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David Nelson, Ralph Kahn, Sebastian Val, Michael Tosca

Columbus Technologies and Services, Inc.

Raytheon Company

Jet Propulsion Laboratory, NASA

California Institute of Technology



MISR

MISR (Multi-angle Imaging Spectro-Radiometer) is an instrument onboard the Terra satellite that gathers imagery which is then radiometrically and geometrically calibrated for use in the study of earth's atmosphere and surface. Its unique design features 9 cameras, each with 4 bands, that capture 400 km-wide scenes at 9 different along-track angles. This redundancy in scene imaging permits the accurate retrieval of aerosol heights and motion. Acquiring data in multiple cameras and bands also enables MISR to retrieve aerosol and surface properties, top-of-atmosphere albedos and other properties.

MINX

MINX (MISR Interactive eXplorer) is an interactive visualization and analysis program written in IDL and designed to make MISR data more accessible to science users. Its principal use is to retrieve heights and motion for aerosol plumes and clouds using stereoscopic methods. MINX is platform independent and has been tested on Mac OS X, MS Windows and Linux.

MINX Documentation

There are 12 PDF files in MINX that serve as “context-sensitive” documentation. You access these files by clicking a “PDF Help” button when one is present, but you must have a PDF reader in your environment's path when you attempt to open a PDF file.

All the graphics in the PDF files were created on a Macintosh computer. Each OS will have its own unique format for displaying dialog boxes and other windows.

Summary of Options on the MINX Main Menu

Show Orbit Location

Display your choice of MISR swath, chosen either by path number or orbit number. The swath is represented as a sequence of MISR block outlines overlain on a map that includes geographic and political boundaries. A subset of the full complement of 180 MISR blocks can be specified resulting in a zoomed image. When an orbit number is entered, its path number and date of acquisition are also displayed. No external files are required.

Find Overpasses

Produce a list of MISR orbit numbers that pass over geographic points or rectangular regions and at dates or date ranges you specify. It generates a log file on disk that contains the MISR path and orbit, the SOM block, line and sample location, and both the GMT and local dates and times where each overpass occurs. It optionally allows you to draw and save a reference map for each orbit showing MISR block outlines and the point or region you provided. No external files are required.

Show Camera Image

Display up to a full orbit of MISR level 1B2 Ellipsoid or Terrain radiance imagery at 1100 meters resolution or up to a few tens of blocks at 275 meters resolution. You choose the Level 1 camera file, the block range and the bands to map to RGB. The NIR band can be chosen to replace the Red band to increase loading speed when many blocks are displayed, and to highlight vegetation.

Blocks stack vertically (not properly offset at block boundaries) when 1100 meter resolution is selected to enable faster loading and narrower window width in case many blocks are displayed. Blocks are properly offset when 275 meter resolution is selected, because fewer blocks can be displayed. A single MISR Level 1 radiance file is required.

Compare Data Products

Select any combination of designated data fields for an orbit from MISR level 1, level 2 and/or ancillary product files and display them side-by-side at 1100 meter resolution in the panes of a wider window. The content of each pane can be independently scaled, and clicking in any pane displays the data values in all the panes at the clicked point.

MISR data fields that can be displayed include: radiance data from level 1 GRP_TERRAIN or GRP_ELLIPSOID products; DEM terrain heights (AGP ancillary geographic product); sun and camera angles (GP_GMP geometry product); cloud heights and winds (TC_STEREO and TC_CLOUD stereoscopic products); aerosol optical depths, single scatter albedos, angstrom exponents and mixture types (AS_AEROSOL product); surface BRF, DHR and RPV parameters (AS_LAND aerosol surface product); three types of top-of-atmosphere albedos (TC_ALBEDO albedo product); cloud, smoke and dust masks (TC_CLASSIFIERS product).

Animate Cameras

Display and animate MISR's 9 cameras for several blocks of 1 or 2 orbits. This is where most of the functionality in MINX resides. Animation refers to the cycling of the display through MISR's camera images to produce a 3D-like effect and is controlled with standard movie controls. Numerous options are available including:

- control the color scaling of MISR imagery
- display and difference cameras if 2 orbits are loaded
- display BRF versus camera plots for single or multiple pixels
- overlay standard sets of Aeronet site locations and volcano locations
- interactively digitize smoke, dust and volcanic plumes and clouds to determine their height, motion vectors and other properties, and save retrieved data and images to disk
- retrieve MODIS thermal anomaly data, overlay their locations on imagery and save the radiative power with digitized plumes
- create and display various combinations of camera and band radiances
- correct some camera geometric co-registration errors
- save selected areas of imagery to file in various formats including TIFF, GIF, JPG, PNG, MPG, GeoTIFF, blue-red 3D, and KML for overlay on Google Earth
- overlay selected MISR data products (see list for "Compare Data Products")

Either nine (1 orbit) or eighteen (2 orbits) MISR Level 1B2 radiance files are required. When 2 orbits are loaded, both must belong to the same path.

Plume Project Preferences

Specify parameters for use in the Plume Project Utilities and Process Plume Project options, and set a working directory for some of the other MINX tools.

Plume Project Utilities

Provides utility functions to prepare MISR and MODIS data for use in the MINX option "Process Plume Project" (see below).

MODIS thermal anomaly data ("fire pixels") can be retrieved in two ways:

- 1) Retrieve a condensed list of fire pixel locations from the University of Hawaii ModVolc website for your region and time of interest; use MINX to convert those data to a list of MODIS MOD14 granules that contain fires and to retrieve them; use MINX to convert information in the MODIS granules to a list of fire pixels for each MISR orbit as well as a list of MISR orbits and block ranges to order.
- 2) Skip the ModVolc step above and order all MODIS granules from the Reverb website for your region and time of interest; then follow the last step in 1) above.

Process Plume Project

Provides the same capabilities as "Animate Cameras" but is specialized to help users efficiently digitize plume data from many orbits using a file containing an orbit list generated automatically by the "Plume Utilities" options or constructed manually for use with your list of interesting orbits. Orbit and block range are selected from the list to bypass lengthier file selection procedures.