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       MODIS Reprojection Tool Swath (MRTSwath) Release Notes
                          Version 2.0
                           July 2004
                    USGS EROS Data Center
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Capabilities
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1. MODIS Data Products

The MODIS Reprojection Tool Swath allows the user to reproject
swath (DAAC and direct broadcast Level-1 and Level-2) MODIS data products.
Support for gridded land products has been implemented in the MODIS
Reprojection Tool (MRT).

2. Map Projections

The MODIS Reprojection Tool Swath allows the user to reproject to the
following map projections:

    * Albers Equal Area
    * Equirectangular
    * Geographic
    * Hammer
    * Integerized Sinusoidal
    * Interrupted Goode Homolosine
    * Lambert Azimuthal
    * Lambert Conformal Conic
    * Mercator
    * Mollweide
    * Polar Stereographic
    * Sinusoidal
    * Transverse Mercator
    * Universal Transverse Mercator

3. ISIN-Enhanced GCTP

As part of this software, the Generalized Cartographic Transformation
Package (GCTP) has been modified to incorporate the new Integerized
Sinusoidal Projection.

4. Spectral Subsetting

Any subset of the input HDF-EOS Scientific Data Sets (SDSs) may be selected
for reprojection. The default is to reproject all input SDSs. NOTE: The
MRTSwath will only process SDSs of the nominal MODIS scan size. If other
SDSs are specified, the MRTSwath will output an error message for that SDS,
but will continue on to process any other specified SDSs.

5. Spatial Subsetting

Two corners (upper left and lower right) of a rectangle in input/output
space may be specified. These corners may be given as coordinates in input
latitude and longitude, input line/sample pairs, or output projection
coordinates. If specifying line/sample pairs specify using a zero-based
coordinate system where the upper left corner is (0, 0). When specifying
input lat/long or input line/sample, the other two rectangle corners (upper
right and lower left) are computed automatically in input space. Then all
four corners are reprojected into output space, using the specified map
projection. Finally, a minimum-bounding rectangle is computed that contains
the four reprojected points, in output space. All points inside this
rectangle in output space are mapped back into input space for

reprojection. The default is to reproject the entire input image, using the bounding rectangular coordinates from the global attributes metadata.

When specifying output projection coordinates, these coordinates must be specified in the same units as is used for the projection (degrees for geographic and meters for all other projections). The upper right and lower left corners are computed from the specified upper left and lower right corners to create a rectangle in output space. Using these coordinates in output space, the corners are mapped back into input space to determine the spatial subset corners in input space. The output image corner coordinates should match the user-specified output spatial subset corners. If not already, the lower right corner may need to be adjusted slightly so that it is an integral number of lines and samples, based on the output pixel size.

6. Resampling

Resampling may be nearest neighbor, bilinear, or cubic convolution.

7. Datum Conversions

Datum conversions are not supported in the MRTSwath application.

8. Output Pixel Size

An output pixel size may be specified, one for each SDS. If only one pixel size is specified, then it will be used for all SDSs. The default is to use the same input and output pixel sizes for corresponding input and output SDSs. For output to the Geographic projections, the pixel size must be specified in decimal degrees. For output to all other projections, the pixel size must be specified in meters.

9. Data Types

The MRTSwath supports character data and 8-bit and 16-bit integer data (both signed and unsigned). If not specified, the default output data type is the same as the input data type for each corresponding SDS.

10. File Formats

MODIS swath HDF-EOS files are supported on input. HDF-EOS, GeoTIFF, and raw binary files are supported on output.

12. Platforms

The MODIS Reprojection Tool Swath is highly portable software. It currently runs on four different platforms:

    * Windows
    * Linux
    * Sun/Solaris
    * SGI/Irix

(See Caveats below.)

13. Interfaces

The MODIS Reprojection Tool Swath may be invoked from a powerful command-line interface. A GUI version of MRTSwath is being developed and will be available at a later date. The scriptable command-line interface, with its variety of command-line options, is likely to be the method of choice for reprojecting large numbers of files.

History

Version 2.0
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1. Added a Graphical User Interface in addition to the command-line MRTSwath
   executable.

2. Modified the parameter file parser to handle the Windows ^M characters
   at the end of a line. Version 1.0 could not handle any ^M characters in
   the parameter file, which caused problems for users creating parameter
   files on the Windows platform.

3. Modified swath2grid executable to output all information and error messages
   to mrtswath.log in the local directory.

4. Modified swath2grid executable to no longer tag the WGS84 datum to all
   GeoTiff and Raw Binary output products. Since the user is providing an
   ellipsoid and/or semi-major and semi-minor axes, it technically is incorrect
   to say that data set has a particular datum. Datums have their own
   ellipsoid axes, which may be different from what the user specified. If
   the use specifies WGS84 as the ellipsoid, then the WGS84 datum will be
   tagged since it has the same axes values as the WGS84 ellipsoid.

5. During testing of the GUI, a bug was found in the conversion of the
   UL and LR corners when using the LINE_SAMPLE option. This problem has been
   fixed.

6. Modified the install script to not create .tcshrc, .cshrc, .bashrc, .login,
   or .bash_profile scripts if they don't already exist on the local system.
   If they do exist, then they are updated for the MRTSwath environment
   variables and to add the MRTSwath 'bin' directory to the PATH.

7. Fixed a bug that caused the software to core dump when projecting to the
   ISIN projection. The MRTSwath software used a value of 99 to represent
   the ISIN projection, however the GCTP software was expecting a value of
   31. The issue was fixed by modifying MRTSwath to use a value of 31 to
   represent the ISIN projection.

8. Added output for CHAR8 data types.

9. Fixed a bug that caused incorrect background fill values to be output
   when converting from one data type to another.

10. Added a shortcut icon for the MRTSwath and instructions for installation
    and setup in the User's Guide.

11. Added the MODIS sphere, radius of 6371007.181, to the list of spheres
    for output data. It will have a sphere code of 20.

12. If the user specifies a file extension of .hdf, .HDF, .tif, .TIF, .hdr,
    or .HDR for the output filename, that extension is now ignored. The
    output file format determines the extension of the output filename.
    Previous versions of MRTSwath would leave in the original extension and
    then add an additional extension, based on the output file format.

13. Previous versions of the MRTSwath output the GeoTiff UL corner point as
    the outer extent of the UL corner. This has been modified to represent
    the center of the pixel of the UL corner. In addition, the
    GTRasterTypeGeoKey GeoTiff tag has been modified to RasterPixelisArea to
    correctly represent that the corner point is the center of the pixel.
    The corner point representations for HDF-EOS and raw binary will remain
    the outer extent of the pixels.

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Version 1.0
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1. First public release.

2. Installation scripts provided.


Caveats
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1. MODIS gridded data (Level-2G, Level-3, and Level-4) is not supported.
   Only Level-1 and Level-2 swath HDF-EOS products are supported.

2. The output GeoTiff products follow the GeoTiff standard that has been
   in use at the USGS EROS Data Center. ENVI supports the output GeoTiff
   products from the MRTSwath, but we have been informed that other software
   does not always support ingesting our GeoTiff products.


Installation
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To obtain the MRTSwath software, download the appropriate installation
files for your specific platform from the USGS EROS Data Center MODIS
Reprojection Tool Swath web site
(http://lpdaac.usgs.gov/landdaac/tools/mrtswath/index.asp). The installation
files include a zip archive containing the MRTSwath software, an
installation script, and an executable file named unzip Unzip and zip are
freeware packages available from GNU. For more information, or to obtain
the zip/unzip software, see the GNU Web site at
http://www.gnu.org/software/software.html.. (On the Windows platform, there
will be several other executable files that also need to be downloaded.) If
using the automatic installation, the MRTSwath_<platform>.zip file should
not be unzipped, since the installation script will handle the unzip.

Once you have obtained the MODIS Reprojection Tool Swath software, it needs
to be installed on your system. You can install the MRTSwath software with
either an automatic installation process or a manual installation process.
The automatic installation process is recommended for most users.
Instructions for both methods are outlined below.

Correct installation requires that the zip archive be unpacked into an
appropriate directory on your system. This process will create an MRTSwath
directory containing several subdirectories (bin, data, doc, include, src).
Once the software has been unpacked, the MRTSwath bin directory needs to be
added to your path, and an environment variable named MRTDATADIR needs to
be set to the MRTSwath data directory.

For automatic installation, you must be able to supply the complete
pathname of the directory in which you want to install the MRTSwath.
This pathname is not necessary if you want to install the MRTSwath in an
MRTSwath subdirectory in the current directory (the default).

Once you have this information, you can run the install script. Make sure
you are in the directory containing the installation files (the zip
archive, the unzip program, and the install script) that you have
downloaded from the EDC web site. On UNIX systems, type ./install. On
Windows, just type install. Follow the installation instructions carefully.
The installation program will automatically unzip the zip archive into the
MRTSwath directory, and will prompt you for the information needed to set
up your path and environment variables correctly.
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Note that full pathnames must be provided for all directories. Wildcards
(?,*) and relative pathnames will be accepted, but the MRTSwath software
may not be set up correctly. The MRTSwath will not run correctly if the
installation uses directory names that include blank spaces, including
Windows platforms.