



Unidata Python Workshop

Overview

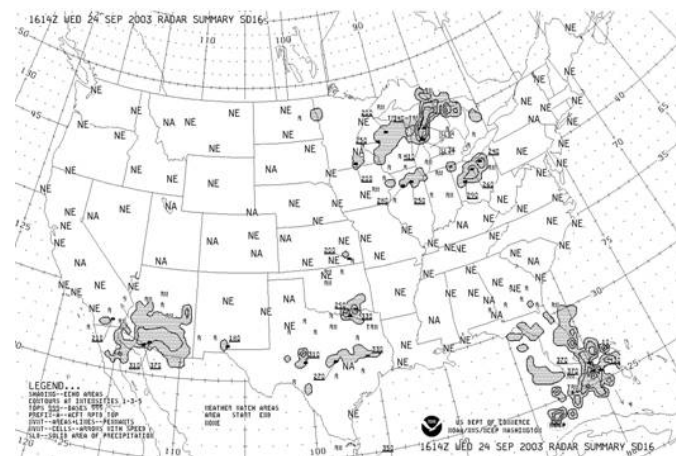
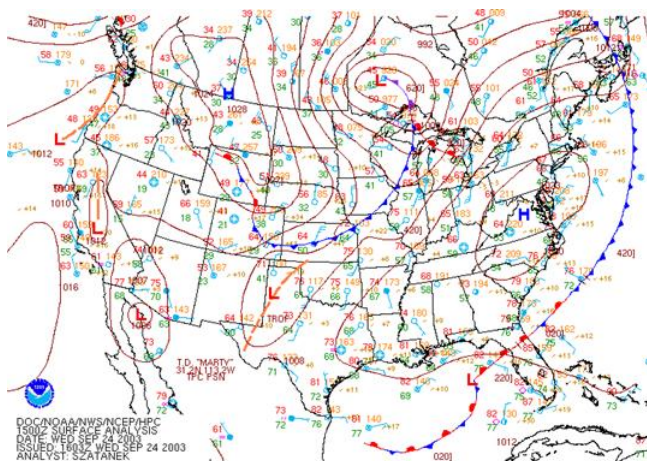
(Unidata, python)

20 July 2015



Unidata: Core Activities

- Facilitate access to (real-time) data by the University research and education community
- Support the community in their use of the data
- Help build, represent, and advocate on behalf of the community





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- Support the community in their use of the data
- Help build, represent, and advocate on behalf of the community
- Develop open source tools and infrastructure for data access, analysis, visualization, and data management
- Advance metadata standards for the earth science community
- Support users of our technologies



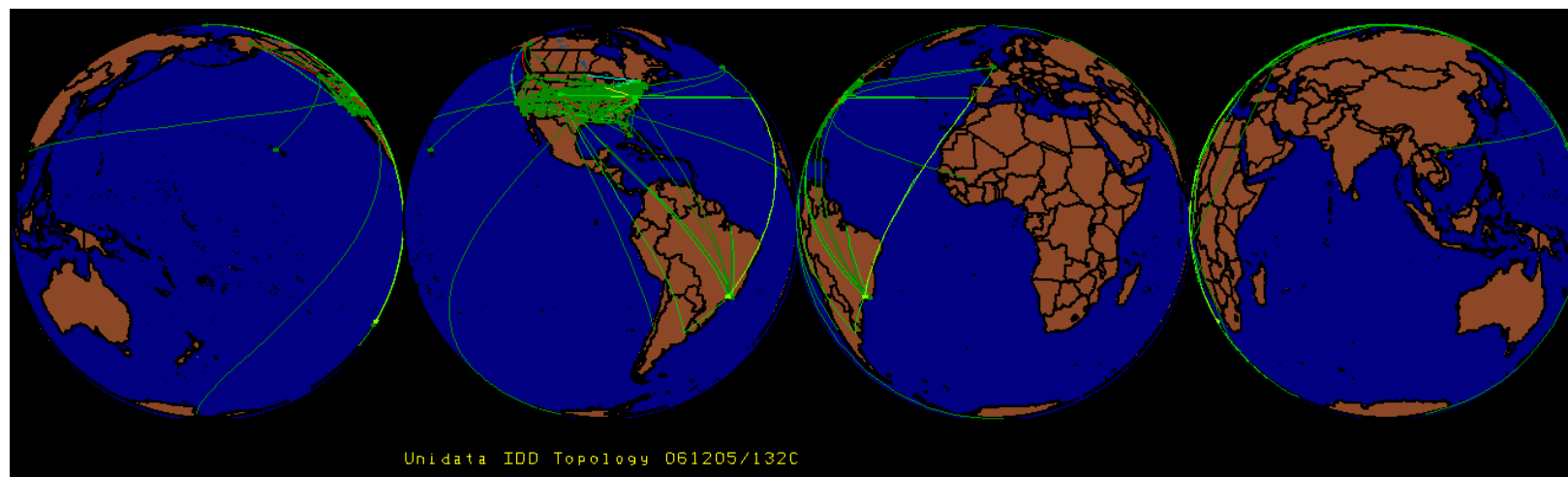
Unidata – What we provide

- Real-time data streams over IDD/LDM
 - Radar, satellite, model forecasts, station, etc.
- Visualization and analysis packages
 - IDV, GEMPAK, McIDAS, AWIPS-II
- Rolling archive of real-time data
 - thredds.ucar.edu
- NetCDF data format and libraries



Unidata: Facilitate access to real-time data

IDD: Real-Time Data Distribution



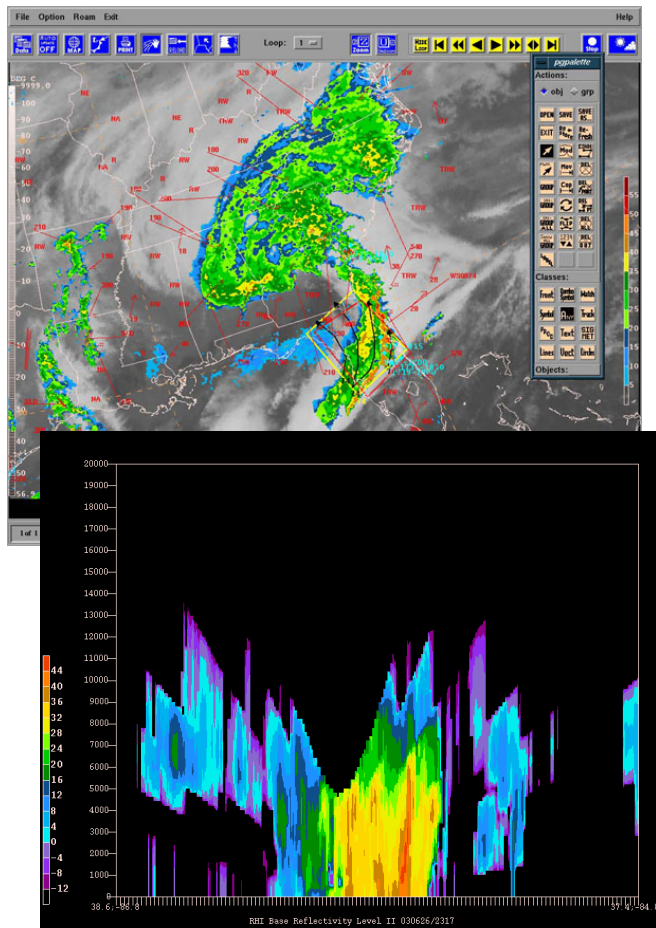
Over 200 sites. Approx 15 GB/hour

Unidata's LDM

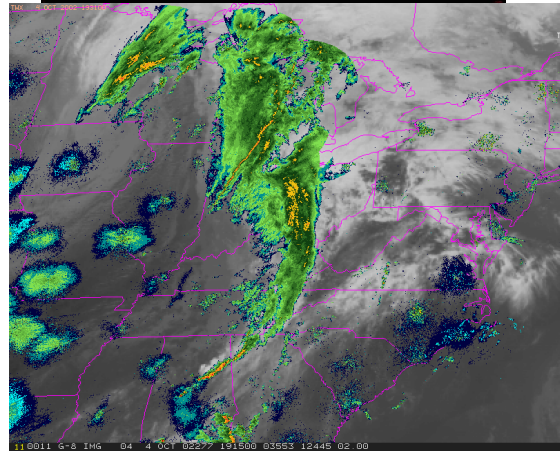
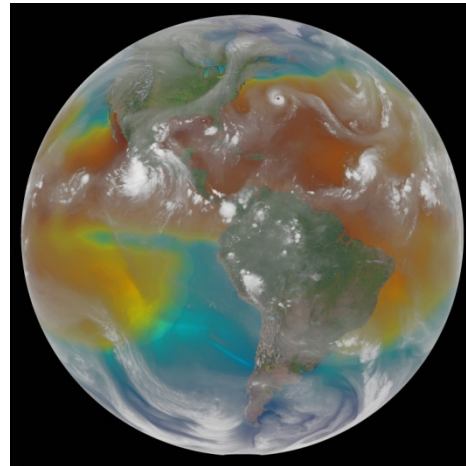
- Protocol and client/server software
- Event-driven data distribution
- Supports subscription to subsets of data feeds

Visualizing and Analyzing Data

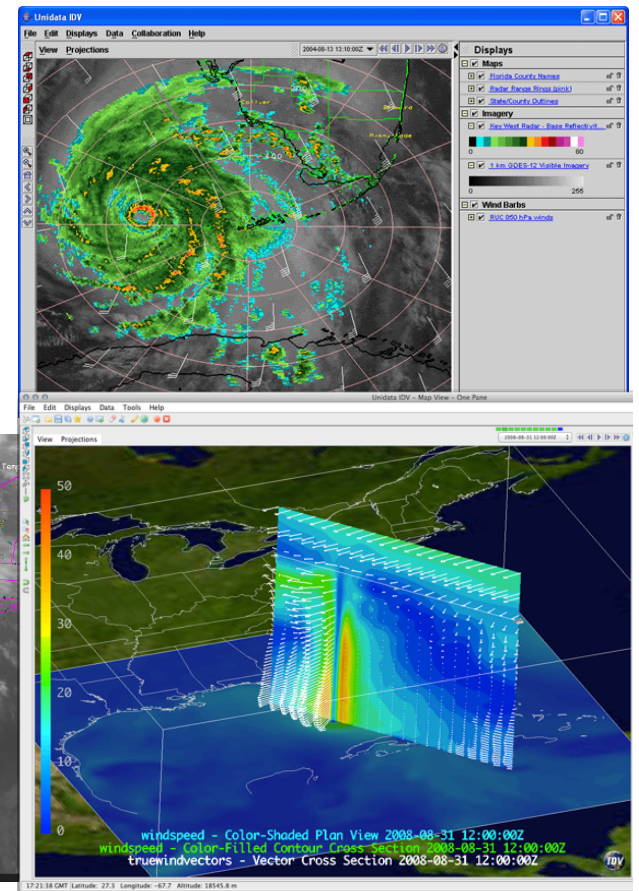
GEMPAK



McIDAS-X



IDV





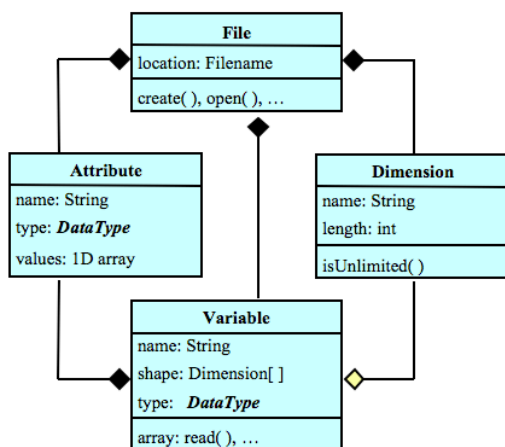
Access to Real-time Data

- Unidata TDS: thredds.ucar.edu
 - Serves the last month or so of IDD/LDM data streams
 - Services:
 - OPeNDAP
 - NCSS
 - OGC WCS and WMS
- Unidata ADDE server: adde.ucar.edu
 - Service: McIDAS ADDE

netCDF

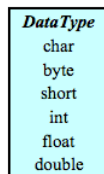
- Array-oriented scientific data:
 - Interface for access (C, Fortran, Java, etc.)
 - Machine-independent encoding format
 - Reference libraries (C and Java)

NetCDF Class Data Model

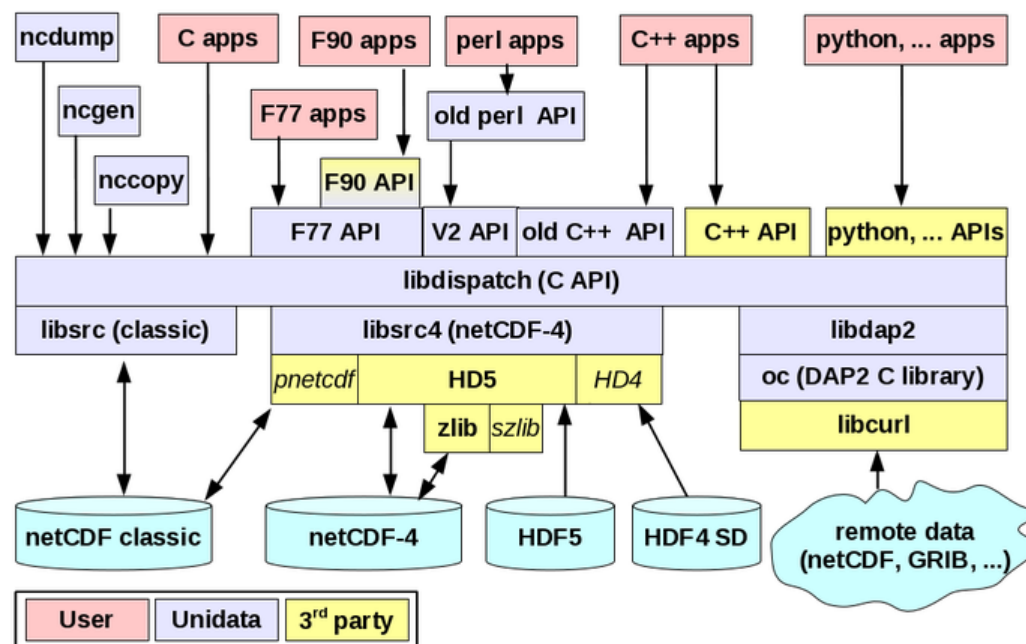


A file has named variables, dimensions, and attributes. Variables also have attributes. Variables may share dimensions, indicating a common grid. One dimension may be of unlimited length.

Variables and attributes have one of six primitive data types.



NetCDF Library Architecture



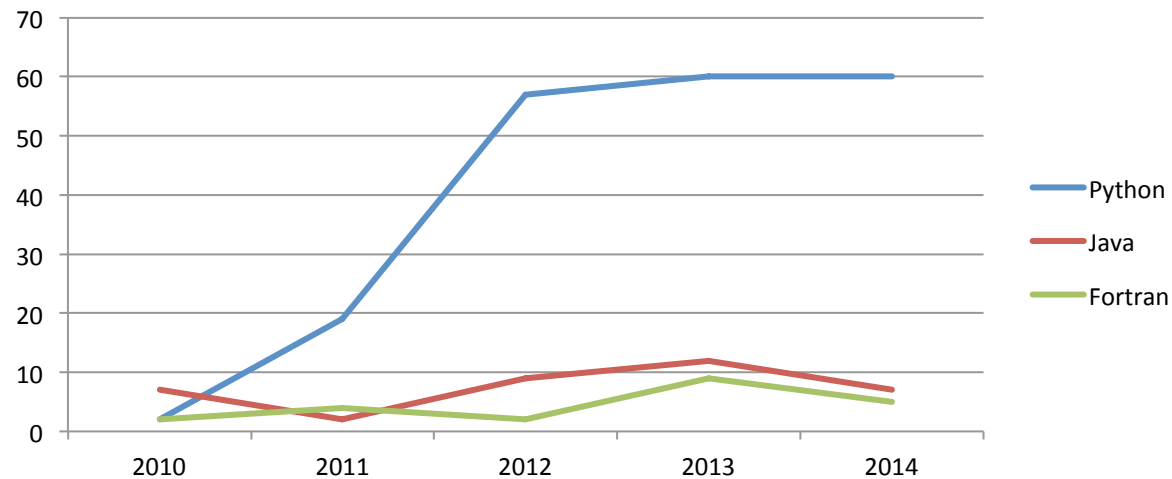


Unidata User Community

- Support the community
 - User Workshops
 - Training Workshops
 - Mailing lists
 - For specific software packages
 - “community” email list – for Unidata community announcements
- Represent and advocate for the community
- More: <http://www.unidata.ucar.edu/>

Why Unidata and Python?

- Embraced by the earth science community
 - Language popularity measured by search hits on [AMS web site](#)



- Requests from Unidata community for Python support

What is Python?

- General purpose, high-level language invented by Guido van Rossum.
- Multiple paradigms
 - scripting
 - object-oriented
 - imperative
 - functional
- "Python is executable pseudocode"





Unidata and Python

"I have used a combination of Perl, Fortran, NCL, Matlab, R and others for routine research, but found out this general-purpose language, Python, can handle almost all in an efficient way from requesting data from remote online sites to statistics, graphics." - UCAR Scientist

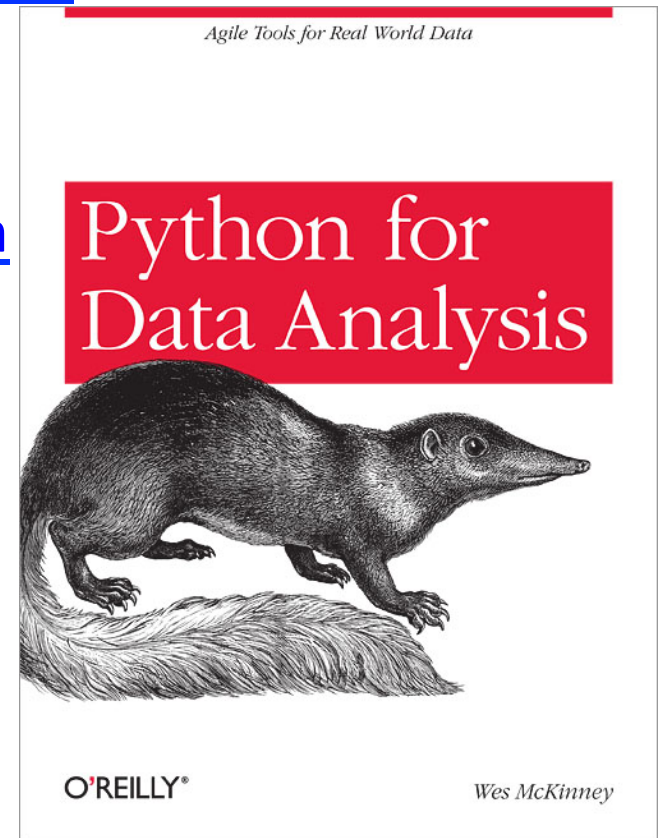
- Avenue for exploring, and leveraging netCDF and THREDDS Data Server technologies.
- Embraced by earth science community for analysis and exploration (see table).
- Publication quality graphics and visualization which are improving all the time.

Python Editor

- Today, we will be using the jupyter notebook. It is good for presentations and sharing finished code. It is not so good for code development. Here are some Python IDEs:
 - [Spyder](#) (Scientific Python Developement EnviRonment)
 - [Emacs jupyter Notebook](#)
 - [Enthought Canopy Editor](#)
 - [Wakari](#), a hosted Python data analysis environment
 - [PyCharm](#)
 - [Python Tools for Visual Studio](#)

Python Background material

- [A Hands-On Introduction to Using Python in the Atmospheric and Oceanic Sciences](#)
- [Lectures on scientific computing with Python](#)
- [Why Python is the Next Wave in Earth Sciences Computing](#)
- [Oceanographic Analysis with Python - Rich Signell](#)
- [Python Scientific Lecture Notes](#)





Where to ask for Help



Tag your questions with python, netcdf, threaded, etc.



Let's Get Started

Today We Will ...

- Software Carpentry for Science
- Jupyter Notebook
- Numpy with matplotlib
- Read and write netCDF files
- Geoscience Visualization with matplotlib and cartopy
- And lots more ...