

# MINX V3.0 for Mac OS X, Windows and Linux

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## Built and Packaged by:

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## Contact for Help:

Go to the MINX page on the Open Channel Foundation website and click on the "MINX discussion forum". Enter your question or problem report there and check back in a few days for a response. If your need is urgent or the discussion forum isn't accessible, send an email to [David.L.Nelson@jpl.nasa.gov](mailto:David.L.Nelson@jpl.nasa.gov).

## System Requirements:

**Platform** - MINX 3.0 has been tested on Macintosh Intel computers running OS X 10.6.8 and 10.7, on Windows XP and 7 and on Linux using Fedora 14. It may run on other platforms as well. Three or more GBytes of memory are strongly recommended. Graphic display resolution should be at least 1280 x 800. Multiple CPUs and a capable GPU processor are highly desirable.

**IDL** – If you do not already have the free IDL Virtual Machine (VM) application installed, go to the Exelis website at: <http://www.exelisvis.com/Downloads/ProductDownloads.aspx> and download it after registering. Read the installation instructions, and when ready to download, choose the version appropriate to your operating system. Mac OS X users should choose the Native x86 64-bit option. After the large download has completed, double-click on the downloaded file to begin the installation.

Two versions of MINX are provided for Mac and Windows platforms. One, built on 32-bit IDL 6.4, should work with any version of IDL including 64-bit versions. The other, built on 64-bit IDL 8.1, should be used only with 64-bit IDL versions 8.1 and later. If you already have IDL installed but do not have an IDL license, then choose your version of MINX based only on your installed version of IDL. Users new to IDL will download IDL 8.2.1 (or later when available).

If you do have an IDL license, then you also have access to an MPG or MP4 license that MINX can use to generate and save animated sequences of MISR camera images. You may need to specifically request the MPG or MP4 license(s), at no extra charge, from Exelis. MPG videos are generated only by IDL 6.4 through 8.0 using 32-bit MINX. MP4 videos are generated only by IDL 8.1 and later using 64-bit MINX, and their generation is more robust than for MPG videos.

**Mac only** - You will need the Mac X11 application to run IDL and MINX. Many users will already have X11.app installed on their Mac. To check, use Finder to determine if it is located in your /Applications/Utilities/ directory. If it isn't there, install it from your Mac CD. In OS X 10.8 (Mountain Lion), Apple replaced X11 with XQuartz. The same instructions above apply to XQuartz, but note that XQuartz version 2.7.2 may cause IDL to fail, so use version 2.7.3 instead.

During IDL installation, accept the default destination directory of /Applications/ if you have administrative access. If you do not, you must install IDL in your home directory under /Users/<your\_userid>/. For MINX to work, the base IDL directory must be one of the following: /Applications/exelis, /Applications/itt, /Users/<your\_userid>/exelis or /Users/<your\_userid>/itt.

If you install IDL 8.2 on OS X 10.8 (Mountain Lion), note that the Mac installer is not signed, so Mountain Lion will refuse to install it if you haven't changed your defaults. To do a one-time bypass of this, right-click (or control-click) on the installer to get the popup menu and select "Open". That will give you an option to install anyway.

**Linux only** - IDL 8.2 requires a 64-bit version of libXp. Red Hat-based Linux distributions such as RHEL and Fedora may not install this library by default. On Red Hat you can obtain this library using the following command: `yum install libXp.x86_64`

## **Downloading MINX:**

**If you have installed IDL version 6.4 through 8.0.n, download one of these:**

MINX\_V3.0\_IDL-32bit.dmg - installer for **Mac OS X** containing:

- MINX.app – A Mac application whose contents include the 32-bit MINX executable file (MINX.sav) and a /data directory containing 3 data files (.txt) and 11 documentation files (.pdf).
- README\_delivery\_V3.0.pdf - this file.

MINXinstaller\_V3.0\_IDL-32bit.exe - installer for **Windows** containing:

- MINX.sav – The 32-bit MINX executable file.
- /data - A directory containing 3 data files (.txt) and 11 documentation files (.pdf) used by MINX.
- Uninstaller.exe – A program to uninstall MINX.
- README\_delivery\_V3.0.pdf - this file.

**If you have installed IDL version 8.1 or later, download one of these:**

MINX\_V3.0\_IDL-64bit.dmg - installer for **Mac OS X** containing:

- MINX.app – A Mac application whose contents include the 64-bit MINX executable file (MINX.sav) and a /data directory containing 3 data files (.txt) and 11 documentation files (.pdf) in PDF format.
- README\_delivery\_V3.0.pdf - this file.

MINXinstaller\_V3.0\_IDL-64bit.exe - installer for **Windows** containing:

- MINX.sav – The MINX 64-bit executable file.
- /data - A directory containing 3 data files (.txt) and 11 documentation files (.pdf) used by MINX.
- Uninstaller.exe – A program to uninstall MINX.
- README\_delivery\_V3.0.pdf - this file.

MINX\_V3.0.tar.gz - installer for **Linux** containing:

- MINX.sav – The 64-bit MINX executable file.
- /data - A directory containing 3 data files (.txt) and 11 documentation files (.pdf) used by MINX.
- README\_delivery\_V3.0.pdf - this file.

## **Installing and Running MINX:**

### **Installing MINX on the Mac:**

To install MINX, double-click the file “MINX\_V3.0\_IDL-xxbit.dmg” that you downloaded and drag a copy of the MINX icon from the delivery folder to your desktop or to the folder where you want it installed.

### **Running MINX on the Mac:**

To run MINX, double-click the MINX icon, then click anywhere inside the IDL virtual machine (VM) banner to show the MINX main menu.

If MINX fails to start and you receive this message: "Cannot run MINX, because IDL was not found in standard directory locations.", you can correct it by following these steps (make sure that the Apple application X11 - or Xquartz for Mountain Lion users - is installed first):

1. Right-click the "MINX.app" icon to bring up a floating menu.
2. Select "Show Package Contents".
3. Open "Contents", then "Resources", then "Scripts".
4. Double-click on "main.scpt" to open the MINX script in AppleScript Editor.
5. In the first line that begins with "set idl\_path to", change the idl pathname to point to your idl directory, e.g. /itt/idl/idl81/bin/idl.
6. Save the changes and exit AppleScript Editor.

MINX requires the use of left and right mouse buttons, so make sure you have both buttons set up correctly in your System Preferences. (Select Keyboard & Mouse; then select Mouse. If the option is available for your mouse, set it to use a secondary button.)

There is a change in behavior in some older versions of Macintosh OS X, which may interfere with right-mouse clicking in IDL graphics windows. The click generates no response, and the window can lock up (test by displaying a map in the “Show Orbit Location” option of MINX and then right-clicking on the map to remove it). If this occurs, quit `X11`, execute the command below in a terminal window, and then restart `X11`. This will change the mouse behavior unless you reset it with a different defaults command.

```
defaults write com.apple.x11 wm_click_through -bool true
```

Some Lion and Mountain Lion versions of OS X have right-click problems that have been reported on Apple Support Communities website (<https://discussions.apple.com>). On this site, search for “secondary click bug” to find a solution.

### **Installing MINX on Windows:**

To install MINX, double-click on the file “MINXinstaller\_V3.0\_IDL-xxbit.exe” you downloaded and follow the on-screen instructions. Note that you must have administrative privileges to install in the default “c:\Program Files” directory. If you do not, the installer will generate an error when it tries to copy files onto your hard drive.

Your alternative is to install MINX in your “home” directory (typically \Users\<>your\_userid>). Note that all the files installed by the MINXinstaller must remain together in the same folder.

### **Running MINX on Windows:**

To run MINX, double-click the MINX icon on your desktop, then click anywhere inside the IDL virtual machine (VM) banner to show the MINX main menu. MINX can also be launched from the Start Menu by clicking on Start -> All Programs -> MINX\_V3.0 -> MINX.

### **Installing MINX on Linux:**

To install MINX:

1. Open an X terminal window.
2. cd to the directory where you downloaded the file “MINX\_V3.0.tar.gz”.
3. Enter the following at the Linux command line: `tar -zxvf MINX_V3.0.tar.gz`

Note that IDL and MINX should be installed and run on a workstation. Installing on a networked server and running from a connected workstation can be extremely slow because of the heavy graphics load.

### **Running MINX on Linux:**

To run MINX:

1. Open an X terminal window.

2. cd to the directory where you installed MINX.
3. Enter the following at the Linux command line: `idl -vm=MINX.sav`
4. Click anywhere inside the IDL virtual machine (VM) banner to show the MINX main menu.
5. You may want to create an alias for MINX in your startup script. For example, using the C shell, you might add to your startup `.cshrc` file:
 

```
alias MINX 'cd <path>;idl -vm=MINX.sav'
```

 where `<path>` is the location where MINX is installed.

In order for MINX to find IDL, your PATH environment variable should have been updated to point to IDL during IDL installation, and environment variables IDL\_DIR and IDL\_DLM\_PATH should have been set as well.

### **Documentation:**

In MINX V3.0, documentation is provided in two forms. First, 11 PDF files in PowerPoint format are included in the MINX installation programs and are available as “context sensitive” help while running MINX. They can be accessed by clicking the “PDF Help” buttons at various places in MINX as indicated by this functional hierarchy:

- MINXdoc\_MainMenu.pdf
  - MINXdoc\_ShowOrbitLocation.pdf
  - MINXdoc\_FindOverpasses.pdf
  - MINXdoc\_ShowCameraImage.pdf
  - MINXdoc\_CompareDataProducts.pdf
  - MINXdoc\_AnimateCameras.pdf
    - MINXdoc\_AnimationWindow.pdf
      - MINXdoc\_TaskMenu.pdf
        - MINXdoc\_DigitizeDialog.pdf
  - MINXdoc\_PlumeUtilities.pdf
  - MINXdoc\_ProcessPlumeProject.pdf

Second, a series of 5 PDF files in PowerPoint format plus one PowerPoint file containing MINX camera animations (MPG movies) are available on the Open Channel website. Individual files can be downloaded as needed, independent of the MINX program files:

- MINX\_Doc1.pdf: MISR - the Instrument, its Orbit and Data Products
- MINX\_Doc2.pdf: MISR - Tools for Ordering and Viewing Data
- MINX\_Doc3.ppt: MINX - Overview and Plume Case Studies
- MINX\_Doc4.pdf: MINX - Basic Features (11 internal MINX documents collected in 1 file)
- MINX\_Doc5.pdf: Measuring Aerosol Height and Motion with MINX
- MINX\_Doc6.pdf: Handling Complexities in Height Retrievals

## **New Features:**

### **V3.0:**

- Replaced 'C' libraries with native IDL code to provide platform independence – MINX now works with Linux as well as OS X and Windows (and possibly others OS's). Also optimized MINX to provide slightly better performance than with 'C' code.
- Added 11 PDF documentation files inside MINX where they are most needed, accessed by clicking buttons named "PDF Help".
- Added 3 new graphics formats for saving images to file:
  - GeoTiff geo-referenced image
  - PNG/KML for overlay on Google Earth
  - Red/blue images for use with 3D glasses
- Added a button on the Animation window to toggle on/off the overlay of geographic features including coastlines and rivers, country and state outlines and a geographic grid.
- Added additional MISR data fields that can be displayed in the "Compare Data Products" option and in the data overlay feature in the Animation window.
- Reworked the code that generates fire pixel data from MODIS thermal anomaly granules (MOD14) to be more robust and less confusing.

### **V2.0:**

- Added a separate version of MINX that uses IDL version 8.1 so the more reliable MP4 movie format can be used in generating MINX animations for those who have an IDL license and IDL V8.1.
- Added a Compare Data Products feature to the main menu that allows users to load and display data swaths (e.g. L1 radiance, terrain height, camera zenith angles, stereo height, aerosol optical depth, ...) from multiple MISR standard data products side-by-side at the same scale and to query the data values at clicked points.
- Removed the Load Documentation option from the main menu. MINX now has a series of PDF files in PowerPoint format that describe the program and how to use it. You should download these separately.
- Animate Cameras option on main menu:
  - Made GRP\_TERRAIN the default L1B2 data to load in file selection dialog box.
  - Changed the format of the MINX session .sav files that contain all the information needed to restore an animation session later. **Consequently, .sav files created in earlier versions of MINX will not work with V2.0.**

- Added a check box on the main animation window to toggle between a per-camera color scaling and a “true color” scaling. Also increased default image brightness.
- Added radio buttons on the main animation window for selection of the MISR band to display in gray-scale imagery as well as the standard RGB imagery.
- Changed the dialog box for selecting the directory for reading marker pixels. It’s now accessed with the Post Marker Pixels from File ... option on the Select Task to Perform menu button. Use radio buttons to choose Aeronet or Volcanos or Other and allow Other to find a custom file anywhere on disk. Also allow deleting current markers so others can be loaded.
- Added a Select Data Overlay Options choice on the menu displayed by the Select Task to Perform menu button. This shows a dialog box that allows changing the type of retrieved data to display inside digitized plume polygons (e.g. image matcher disparities, zero-wind heights, wind speeds). It also provides choices for displaying a color key for the selected data type.
- Added a Select MISR Data to Show button on the main animation window for selection of MISR data (terrain elevation, camera geometry, SVM masks, ....) to load and display in the OP window. User can quickly toggle back-and-forth between MISR imagery and the selected imagery.
- BRF Analysis option on main animation window:
  - Cleaned up BRF plots window – added device fonts, fixed 2-orbit plotting, fixed zoom window size and cursor position and changed window text.
  - Added feature to save an MPEG file of the 64x64-pixel zoom window.
  - Added option to print out table of radiances and geometry at clicked point.
  - Changed display of 1.1 km channels to show at true resolution.
  - Removed brightest 5% of pixels from calculation of max brightness for scaling purposes.
- Changed the format of ASCII output files automatically written for each plume:
  - Renamed and reordered some of the parameters in the header section.
  - Added Date digitized to the header section.
    - Added several retrieval parameter values to the header section that were selected by the user in the Digitizing Options dialog box.
  - Added POLYGON and DIRECTION tables that describe the coordinates of points on digitized plume polygon and plume direction lines.
  - Added names for the tables including RESULTS for the point data table.
  - Added the number of points in each table to the table name line.
  - Added 2 columns to the RESULTS table – Fltrd height and Total windspeed.
  - Allow the user to exclude columns from the RESULTS table for groups of parameters (aerosol, albedo and fire pixels) if the corresponding checkboxes

were not selected in the Digitizing Options dialog box.

- Extensively modified the Digitizing Options dialog box with changes to existing controls and functionality and additions of user-selectable controls and functionality:
  - All buttons show context-sensitive help when the cursor hovers over the control. IDL text boxes do not have this capability.
  - All values used in the current session are restored to dialog box whenever it is reentered.
  - Renamed the Object Type group to Aerosol Type
  - Changed the items in the Aerosol Type group to physical types: Dust, Smoke, Volcanic ash, Cloud/Snow, Contrails and Other aerosol.
  - Moved and changed the Display Options group:
    - Removed SVM mask option and moved to Select MISR Data to Show.
    - Removed Show Stereo Results – height/wind results are always shown.
    - Renamed Show Albedo Results and Show Aerosol Results.
    - Added Compare heights w/ PGE8a to allow displaying results from the MISR standard stereo product on the height/wind profile plots for comparison purposes.
    - Added a Publication qual plots checkbox that, if checked:
      - Height/wind profile plots are produced extra-large for best quality.
      - Non-essential clutter in height/wind profile plots is removed.
      - MISR imagery is saved to file without the camera names (e.g. An) written in red in the lower left corners.
  - Replaced the Processing Parameters group with Wind Correction Filters, Sample Spacing and Retrieval Options groups.
- Wind Correction Filters group:
  - Changed name of Terrain Ht Mask text box to Min hght above terrain.
  - Changed name of Maximum Height text box to Max hght above sea level. Entered value now acts as a filter that prevents retrieval of any wind-corrected heights value above this level. Zero-wind heights are not affected.
  - Changed name of Maximum Wind text box to Max retrieved wind.
  - Changed height units from meters to kilometers.
- Sample Spacing group:
  - Removed Plume Point Grid and Cloud/Land Grid text boxes that require entry of grid spacing values and replaced them with a group of radio buttons representing the allowable values.
- Retrieval Options group:
  - Created a new pair of alternatives to specify how digitizing will work: Retrieve



along line or Retrieve inside polygon. This replaces the old distinction between Plume Lines and other Object Type choices.

- Created a new pair of alternatives to replace the distinction between Plumes and Clouds in the old Object Type group: Use no wind direction and Provide wind direction.
  - Created a checkbox option to allow Bi-directional wind. If checked, the user-specified wind-direction and the direction 180 degrees opposite will be used in the retrieval.
  - Added a new section of 5 radio buttons to allow selection of the MISR band to use in height retrievals. Red is still the preferred band, but blue often provides superior results for low optical density plumes over bright terrain. Match w/ Blue (land) and Red (water) automatically switches bands depending on the underlying surface.
  - Added Match selected band w/ An blue band. This uses the band you choose for all cameras except An, for which the blue band is used.
  - Added 4 radio buttons to allow selecting the size of the reference camera image matcher to use, which significantly affects processing time.
  - Added 3 radio buttons to allow selecting the precision of the retrieval process, which significantly affects retrieval coverage.
  - Added 5 radio buttons to allow selecting which combinations of comparison cameras to use with the An reference camera.
  - Replaced the single letter (P, S, V) in MINX digitized region names describing the region type with 4 letters:
    - Letter 1 - D = dust, S = smoke, V = volcanic ash, W = water.
    - Letter 2 - L = line, P = polygon.
    - Letter 3 - N = no wind provided, W = wind provided.
    - Letter 4 - R = red band, G = green band, B = blue band, N = near IR band, C = red + blue band.
  - Changed the colors and symbols for different plume types in animation window.
  - Changed the colors for point symbols in the height and wind profile plots.
  - Changed text fonts to True Type to produce more presentable graphics in height/wind plot, height/wind histogram and aerosol histogram.
  - Changed wind direction vector so directions are interpolated by spline between control points.
  - When drawing heights on animation imagery along digitized lines rather than in polygons, use the same color scale as in polygons.
  - Adjusted the size of images written to file during digitizing so they are at least some minimum size.
  - Added hourglass cursor to several operations.
  - Exclude obvious outlier points in the calculation of maximum height to display on height profiles.
- Plume Utilities option on main menu:

- Added the ability to process MODIS MOD14 thermal anomaly granules directly for use in plume digitizing without having to download and process ModVolc data first.
- Process Plume Project option on main menu:
  - Changed the format of the input PlumeProjOrbitList.txt file to allow greater flexibility in specifying L1 terrain-projected and ellipsoid-projected radiance files. Now either 1 or 2 pathnames can be entered on the first line: if 1, it specifies the location where both L1 file types will be found; if 2, the first specifies the location of terrain-projected files, and the second specifies the location of the ellipsoid-projected files.
  - The PlumeProjOrbitList.txt file can now include blank separator lines

### **V1.2:**

- Changed the format of the .sav files MINX writes from the Animation window that contain all the information needed to restore a session later. Consequently, .sav files created in earlier versions of MINX will not work with V1.2.
- Changed the format of the file that contains the most recently visited directory for each of several MISR options. Consequently, the /<home\_directory>/MINX\_dflt\_path.sav file created in earlier version of MINX will not work with V1.2. A message will be displayed asking the user to delete the old file before running certain MINX options.
- Added two sliders to the Animation window that support rescaling the image brightness and the NIR content of the green band.
- Added an option to the main menu to determine which MISR orbits overpass a user-supplied set of geographic coordinates at a user-supplied set of times.
- Added an option to the Animation window menu that enables a file containing geographic coordinates, symbols and names to be read and posted on the image. A new button allows posted symbols and names to be turned off and on. An additional data file is located in the MINX program directory containing over 791 Aeronet site locations with names and elevations that can be read and posted on MINX images.
- Added a checkbox to the Digitizing dialog box to allow user to choose not to load the SVM masks from Classifier files.
- Added a text entry box to the Digitizing dialog box to allow specification of a height above terrain below which any wind-corrected heights will be considered blunders.

### **V1.1:**

- Added support for Windows: added new 'C' libraries, backslash directory delimiters, GUI tweaks, Plume Utility ftp files, etc.

- Added calculation of plume quality flag as well as other parameters to write to output text file. E.g. number of pts in table, area per point, standard deviation metric, wind direction relative to along direction, etc.
- Added all the input/output files and directories in Plume Utilities to the list of directories to save between sessions so user doesn't need to reenter them each time MINX is loaded.
- Changed animation code for generation of MPEG. When no IDL license is available and capturing digitized region, 9 JPEGs are created instead.
- Added ability to display 4-bands of data in BRF plot utility rather than only the red-band.
- Added ability to use MISR block-subsetted files in "Process Plumes" and "Animate Cameras" options.

### **V1.0:**

- This was the initial delivery of MINX.

### **Resolved Issues:**

#### **V3.0:**

- Performed extensive code cleanup and reorganization of portions of the code.
- Fixed numerous small bugs and irregularities.

#### **V2.0:**

- Performed a major cleanup and reorganization on portions of the code.
- Fixed the 2-orbit save image option so the correct orbit of the two is plotted and is named correctly.
- When a .sav file containing a MINX session is saved by one user and later restored by a different user, MINX no longer crashes.
- When an orbit number had 4 digits (9999 or smaller), the delete plume function couldn't find the correct subdirectory. A '0' is now prefixed to the orbit directory name to prevent this.
- In dialog boxes where a directory is selected for writing, e.g. in OverpassFinder, if the dialog box is closed with an entry in only the top text box, then data were not written to the correct location. This has been fixed.
- Fixed the arrowhead on wind direction vectors.

- Corrected the values of RMS errors reported in text window after camera co-registration correction.

### **V1.2:**

- Removed the requirement to right-click to exit a map window in the Show Orbit Location option, in favor of a new button on the window that can be clicked with the left button.
- Moved the Exit button on the Animation window from the top control panel to the bottom coordinate panel to reduce window width on low-resolution graphic displays.
- Adjusted the size of the MPEG window created during digitizing to properly contain the characters identifying the camera and increased the MPEG resolution and quality.
- Fixed a bug that prevented retrieved points from being printed to text output if the zero-wind height was below 0.0 and no aerosol data was available. Now allow printing if wind-corrected height is above 0.0.
- Rewrote the method for assigning colors to TOA BRF data in animation windows.
- Fixed a MINX failure when Modvolc fire pixel data were used to create a fire pixel file directly instead of using MODIS data.
- Fixed an occasional MINX failure when drawing height/wind histograms.
- Converted most of the variables in COMMON blocks to system global variables.

### **V1.1:**

- Fixed zero-wind height retrieval problem when terrain is higher than 2500 meters.
- Fixed bug that caused crash when large height or wind range produced more than 60 bins in height/wind histogram.
- Fixed a crash when Restoring a Saved session and there are 2 orbits loaded.
- Set the "2 Orbits" button and made it insensitive along with BlkBeg and BlkEnd text controls.
- Fixed a bug in the plume utility that reports available MISR products. It previously reported a product file was available if it contained the SCF .subset... string.
- Fixed bug that reset region type to smoke plume whenever a plume being digitized was canceled.
- Fixed bug that created black histogram window if there were no zero-wind heights less than the maximum specified height.

- Fixed bug that caused failure when fire pixels were loaded under IDL 7.0. Added a message to make it clear when a L1B2 file is corrupted and needs to be reordered.
- Changed plume utility that reports on available MISR orbits so that all products with version number  $\geq$  the template value will be reported on.
- Changed maximum absolute wind speed in height/wind retrieval to 75 m/s.
- Fixed MPEG animation when grayscale images are selected.

**V1.0:**

- This was the initial delivery of MINX.

**Known Problems:**

- IDL does not follow symbolic links unless the files pointed to by the links are on local disks or are on auto-mounted networked disks. If the disks containing the files MINX needs to read are manually mounted, the solution is ask your system administrator to auto-mount them.