

Use in Support of Two Disparate RAMADDA and THREDDS Projects



Tom Yoksas, John Caron, Ethan Davis¹
Jeff McWhirter², Don Murray³
Matthew Lazzara⁴



¹Unidata Program Center/UCAR
²UNAVCO
³NOAA/ESRL/PSD and CIRES
⁴University of Wisconsin AMRC/SSEC



Data Access, Display & Analysis, Support, ...

- **Provide Tools** to visualize, analyze, organize and share data:
 - ▣ GEMPAK, IDV, LDM, McIDAS, netCDF, netCDF-Java, libcf, CDM, netCDF Decoders, Idm-mcidas, NOAAPort, RAMADDA, THREDDS, UDUNITS, ...
- **Facilitate Data Access** for a broad spectrum of observations and forecasts most in near real-time:
 - ▣ LDM, RAMADDA, THREDDS Data Server, McIDAS ADDE
- **Implement Systems** that demonstrate the utility of the systems we provide and lobby the community for their adoption and use:
 - ▣ IDD, IDD-Brazil, Antarctic-IDD, IDD-Caribe, Africa Initiative Cyberinfrastructure
- **Support Faculty** who use Unidata systems:
 - ▣ Training workshops, web-based documentation and training, ...
- **Build a Community** where data, tools and best practices in education and research are shared:
 - ▣ Reference material, Users workshops, On-line collaboration facilities, Earth and Space Science Informatics (ESSI) sessions at AGU/EGU meetings, ...



UCAR Africa Initiative: Google Meningitis Project

- Meningitis is endemic in the Sahel in countries with a distinct wet-dry season
- Infectious disease due to bacterium – *Neisseria meningitidis*
- Epidemic in 1996-1997 resulted in 250,000 cases and 25,000 fatalities
- Person-to-person transmission through respiratory and throat secretions – between 10-25% of population may carry bacteria at any time; higher during epidemics
- A **reactive** vaccine strategy is currently used to manage epidemics
 - *Doesn't prevent transmission of the disease by the individual vaccinated*
 - *Only lasts one-to-two years*
 - *Doesn't produce an immune response in children under two*

U.S. Antarctic Research Program

- Numerical Weather Prediction:
 - NCAR-MMM – Antarctic Mesoscale Prediction System (WRF)
GRIB files for each domain, PNG files of pre-generated displays
 - NOAAPort-delivered GFS model fields in McIDAS GRID format
- Satellite Observations:
 - AMRC – Antarctic composite (infra-red, visible, water vapor)
McIDAS AREA files, JPEG images
- Surface / Upper Air Observations:
 - AMRC – Automatic Weather Station Observations
text files from retrieval sites, McIDAS Data (MD) files
 - AMRC – station observations and upper-air plots, GIF images
 - SPAWAR - McMurdo – AWS and air field observations
- Other data to be included?

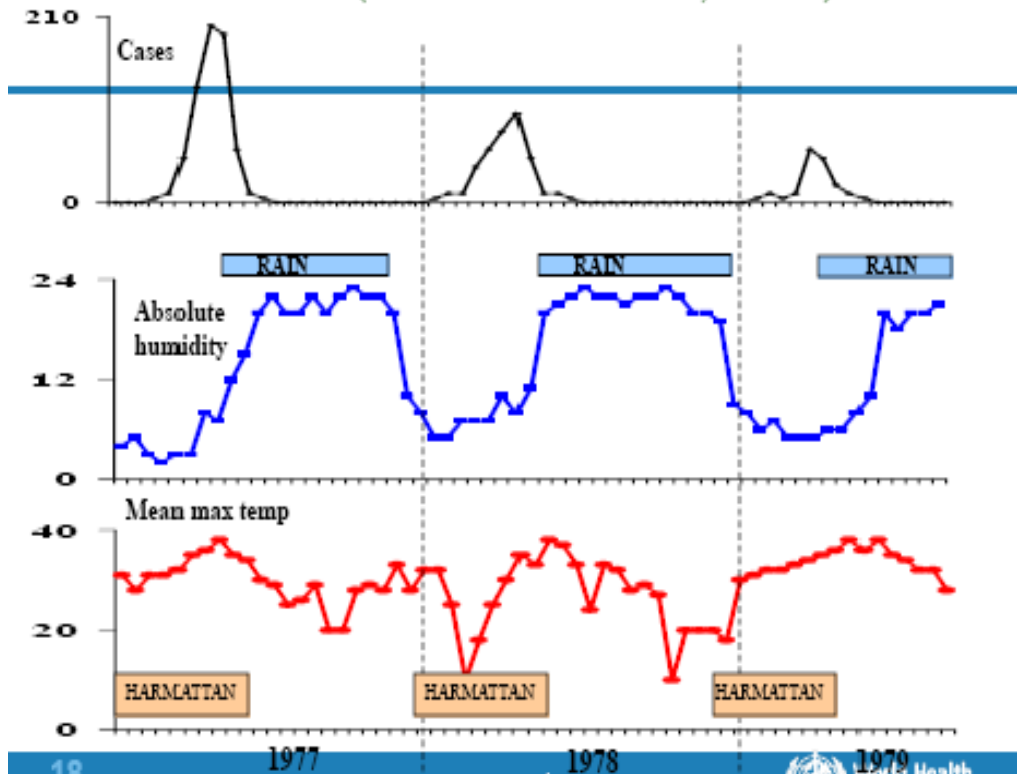
Common need: collection, dissemination and analysis of project-specific data



Objective: Develop a Prototype Earth-gauging System Integrating Weather and Health Data to Help Manage Meningitis

Season and Meningococcal Epidemics

(Greenwood et al. Lancet 1979; 73:557-62)

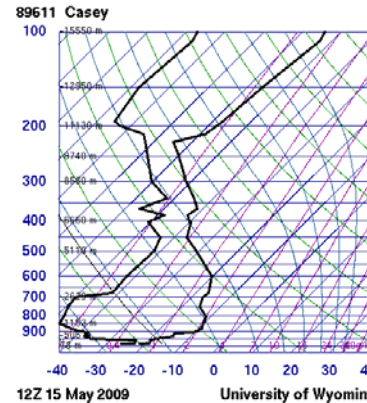
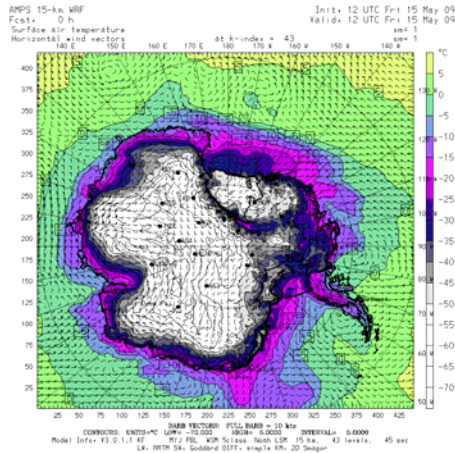
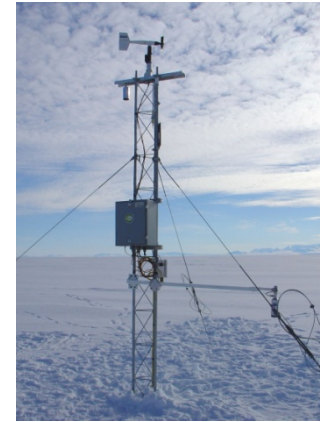
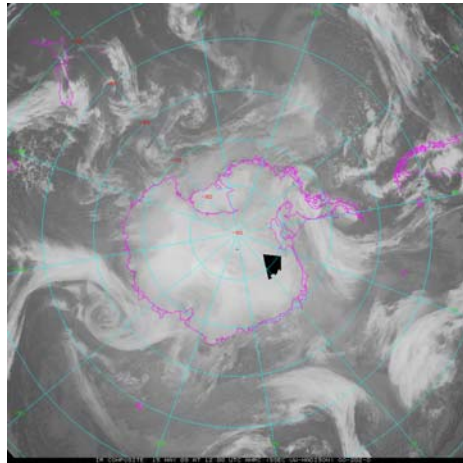
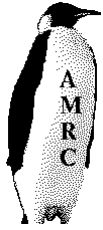




Unidata

Antarctic Research

*During the last 15+ years the availability of real-time meteorological data over Antarctica has been steadily increasing
How can this data be made available for operations, research and education?*



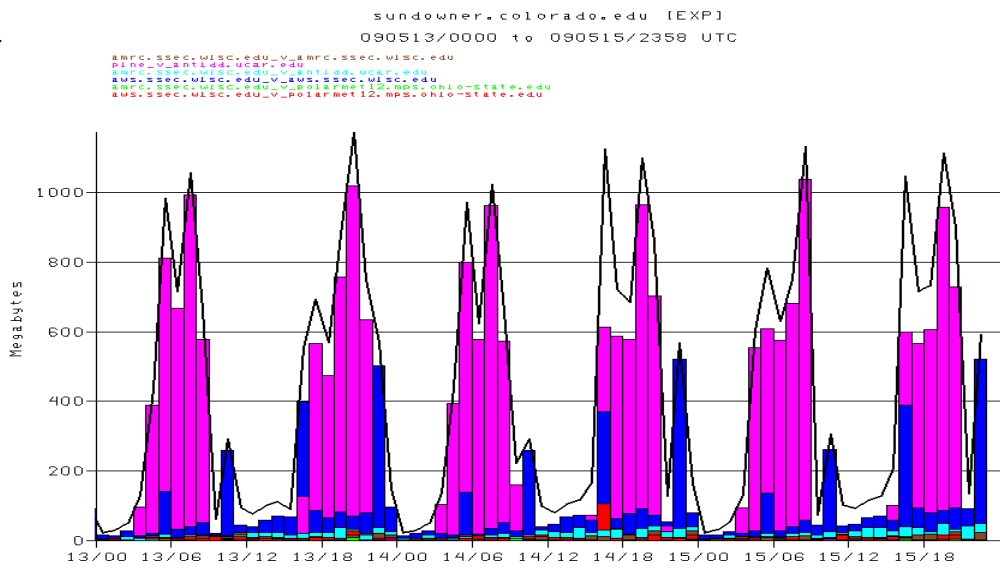
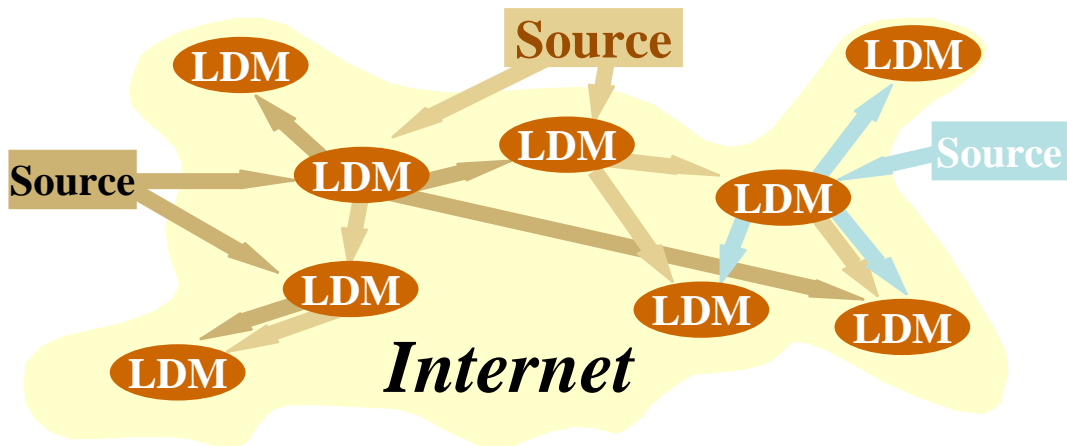
SLAT	-88.28
SLON	110.53
SELV	42.00
SHOW	16.89
LFT	29.64
LFTV	29.66
SWET	40.99
KINX	-60.1
CTOT	-16.6
VTOT	20.20
TOTL	3.40
CAPE	0.00
CAPV	0.00
CINS	0.00
CRNV	0.00
EQLV	-9999
EQTV	-9999
LFCT	-9999
LFCV	-9999
BRCH	0.00
BRCV	0.00
LCLT	241.2
LCLP	782.5
MLTH	258.7
MLMR	0.39
THCK	5185.
PWAT	1.02



Internet Data Distribution Systems

Project-specific IDD:

- North American IDD
- IDD-Brasil
- Antarctic-IDD
- US National Weather Service – NEXRAD Level II & III
- SURA Coastal Ocean Observing and Prediction (**SCOOP**)
- THORPEX Interactive Grand Global Ensemble (**TIGGE**)
 - Demonstrated bi-directional relay of 8.4 GB/hr between NCAR/SCD and ECMWF for three week period in January
 - Peak relay of 25+ GB/hr from ECMWF to NCAR/SCD
 - Demonstrated ability to relay small (100-300 KB) and large (10-60 MB) products with very low latencies
- Governments of South Korea, Spain, ...
- NASA, EPA, Private Industry, ...





The Objective:

Use Unidata tools to provide free and easy access to the Earth science community

Web-based data-access services:

Antarctic-IDD:

Implemented human-interactive and programmatic access to the suite of data through its THREDDS Data Server and RAMADDA technologies in 2008/2009

Africa Initiative:

Lobbying diverse, international participants to adopt use of THREDDS Data Server and RAMADDA technologies in support of Google initiative



Unidata

TDS

Thematic Real-time Environmental Distributed Data Services Data Server

- THREDDS Data Server (TDS):
 - a web-based server which provides metadata and data access
 - provides several data access protocols including OPeNDAP and HTTP
 - developed, distributed and supported by Unidata
 - written in Java and easily implemented by the Tomcat server
- Free and open access to the data is now available to users around the world using standard web browsers and appropriately enabled applications:
 - Integrated Data Viewer (IDV, Unidata)
 - McIDAS-V (McV, UW/SSEC)
 - ...



Repository for Archiving, Managing and Accessing Diverse Data

- RAMADDA:
 - a recent development effort in Unidata
 - a Java-base server that runs under Tomcat or can be run as a standalone application
 - content management system with a focus on earth science data
 - publishing platform
 - collaboration environment
 - extensible framework
 - implements a front end to THREDDS Data Server functionality
- RAMADDA provides new opportunities for data access:
 - preview/browse functions
 - collections search facility
 - federated servers provide transparent access to geographically-distributed data holdings
- Antarctic-IDD and UCAR Africa Initiative data are currently being made available via RAMADDA on the Unidata demonstration data server ***motherlode*** (<http://motherlode.ucar.edu/repository>)



Web UI

Basic Services
CRUD
Search (federated)
Access control
Event notification

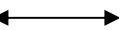
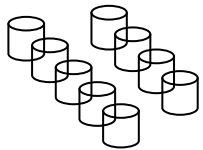
Viewing
Output Handlers

HTML
RSS
Catalog
OAI-PMH
OPeNDAP
KML
...



APIs
HTTP & FTP

...



Harvesters

File, image, chat, Wiki page, link, script, ...
DIF, THREDDS, ...

Folders, Entries, Metadata,...

RDMS



Unidata

RAMADDA

The full Antarctic-IDD data collection can be accessed through Unidata's demonstration RAMADDA server

Unidata's RAMADDA Data Repository - Group Top - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://motherlode.ucar.edu/repository

Unidata's RAMADDA Data Repository - Group

File | Edit | View

Top

Welcome to Unidata's RAMADDA data repository.
More information is available [here](#).

Links:

- Top
- Search
- Repositories
- Data Cart
- Login
- Help

Links:

- Case Studies 2008/04/28 21:12
- Data 2008/12/18 15:06
- IDV Community Resources 2008/12/18 15:12
- Projects 2009/01/22 17:29
 - GLOBE 2009/03/18 21:27
 - GALEON 2009/02/05 21:34
 - NACP 2009/02/02 17:09
 - Antarctic IDD 2009/01/29 21:47
 - Miscellaneous 2009/02/23 21:08
 - Satellite Imagery 2009/02/23 21:06
 - AMPS Model Output 2009/02/23 21:04
 - Africa Initiative 2009/01/23 14:39
 - RAMADDA Examples 2009/04/22 15:07
 - Unidata 2008/12/18 11:36

<http://motherlode.ucar.edu/repository>



Unidata

RAMADDA

Data products filed by the LDM are cataloged by RAMADDA & TDS to include appropriate metadata

The screenshot shows a web browser window with the following content:

- Browser Title Bar:** Unidata's RAMADDA Data Repository - Entry Top > Projects > Antarctic IDD > AMPS Model Output > D3 > 20090516 > AMPS_D...
- Address Bar:** <http://motherlode.ucar.edu/repository/entry/show/Top/Projects/Anta>
- Page Title:** Unidata's RAMADDA Data Repository - Entry
- Navigation:** File | Edit | View
- Breadcrumbs:** Top > Projects > Antarctic IDD > AMPS Model Output > D3 > 20090516
- File Name:** AMPS_D3_20090516_0000.grib1
- Information Section:**
 - Created by:** localuser @ 2009-05-16 07:00:59 GMT
 - Resource:** D3_20090516_0000.grib1 138755304 bytes
 - Type:** File
- Left Sidebar (Links):**
 - Top
 - Search
 - Repositories
 - Data Cart
 - Login
 - Help
- Status Bar:** Done

<http://motherlode.ucar.edu/repository/entry/show/Top/Projects/Antarctic+ID>



Unidata

RAMADDA

A variety of data views are provided

The screenshot displays the Unidata's RAMADDA Data Repository interface. The browser address bar shows the URL: http://motherlode.ucar.edu/repository/entry/show/Top/Projects/Antarctic+IDD/Miscellaneous/AMRC/AWS/Text/McMurdo/McMurdo_20090523_19.txt. The page title is "Unidata's RAMADDA Data Repository - Text".

The interface includes a navigation menu on the left with options like "Top", "Search", "Repositories", "Data Cart", "Login", and "Help". A central menu offers various data views: "Entry", "Annotated Text", "Word Cloud", "Chat", "Catalog", "Dif-XML", "Dif-Text", "RSS Feed", "Graph", "View Previous Entry", and "View Next Entry".

The main content area displays a table of data with columns: TIME, ALT, SPD, DIR, MOD, TYPE, HMS, DAY, and GSID. The table contains 57 rows of data, starting with:

TIME	ALT	SPD	DIR	MOD	TYPE	HMS	DAY	GSID					
1	19 7350	-77.5800	-158.3200	1720.0	-35.5	66.0	795.3	7.1	190.0	0	19:00:00	2009143	McM
2	19 8928	-82.4860	174.5530	38.0	-44.5	444.0	975.7	2.0	180.0	0	19:10:13	2009143	McM
3	19 7350	-77.5800	-158.3200	1720.0	-35.5	66.0	972.3	12.8	290.0	0	19:00:00	2009143	McM
4	19 1593	-77.5800	-158.3200	1720.0	-35.5	66.0	993.2	9.9	285.8	0	18:20:35	2009143	McM
5	19 890	-77.5800	-158.3200	1720.0	-35.5	66.0	973.8	0.0	283.1	0	19:10:09	2009143	McM
6	19 898	-77.5800	-158.3200	1720.0	-35.5	66.0	701.9	3.7	222.2	0	19:10:10	2009143	McM
7	19 2005	-77.5800	-158.3200	1720.0	-35.5	66.0	676.5	12.8	254.1	0	19:13:33	2009143	McM
8	19 28339	-77.7470	-161.5160	1580.0	-35.5	66.0	790.9	4.3	77.2	0	18:20:00	2009143	McM
9	19 7350	-77.5800	-158.3200	1720.0	-35.5	66.0	795.3	7.1	190.0	0	19:00:00	2009143	McM
10	19 8928	-82.4860	174.5530	38.0	-44.5	444.0	975.7	2.0	180.0	0	19:10:13	2009143	McM
11	19 30477	-77.8660	-166.9830	14.0	-35.9	65.5	444.0	2.9	27.2	0	19:10:00	2009143	McM
12	19 21360	-77.5170	-170.8010	37.0	-32.8	76.4	978.2	9.0	210.9	0	19:07:14	2009143	McM
13	19 8906	-77.4390	-163.7540	108.0	-24.4	444.0	971.4	2.2	271.4	0	19:10:51	2009143	McM
14	19 8911	-79.9220	178.5860	54.0	-46.1	444.0	969.9	5.6	263.4	0	19:04:09	2009143	McM
15	19 8989	-75.1210	-123.3740	3250.0	-59.9	444.0	644.7	1.8	198.3	0	19:07:20	2009143	McM
16	19 26754	-76.4180	-77.0300	2824.0	-45.9	34.0	682.0	0.0	48.0	0	19:14:13	2009143	McM
17	19 8929	-77.8600	-170.8190	46.0	-33.1	83.5	976.9	6.9	199.1	0	19:07:39	2009143	McM
18	19 2316	-80.7900	-124.4340	2884.0	444.0	444.0	444.0	444.0	444.0	0	19:14:21	2009143	McM
19	19 8982	-77.7230	-167.6920	40.0	-27.0	75.5	929.1	1.1	24.0	0	19:10:00	2009143	McM
20	19 24427	-66.7290	-112.8350	1366.0	-30.2	70.0	444.0	0.0	42.0	0	19:14:25	2009143	McM
21	19 7355	-73.6300	-160.6500	1900.0	-46.9	49.0	756.3	9.7	320.0	0	18:00:00	2009143	McM
22	19 8912	-68.9120	-134.6550	444.0	-47.4	54.6	720.4	4.9	156.1	0	19:11:10	2009143	McM
23	19 8695	-78.5010	-177.7530	50.0	-43.5	64.1	974.6	1.0	213.8	0	19:04:25	2009143	McM
24	19 24860	-66.5820	-110.6940	63.0	-34.0	84.0	444.0	11.6	138.0	0	19:14:33	2009143	McM
25	19 7352	-74.2500	-163.1700	640.0	-33.3	13.0	871.1	444.0	340.0	0	18:00:00	2009143	McM
26	19 30580	-67.8776	-154.2750	444.0	-33.2	90.4	982.5	6.8	90.9	0	18:20:22	2009143	McM
27	19 8984	-71.8910	-171.2100	30.0	-22.8	444.0	969.5	0.0	358.6	0	19:08:38	2009143	McM
28	19 2769	-80.7750	-124.5260	2881.0	-54.3	444.0	678.6	14.3	193.5	0	19:15:25	2009143	McM
29	19 8697	-81.5040	-163.9400	45.0	-35.2	72.5	974.5	4.7	312.2	0	19:08:34	2009143	McM
30	19 30393	-77.5330	-160.2710	1922.0	-37.5	52.0	752.8	18.1	209.7	0	19:10:00	2009143	McM
31	19 8947	-67.3970	-138.7260	1550.0	-33.4	444.0	815.1	14.8	203.9	0	19:05:19	2009143	McM
32	19 26407	-80.3680	-77.3740	4093.0	-52.9	26.0	574.2	0.0	120.0	0	19:15:45	2009143	McM
33	19 7351	-73.5800	-166.6200	160.0	-27.6	66.0	964.4	1.0	250.0	0	19:00:00	2009143	McM
34	19 8923	-77.9520	-166.5000	8.0	-35.2	444.0	942.8	0.0	101.4	0	19:09:04	2009143	McM
35	19 24078	-65.5120	-113.0670	519.0	-15.6	75.0	444.0	0.0	42.0	0	19:15:53	2009143	McM
36	19 21356	-78.2500	-170.0000	45.0	-30.9	444.0	976.8	6.4	223.6	0	19:05:47	2009143	McM
37	19 8939	-78.5540	-166.6910	895.0	-30.4	68.1	870.5	9.7	198.3	0	19:05:53	2009143	McM
38	19 7354	-74.7200	-164.0300	210.0	-24.4	69.0	949.3	16.8	300.0	0	19:00:00	2009143	McM
39	19 1180	-70.8920	-69.8720	84.0	-26.5	82.0	444.0	0.0	0.0	0	19:16:14	2009143	McM
40	19 8980	-78.4880	-173.1340	52.0	-38.1	64.0	978.7	2.1	208.8	0	19:10:00	2009143	McM
41	19 8983	-79.3050	-162.9850	58.0	-28.9	55.0	979.4	3.7	310.5	0	19:10:00	2009143	McM
42	19 8900	-83.0030	121.3930	945.0	-18.9	93.8	855.7	12.7	25.3	0	19:12:59	2009143	McM
43	19 21361	-82.6070	137.0780	519.0	-41.6	85.0	902.1	3.6	5.6	0	19:12:58	2009143	McM
44	19 20655	-83.8600	-129.6100	2813.0	-38.6	444.0	678.6	14.3	251.3	0	19:15:25	2009143	McM
45	19 7353	-74.7000	-164.1000	90.0	-24.2	31.0	972.2	12.8	290.0	0	19:00:00	2009143	McM
46	19 7356	-74.1300	-163.4300	1700.0	-30.1	27.0	785.6	8.7	210.0	0	19:00:00	2009143	McM
47	19 8931	-83.8890	134.1540	525.0	-24.2	59.0	904.6	9.8	57.7	0	19:06:22	2009143	McM
48	19 15930	-66.0325	-107.9940	444.0	-9.1	90.8	993.0	9.1	281.1	0	19:00:35	2009143	McM
49	19 8927	-81.2010	126.1770	959.0	-34.5	444.0	851.1	17.5	5.6	0	19:13:18	2009143	McM
50	19 21362	-78.4510	-168.3940	43.0	-26.0	85.2	977.0	10.5	218.0	0	19:13:21	2009143	McM
51	19 8905	-74.9460	-163.6870	78.0	-26.4	37.2	973.8	0.0	283.1	0	19:10:07	2009143	McM
52	19 30374	-66.7100	-139.8300	243.0	-20.0	46.7	966.2	4.9	213.8	0	19:00:00	2009143	McM
53	19 8913	-79.8670	-170.1420	54.0	-40.9	64.7	974.6	5.8	247.9	0	19:06:50	2009143	McM
54	19 8985	-89.0110	1.0250	2755.0	-56.6	40.1	694.8	5.8	15.0	0	19:06:51	2009143	McM
55	19 28339	-77.7470	-161.5160	1580.0	-35.6	41.7	791.1	7.3	47.8	0	19:00:00	2009143	McM
56	19 7350	-73.5800	-158.3200	1720.0	-35.5	66.0	795.3	7.1	190.0	0	19:00:00	2009143	McM
57	19 28336	-78.0931	178.4653	444.0	-44.2	58.7	923.0	1.7	223.3	0	18:43:13	2009143	McM

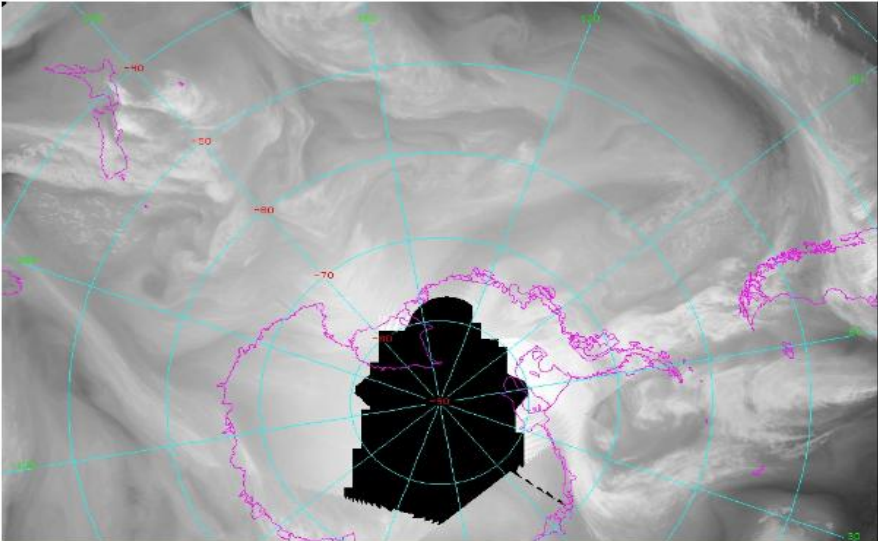


Unidata

RAMADDA

Browse is provided for a variety of data types including model output, satellite imagery, observations, etc.

The screenshot displays a web browser window with the URL <http://motherlode.ucar.edu/repository/entry/show/Top/Projects/Anta>. The page title is "Unidata's RAMADDA Data Repository - Entry". The breadcrumb navigation path is "Top > Projects > Antarctic IDD > Miscellaneous > AMRC > Satpics > WV". The main content area shows a file named "WV_20090516_0600.jpg" with the following information:

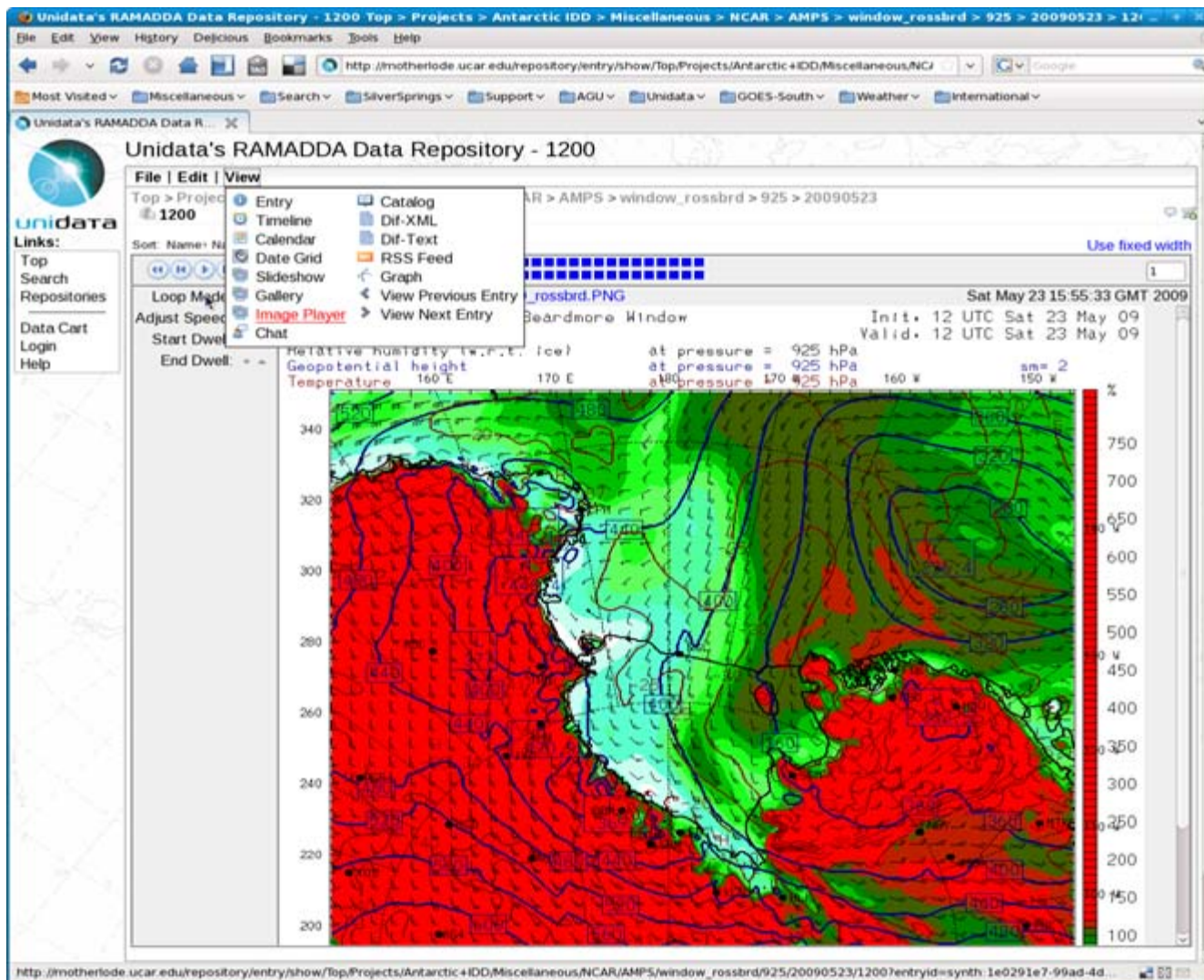
- Created by:** localuser @ 2009-05-16 08:56:24 GMT
- Resource:** 20090516_0600.jpg 1464408 bytes
- Type:** File
- Image:** 

The satellite image shows the continent of Antarctica in black, surrounded by a grid of latitude and longitude lines. Overlaid on the image are several magenta tracks, likely representing satellite observations or model output. The tracks are concentrated around the continent and extend into the surrounding ocean. The browser window also shows a sidebar with navigation links: Top, Search, Repositories, Data Cart, Login, and Help.

<http://motherlode.ucar.edu/repository/entry/show/Top/Projects/Antarctic+IDD>



A variety of data views are provided





Unidata

IDV

Integrated Data Viewer

- A Java based software framework for analyzing and visualizing geoscience data
- Provides the ability to display and work with:
 - ▣ satellite imagery
 - ▣ gridded model output
 - ▣ surface, upper-air, wind profiler, lightning, etc. observations
 - ▣ radar data
 - ▣ and much more ...
- Can create a variety of displays:
 - ▣ 2-D horizontal contours and color-filled contours
 - ▣ 3-D iso-surfaces
 - ▣ vertical cross sections
 - ▣ interactive data probing
 - ▣ and much more...
- McIDAS-V based on IDV

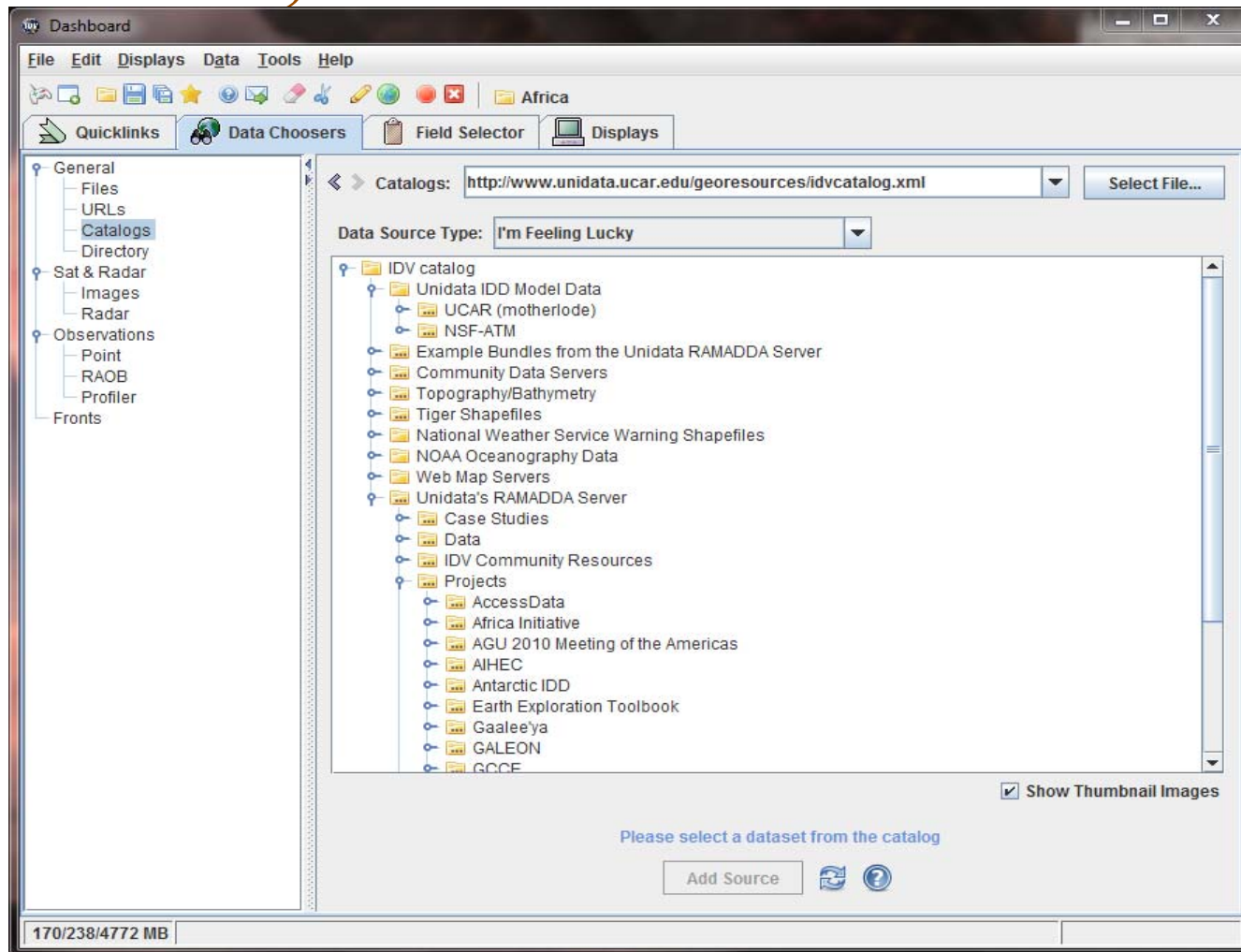




Unidata

IDV

IDV/McV can access remote-held data using RAMADDA, TDS and McIDAS ADDE services



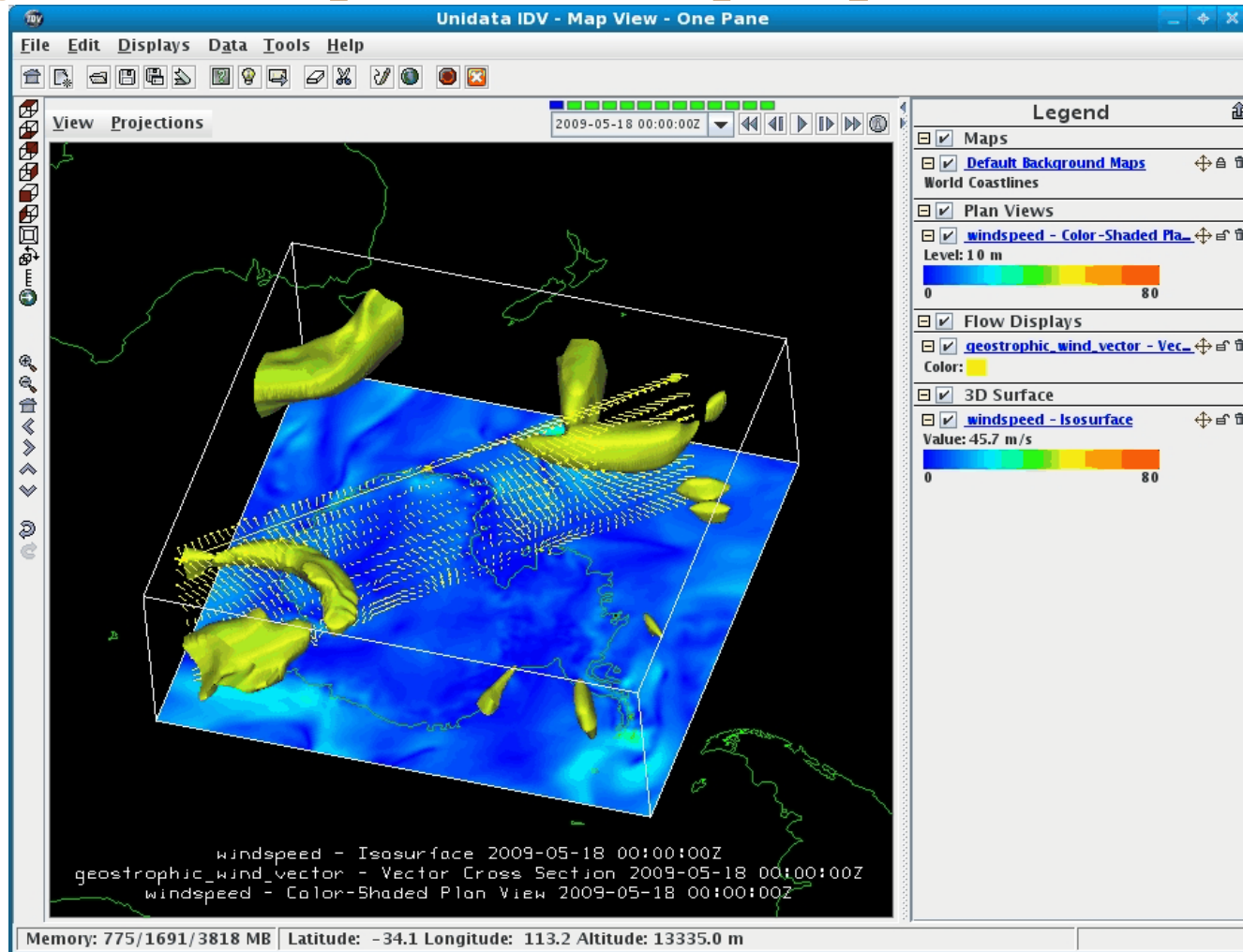
<http://www.unidata.ucar.edu/software/idv>



Unidata

IDV

IDV/McV analysis/visualization of RAMADDA data holdings makes exploration simple, quick and transparent



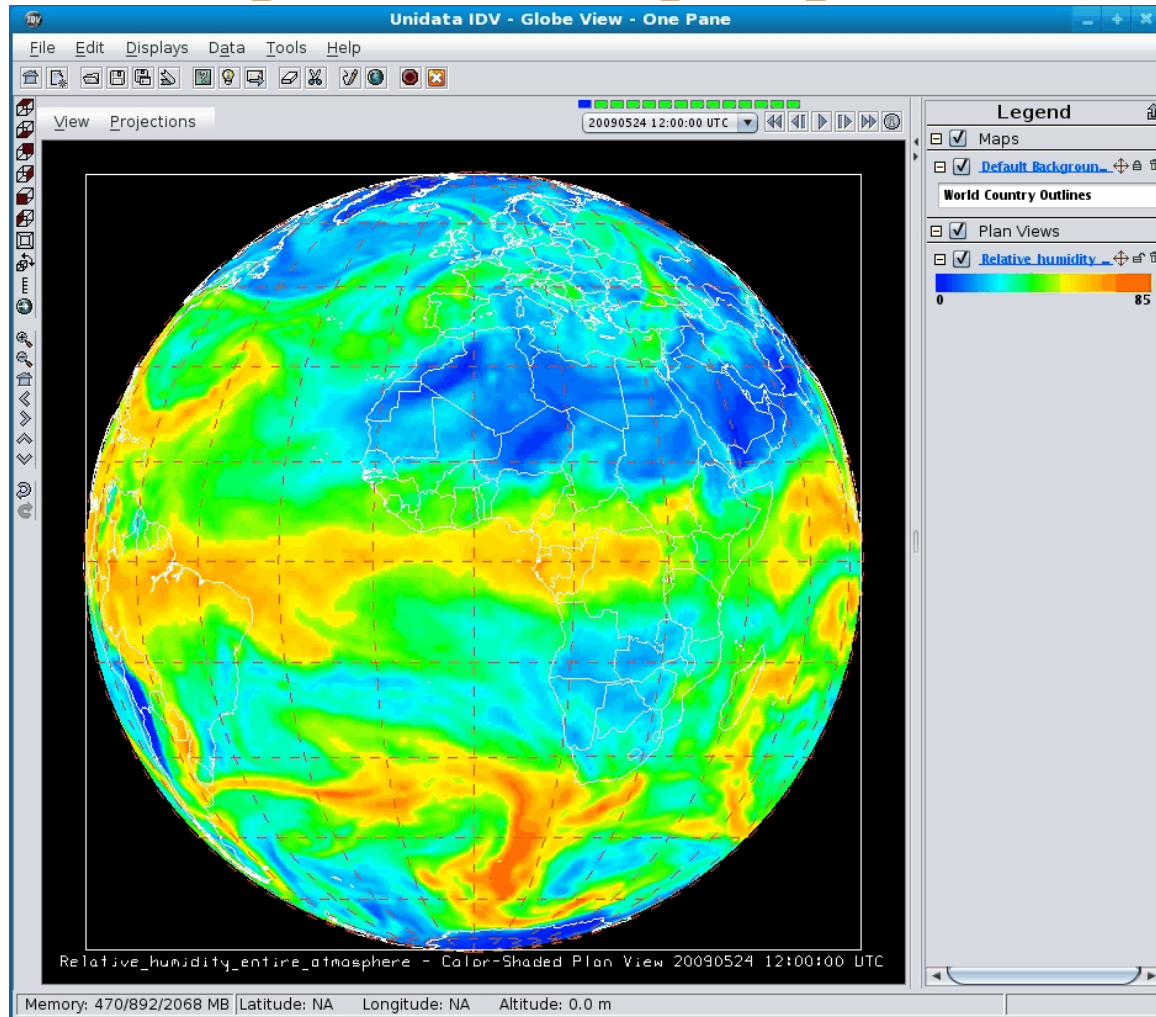
<http://www.unidata.ucar.edu/software/idv>



Unidata

IDV

IDV/McV analysis/visualization of RAMADDA data holdings makes exploration simple, quick and transparent



<http://www.unidata.ucar.edu/software/idv>



Unidata

IDV

IDV/McV can publish data/displays on a RAMADDA server

The screenshot displays the Unidata IDV software interface. The main window, titled "Unidata IDV - Map View - One Pane", shows a 3D visualization of wind speed over Antarctica. The wind speed is represented by a color scale from 0 to 80 m/s, with a value of 40 m/s indicated. The visualization is overlaid on a map of Antarctica. The interface includes a menu bar (File, Edit, Displays, Data, Tools, Help), a toolbar, and a legend panel on the right. The legend panel shows the following settings:

- Maps: Maps
- Default Background Maps: Default Background Maps
- World Political Very Hi-Res: World Political Very Hi-Res
- World Outlines Very High Resolution: World Outlines Very High Resolution
- 3D Surface: 3D Surface
- windspeed - Isosurface: windspeed - Isosurface

The "Publish to RAMADDA" dialog box is open, showing the following fields and options:

- File: antarctic-idd_wind_speeds.jpg Publish bundle and attach image Save as zidv file
- Name: antarctic-idd_wind_speeds
- Description: 3D view of 40 m/s winds over Antarctica on 20090523.1200
- Tags: Antarctic-IDD, 3D, Assignment #3 (optional)
- Parent Group: IDV Contributions Area
- Date Range: May 23, 2009 12:00 GMT May 23, 2009 12:00 GMT
- Lat/Lon Box: -5.3 358.1 -15.0 -77.5
- Make associations to: Top/Projects/Antarctic IDD/AMPS Model Output/D2/20090523 AMPS_D2_20090523_1200.grib1

At the bottom of the dialog box are "OK" and "Cancel" buttons. The status bar at the bottom of the main window shows: Memory: 174/240/1553 MB Latitude: -43.7 Longitude: -153.8 Altitude:

<http://www.unidata.ucar.edu/software/idv>



Unidata

Contact Information

Tom Yoksas	yoksas@unidata.ucar.edu
John Caron	jcaron@unidata.ucar.edu
Ethan Davis	edavis@unidata.ucar.edu
Jeff McWhirter	jeffmc@unavco.org
Matthew Lazzara	mattl@ssec.wisc.edu

<http://www.unidata.ucar.edu>
<http://www.unidata.ucar.edu/software>
<http://motherlode.ucar.edu/repository>