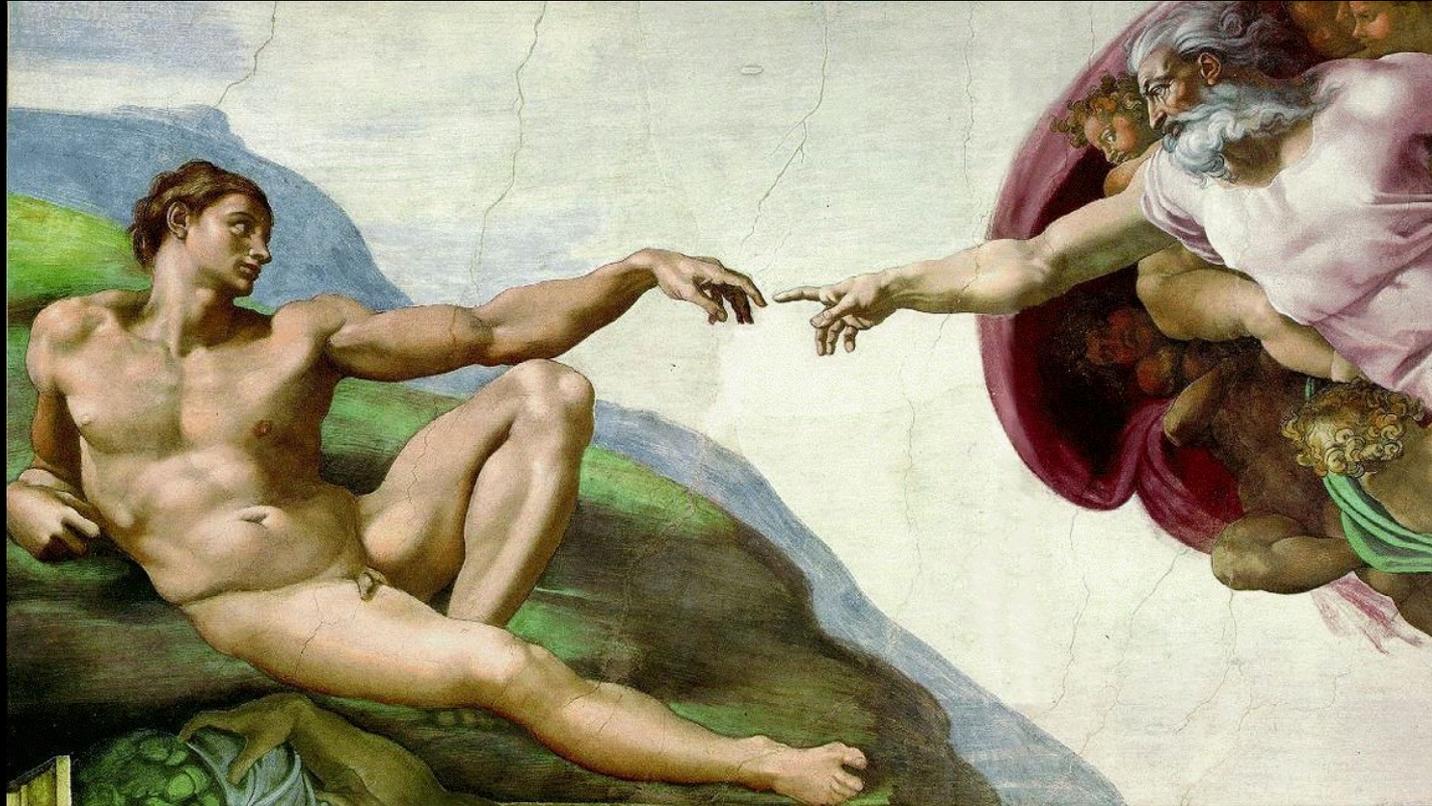


A Plague of Too Much Data? Challenges and Opportunities for Using Authentic Data in the Classroom

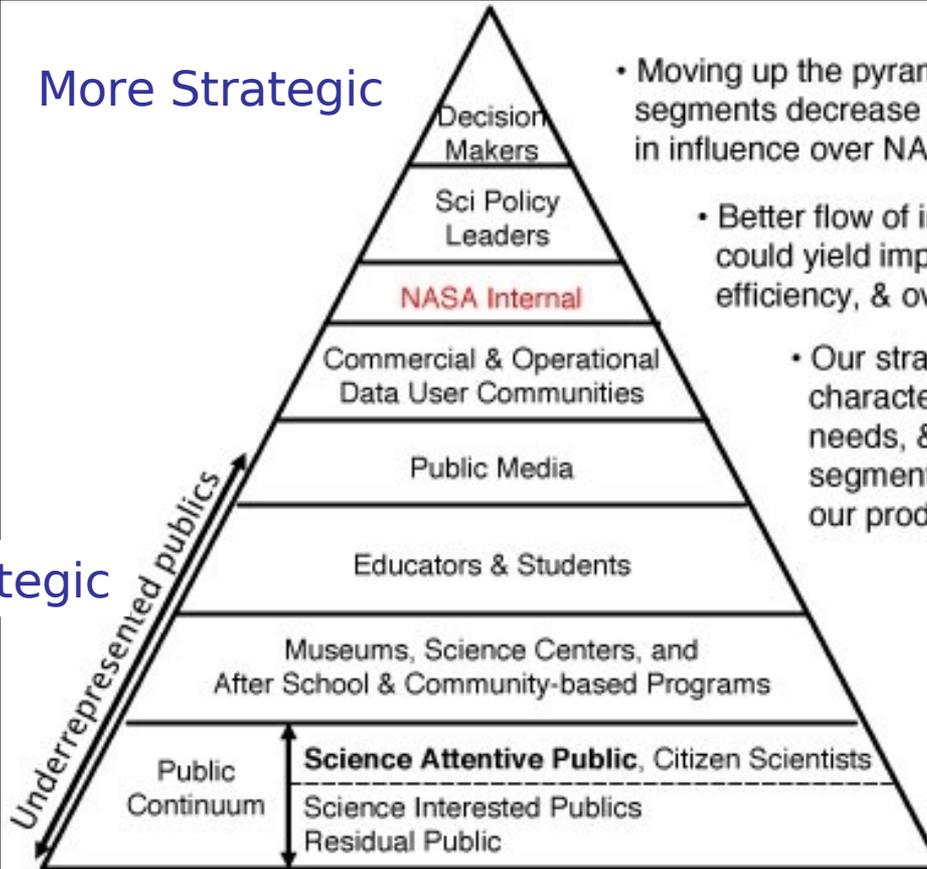


Emily CoBabe-Ammann

Laboratory for Atmospheric and Space Physics, University of Colorado

Data has Lots of Audiences

More Strategic



- Moving up the pyramid, these audience segments decrease in size while increasing in influence over NASA's budget & agenda.
- Better flow of information within NASA could yield improved synergy, efficiency, & overall effectiveness.
- Our strategy should be to characterize the information wants, needs, & expectations of each segment of the public, & then tailor our products/programs accordingly.

- The 'science attentive' public considers itself knowledgeable & willing to participate in policy-relevant discussions. Thus, this is a particularly beneficial audience to target.

From "Why EPO?", a NASA internal report on science education, 2005

Why is Data Important in Science Education?

Data is a critical component for understanding how science works. With it, we can:

- o Design and conduct scientific investigations
- o Understand the quality of data and the role of uncertainty in results
- o Focus on quantitative analysis and reasoning
- o Explore tools for visual representation

Virtual Observatories provide new mechanisms for collecting, manipulating, and aggregating data. They also provide the opportunity for new kinds of student experiences.



Creating the “Real World” Experience

Data can be used to highlight the complexity of natural systems and the importance of an interdisciplinary approach to the natural world.

- o Allows students to explore scenarios where they have to make real decisions regarding and using data.
- o Given an appropriate level of structure and guidance, virtual observatories can be explored by the student in a way that promotes discovery-based learning.

Connecting a student from their backyard to the world



Important Things to Know About Teachers

- 1) The life of a teacher is one of limited time and high expectations. They have very little time to teach anything outside the standards, but almost all data can support those content goals.
- 2) Teachers are not scientists nor necessarily computer savvy.
 - * Complex user interfaces can be a major barrier for utilization.
 - * Offering visualization tools can be a good thing.

What are they looking for? **DATA STORIES!!!**
Prepackaged, refined data that addresses some specific aspect of the science they need to teach



Levels of Support from Science Institutes

- *Provides educational support for the subject, but not necessarily access to 'live' data*
- *Access to 'live' data that is already packaged*
- *Access to 'live' data, using tools especially developed for general audiences*



Educational Support -- Familiar Resources



Eruptions of Mount St. Helens: Past, Present, and Future



IRIS

site map contact

introduction members programs publications earthquakes seismic monitor data

You are here: IRIS > *Programs > Education & Outreach

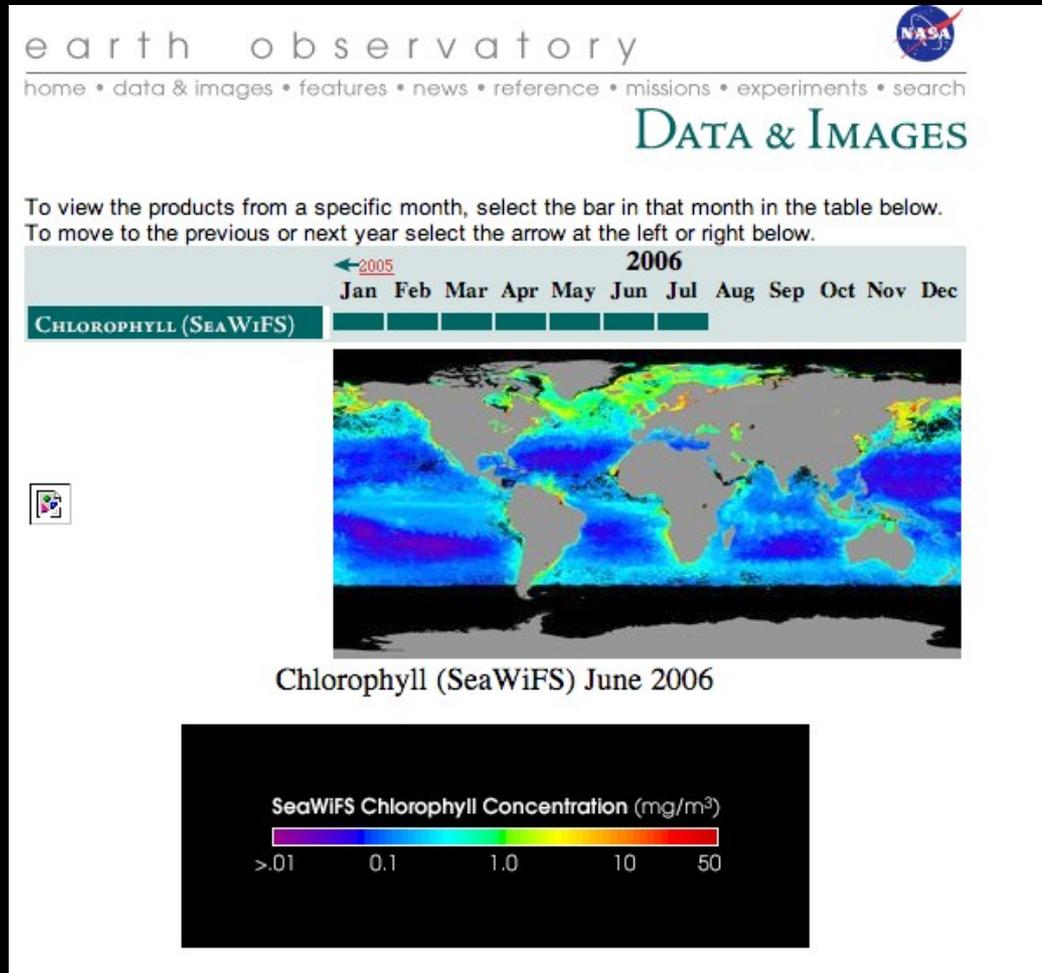
IRIS Education & Outreach

The IRIS Education & Outreach (E&O) program, in collaboration with the seismological and educational communities, develops and implements programs designed to enhance seismology and Earth Science education in K-12 schools, colleges and universities, and in adult education.

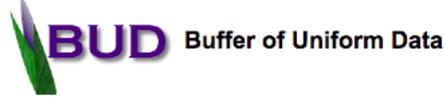
-  Lessons and Resources For Educators
-  Professional Development for Educators
-  School Seismographs
-  IRIS/USGS Museum display
-  Summer Internship Opportunities
-  IRIS/SSA Distinguished Lectureship
-  IRIS Educational Affiliate Membership



Packaged Data



'Live' Data with Full Support



[help](#) || [about BUD](#)

Virtual Net:

Define data filter:

(asterisk is a wildcard)

network:
AK
AR
AT
AU

Deselect networks

Select region: <= LAT <= , <= LON <=

Advanced Options
Selections below will be applied to the filtered data set and

Make a map of: Location Data Latency
(choose one)

Show table of: Data Latency Feed Latency Summarize table

The **show** option allows you to view a table of latency times of the filter summarized by network, station or channel. For more details about this c

or

IRIS

VO DataScope Query

VO Tools and Services

National Virtual Observatory Hosted at NASA/HEASARC

Welcome to the NVO DataScope

If you have comments or suggestions send us [feedback](#).

[Table of recent transients/GRBs](#)

What do we know about a given point or region in the sky?
To find out, just enter a target or position. The NVO DataScope will show you the results from hundreds of resources.

Position:

Use a target name (e.g., 3c273) or position (e.g., 10 10 10.1, 20 20 20.2)

Size: (in degrees, max is 2)

Run query:

Skip cache? Refresh registry?

Do not add to list of recent queries?

Some recent queries:

- mrk 421 (0.25)
- ngc 3690 (0.25)
- 288.83, 11.011 (0.1333)
- 288.83, 11.010 (0.1333)
- 243.00, 55.399 (0.54)

Positions may be entered in decimal (dd.f, sdd.f) or sexagesimal (hh mm ss.f, dd mm ss.f) notation or as targets recognized by SIMBAD.

The **Size** should be entered in decimal degrees.



What do these successful programs have in common?

- They develop an educational context
- They treat educators as a class of users
- They constrain the user interface to limit choices -- *Already knowing what teachers and students are going to ask for...*



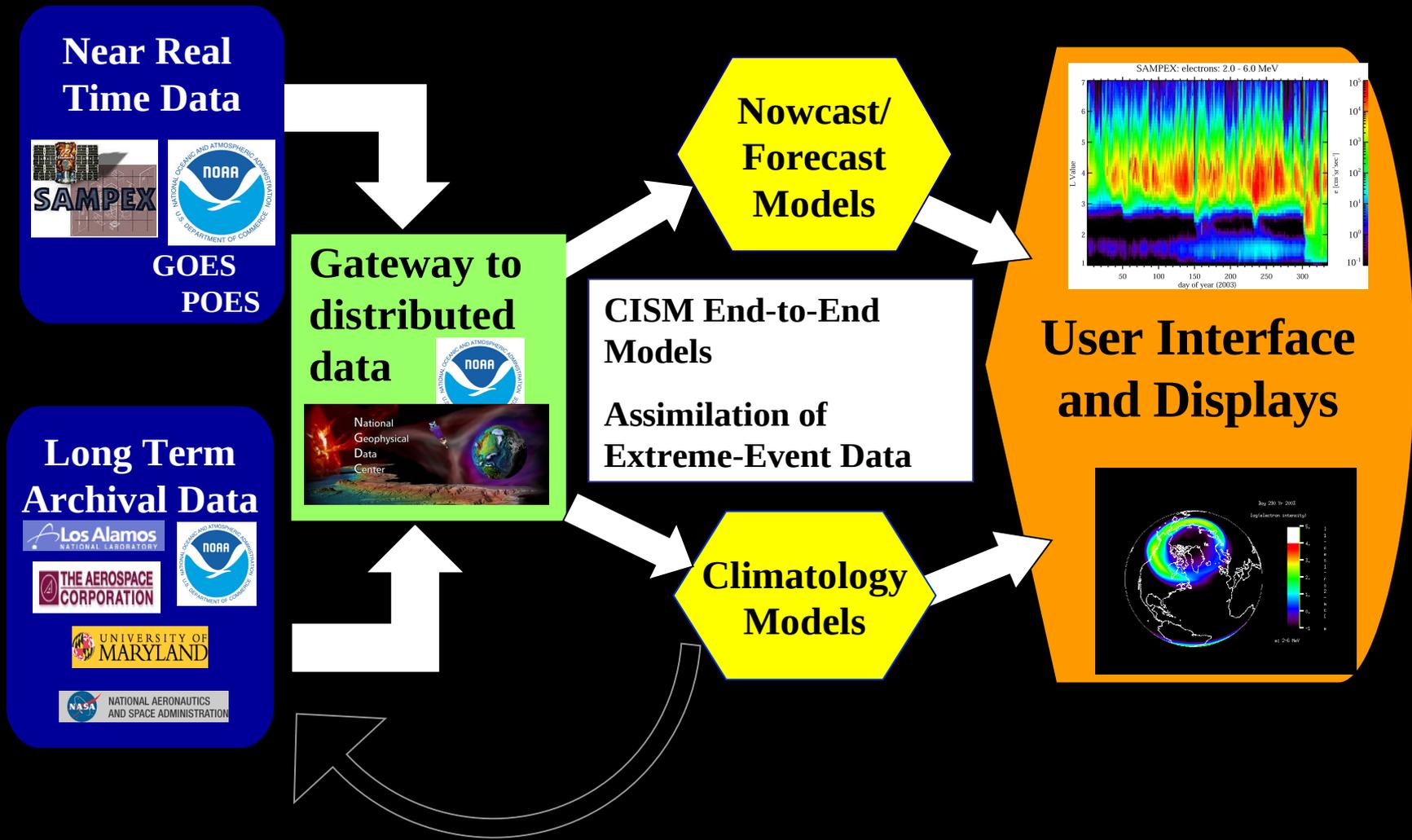
What is a Virtual Observatory?

It's a distributed data system....

- *Access to multiple data sets through a single portal*
- *User interface that takes care of database idiosyncracies*
- *Allows users to interact with wide variety of data seamlessly*
- *Often also involved specialized data tools*



Virtual Radiation Belt Observatory



The Many Flavors of VOs!

No part of the Earth and its Environment Untouched

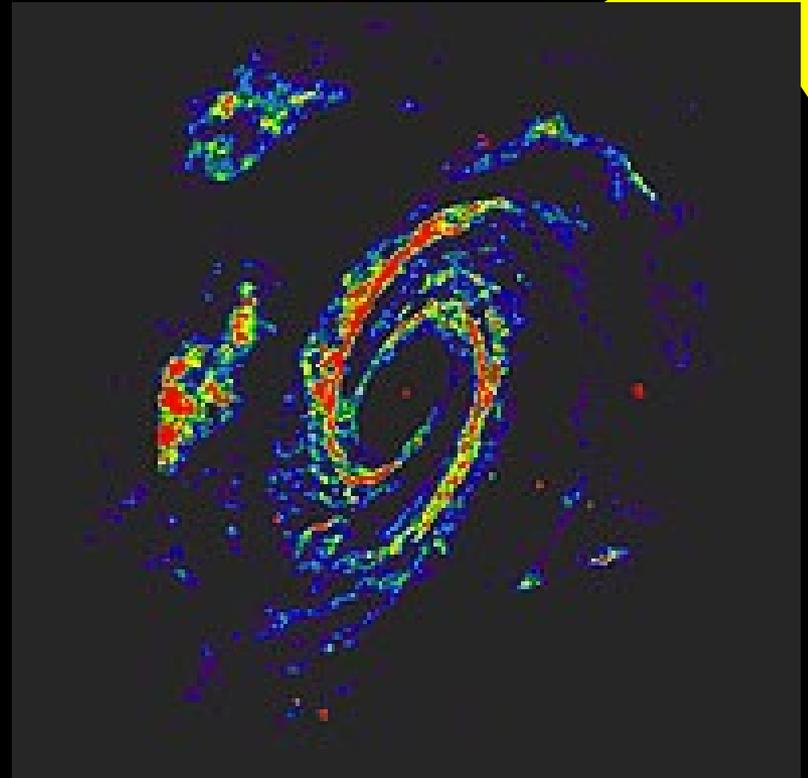
Atmospheres

Oceans

Geology and Hazards

Sun-Earth Connection

Biospheres



Not to mention, our Universe!

The Many Flavors of VOs!

It's not just the subject areas that are wide reaching....It's also about the data....

real time vs. archived

raw data

images

spectral data

time series

You may also have tools
on hand to help....

How you receive the data...

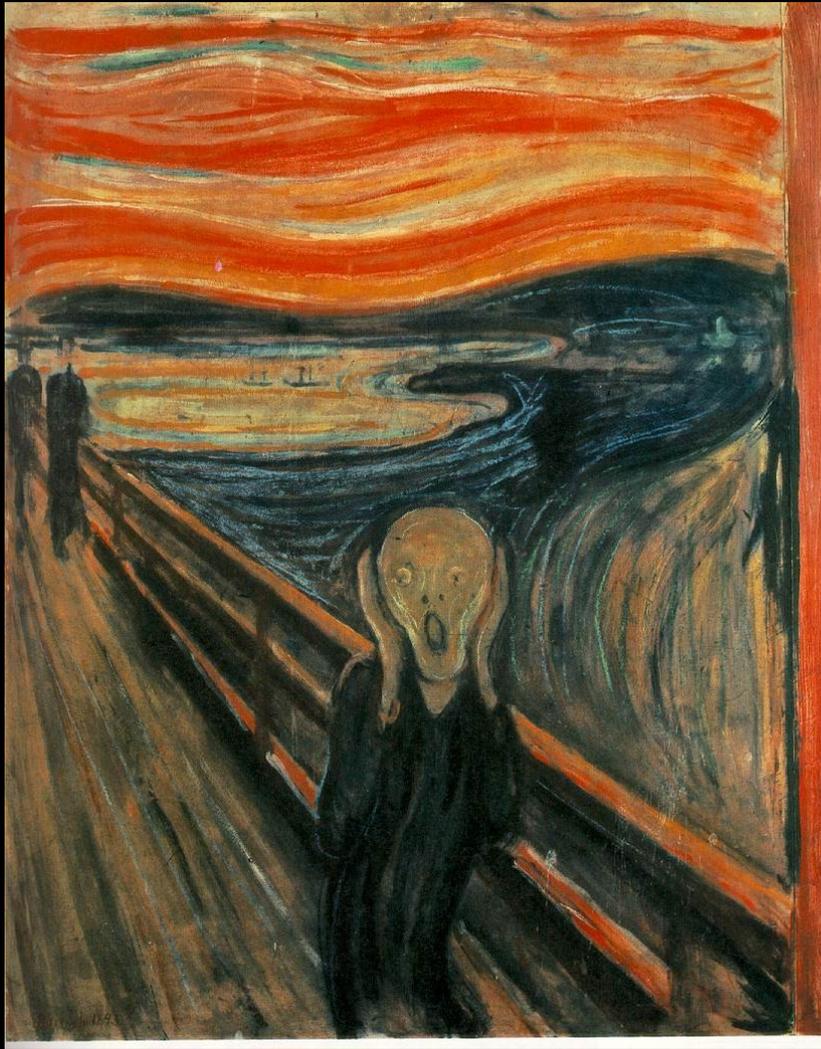
ascii files

excel spreadsheets

fits files

level 2 and 3 data products

Yikes!



So.....

*The data are there,
They are a tremendous
opportunity*

How do you get at it?

This is an Emerging Field...



The best VOs are taking a smart approach:

- Starting with a conversation between educators, scientists and technologists*
- Working to develop the educational context*
- Using teachers and curriculum developers as consultants to inform their architecture*
- Leveraging programs through existing educational channels (NASA, NSF, NSTA...)*

Start by Googling “Virtual Observatory”.

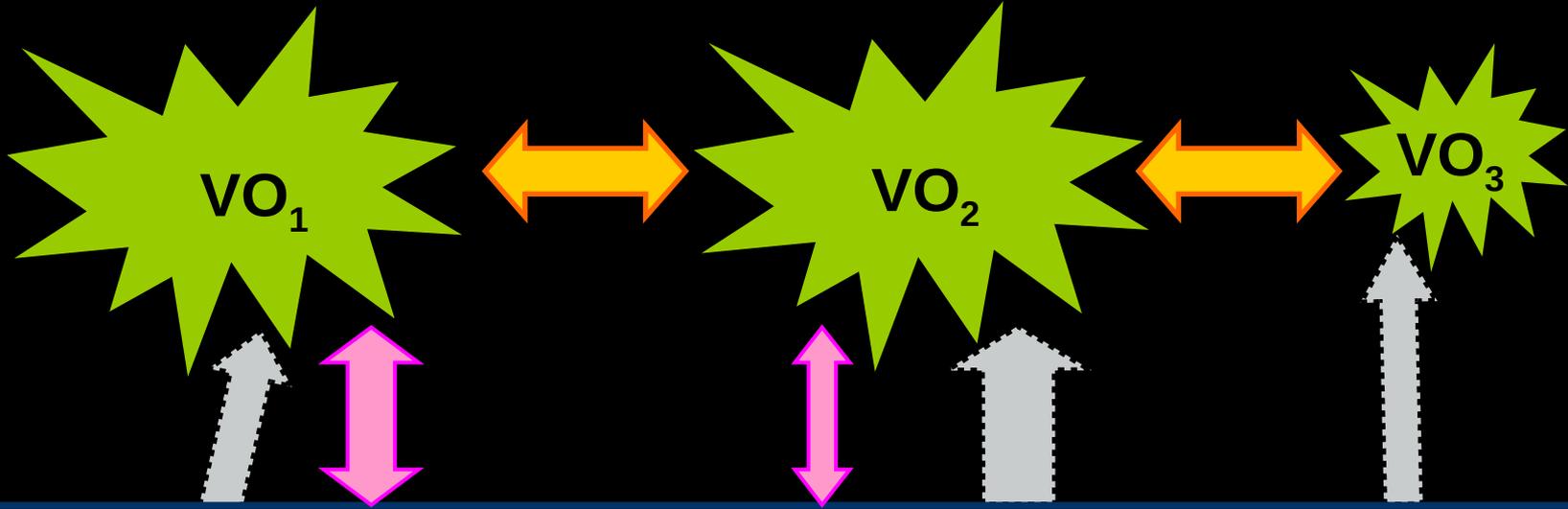
Right now, This is a VO issue....

Virtual Observatories are recognizing the need to look outward, to bring their data to a broader set of audiences.

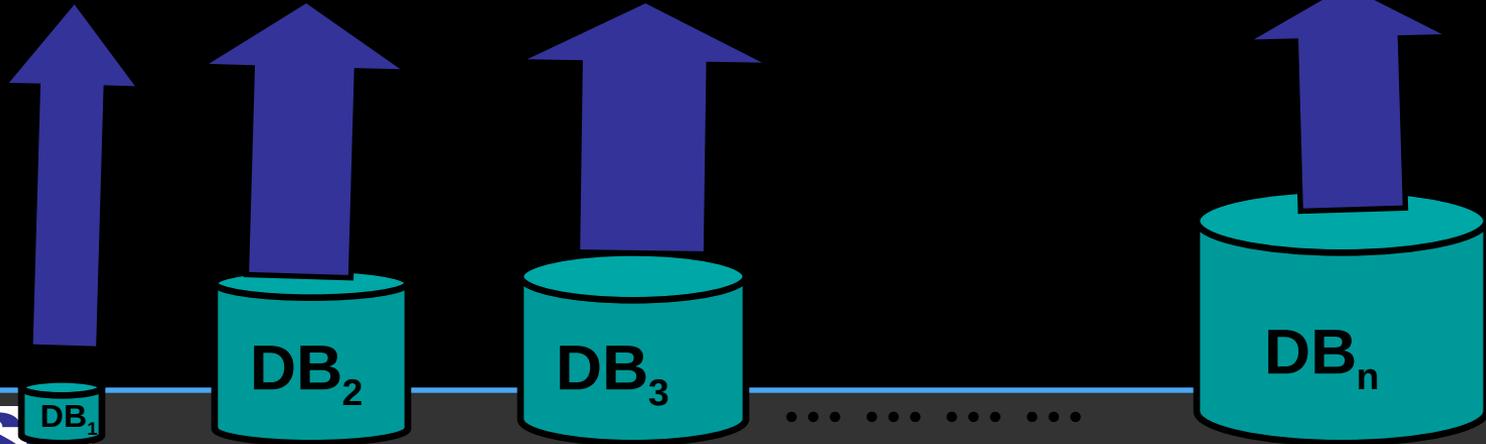
Several are developing a 'non-specialist' use case for the VOs... The framework that will allow them to serve the needs of teachers and students...

Education, clearinghouses, other services, disciplines, etc.

Semantic mediation layer - SWEET, ..



Semantic mediation layer



What is a Non-Specialist Use Case?



Someone should be able to query a virtual observatory without having specialist knowledge

Teacher accesses internet goes to An Educational Virtual Observatory and enters a search for "Aurora".

What should the User Receive?



Teacher receives four groupings of search results:

1) Educational materials:

http://www.meted.ucar.edu/topics_spacewx.php and
<http://www.meted.ucar.edu/hao/aurora/>

2) Research, data and tools: via VSTO, VSPO and VITMO, knows to search for brightness, or green/red line emission

3) Did you know?: *Aurora is a phenomena of the upper terrestrial atmosphere (ionosphere) also known as Northern Lights*

4) Did you mean?: *Aurora Borealis or Aurora Australis, etc*



What does a VO need to make this happen?

- A set of rules that define the users needs... Use Case!
- This use case can be applicable across VOs...
- But there are some other kinds of visionary leaps that have to be made...

