics (i.e. mean, median, minimum, and maximum) grouped by month and year.
3. Write results to a tabular format.

Implementation

An OCGIS script was produced to perform the tasks in the use case. The OCGIS snapshot to use as reference is: https://github.com/NCPP/ocgis/releases/tag/v0.06b-snapshot-01. The script

[1] http://www.earthsystemcog.org/projects/openclimategis/
[2] http://www.narccap.ucar.edu/

is located here:
https://github.com/NCPP/ocgis/blob/v0.06b-snapshot-01/examples/narccap/city_centroid_subset/city_centroid_subset.py. The script should be fully executable provided the installation of OCGIS matches or post-dates the snapshot reference.

Three major features were added to the software during the use case process. In truth, the first feature is a more a series of enhancements.

1. Support for additional NARCCAP projections: Oblique Mercator, Polar Stereographic, and Rotated Pole. Descriptive information on file projections as determined by OCGIS may be found in Appendix B.
2. Add option to subset data by point via a nearest neighbor search.
3. Allow multiple data projections within a single request providing an option to push data to a common projection prior to format conversion.

The final script performs the necessary logic to manage the multiple geographic projections pushing the resulting subsetted and computed data to a single projection and tabular file (with extraneous metadata). The final output from the script may be downloaded here: https://dl.dropboxusercontent.com/u/867854/narccap/city_centroid_subset/ocgis_output.zip. The password to unzip the file is “its_a_subset!”.

A pseudocode representation of the script is as follows:

1. Set OCGIS environment variables.
2. Parse the directory containing NARCCAP data files into OCGIS RequestDataset[3] objects which contain the path(s) to the files to operate on in addition to the target variable and RequestDataset aliases.
3. Parameterize the request through the OcgOperations[4] object. This contains the bulk of the processing information including the calculations to perform, the coordinates of the point to extract, the output format, and the spatial operations to apply.
4. Execute the operations and return a path to the output file.

The output of the processing script is the “csv+” OCGIS format[5] which, in addition to the derived values and metadata, also includes shapefile overviews of the selection and data geometries.

Outstanding Issues

There are several outstanding issues. Each is described below. Given the outstanding issues, output data from the use case should be considered preliminary.

RegCM3 Model Spatial Reference

[3] http://ncpp.github.io/ocgis/api.html#ocgis.RequestDataset
[4] http://ncpp.github.io/ocgis/api.html#ocgis-ocgoperations
[5] http://ncpp.github.io/ocgis/api.html#output-format

Coordinates for the RegCM3 (RCM3)[6] model are shifted relative to NARCCAP graphical coordinate representations[7] following a coordinate transformation from the model's source spatial reference (oblique mercator) to a standard latitude/longitude geographic coordinate system. It is interesting to note that PROJ4[8] (the projection library used by the GIS software) chokes on an azimuth value of zero or 90, but may accept 360 or 1e-5 and not break. Leaving the "+alpha" (corresponding to "azimuth of initial line") term out of the projection definition altogether raises an error. This is a known bug[9] (scroll down to PROJ.4 Organization).

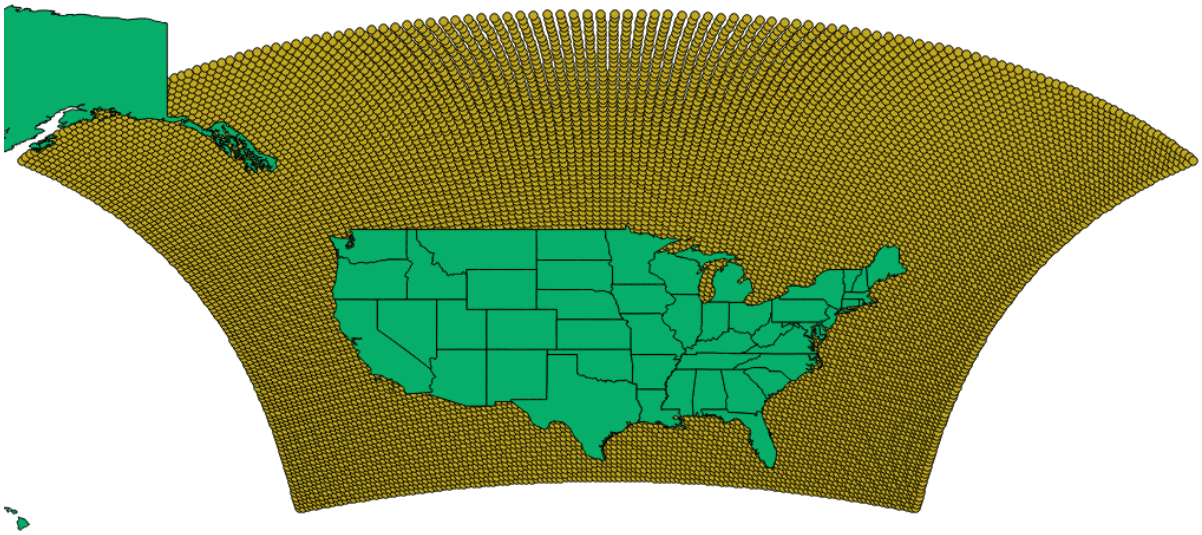

Figure 1. *RCM3 Model Grid as interpreted by OpenClimateGIS.*

[6] RegCM3 (http://users.ictp.it/RegCNET/model.html)
[7] http://www.narccap.ucar.edu/data/gridpoint-maps.html
[8] http://trac.osgeo.org/proj/
[9] http://www.remotesensing.org/geotiff/proj_list/hotine_oblique_mercator.html

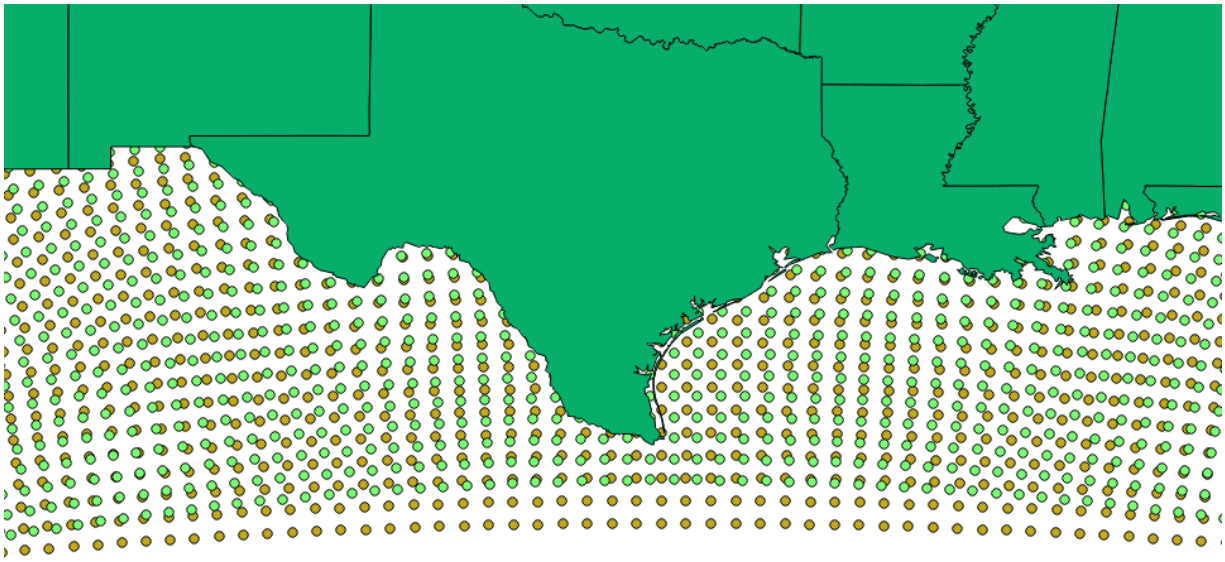

Figure 2. *Zoom on southern Texas showing the raw latitude and longitude coordinates (gree plotted with the transformed coordinates (brown).*

This sums to uncertainty in returning a correctly projected representation of the model's coordinate system. Figures 1 and 2 contain plots of the RCM3 coordinates. Figure 2 overlays the raw latitude and longitude coordinates with the projected version of the oblique mercator coordinates.

Rotated Pole Spatial Reference

The HRM3/PRECIS[10] model uses a rotated pole projection which requires special processing as the projection is not directly supported by the projection library[11]. The current solution is a bit of a hack, but the unique nature of the projection and the requirements for transforming it may require it remain this way. There is an open ticket for the PROJ4 spatial reference library in regards to the transformation[12].

Subset to NetCDF

Another issue[13] to address is the writing of the data to netCDF following a subset and/or calculation. Currently, coordinate variables referenced by the "coordinate" attribute are not written to the output or handled in the subsetting. Hence, the "lat" and "lon" variables containing

[10] Hadley Regional Model 3/Providing REgional Climates for Impact Studies (http://www.metoffice.gov.uk/precis/)
[11] http://goo.gl/sJYuy
[12] http://trac.osgeo.org/gdal/ticket/4285
[13] https://github.com/NCPP/ocgis/issues/143

the gridded latitude and longitude coordinates are not written to the output and, if they were, they would not be subsetted. This takes some customization to handle this special case. There is also some minor work for correctly writing projection information to a netCDF file[14].

Missing Projection Information

The ECP2-NCEP model combination is missing false eastings and northings. They are present in other ECP2 files, so those were used as fill values in the subsetting script.

Masked Fields

Some time-variable fields were entirely masked. No search was performed to identify the fields, but the missing/masked values were not included in any computations. An issue[15] was created to ensure these values are not included in the sample size calculation. Masked values (in the case of time not space) are written to output files without a calculation.

Performance Report

Methodology

A profiling script[16] was written wrapping the NARCCAP example script using a standard Python profiler[17].

Results

Raw output from the profiling script is located here (units of seconds): https://docs.google.com/spreadsheet/ccc?key=0AjHYk4a_tHfydGN0bWFYYWpnOXdYaHRreE04bEFyOHc&usp=sharing.

The script took approximately 30 minutes to execute on a single CPU operating at 2.80GHz. This reduces to a little under a minute per AOGCM-RCM combination. The bulk of the processing time was spent extracting the data slice from the file (read operation), converting the netCDF time representation to Python datetime objects, and grouping time coordinates into groups for the aggregate computations.

The operations performed in the example script are not memory intensive with only a single time slice, and, hence, conversion of the extracted data to tabular format (also accounting for temporal aggregation) was not a consideration. The small data cube also ensured there were no scaling issues with the computations. Larger data slices would drastically increase write times while also decreasing computational efficiency. Accordingly, this performance profile is not

[14] https://github.com/NCPP/ocgis/issues/152
[15] https://github.com/NCPP/ocgis/issues/142
[16] http://goo.gl/cbhrH
[17] http://docs.python.org/2/library/profile.html#module-cProfile

relevant for those cases.

There are two recommendations for speedups on the OCGIS side:

1. Parallelization - Requests inside OCGIS are structured to be compatible with a multiprocessing environment.
2. Caching - Linking a dataset to a cached and serialized time vector could reduce the time necessary to format a dataset's time dimension provided OCGIS touches the dataset first (i.e. not applicable for "cold" runs).

On the NARCCAP side, performance improvement could come from altering the chunking[18] of the netCDF data provided it is netCDF-4. This is a considerable undertaking and should only be done if requests like this (i.e. complete time series from a few locations) are commonplace.

Summary

A script using OCGIS to subset and compute standard descriptive statistics was applied to an example NARCCAP dataset. A number of improvements to the software including support for additional projections, subsetting by point, and projection management were added to the software. Outstanding issues remain with OCGIS's interpretation and conversion of NARCCAP datasets. These issues are described in detail in the Outstanding Issues section of this report.

[18] http://www.unidata.ucar.edu/software/netcdf/docs/netcdf/Chunking.html

Appendix A: NARCCAP Dataset Descriptions

DID	Filenames	Variable	Time Start	Time End
1	['pr_CRCM_ccsm_1981010103.nc', 'pr_CRCM_ccsm_1986010103.nc']	pr	1981-01-01 03:00:00	1991-01-01 00:00:00
2	['pr_CRCM_cgcm3_1981010103.nc', 'pr_CRCM_cgcm3_1986010103.nc']	pr	1981-01-01 03:00:00	1991-01-01 00:00:00
3	['pr_CRCM_ncep_1981010103.nc', 'pr_CRCM_ncep_1986010103.nc']	pr	1981-01-01 03:00:00	1991-01-01 00:00:00
4	['pr_ECP2_gfdl_1981010103.nc', 'pr_ECP2_gfdl_1986010103.nc']	pr	1981-01-01 03:00:00	1991-01-01 00:00:00
5	['pr_ECP2_ncep_1981010103.nc', 'pr_ECP2_ncep_1986010103.nc']	pr	1981-01-01 03:00:00	1991-01-01 00:00:00
6	['pr_HRM3_gfdl_1981010103.nc', 'pr_HRM3_gfdl_1986010103.nc']	pr	1981-01-01 03:00:00	1991-01-01 00:00:00
7	['pr_HRM3_ncep_1981010103.nc', 'pr_HRM3_ncep_1986010103.nc']	pr	1981-01-01 03:00:00	1991-01-01 00:00:00
8	['pr_MM5I_ccsm_1981010103.nc', 'pr_MM5I_ccsm_1986010103.nc']	pr	1981-01-01 03:00:00	1991-01-01 00:00:00
9	['pr_MM5I_ncep_1981010103.nc', 'pr_MM5I_ncep_1986010103.nc']	pr	1981-01-01 03:00:00	1991-01-01 00:00:00
10	['pr_RCM3_cgcm3_1981010103.nc', 'pr_RCM3_cgcm3_1986010103.nc']	pr	1981-01-01 03:00:00	1991-01-01 00:00:00
11	['pr_RCM3_gfdl_1981010103.nc', 'pr_RCM3_gfdl_1986010103.nc']	pr	1981-01-01 03:00:00	1991-01-01 00:00:00
12	['pr_RCM3_ncep_1981010103.nc', 'pr_RCM3_ncep_1986010103.nc']	pr	1981-01-01 03:00:00	1991-01-01 00:00:00
13	['pr_TMSL_ccsm_1981010103.nc', 'pr_TMSL_ccsm_1986010103.nc']	pr	1981-01-01 03:00:00	1991-01-01 00:00:00
14	['pr_TMSL_gfdl_1981010100.nc', 'pr_TMSL_gfdl_1986010100.nc']	pr	1981-01-01 01:30:00	1990-12-31 22:30:00
15	['pr_WRFG_ccsm_1981010103.nc', 'pr_WRFG_ccsm_1986010103.nc']	pr	1981-01-01 03:00:00	1991-01-01 00:00:00
16	['pr_WRFG_cgcm3_1981010103.nc', 'pr_WRFG_cgcm3_1986010103.nc']	pr	1981-01-01 03:00:00	1991-01-01 00:00:00
17	['pr_WRFG_ncep_1981010103.nc', 'pr_WRFG_ncep_1986010103.nc']	pr	1981-01-01 03:00:00	1991-01-01 00:00:00
18	['tas_CRCM_ccsm_1981010103.nc', 'tas_CRCM_ccsm_1986010103.nc']	tas	1981-01-01 03:00:00	1991-01-01 00:00:00
19	['tas_CRCM_cgcm3_1981010103.nc', 'tas_CRCM_cgcm3_1986010103.nc']	tas	1981-01-01 03:00:00	1991-01-01 00:00:00
20	['tas_CRCM_ncep_1981010103.nc', 'tas_CRCM_ncep_1986010103.nc']	tas	1981-01-01 03:00:00	1991-01-01 00:00:00
21	['tas_ECP2_gfdl_1981010103.nc', 'tas_ECP2_gfdl_1986010103.nc']	tas	1981-01-01 03:00:00	1991-01-01 00:00:00
22	['tas_ECP2_ncep_1981010103.nc', 'tas_ECP2_ncep_1986010103.nc']	tas	1981-01-01 03:00:00	1991-01-01 00:00:00
23	['tas_HRM3_gfdl_1981010103.nc',	tas	1981-01-01 03:00:00	1991-01-01 00:00:00

	'tas_HRM3_gfdl_1986010103.nc']			
24	['tas_HRM3_ncep_1981010103.nc', 'tas_HRM3_ncep_1986010103.nc']	tas	1981-01-01 03:00:00	1991-01-01 00:00:00
25	['tas_MM5I_ccsm_1981010103.nc', 'tas_MM5I_ccsm_1986010103.nc']	tas	1981-01-01 03:00:00	1991-01-01 00:00:00
26	['tas_MM5I_ncep_1981010103.nc', 'tas_MM5I_ncep_1986010103.nc']	tas	1981-01-01 03:00:00	1991-01-01 00:00:00
27	['tas_RCM3_cgcm3_1981010103.nc', 'tas_RCM3_cgcm3_1986010103.nc']	tas	1981-01-01 03:00:00	1991-01-01 00:00:00
28	['tas_RCM3_gfdl_1981010103.nc', 'tas_RCM3_gfdl_1986010103.nc']	tas	1981-01-01 03:00:00	1991-01-01 00:00:00
29	['tas_RCM3_ncep_1981010103.nc', 'tas_RCM3_ncep_1986010103.nc']	tas	1981-01-01 03:00:00	1991-01-01 00:00:00
30	['tas_TMSL_ccsm_1981010103.nc', 'tas_TMSL_ccsm_1986010103.nc']	tas	1981-01-01 03:00:00	1991-01-01 00:00:00
31	['tas_TMSL_gfdl_1981010100.nc', 'tas_TMSL_gfdl_1986010100.nc']	tas	1981-01-01 03:00:00	1991-01-01 00:00:00
32	['tas_WRFG_ccsm_1981010103.nc', 'tas_WRFG_ccsm_1986010103.nc']	tas	1981-01-01 03:00:00	1991-01-01 00:00:00
33	['tas_WRFG_cgcm3_1981010103.nc', 'tas_WRFG_cgcm3_1986010103.nc']	tas	1981-01-01 03:00:00	1991-01-01 00:00:00
34	['tas_WRFG_ncep_1981010103.nc', 'tas_WRFG_ncep_1986010103.nc']	tas	1981-01-01 03:00:00	1991-01-01 00:00:00

Appendix B: Projection Metadata as Determined by OpenClimateGIS

```
Filename: pr_WRFG_ccsm_1986010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.LambertConformalConic'>
OpenClimateGIS Computed PROJ4 String: +proj=lcc +lat_1=30.0 +lat_2=60.0 +lat_0=47.5
+lon_0=-97.0 +x_0=3325000.0 +y_0=2700000.0 +datum=WGS84 +units=km +no_defs
NetCDF Variable/Attribute Dump:
 Lambert_Conformal
  grid_mapping_name: lambert_conformal_conic
  standard_parallel: [ 30.  60.]
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  false_easting: 3325000.0
  false_northing: 2700000.0

-----------------------------------------------------------------------------------------

Filename: tas_CRCM_cgcm3_1981010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.PolarStereographic'>
OpenClimateGIS Computed PROJ4 String: +proj=stere +lat_ts=60.0 +lat_0=90.0 +lon_0=263.0
+k_0=1.0 +x_0=3475000.0 +y_0=7475000.0
NetCDF Variable/Attribute Dump:
 polar_stereographic
  straight_vertical_longitude_from_pole: 263.0
  standard_parallel: 60.0
  false_easting: 3475000.0
  false_northing: 7475000.0
  latitude_of_projection_origin: 90.0
  grid_mapping_name: polar_stereographic
  resolution_at_standard_parallel: 50000.0
  earth_radius: 6371000.0

-----------------------------------------------------------------------------------------

Filename: pr_WRFG_ccsm_1981010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.LambertConformalConic'>
OpenClimateGIS Computed PROJ4 String: +proj=lcc +lat_1=30.0 +lat_2=60.0 +lat_0=47.5
+lon_0=-97.0 +x_0=3325000.0 +y_0=2700000.0 +datum=WGS84 +units=km +no_defs
NetCDF Variable/Attribute Dump:
 Lambert_Conformal
  grid_mapping_name: lambert_conformal_conic
  standard_parallel: [ 30.  60.]
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  false_easting: 3325000.0
```

```
  false_northing: 2700000.0

--------------------------------------------------------------------------------------------

Filename: tas_ECP2_ncep_1986010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.PolarStereographic'>
OpenClimateGIS Computed PROJ4 String: +proj=stere +lat_ts=60.0 +lat_0=90.0 +lon_0=263.0
+k_0=1.0 +x_0= +y_0=
NetCDF Variable/Attribute Dump:
 polar_stereographic
  grid_mapping_name: polar_stereographic
  longitude_of_central_meridian: 263.0
  straight_vertical_longitude_from_pole: 263.0
  standard_parallel: 60.0
  latitude_of_projection_origin: 90.0
  XGridLength_M: 50000.0
  YGridLength_M: 50000.0
  PoleOnPlane: north
  false_easting:
  false_northing:

--------------------------------------------------------------------------------------------

Filename: tas_MM5I_ccsm_1986010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.LambertConformalConic'>
OpenClimateGIS Computed PROJ4 String: +proj=lcc +lat_1=30.0 +lat_2=60.0 +lat_0=47.5
+lon_0=-97.0 +x_0=3825000.0 +y_0=3200000.0 +datum=WGS84 +units=km +no_defs
NetCDF Variable/Attribute Dump:
 Lambert_Conformal
  grid_mapping_name: lambert_conformal_conic
  standard_parallel: [ 30.  60.]
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  false_easting: 3825000.0
  false_northing: 3200000.0

--------------------------------------------------------------------------------------------

Filename: pr_MM5I_ccsm_1981010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.LambertConformalConic'>
OpenClimateGIS Computed PROJ4 String: +proj=lcc +lat_1=30.0 +lat_2=60.0 +lat_0=47.5
+lon_0=-97.0 +x_0=3825000.0 +y_0=3200000.0 +datum=WGS84 +units=km +no_defs
NetCDF Variable/Attribute Dump:
 Lambert_Conformal
  grid_mapping_name: lambert_conformal_conic
  standard_parallel: [ 30.  60.]
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
```

```
  false_easting: 3825000.0
  false_northing: 3200000.0

--------------------------------------------------------------------------------------------

Filename: tas_WRFG_cgcm3_1981010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.LambertConformalConic'>
OpenClimateGIS Computed PROJ4 String: +proj=lcc +lat_1=30.0 +lat_2=60.0 +lat_0=47.5
+lon_0=-97.0 +x_0=3325000.0 +y_0=2700000.0 +datum=WGS84 +units=km +no_defs
NetCDF Variable/Attribute Dump:
 Lambert_Conformal
  grid_mapping_name: lambert_conformal_conic
  standard_parallel: [ 30.  60.]
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  false_easting: 3325000.0
  false_northing: 2700000.0

--------------------------------------------------------------------------------------------

Filename: pr_WRFG_cgcm3_1986010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.LambertConformalConic'>
OpenClimateGIS Computed PROJ4 String: +proj=lcc +lat_1=30.0 +lat_2=60.0 +lat_0=47.5
+lon_0=-97.0 +x_0=3325000.0 +y_0=2700000.0 +datum=WGS84 +units=km +no_defs
NetCDF Variable/Attribute Dump:
 Lambert_Conformal
  grid_mapping_name: lambert_conformal_conic
  standard_parallel: [ 30.  60.]
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  false_easting: 3325000.0
  false_northing: 2700000.0

--------------------------------------------------------------------------------------------

Filename: pr_CRCM_ccsm_1981010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.PolarStereographic'>
OpenClimateGIS Computed PROJ4 String: +proj=stere +lat_ts=60.0 +lat_0=90.0 +lon_0=263.0
+k_0=1.0 +x_0=3475000.0 +y_0=7475000.0
NetCDF Variable/Attribute Dump:
 polar_stereographic
  straight_vertical_longitude_from_pole: 263.0
  standard_parallel: 60.0
  false_easting: 3475000.0
  false_northing: 7475000.0
  latitude_of_projection_origin: 90.0
  grid_mapping_name: polar_stereographic
  resolution_at_standard_parallel: 50000.0
```

```
-----------------------------------------------------------------------------------------

Filename: pr_MM5I_ccsm_1986010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.LambertConformalConic'>
OpenClimateGIS Computed PROJ4 String: +proj=lcc +lat_1=30.0 +lat_2=60.0 +lat_0=47.5
+lon_0=-97.0 +x_0=3825000.0 +y_0=3200000.0 +datum=WGS84 +units=km +no_defs
NetCDF Variable/Attribute Dump:
 Lambert_Conformal
  grid_mapping_name: lambert_conformal_conic
  standard_parallel: [ 30.  60.]
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  false_easting: 3825000.0
  false_northing: 3200000.0

-----------------------------------------------------------------------------------------

Filename: pr_TMSL_ccsm_1986010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.WGS84'>
OpenClimateGIS Computed PROJ4 String: +proj=longlat +datum=WGS84 +no_defs

-----------------------------------------------------------------------------------------

Filename: tas_MM5I_ccsm_1981010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.LambertConformalConic'>
OpenClimateGIS Computed PROJ4 String: +proj=lcc +lat_1=30.0 +lat_2=60.0 +lat_0=47.5
+lon_0=-97.0 +x_0=3825000.0 +y_0=3200000.0 +datum=WGS84 +units=km +no_defs
NetCDF Variable/Attribute Dump:
 Lambert_Conformal
  grid_mapping_name: lambert_conformal_conic
  standard_parallel: [ 30.  60.]
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  false_easting: 3825000.0
  false_northing: 3200000.0

-----------------------------------------------------------------------------------------

Filename: tas_CRCM_ncep_1981010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.PolarStereographic'>
OpenClimateGIS Computed PROJ4 String: +proj=stere +lat_ts=60.0 +lat_0=90.0 +lon_0=263.0
+k_0=1.0 +x_0=3475000.0 +y_0=7475000.0
NetCDF Variable/Attribute Dump:
 polar_stereographic
  straight_vertical_longitude_from_pole: 263.0
  standard_parallel: 60.0
  false_easting: 3475000.0
```

```
  false_northing: 7475000.0
  latitude_of_projection_origin: 90.0
  grid_mapping_name: polar_stereographic
  resolution_at_standard_parallel: 50000.0
  earth_radius: 6371000.0

-----------------------------------------------------------------------------------------

Filename: pr_CRCM_ccsm_1986010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.PolarStereographic'>
OpenClimateGIS Computed PROJ4 String: +proj=stere +lat_ts=60.0 +lat_0=90.0 +lon_0=263.0
+k_0=1.0 +x_0=3475000.0 +y_0=7475000.0
NetCDF Variable/Attribute Dump:
 polar_stereographic
  straight_vertical_longitude_from_pole: 263.0
  standard_parallel: 60.0
  false_easting: 3475000.0
  false_northing: 7475000.0
  latitude_of_projection_origin: 90.0
  grid_mapping_name: polar_stereographic
  resolution_at_standard_parallel: 50000.0

-----------------------------------------------------------------------------------------

Filename: tas_MM5I_ncep_1981010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.LambertConformalConic'>
OpenClimateGIS Computed PROJ4 String: +proj=lcc +lat_1=30.0 +lat_2=60.0 +lat_0=47.5
+lon_0=-97.0 +x_0=3825000.0 +y_0=3200000.0 +datum=WGS84 +units=km +no_defs
NetCDF Variable/Attribute Dump:
 Lambert_Conformal
  grid_mapping_name: lambert_conformal_conic
  standard_parallel: [ 30.  60.]
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  false_easting: 3825000.0
  false_northing: 3200000.0

-----------------------------------------------------------------------------------------

Filename: pr_ECP2_gfdl_1981010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.PolarStereographic'>
OpenClimateGIS Computed PROJ4 String: +proj=stere +lat_ts=60.0 +lat_0=90.0 +lon_0=263.0
+k_0=1.0 +x_0=4700000.0 +y_0=8400000.0
NetCDF Variable/Attribute Dump:
 polar_stereographic
  grid_mapping_name: polar_stereographic
  latitude_of_projection_origin: 90.0
  standard_parallel: 60.0
  false_easting: 4700000.0
```

```
  false_northing: 8400000.0
  longitude_of_central_meridian: 263.0
  straight_vertical_longitude_from_pole: 263.0

--------------------------------------------------------------------------------------------

Filename: pr_RCM3_gfdl_1986010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.NarccapObliqueMercator'>
OpenClimateGIS Computed PROJ4 String: +proj=omerc +lat_0=47.5 +lonc=-97.0 +k_0=1.0
+x_0=3925000.0 +y_0=3175000.0 +alpha=360
NetCDF Variable/Attribute Dump:
 Transverse_Mercator
  grid_mapping_name: transverse_mercator
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  scale_factor_at_central_meridian: 1.0
  false_easting: 3925000.0
  false_northing: 3175000.0

--------------------------------------------------------------------------------------------

Filename: pr_HRM3_gfdl_1986010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.RotatedPole'>
OpenClimateGIS Computed PROJ4 String: +proj=longlat +datum=WGS84 +no_defs
NetCDF Variable/Attribute Dump:
 rotated_pole
  grid_mapping_name: rotated_latitude_longitude
  grid_north_pole_latitude: 42.5
  grid_north_pole_longitude: 83.0

--------------------------------------------------------------------------------------------

Filename: tas_ECP2_gfdl_1986010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.PolarStereographic'>
OpenClimateGIS Computed PROJ4 String: +proj=stere +lat_ts=60.0 +lat_0=90.0 +lon_0=263.0
+k_0=1.0 +x_0=4700000.0 +y_0=8400000.0
NetCDF Variable/Attribute Dump:
 polar_stereographic
  grid_mapping_name: polar_stereographic
  latitude_of_projection_origin: 90.0
  standard_parallel: 60.0
  false_easting: 4700000.0
  false_northing: 8400000.0
  longitude_of_central_meridian: 263.0
  straight_vertical_longitude_from_pole: 263.0

--------------------------------------------------------------------------------------------

Filename: pr_ECP2_gfdl_1986010103.nc
```

```
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.PolarStereographic'>
OpenClimateGIS Computed PROJ4 String: +proj=stere +lat_ts=60.0 +lat_0=90.0 +lon_0=263.0
+k_0=1.0 +x_0=4700000.0 +y_0=8400000.0
NetCDF Variable/Attribute Dump:
 polar_stereographic
  grid_mapping_name: polar_stereographic
  latitude_of_projection_origin: 90.0
  standard_parallel: 60.0
  false_easting: 4700000.0
  false_northing: 8400000.0
  longitude_of_central_meridian: 263.0
  straight_vertical_longitude_from_pole: 263.0

--------------------------------------------------------------------------------------------

Filename: tas_RCM3_cgcm3_1981010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.NarccapObliqueMercator'>
OpenClimateGIS Computed PROJ4 String: +proj=omerc +lat_0=47.5 +lonc=-97.0 +k_0=1.0
+x_0=3925000.0 +y_0=3175000.0 +alpha=360
NetCDF Variable/Attribute Dump:
 Transverse_Mercator
  grid_mapping_name: transverse_mercator
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  scale_factor_at_central_meridian: 1.0
  false_easting: 3925000.0
  false_northing: 3175000.0

--------------------------------------------------------------------------------------------

Filename: tas_WRFG_ccsm_1981010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.LambertConformalConic'>
OpenClimateGIS Computed PROJ4 String: +proj=lcc +lat_1=30.0 +lat_2=60.0 +lat_0=47.5
+lon_0=-97.0 +x_0=3325000.0 +y_0=2700000.0 +datum=WGS84 +units=km +no_defs
NetCDF Variable/Attribute Dump:
 Lambert_Conformal
  grid_mapping_name: lambert_conformal_conic
  standard_parallel: [ 30.  60.]
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  false_easting: 3325000.0
  false_northing: 2700000.0

--------------------------------------------------------------------------------------------

Filename: pr_CRCM_ncep_1986010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.PolarStereographic'>
OpenClimateGIS Computed PROJ4 String: +proj=stere +lat_ts=60.0 +lat_0=90.0 +lon_0=263.0
```

```
+k_0=1.0 +x_0=3475000.0 +y_0=7475000.0
NetCDF Variable/Attribute Dump:
 polar_stereographic
  straight_vertical_longitude_from_pole: 263.0
  standard_parallel: 60.0
  false_easting: 3475000.0
  false_northing: 7475000.0
  latitude_of_projection_origin: 90.0
  grid_mapping_name: polar_stereographic
  resolution_at_standard_parallel: 50000.0
  earth_radius: 6371000.0

--------------------------------------------------------------------------------------------

Filename: pr_TMSL_gfdl_1981010100.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.WGS84'>
OpenClimateGIS Computed PROJ4 String: +proj=longlat +datum=WGS84 +no_defs

--------------------------------------------------------------------------------------------

Filename: pr_RCM3_gfdl_1981010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.NarccapObliqueMercator'>
OpenClimateGIS Computed PROJ4 String: +proj=omerc +lat_0=47.5 +lonc=-97.0 +k_0=1.0
+x_0=3925000.0 +y_0=3175000.0 +alpha=360
NetCDF Variable/Attribute Dump:
 Transverse_Mercator
  grid_mapping_name: transverse_mercator
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  scale_factor_at_central_meridian: 1.0
  false_easting: 3925000.0
  false_northing: 3175000.0

--------------------------------------------------------------------------------------------

Filename: pr_HRM3_gfdl_1981010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.RotatedPole'>
OpenClimateGIS Computed PROJ4 String: +proj=longlat +datum=WGS84 +no_defs
NetCDF Variable/Attribute Dump:
 rotated_pole
  grid_mapping_name: rotated_latitude_longitude
  grid_north_pole_latitude: 42.5
  grid_north_pole_longitude: 83.0

--------------------------------------------------------------------------------------------

Filename: tas_RCM3_cgcm3_1986010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.NarccapObliqueMercator'>
```

```
OpenClimateGIS Computed PROJ4 String: +proj=omerc +lat_0=47.5 +lonc=-97.0 +k_0=1.0
+x_0=3925000.0 +y_0=3175000.0 +alpha=360
NetCDF Variable/Attribute Dump:
 Transverse_Mercator
  grid_mapping_name: transverse_mercator
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  scale_factor_at_central_meridian: 1.0
  false_easting: 3925000.0
  false_northing: 3175000.0

--------------------------------------------------------------------------------------------

Filename: pr_RCM3_ncep_1986010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.NarccapObliqueMercator'>
OpenClimateGIS Computed PROJ4 String: +proj=omerc +lat_0=47.5 +lonc=-97.0 +k_0=1.0
+x_0=3925000.0 +y_0=3175000.0 +alpha=360
NetCDF Variable/Attribute Dump:
 Transverse_Mercator
  grid_mapping_name: transverse_mercator
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  scale_factor_at_central_meridian: 1.0
  false_easting: 3925000.0
  false_northing: 3175000.0

--------------------------------------------------------------------------------------------

Filename: tas_RCM3_gfdl_1986010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.NarccapObliqueMercator'>
OpenClimateGIS Computed PROJ4 String: +proj=omerc +lat_0=47.5 +lonc=-97.0 +k_0=1.0
+x_0=3925000.0 +y_0=3175000.0 +alpha=360
NetCDF Variable/Attribute Dump:
 Transverse_Mercator
  grid_mapping_name: transverse_mercator
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  scale_factor_at_central_meridian: 1.0
  false_easting: 3925000.0
  false_northing: 3175000.0

--------------------------------------------------------------------------------------------

Filename: tas_WRFG_cgcm3_1986010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.LambertConformalConic'>
OpenClimateGIS Computed PROJ4 String: +proj=lcc +lat_1=30.0 +lat_2=60.0 +lat_0=47.5
+lon_0=-97.0 +x_0=3325000.0 +y_0=2700000.0 +datum=WGS84 +units=km +no_defs
```

```
NetCDF Variable/Attribute Dump:
 Lambert_Conformal
  grid_mapping_name: lambert_conformal_conic
  standard_parallel: [ 30.  60.]
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  false_easting: 3325000.0
  false_northing: 2700000.0

--------------------------------------------------------------------------------------------

Filename: pr_RCM3_ncep_1981010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.NarccapObliqueMercator'>
OpenClimateGIS Computed PROJ4 String: +proj=omerc +lat_0=47.5 +lonc=-97.0 +k_0=1.0
+x_0=3925000.0 +y_0=3175000.0 +alpha=360
NetCDF Variable/Attribute Dump:
 Transverse_Mercator
  grid_mapping_name: transverse_mercator
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  scale_factor_at_central_meridian: 1.0
  false_easting: 3925000.0
  false_northing: 3175000.0

--------------------------------------------------------------------------------------------

Filename: tas_RCM3_gfdl_1981010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.NarccapObliqueMercator'>
OpenClimateGIS Computed PROJ4 String: +proj=omerc +lat_0=47.5 +lonc=-97.0 +k_0=1.0
+x_0=3925000.0 +y_0=3175000.0 +alpha=360
NetCDF Variable/Attribute Dump:
 Transverse_Mercator
  grid_mapping_name: transverse_mercator
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  scale_factor_at_central_meridian: 1.0
  false_easting: 3925000.0
  false_northing: 3175000.0

--------------------------------------------------------------------------------------------

Filename: pr_CRCM_ncep_1981010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.PolarStereographic'>
OpenClimateGIS Computed PROJ4 String: +proj=stere +lat_ts=60.0 +lat_0=90.0 +lon_0=263.0
+k_0=1.0 +x_0=3475000.0 +y_0=7475000.0
NetCDF Variable/Attribute Dump:
 polar_stereographic
  straight_vertical_longitude_from_pole: 263.0
```

```
  standard_parallel: 60.0
  false_easting: 3475000.0
  false_northing: 7475000.0
  latitude_of_projection_origin: 90.0
  grid_mapping_name: polar_stereographic
  resolution_at_standard_parallel: 50000.0
  earth_radius: 6371000.0

--------------------------------------------------------------------------------------------

Filename: tas_TMSL_gfdl_1981010100.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.WGS84'>
OpenClimateGIS Computed PROJ4 String: +proj=longlat +datum=WGS84 +no_defs

--------------------------------------------------------------------------------------------

Filename: pr_WRFG_cgcm3_1981010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.LambertConformalConic'>
OpenClimateGIS Computed PROJ4 String: +proj=lcc +lat_1=30.0 +lat_2=60.0 +lat_0=47.5
+lon_0=-97.0 +x_0=3325000.0 +y_0=2700000.0 +datum=WGS84 +units=km +no_defs
NetCDF Variable/Attribute Dump:
 Lambert_Conformal
  grid_mapping_name: lambert_conformal_conic
  standard_parallel: [ 30.  60.]
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  false_easting: 3325000.0
  false_northing: 2700000.0

--------------------------------------------------------------------------------------------

Filename: tas_HRM3_gfdl_1986010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.RotatedPole'>
OpenClimateGIS Computed PROJ4 String: +proj=longlat +datum=WGS84 +no_defs
NetCDF Variable/Attribute Dump:
 rotated_pole
  grid_mapping_name: rotated_latitude_longitude
  grid_north_pole_latitude: 42.5
  grid_north_pole_longitude: 83.0

--------------------------------------------------------------------------------------------

Filename: tas_CRCM_cgcm3_1986010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.PolarStereographic'>
OpenClimateGIS Computed PROJ4 String: +proj=stere +lat_ts=60.0 +lat_0=90.0 +lon_0=263.0
+k_0=1.0 +x_0=3475000.0 +y_0=7475000.0
NetCDF Variable/Attribute Dump:
 polar_stereographic
  straight_vertical_longitude_from_pole: 263.0
```

```
  standard_parallel: 60.0
  false_easting: 3475000.0
  false_northing: 7475000.0
  latitude_of_projection_origin: 90.0
  grid_mapping_name: polar_stereographic
  resolution_at_standard_parallel: 50000.0
  earth_radius: 6371000.0

--------------------------------------------------------------------------------------------

Filename: tas_WRFG_ccsm_1986010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.LambertConformalConic'>
OpenClimateGIS Computed PROJ4 String: +proj=lcc +lat_1=30.0 +lat_2=60.0 +lat_0=47.5
+lon_0=-97.0 +x_0=3325000.0 +y_0=2700000.0 +datum=WGS84 +units=km +no_defs
NetCDF Variable/Attribute Dump:
 Lambert_Conformal
  grid_mapping_name: lambert_conformal_conic
  standard_parallel: [ 30.  60.]
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  false_easting: 3325000.0
  false_northing: 2700000.0

--------------------------------------------------------------------------------------------

Filename: tas_HRM3_gfdl_1981010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.RotatedPole'>
OpenClimateGIS Computed PROJ4 String: +proj=longlat +datum=WGS84 +no_defs
NetCDF Variable/Attribute Dump:
 rotated_pole
  grid_mapping_name: rotated_latitude_longitude
  grid_north_pole_latitude: 42.5
  grid_north_pole_longitude: 83.0

--------------------------------------------------------------------------------------------

Filename: pr_HRM3_ncep_1986010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.RotatedPole'>
OpenClimateGIS Computed PROJ4 String: +proj=longlat +datum=WGS84 +no_defs
NetCDF Variable/Attribute Dump:
 rotated_pole
  grid_mapping_name: rotated_latitude_longitude
  grid_north_pole_latitude: 42.5
  grid_north_pole_longitude: 83.0

--------------------------------------------------------------------------------------------

Filename: tas_CRCM_ccsm_1986010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.PolarStereographic'>
```

```
OpenClimateGIS Computed PROJ4 String: +proj=stere +lat_ts=60.0 +lat_0=90.0 +lon_0=263.0
+k_0=1.0 +x_0=3475000.0 +y_0=7475000.0
NetCDF Variable/Attribute Dump:
 polar_stereographic
  straight_vertical_longitude_from_pole: 263.0
  standard_parallel: 60.0
  false_easting: 3475000.0
  false_northing: 7475000.0
  latitude_of_projection_origin: 90.0
  grid_mapping_name: polar_stereographic
  resolution_at_standard_parallel: 50000.0

--------------------------------------------------------------------------------------------

Filename: tas_HRM3_ncep_1981010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.RotatedPole'>
OpenClimateGIS Computed PROJ4 String: +proj=longlat +datum=WGS84 +no_defs
NetCDF Variable/Attribute Dump:
 rotated_pole
  grid_mapping_name: rotated_latitude_longitude
  grid_north_pole_latitude: 42.5
  grid_north_pole_longitude: 83.0

--------------------------------------------------------------------------------------------

Filename: pr_HRM3_ncep_1981010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.RotatedPole'>
OpenClimateGIS Computed PROJ4 String: +proj=longlat +datum=WGS84 +no_defs
NetCDF Variable/Attribute Dump:
 rotated_pole
  grid_mapping_name: rotated_latitude_longitude
  grid_north_pole_latitude: 42.5
  grid_north_pole_longitude: 83.0

--------------------------------------------------------------------------------------------

Filename: tas_ECP2_ncep_1981010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.PolarStereographic'>
OpenClimateGIS Computed PROJ4 String: +proj=stere +lat_ts=60.0 +lat_0=90.0 +lon_0=263.0
+k_0=1.0 +x_0= +y_0=
NetCDF Variable/Attribute Dump:
 polar_stereographic
  grid_mapping_name: polar_stereographic
  longitude_of_central_meridian: 263.0
  straight_vertical_longitude_from_pole: 263.0
  standard_parallel: 60.0
  latitude_of_projection_origin: 90.0
  XGridLength_M: 50000.0
  YGridLength_M: 50000.0
  PoleOnPlane: north
```

```
  false_easting:
  false_northing:

--------------------------------------------------------------------------------------------

Filename: pr_CRCM_cgcm3_1981010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.PolarStereographic'>
OpenClimateGIS Computed PROJ4 String: +proj=stere +lat_ts=60.0 +lat_0=90.0 +lon_0=263.0
+k_0=1.0 +x_0=3475000.0 +y_0=7475000.0
NetCDF Variable/Attribute Dump:
 polar_stereographic
  straight_vertical_longitude_from_pole: 263.0
  standard_parallel: 60.0
  false_easting: 3475000.0
  false_northing: 7475000.0
  latitude_of_projection_origin: 90.0
  grid_mapping_name: polar_stereographic
  resolution_at_standard_parallel: 50000.0
  earth_radius: 6371000.0

--------------------------------------------------------------------------------------------

Filename: tas_HRM3_ncep_1986010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.RotatedPole'>
OpenClimateGIS Computed PROJ4 String: +proj=longlat +datum=WGS84 +no_defs
NetCDF Variable/Attribute Dump:
 rotated_pole
  grid_mapping_name: rotated_latitude_longitude
  grid_north_pole_latitude: 42.5
  grid_north_pole_longitude: 83.0

--------------------------------------------------------------------------------------------

Filename: pr_MM5I_ncep_1986010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.LambertConformalConic'>
OpenClimateGIS Computed PROJ4 String: +proj=lcc +lat_1=30.0 +lat_2=60.0 +lat_0=47.5
+lon_0=-97.0 +x_0=3825000.0 +y_0=3200000.0 +datum=WGS84 +units=km +no_defs
NetCDF Variable/Attribute Dump:
 Lambert_Conformal
  grid_mapping_name: lambert_conformal_conic
  standard_parallel: [ 30.  60.]
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  false_easting: 3825000.0
  false_northing: 3200000.0

--------------------------------------------------------------------------------------------

Filename: pr_CRCM_cgcm3_1986010103.nc
```

```
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.PolarStereographic'>
OpenClimateGIS Computed PROJ4 String: +proj=stere +lat_ts=60.0 +lat_0=90.0 +lon_0=263.0
+k_0=1.0 +x_0=3475000.0 +y_0=7475000.0
NetCDF Variable/Attribute Dump:
 polar_stereographic
  straight_vertical_longitude_from_pole: 263.0
  standard_parallel: 60.0
  false_easting: 3475000.0
  false_northing: 7475000.0
  latitude_of_projection_origin: 90.0
  grid_mapping_name: polar_stereographic
  resolution_at_standard_parallel: 50000.0
  earth_radius: 6371000.0

--------------------------------------------------------------------------------------------

Filename: tas_RCM3_ncep_1981010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.NarccapObliqueMercator'>
OpenClimateGIS Computed PROJ4 String: +proj=omerc +lat_0=47.5 +lonc=-97.0 +k_0=1.0
+x_0=3925000.0 +y_0=3175000.0 +alpha=360
NetCDF Variable/Attribute Dump:
 Transverse_Mercator
  grid_mapping_name: transverse_mercator
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  scale_factor_at_central_meridian: 1.0
  false_easting: 3925000.0
  false_northing: 3175000.0

--------------------------------------------------------------------------------------------

Filename: tas_WRFG_ncep_1981010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.LambertConformalConic'>
OpenClimateGIS Computed PROJ4 String: +proj=lcc +lat_1=30.0 +lat_2=60.0 +lat_0=47.5
+lon_0=-97.0 +x_0=3325000.0 +y_0=2700000.0 +datum=WGS84 +units=km +no_defs
NetCDF Variable/Attribute Dump:
 Lambert_Conformal
  grid_mapping_name: lambert_conformal_conic
  standard_parallel: [ 30.  60.]
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  false_easting: 3325000.0
  false_northing: 2700000.0

--------------------------------------------------------------------------------------------

Filename: pr_WRFG_ncep_1981010103.nc
OpenClimateGIS Projection Class: <class
```

```
'ocgis.interface.projection.LambertConformalConic'>
OpenClimateGIS Computed PROJ4 String: +proj=lcc +lat_1=30.0 +lat_2=60.0 +lat_0=47.5
+lon_0=-97.0 +x_0=3325000.0 +y_0=2700000.0 +datum=WGS84 +units=km +no_defs
NetCDF Variable/Attribute Dump:
 Lambert_Conformal
  grid_mapping_name: lambert_conformal_conic
  standard_parallel: [ 30.  60.]
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  false_easting: 3325000.0
  false_northing: 2700000.0

--------------------------------------------------------------------------------------------

Filename: pr_MM5I_ncep_1981010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.LambertConformalConic'>
OpenClimateGIS Computed PROJ4 String: +proj=lcc +lat_1=30.0 +lat_2=60.0 +lat_0=47.5
+lon_0=-97.0 +x_0=3825000.0 +y_0=3200000.0 +datum=WGS84 +units=km +no_defs
NetCDF Variable/Attribute Dump:
 Lambert_Conformal
  grid_mapping_name: lambert_conformal_conic
  standard_parallel: [ 30.  60.]
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  false_easting: 3825000.0
  false_northing: 3200000.0

--------------------------------------------------------------------------------------------

Filename: tas_TMSL_ccsm_1981010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.WGS84'>
OpenClimateGIS Computed PROJ4 String: +proj=longlat +datum=WGS84 +no_defs

--------------------------------------------------------------------------------------------

Filename: pr_TMSL_gfdl_1986010100.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.WGS84'>
OpenClimateGIS Computed PROJ4 String: +proj=longlat +datum=WGS84 +no_defs

--------------------------------------------------------------------------------------------

Filename: pr_RCM3_cgcm3_1986010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.NarccapObliqueMercator'>
OpenClimateGIS Computed PROJ4 String: +proj=omerc +lat_0=47.5 +lonc=-97.0 +k_0=1.0
+x_0=3925000.0 +y_0=3175000.0 +alpha=360
NetCDF Variable/Attribute Dump:
 Transverse_Mercator
  grid_mapping_name: transverse_mercator
```

```
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  scale_factor_at_central_meridian: 1.0
  false_easting: 3925000.0
  false_northing: 3175000.0

-----------------------------------------------------------------------------------------

Filename: pr_ECP2_ncep_1981010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.PolarStereographic'>
OpenClimateGIS Computed PROJ4 String: +proj=stere +lat_ts=60.0 +lat_0=90.0 +lon_0=263.0
+k_0=1.0 +x_0= +y_0=
NetCDF Variable/Attribute Dump:
 polar_stereographic
  grid_mapping_name: polar_stereographic
  longitude_of_central_meridian: 263.0
  straight_vertical_longitude_from_pole: 263.0
  standard_parallel: 60.0
  latitude_of_projection_origin: 90.0
  XGridLength_M: 50000.0
  YGridLength_M: 50000.0
  PoleOnPlane: north
  false_easting:
  false_northing:

-----------------------------------------------------------------------------------------

Filename: tas_RCM3_ncep_1986010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.NarccapObliqueMercator'>
OpenClimateGIS Computed PROJ4 String: +proj=omerc +lat_0=47.5 +lonc=-97.0 +k_0=1.0
+x_0=3925000.0 +y_0=3175000.0 +alpha=360
NetCDF Variable/Attribute Dump:
 Transverse_Mercator
  grid_mapping_name: transverse_mercator
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  scale_factor_at_central_meridian: 1.0
  false_easting: 3925000.0
  false_northing: 3175000.0

-----------------------------------------------------------------------------------------

Filename: pr_WRFG_ncep_1986010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.LambertConformalConic'>
OpenClimateGIS Computed PROJ4 String: +proj=lcc +lat_1=30.0 +lat_2=60.0 +lat_0=47.5
+lon_0=-97.0 +x_0=3325000.0 +y_0=2700000.0 +datum=WGS84 +units=km +no_defs
NetCDF Variable/Attribute Dump:
 Lambert_Conformal
```

```
  grid_mapping_name: lambert_conformal_conic
  standard_parallel: [ 30.  60.]
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  false_easting: 3325000.0
  false_northing: 2700000.0

--------------------------------------------------------------------------------------------

Filename: tas_CRCM_ccsm_1981010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.PolarStereographic'>
OpenClimateGIS Computed PROJ4 String: +proj=stere +lat_ts=60.0 +lat_0=90.0 +lon_0=263.0
+k_0=1.0 +x_0=3475000.0 +y_0=7475000.0
NetCDF Variable/Attribute Dump:
 polar_stereographic
  straight_vertical_longitude_from_pole: 263.0
  standard_parallel: 60.0
  false_easting: 3475000.0
  false_northing: 7475000.0
  latitude_of_projection_origin: 90.0
  grid_mapping_name: polar_stereographic
  resolution_at_standard_parallel: 50000.0

--------------------------------------------------------------------------------------------

Filename: tas_TMSL_ccsm_1986010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.WGS84'>
OpenClimateGIS Computed PROJ4 String: +proj=longlat +datum=WGS84 +no_defs

--------------------------------------------------------------------------------------------

Filename: pr_RCM3_cgcm3_1981010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.NarccapObliqueMercator'>
OpenClimateGIS Computed PROJ4 String: +proj=omerc +lat_0=47.5 +lonc=-97.0 +k_0=1.0
+x_0=3925000.0 +y_0=3175000.0 +alpha=360
NetCDF Variable/Attribute Dump:
 Transverse_Mercator
  grid_mapping_name: transverse_mercator
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  scale_factor_at_central_meridian: 1.0
  false_easting: 3925000.0
  false_northing: 3175000.0

--------------------------------------------------------------------------------------------

Filename: pr_TMSL_ccsm_1981010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.WGS84'>
OpenClimateGIS Computed PROJ4 String: +proj=longlat +datum=WGS84 +no_defs
```

```
-----------------------------------------------------------------------------------------

Filename: tas_CRCM_ncep_1986010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.PolarStereographic'>
OpenClimateGIS Computed PROJ4 String: +proj=stere +lat_ts=60.0 +lat_0=90.0 +lon_0=263.0
+k_0=1.0 +x_0=3475000.0 +y_0=7475000.0
NetCDF Variable/Attribute Dump:
 polar_stereographic
  straight_vertical_longitude_from_pole: 263.0
  standard_parallel: 60.0
  false_easting: 3475000.0
  false_northing: 7475000.0
  latitude_of_projection_origin: 90.0
  grid_mapping_name: polar_stereographic
  resolution_at_standard_parallel: 50000.0
  earth_radius: 6371000.0

-----------------------------------------------------------------------------------------

Filename: tas_WRFG_ncep_1986010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.LambertConformalConic'>
OpenClimateGIS Computed PROJ4 String: +proj=lcc +lat_1=30.0 +lat_2=60.0 +lat_0=47.5
+lon_0=-97.0 +x_0=3325000.0 +y_0=2700000.0 +datum=WGS84 +units=km +no_defs
NetCDF Variable/Attribute Dump:
 Lambert_Conformal
  grid_mapping_name: lambert_conformal_conic
  standard_parallel: [ 30.  60.]
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  false_easting: 3325000.0
  false_northing: 2700000.0

-----------------------------------------------------------------------------------------

Filename: tas_MM5I_ncep_1986010103.nc
OpenClimateGIS Projection Class: <class
'ocgis.interface.projection.LambertConformalConic'>
OpenClimateGIS Computed PROJ4 String: +proj=lcc +lat_1=30.0 +lat_2=60.0 +lat_0=47.5
+lon_0=-97.0 +x_0=3825000.0 +y_0=3200000.0 +datum=WGS84 +units=km +no_defs
NetCDF Variable/Attribute Dump:
 Lambert_Conformal
  grid_mapping_name: lambert_conformal_conic
  standard_parallel: [ 30.  60.]
  longitude_of_central_meridian: -97.0
  latitude_of_projection_origin: 47.5
  false_easting: 3825000.0
  false_northing: 3200000.0
```

```
-----------------------------------------------------------------------------------------

Filename: tas_TMSL_gfdl_1986010100.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.WGS84'>
OpenClimateGIS Computed PROJ4 String: +proj=longlat +datum=WGS84 +no_defs

-----------------------------------------------------------------------------------------

Filename: tas_ECP2_gfdl_1981010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.PolarStereographic'>
OpenClimateGIS Computed PROJ4 String: +proj=stere +lat_ts=60.0 +lat_0=90.0 +lon_0=263.0
+k_0=1.0 +x_0=4700000.0 +y_0=8400000.0
NetCDF Variable/Attribute Dump:
 polar_stereographic
  grid_mapping_name: polar_stereographic
  latitude_of_projection_origin: 90.0
  standard_parallel: 60.0
  false_easting: 4700000.0
  false_northing: 8400000.0
  longitude_of_central_meridian: 263.0
  straight_vertical_longitude_from_pole: 263.0

-----------------------------------------------------------------------------------------

Filename: pr_ECP2_ncep_1986010103.nc
OpenClimateGIS Projection Class: <class 'ocgis.interface.projection.PolarStereographic'>
OpenClimateGIS Computed PROJ4 String: +proj=stere +lat_ts=60.0 +lat_0=90.0 +lon_0=263.0
+k_0=1.0 +x_0= +y_0=
NetCDF Variable/Attribute Dump:
 polar_stereographic
  grid_mapping_name: polar_stereographic
  longitude_of_central_meridian: 263.0
  straight_vertical_longitude_from_pole: 263.0
  standard_parallel: 60.0
  latitude_of_projection_origin: 90.0
  XGridLength_M: 50000.0
  YGridLength_M: 50000.0
  PoleOnPlane: north
  false_easting:
  false_northing:

-----------------------------------------------------------------------------------------
```