McIDAS-V: An open source data analysis and visualization tool for multi- and hyperspectral satellite data

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What is McIDAS?
(Man computer Interactive Data Access System)

- Collection of user programs and libraries for visualizing and analyzing geophysical data (focus on environmental satellites)
  - UNIX, PC & Mac capable
- A synergistic tool that integrates numerous data types into one system
- First developed in the early 1970s
- Still in use worldwide at research, operational, educational, and commercial sites
McIDAS-X Users
(MUG has about 50 members)

• NOAA – NESDIS, AWC, SPC, TPC, etc.
• NASA – STS, LaRC, MSFC, JPL
• Unidata – 130 universities, colleges and international educational collaborators
• International – EUMETSAT, Spain, Greece, Mexico, Australia
• Industry – Honeywell, Weathernews, Universal Weather, Meteorlogix, Weather Central, etc.
Why the Change?

- McIDAS software (written in Fortran 77 & C) has a 30+ year heritage resulting in limited potential
- METOP, NPOESS and GOES-R operational satellite data cannot be optimally utilized
  - great increase in data rates
  - new tools for working with these large data sets
- Platform / OS dependence
- New data analysis and visualization concepts are now available (e.g. 4-D)
McIDAS-V Requirements

- Create a powerful and versatile software system for environmental data processing, analysis and visualization
- Continue to fully support McIDAS Users’ Group (MUG) and McIDAS-X functionality as users transition to McIDAS-V
- Support existing and evolving needs of scientific research and algorithm/applications development for new programs
- Support operational users by providing frameworks in McIDAS-V, enabling a natural transition path for research results into operations
- Use system to educate students in remote sensing and physical sciences; involve students in its development, evolution and use
What is McIDAS-V

\[ \text{McIDAS-X} \rightarrow \text{VisAD} + \text{IDV} + \text{HYDRA} = \text{McIDAS-V} \]
VisAD
Developer: Bill Hibbard, UW SSEC

- **Open-source, Java library for building interactive and collaborative visualization and analysis tools**
- **Features include:**
  - Powerful mathematical data model that embraces virtually any numerical data set
  - General display model that supports 2- and 3-D displays, multiple data views, direct manipulation
  - Adapters for multiple data formats (netCDF, HDF-5, FITS, HDF-EOS, McIDAS, Vis5D, etc.) and access to remote data servers through HTTP, FTP, DODS/OpenDAP, and OpenADDE protocols
  - Metadata can be integrated into each data object
IDV-Integrated Data Viewer
Developers: Unidata (Don Murray/Jeff McWhirter)

- Unidata developed, VisAD-based, scientific analysis and visualization library and toolkit
- Open Source, Java™ framework and reference application
- Provides 2- and 3-D displays of geo-scientific data (plus, of course, animations)
- Stand-alone or networked application

http://www.unidata.ucar.edu/idv
Why VisAD and IDV?

- VisAD brings the Data Model and advanced display capabilities
- IDV is a “reference application” that provides a framework for fetching, selecting and displaying data
- Both in Java and Open Source
- Use Jython (Python running in Java) as scripting language
- Many other supporting libraries available
The “X to V” Bridge

• Interacts with a McIDAS-X remote session
• Users provides command line input in a McIDAS-V Data Chooser that sends commands to a server running McIDAS-X
• Runs all McIDAS-X commands, including status, text, imagery and graphics
  – McIDAS-X output displayed in McIDAS-V
• Allows bi-directional interactive communication between McIDAS-V and McIDAS-X
The “X to V” Bridge
HYDRA
Interrogation of multi- and hyper-spectral data
Developer: Tom Rink SSEC

- Display individual pixel location and spectral band measurements
- Combine spectral channels in linear functions and display resulting image products
- Construct false color images from multiple channel combinations
- Create scatter plots of spectral channel combinations
- Locate image pixels in scatter plots and vice versa
- Display transects of measurements
- Compare Level 2 products (e.g. soundings of temperature and moisture as well as spectra from selected pixels)
- Integrated data and product analysis/evaluation between Geostationary and Polar observing platforms
Mt Etna viewed by AIRS
28 Oct 2002

SO2 signal 1284-1345 cm⁻¹
Inferring ash cloud height from AIRS clear sky and in ash soundings

Ash cloud and clear sky spectra

Instrument: AIRS
Offline-Online in LW CO₂
Offline-Online in H$_2$O
Hydra Integration into McIDAS-V
IASI granule
Hydra Integration into McIDAS-V

pointers select location of spectra
Hydra Integration into McIDAS-V
slider bar selects spectral band display
McIDAS-V web page
software, manuals

McIDAS-V is a free, open source, visualization and data analysis software package that is the next generation in SSEC’s 35-year history of sophisticated McIDAS software packages. McIDAS-V displays weather satellite (including hyperspectral) and other geophysical data in 2- and 3-dimensions. McIDAS-V can also analyze and manipulate the data with its powerful mathematical functions. McIDAS-V is built on SSEC’s VisAD and Usadas’s IDV libraries, and contains “Bridge” software that enables McIDAS-X users to run their commands and tasks in the McIDAS-V environment. A future version of McIDAS-V will contain an integrated version of SSEC’s HYDRA software package.

Note: McIDAS-X users who install McIDAS-V and want to run their McIDAS-X commands in the McIDAS-V environment via the Bridge must also be running McIDAS-X version 2007a or greater. Sites that have joined the McIDAS User Group and purchased McIDAS-X support can download McIDAS-X 2007a from the McIDAS-X Download page.

This page contains information on how to download McIDAS-V, install McIDAS-V, and run McIDAS-V, as well as links to the latest McIDAS-V Release notes and the McIDAS-V source code.

Download McIDAS-V:
Check that your system meets the system requirements for McIDAS-V and download the appropriate package for your operating system:

- Linux
- Mac OS X
- Solano SPARC
- Solano x86
- Windows
- all other unix

Note: This file is just the installer and can be placed anywhere on your machine. When you run the installer in the next step, you can then indicate where you want McIDAS-V to be installed.

Optional - If you’d like to be notified of McIDAS-V updates and other important information, please enter your name, email address and location here.

First name: 
Last name: 
Email address: 
Location: (e.g. Badger Weather Corp - Madison, WI)

Install McIDAS-V:
Start the installer following the instructions appropriate for your operating system:

- Linux open a terminal window and run sh <installer.sh>
- Mac OS X mount the .dmg and double-click the installer
- Solano SPARC open a terminal window and run sh <installer.sh>
- Solano x86 open a terminal window and run sh <installer.sh>
- Windows double-click the downloaded .exe file
McIDAS-V is a collection of software tools, and networked services and data designed to take advantage of a scalable distributed computing environment to meet user needs.
McIDAS-V Future Work

• Complete HYDRA integration (summer ‘08)
• Further enhancement of the ‘X to V Bridge’
  – Alpha 0.6 release at 10/2007 MUG meeting
• Provide full capabilities for Direct Broadcast data acquisition, analysis and display
• Support data analysis and visualization capabilities and applications for advanced satellite systems, including METOP, NPP/NPOESS and GOES R
  – Innovative data analysis and visualization tools
  – Broad array of formats and services
  – Data management and accessibility
McIDAS-V software

McIDAS-V is free, open source software available at

http://www.ssec.wisc.edu/mcidas/software/v/

(google McIDAS-V)

or contact
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