Introduction to MISR Data Analysis and Tools

MISR

Multi-angle Imaging SpectroRadiometer

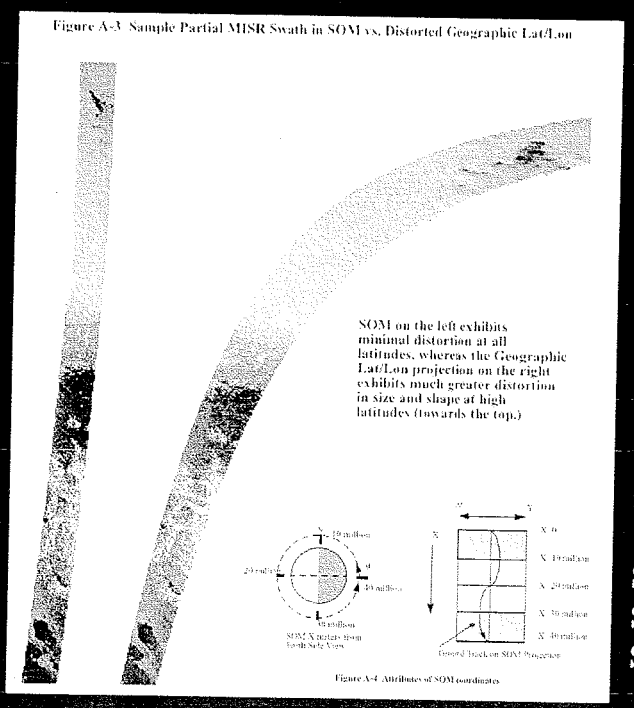
Brian E. Rheingans
Jet Propulsion Laboratory,
California Institute of Technology

Exploring and Using MISR Data
Montreal, Quebec, Canada
May 2004

JPL

NASA

SOM Background



The Space Oblique Mercator (SOM) map projection was developed to support LandSat which covers the same large geographic extent as MISR.

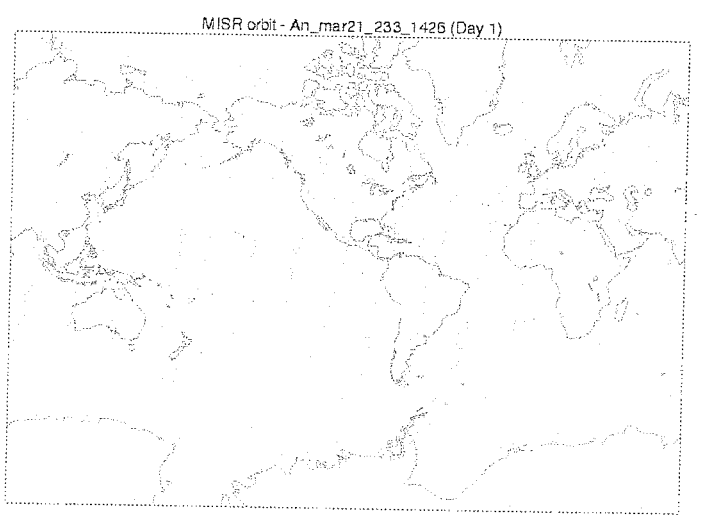
SOM was designed to minimize the shape distortion and scale errors throughout the length of the MISR swath near the satellite ground track.

SOM X is in the direction of the Spacecraft ground track and SOM Y is perpendicular X

SOM Background

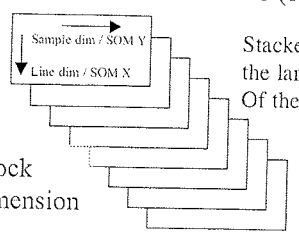
- Terra follows a pattern of orbits which repeats after 233 unique orbits
- Each of the 233 possible orbits is called a path
- SOM defines a separate projection for each of these paths
- For MISR, a path begins at a particular longitude as the satellite crosses the ascending node.
- This path implies a specific longitude of ascending node, which implies a specific SOM projection applicable to that path

MISR Orbital Paths/Blocks



MISR HDF-EOS "Stacked Block" File vs. Aligned Image

Red Channel Grid SDS (180 Stacked Blocks)



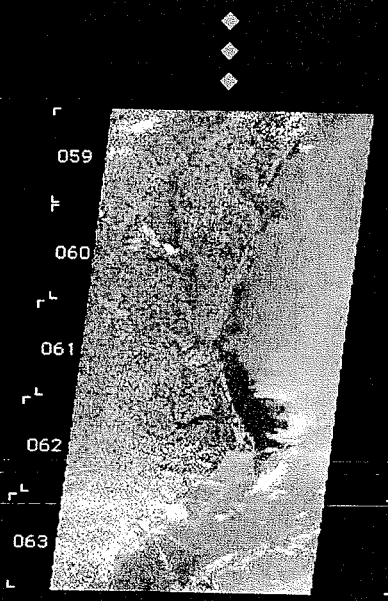
Stacked blocks are due to the large geographic extent Of the MISR swath

Block dimension

-SOM coordinates of top-block corners part of Grid metadata.

-Projection and orbital parameters part of Grid Metadata

-Offsets of each block from the one above is part of Stacked-block grid extension metadata.



HDF-EOS Background

HDF-EOS routines do NOT assemble the Blocks. That is left for the user.

180 blocks are defined for every MISR Product to make block index in absolute.

However, roughly 142 blocks have data for Any given orbit. The extra blocks are to Allow for seasonal variation.

We are working on a summary product Specification that will not use the dreaded Stacked blocks, although we will preserve Them for Standard Processing.

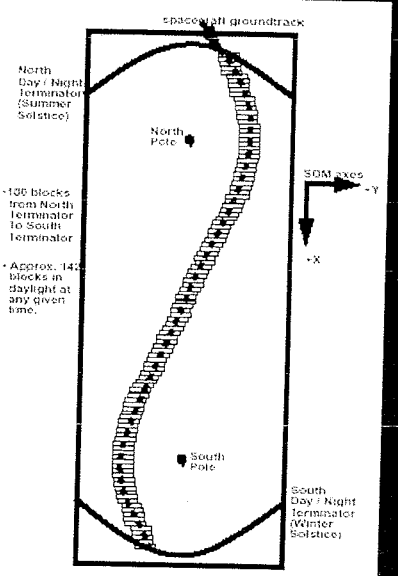


Diagram representing the 180 block series covering a MISR path.

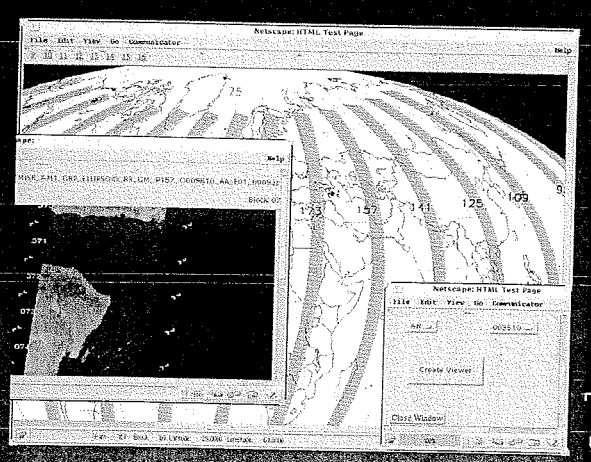
Where does this pixel belong?

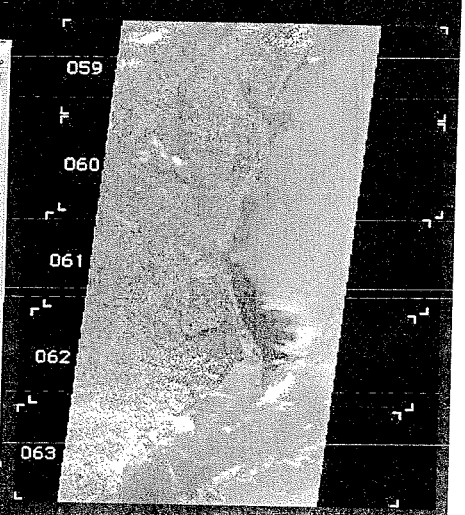
- Inside the HDF-EOS "stacked block grid" = (block, line, sample)
- Convert (block, line, sample) <-> SOM
  - Requires several metadata values and some arithmetic.
- Convert SOM <-> Lat/Lon
  - Requires use of GCTP map projection coordinate conversion library in HDF-EOS distribution.
- This process is described in the MISR Data Product Specification, Appendix A.

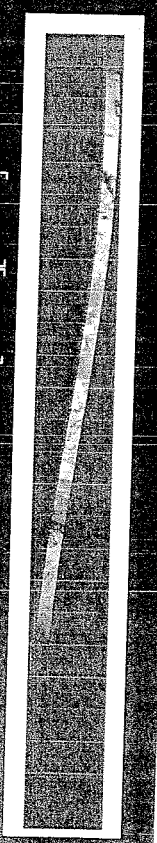
- Or simply look up corresponding block, line, sample in the AGP dataset.

L1B2 Browse Products

JPEG format true-color imagery, all 9 cameras, 2.2 km sampling





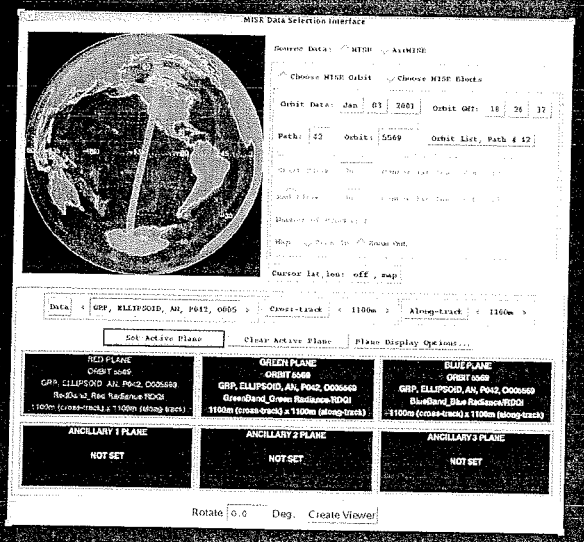


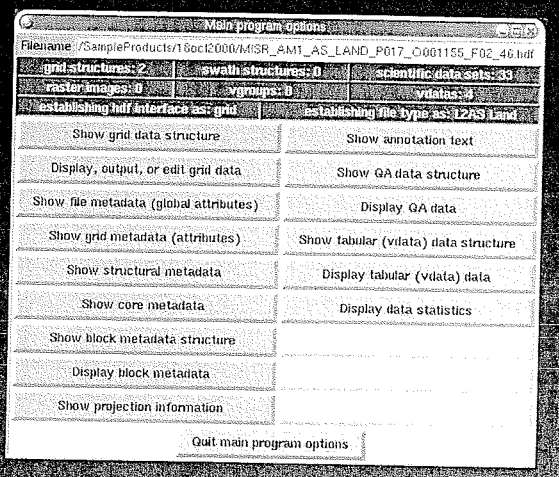
Color, multi-angle browse products and on-line interactive viewer
http://eosweb.larc.nasa.gov/MISRBR/

Actual browse resolution

Actual browse extent

Data visualization and analysis tools

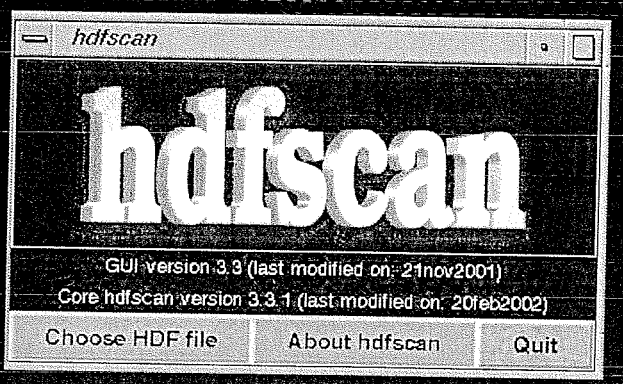




- misr_view (IDL-based)
- hdfscan (Tcl/tk and Fortran90 based)
- HDF-to-binary converter
- HDF-EOS to GeoTIFF converter (HEG)

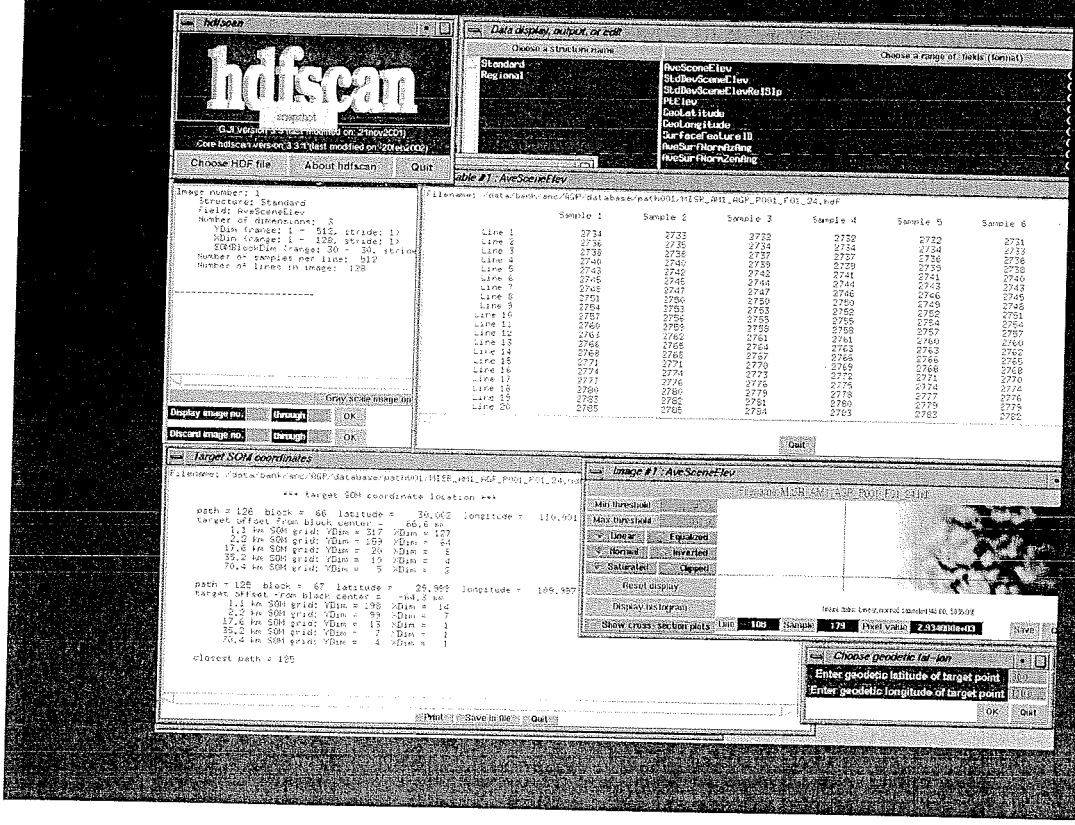
http://eosweb.larc.nasa.gov/PRODOCS/misr/misr_tools.html

Hdfscan

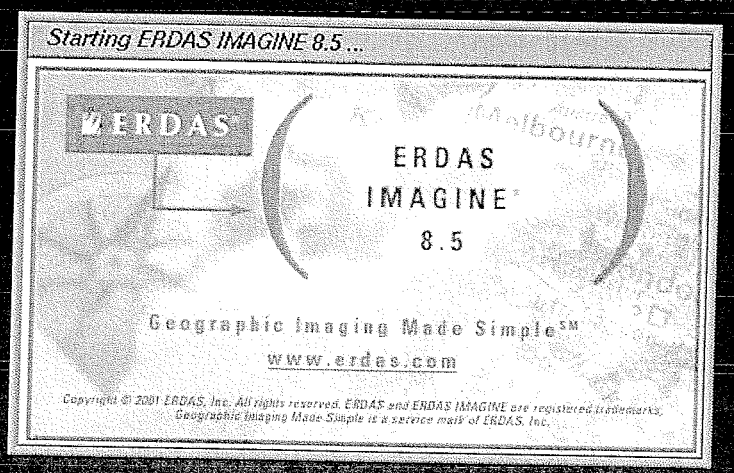


- Very useful during the debugging process
- Displays all HDF-EOS Attributes, SDS's, Vdata's easily
- Allows minor editing of the HDF-EOS file
- Performs some statistics on the data.
- Does not assemble MISR blocks
- Only available on SGI Irix and Sun Solaris

Hdfscan - Locate Path/Block Display using AGP



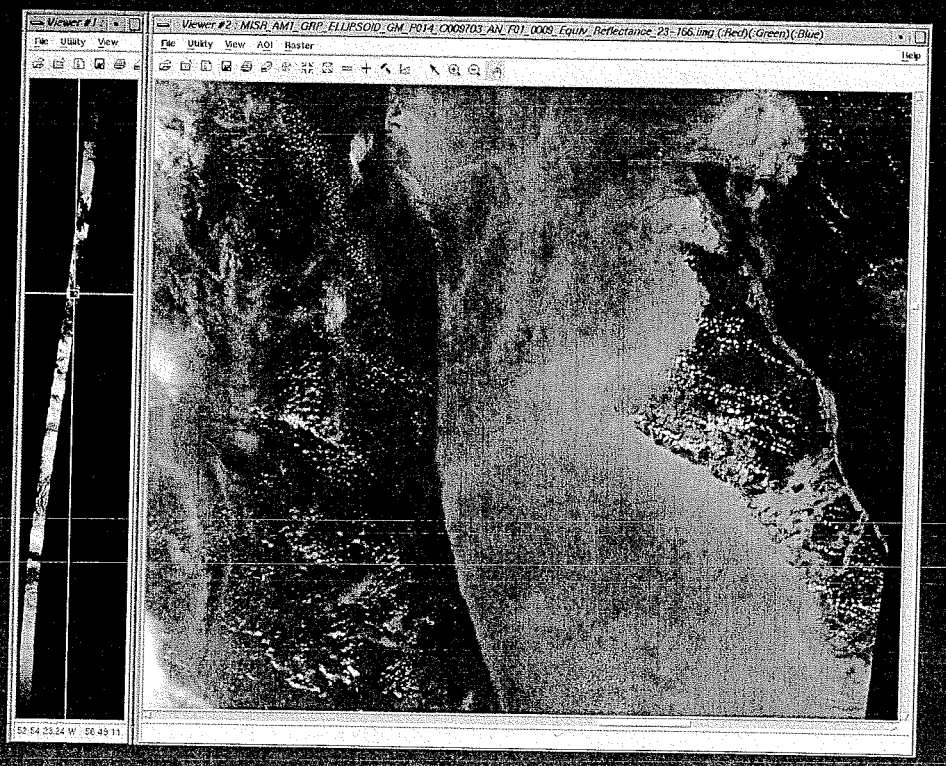
ERDAS Imagine 8.5



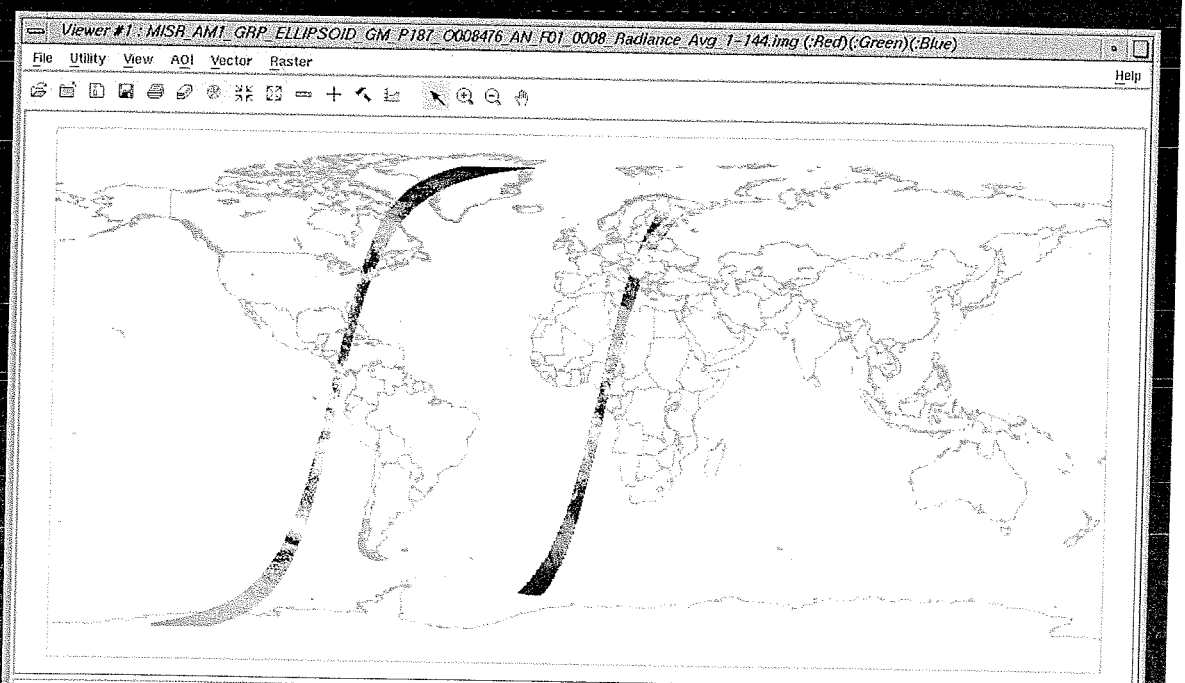
- We wrote custom import routines to convert MISR HDF-EOS files into Imagine files preserving geolocation via projection parameters to facilitate geo-calibration.
- Unfornuately, these are not generally available and are only for SGI Irix.

- An alternative may be using - **HDF-EOS to GeoTIFF converter (HEG)**
http://support.erdas.com/downloads/hdf-eos/hef-eos_to_geotiff.asp

ERDAS Imagine – Full Swath/Full Res. Geo-linked



ERDAS Imagine – Raster/Vector Overlay



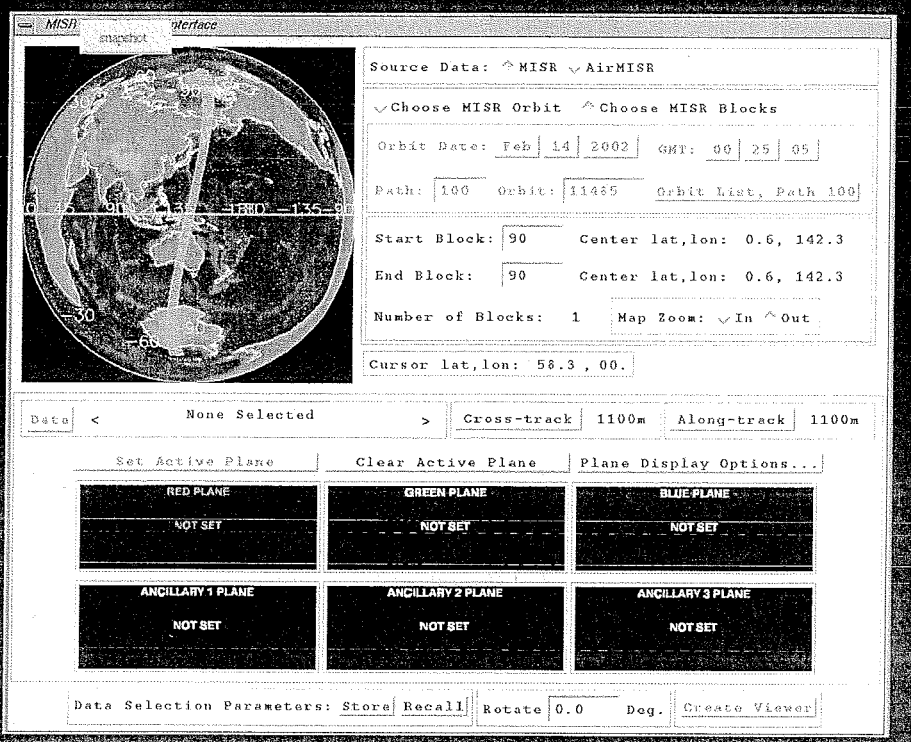
ERDAS Imagine – GIS Data Analysis

MISRView

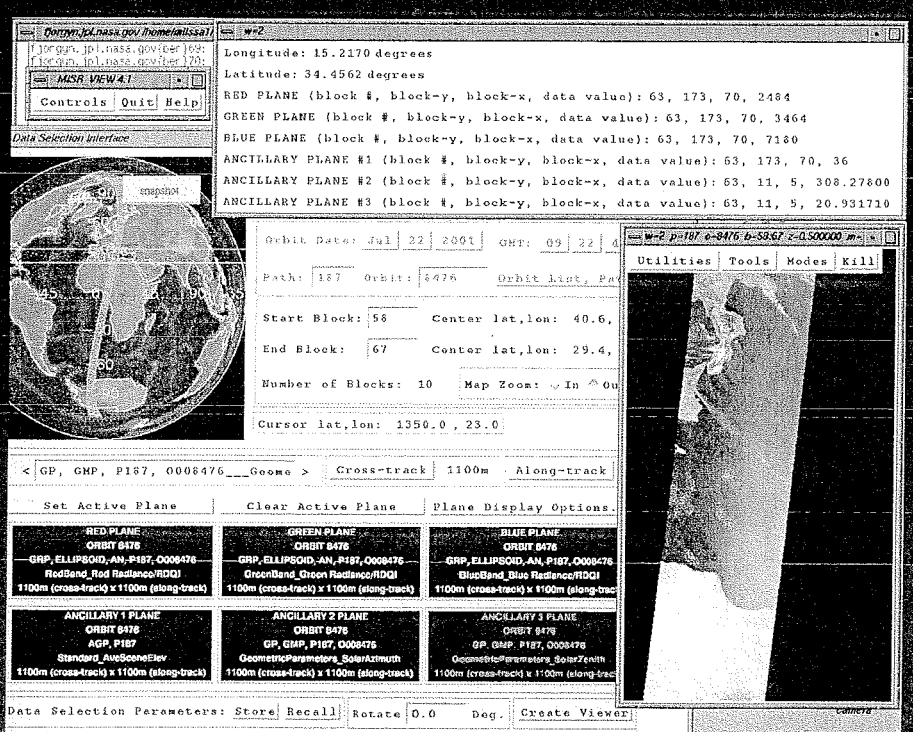
- Maps path/orbit to time and date
- Assembles MISR blocks
- Reports geolocation using the AGP
- Displays true color MISR imagery
- Can reproject MISR imagery
- Requires IDL

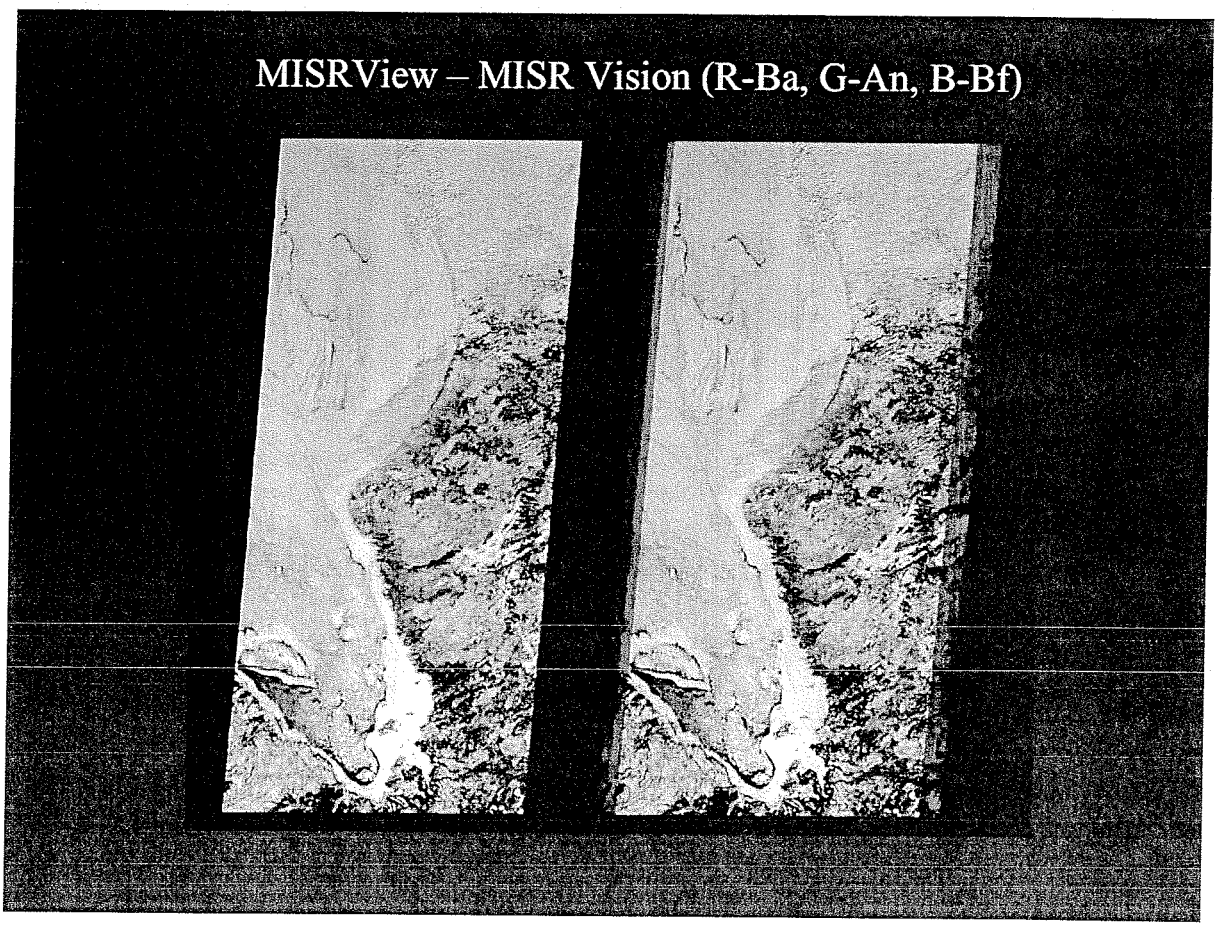
- Perspective tool
- Band slider tool
- Scroll tool
- Vector overlay tool
- Reprojection tool
- Color / Contrast tools

MISRView – Main Menu



MISRView – L1B2 imagery




MISRView – MISR Vision (R-Ba, G-An, B-Bf)