Evaluating Facility Usage to Guide Efforts to Engage Users

Kris Ludwig
US Geological Survey
2011-2012 AAAS Science & Technology Policy Fellow
NSF - Large Facilities Office

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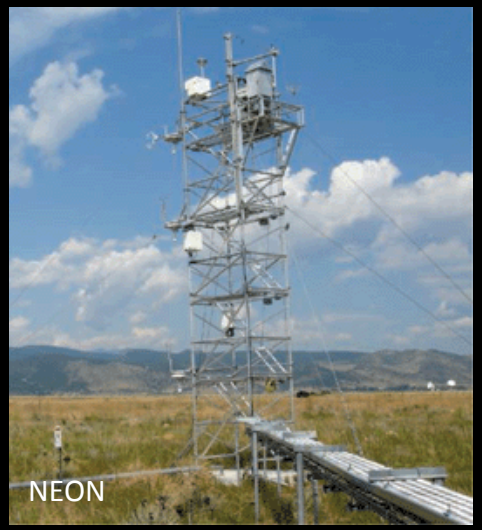
NSF's Investment in Large Facilities


Gemini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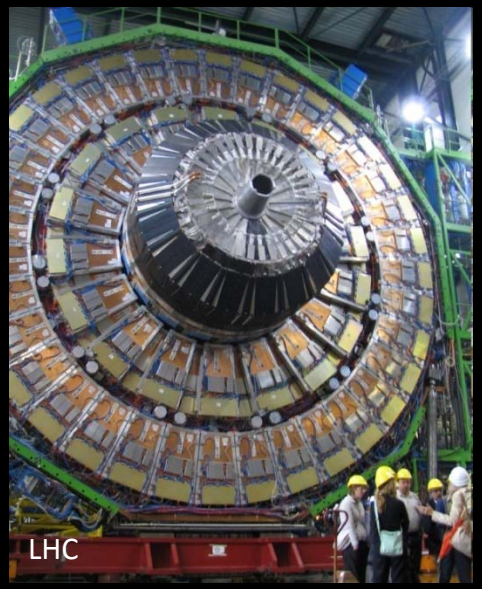

LHC

Who is benefiting from these investments and what can we learn from this?

Facilities are inherently complex and many decisions are related to facility use.

Facility Planning

Data Product Needs

Funding

Data Archiving and Re-use

STEM Education

Performance Metrics

Reciprocality with International/Commercial Users

Workforce Development

Opportunities for New Research Areas

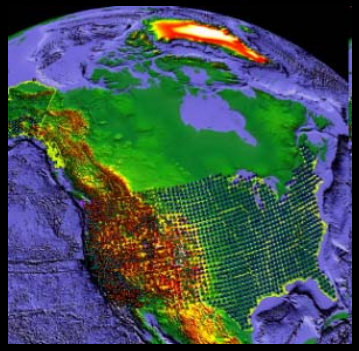
Leveraging Assets

Community Building

Sunsetting

Impact of CI

Methods



- 4 case studies
- Observation of facility reviews/meetings
- 78 interviews (incl. DOE Office of Science/NASA Space Telescope Science Institute)
- Quantitative data analysis
- Review of relevant reports/documents

Case Studies

EarthScope

Network for Earthquake Engineering Simulation (NEES)

Academic Research Fleet (UNOLS)

National Optical Astronomy Observatory (NOAO)/Kitt Peak (KPNO)

Information from additional facilities added as opportunities arose.

Workshop Goals

Explore frameworks for considering different dimensions of facility use.

1. Define a facility user.

2. Identify how users access & interact with facilities.

3. Determine how to evaluate facility use – and discuss how this information can be informative.

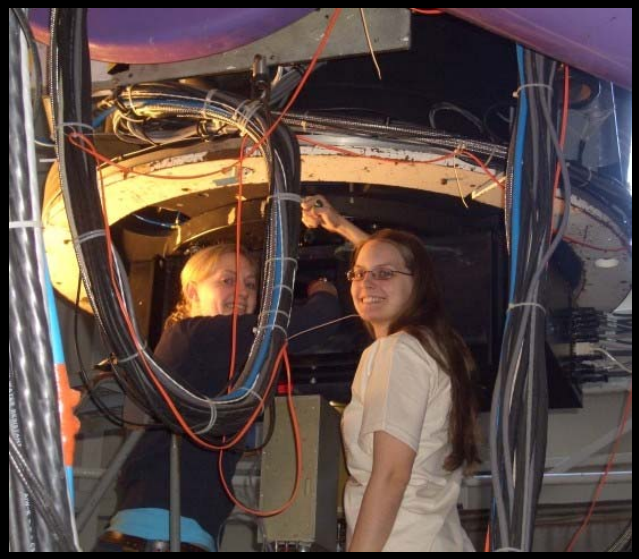
This is an interactive workshop!

1. Define a Facility User

Interviewee Definitions of NSF Facility Users Varied:

Someone who:

- Has funding to use my lab
- Is doing long term projects
- Writes a proposal to work at the facility
- Has been allocated time
- Uses data for research & education

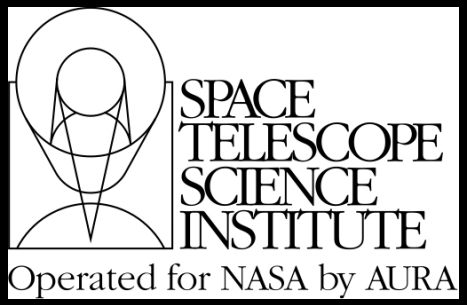


User: *someone who interacts with the facility for the purpose of furthering scientific research and/or science education. NSF facility users are not necessarily supported by NSF.*

Other Definitions of Facility "Users"

Researchers who propose & conduct peer-reviewed experiments at a facility.

Excludes: individuals who send samples to be analyzed, tour participants, educators



Variable across facilities.

The National User Facilities Organization (NUFO) - variable.

7 Primary "Types" of Users:

1. Investigators (*professional researchers, post-docs*)
2. Graduate Students
3. Undergraduate Students
4. Educators (Formal/Informal)*
5. Commercial/Industry Reps
6. Citizen Scientists/Amateurs
7. Public*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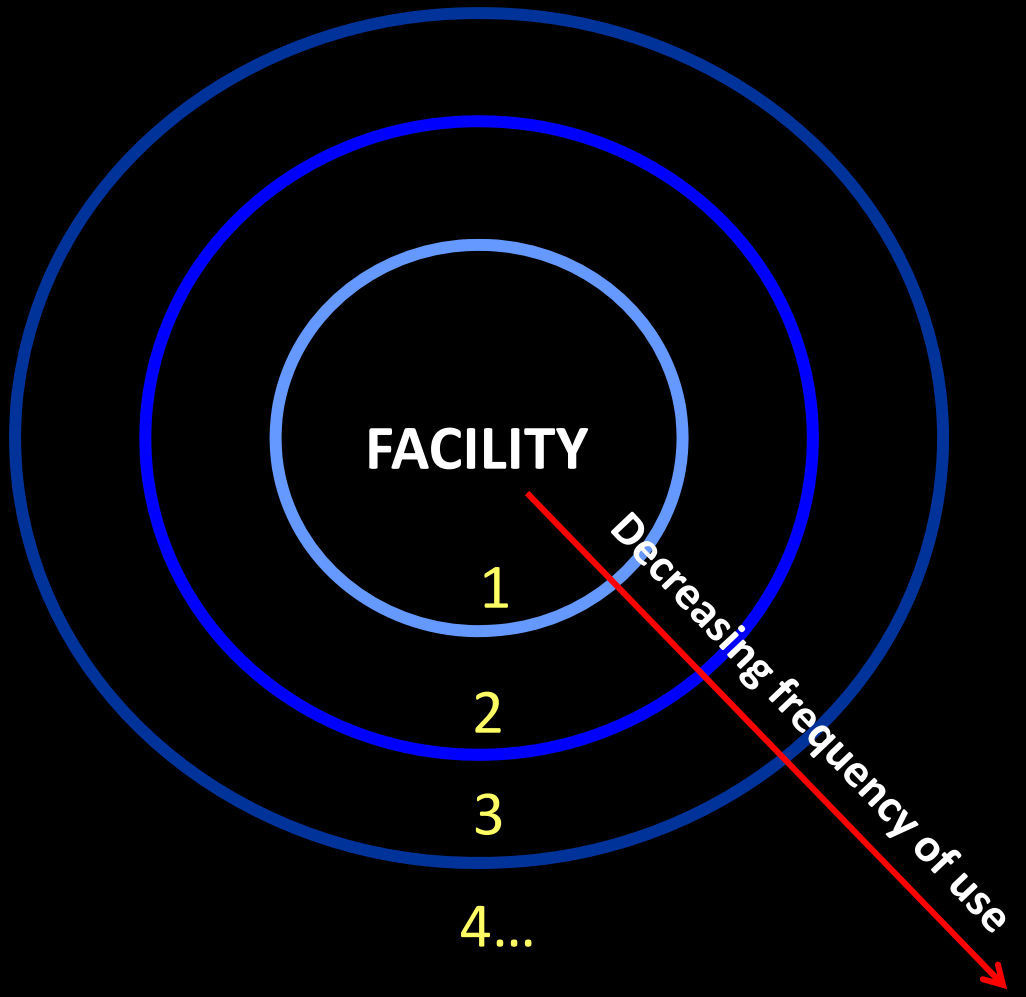
**Answers varied when considering whether or not educators and the public are "users."*

NSF Facilities Have Multiple Tiers of Users



Example Users/Tier:

1. PIs/"Power Users"
2. Grad Students
3. Educators/Undergrads
4. Public/Citizen Scientists

2. Identify how users access & interact with facilities.

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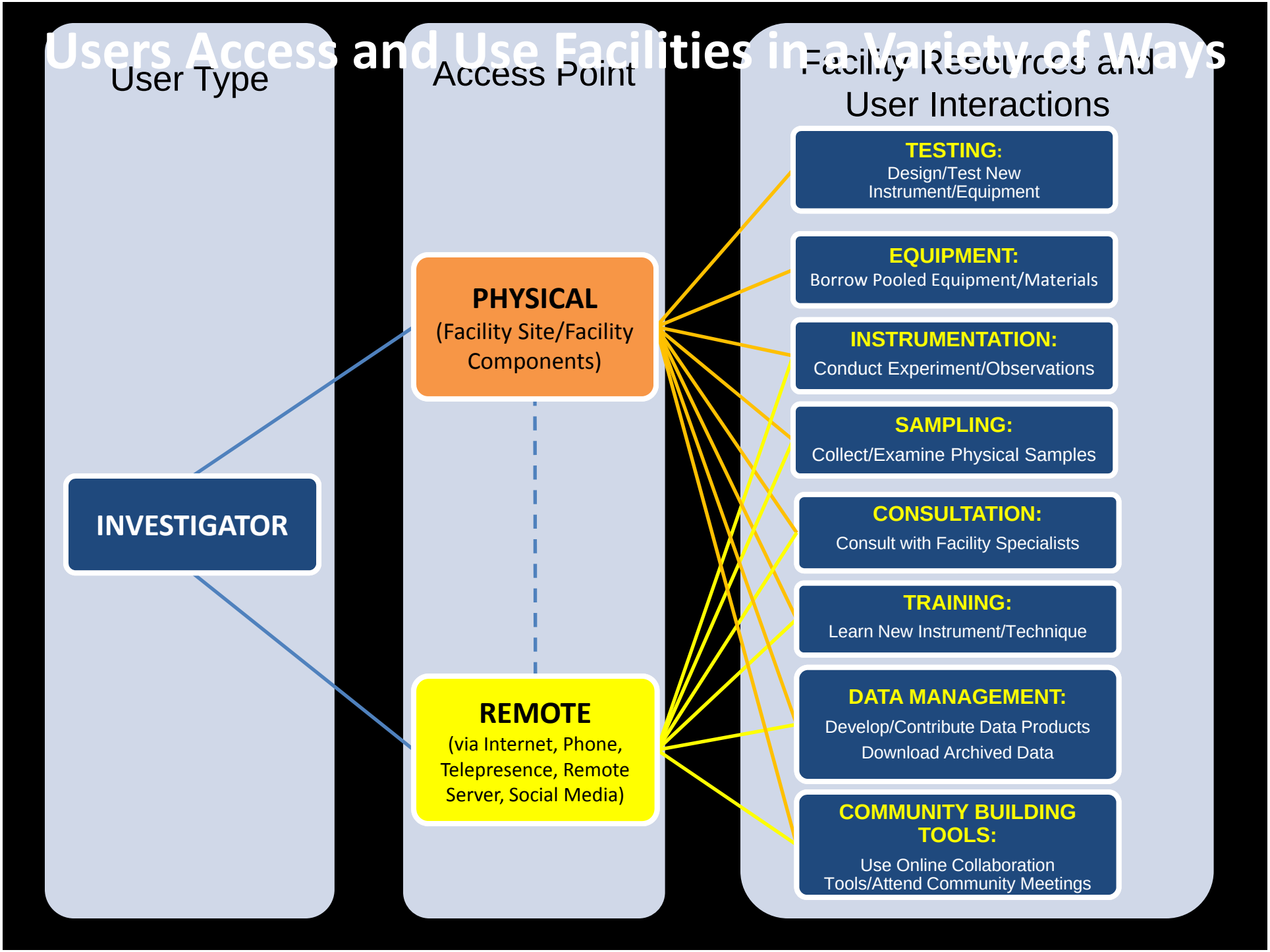
Users Access and Use Facilities in a Variety of Ways



3. Determine how to evaluate facility use – and discuss how this information can be informative

Measuring & Tracking Users

- How do you track facility use?
- What is the most useful information for engaging users? (ie, what works really well?)
- Any themes?

How Do You Know Who's Using NSF's Facilities?

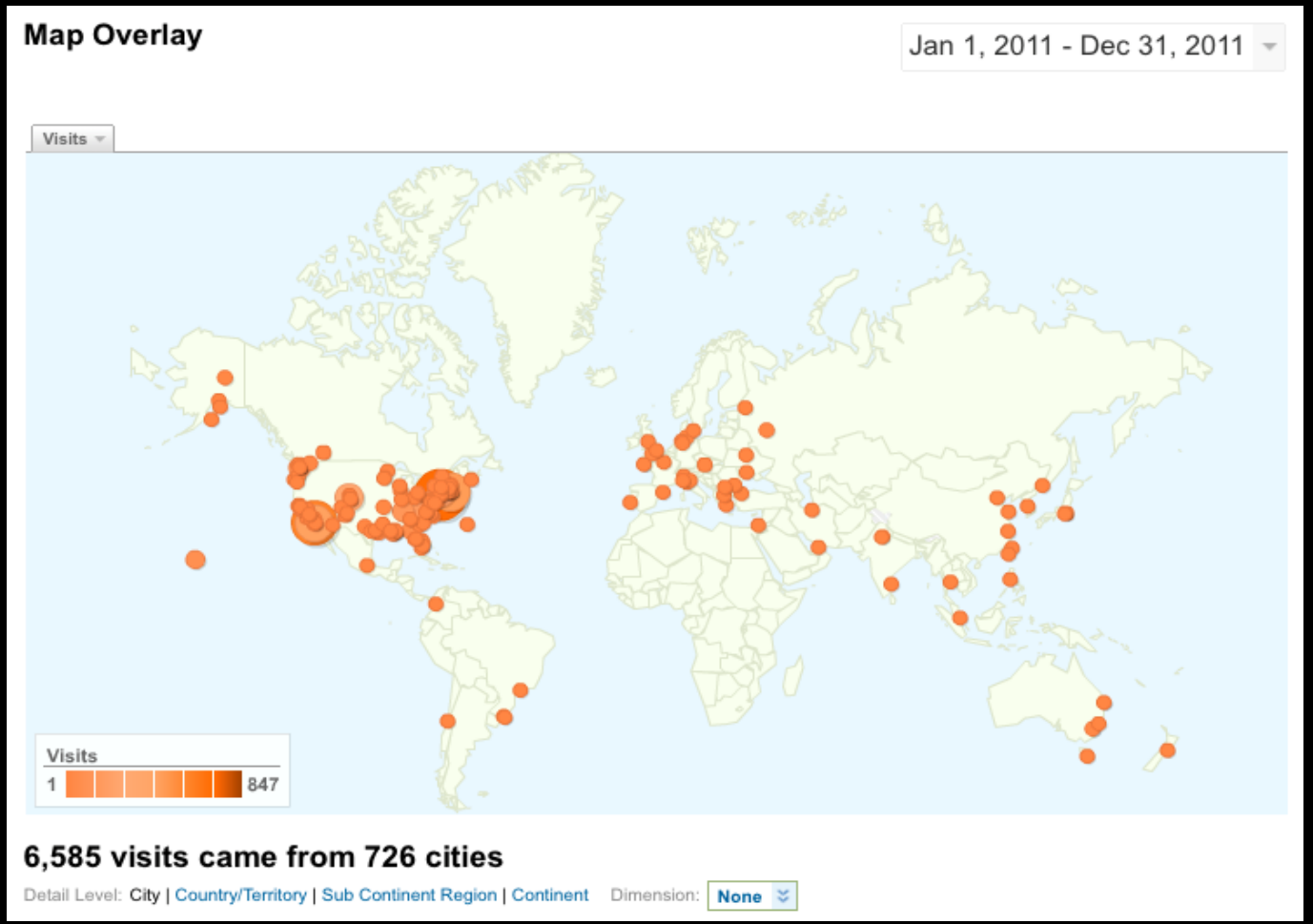
1. **User Tracking:**
   Quantity of Use
2. **User Feedback:**
   Quality of Use
3. **Community Surveys:**
   Perceived Value/Intentions of Future Use

Each Facility Tracks Users Differently and Reports Use in Different Locations

Tracking Mechanism	IP Addresses	# On Site	# Workshop Attendees	# Event Visitors	Refereed Pubs
ARF	✓	✓	✓		
EarthScope	✓		✓	✓	✓
NEES	✓	✓	✓	✓	✓
NOAO/ KPNO	✓	✓		✓	✓

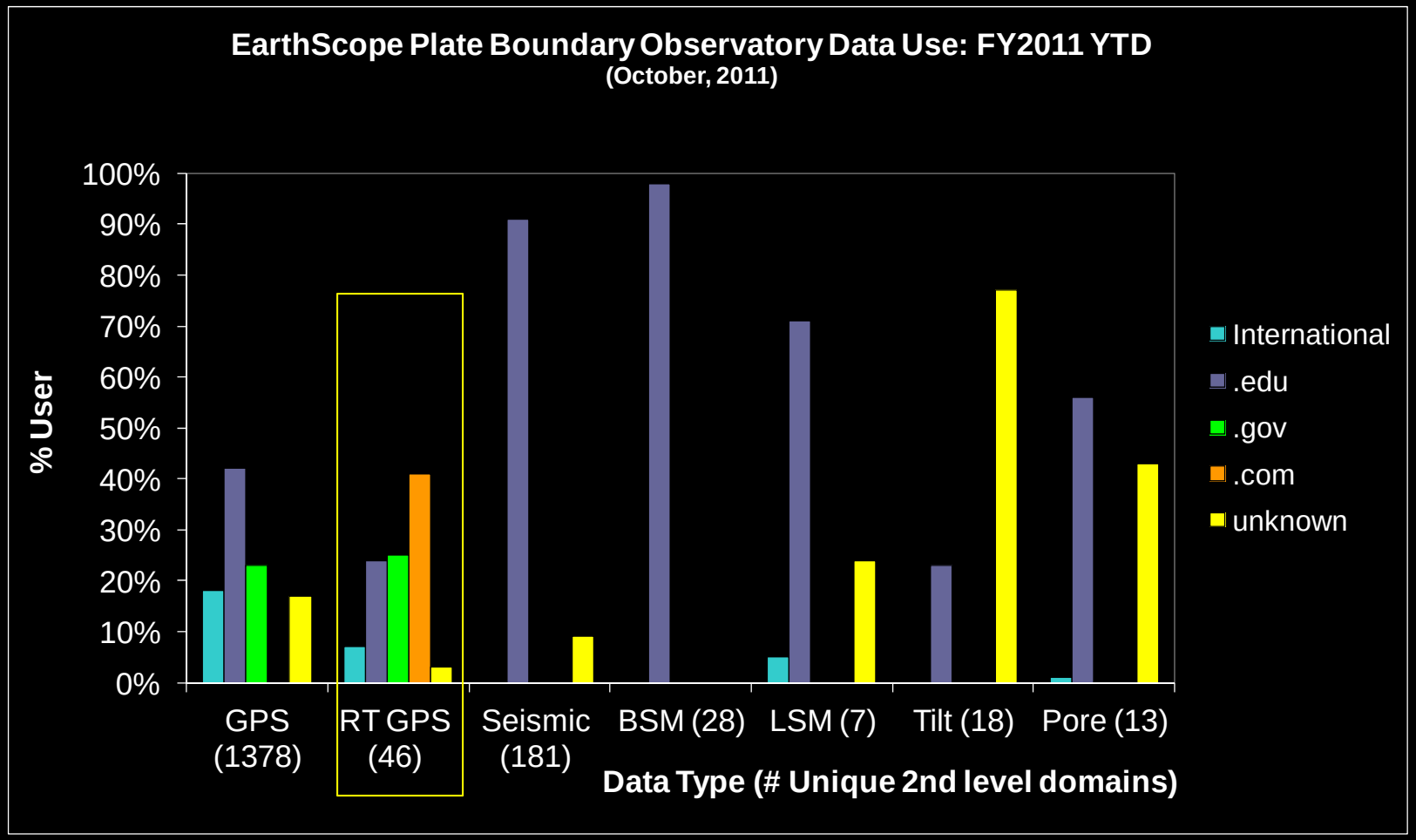
Each method has its caveats.
Comparing use quantitatively across facilities is challenging.

IP Addresses of Access to UNOLS Data Shows Global Distribution of Users



Data courtesy LDEO

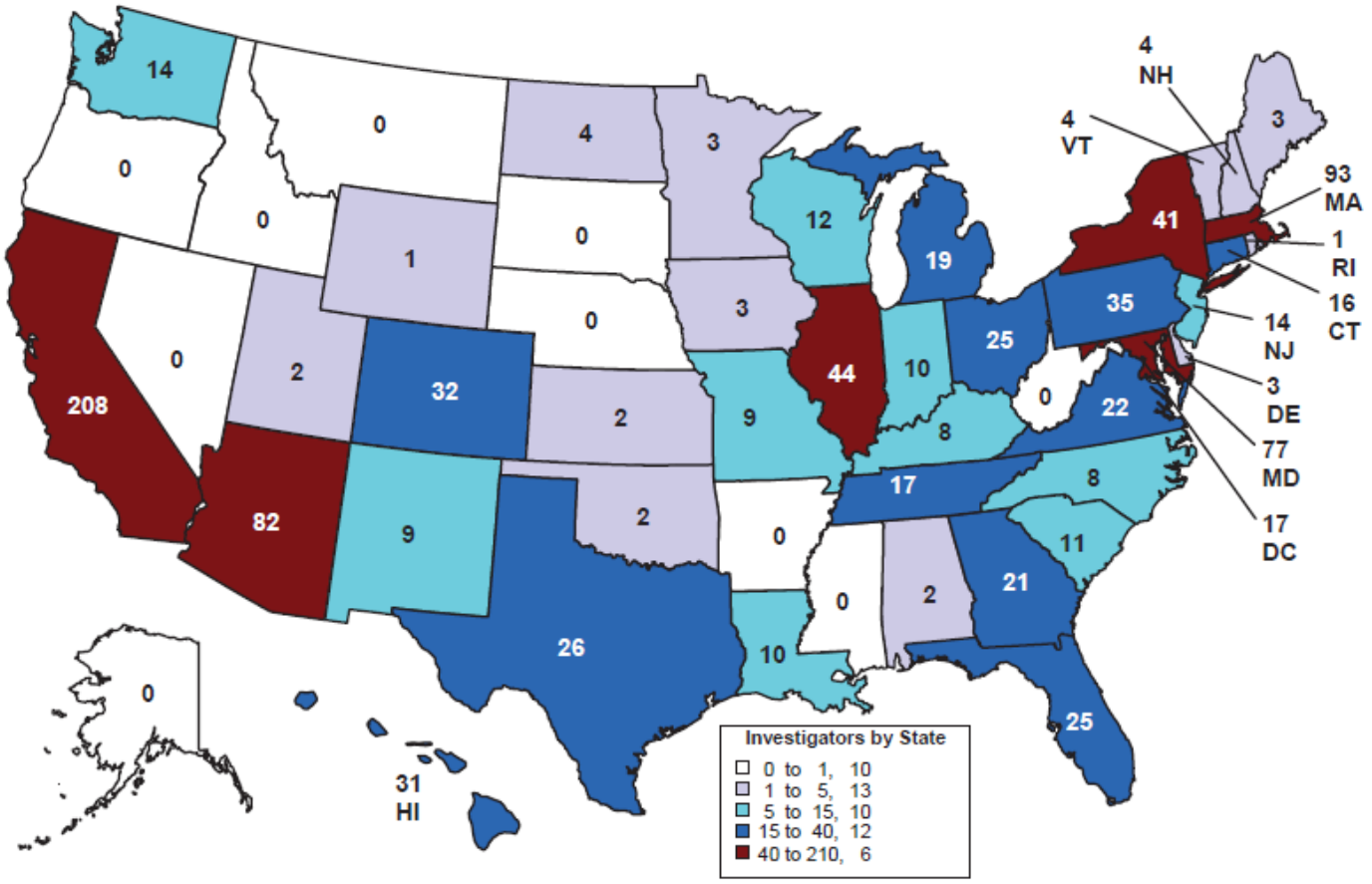
IP Addresses Show EarthScope PBO Data Users Represent Multiple Sectors



Data courtesy UNAVCO

NOAO's US Investigators Span the Country

Breakdown of Investigators from US Institutions for Approved 2011A/B Observing Programs
(Excludes NOAO Staff)



[1] Previous reports incorrectly included data on Chilean and partner institution programs that did not go through the NOAO TAC.

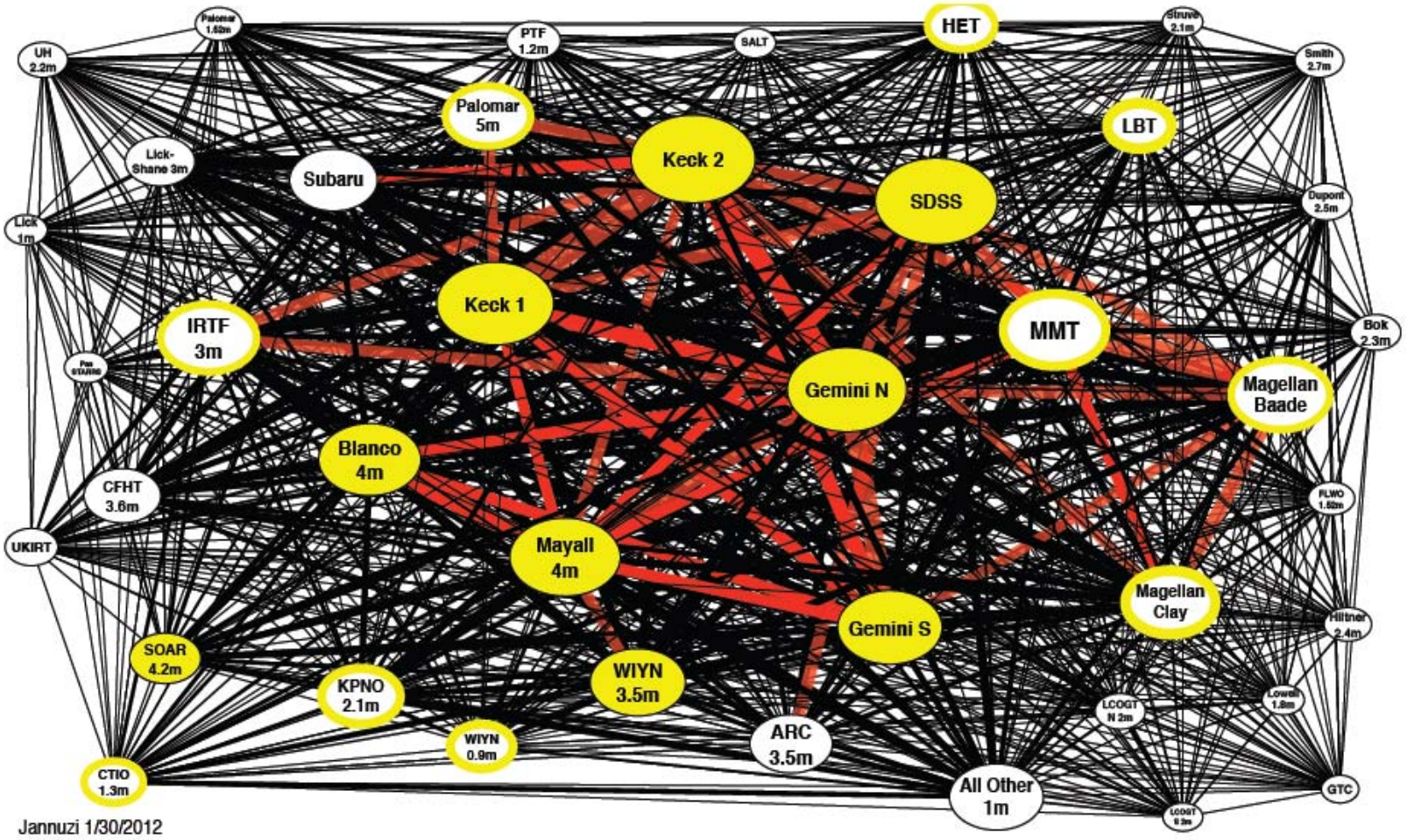
NOAO Fiscal Year Annual Report FY 2011

User Feedback Provides Insight into How Facilities are Used and Accessed.

Feedback Mechanism	User Committees	Informal Feedback	Online Feedback	User Evaluations	Community Surveys
ARF	✓	✓	✓	✓	✓
EarthScope	✓	✓	✓		
NEES	✓	✓	✓	✓	
NOAO/ KPNO	✓	✓		✓	✓

Facilities use multiple mechanisms to effectively communicate with their users.

Astronomy Ground-Based O/IR System Survey Shows Frequency of Use Across Facilities



1178 responses; 962 US-based

Jannuzi and Valenti, 2012 (V 1.5)

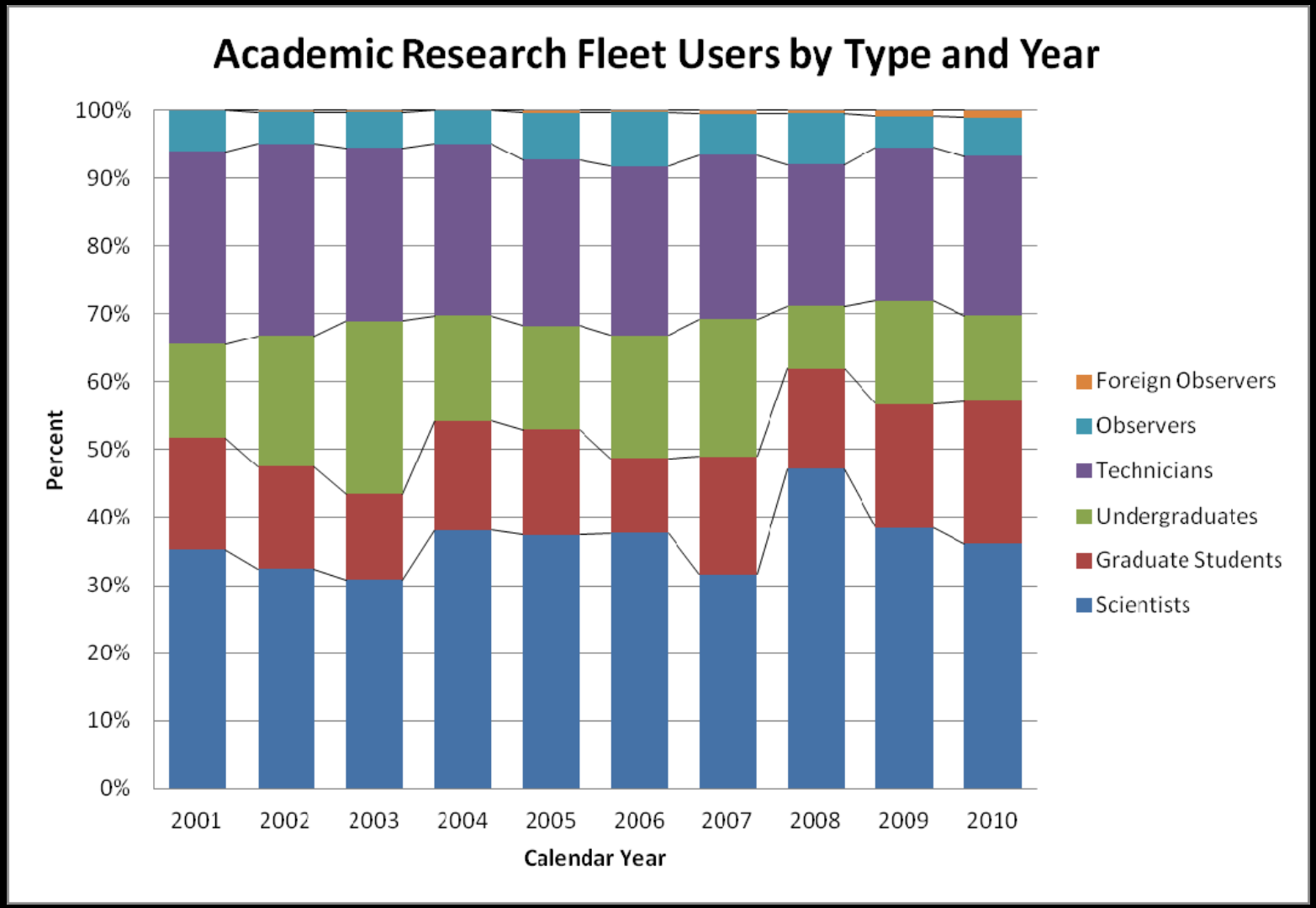
Changes in Use over Time: Examples

Facilities Can Engage New Disciplines Over Time

USERS	TYPE OF USE
Geodesists*, Seismologists*, Geologists*	**GPS and Seismic data to study structure and evolution of N. American continent**
Educators*/Students	**Real time data and curricula**
Hydrologists*	GPS data to estimate snow depth, soil moisture
Public Utilities companies	GPS data for city pipeline planning
LIGO Researchers*	Seismic data to inform gravity wave research
Glaciologists*	Explore seismic data to detect calving glaciers
NEES Researchers*	Seismic data to inform earthquake engineering experiments

**funded by NSF*

Tracking Users On Site across the Academic Research Fleet Shows Little Change over Time



Tracking Users On Site by Ship Class Reflects Different Uses of the Fleet

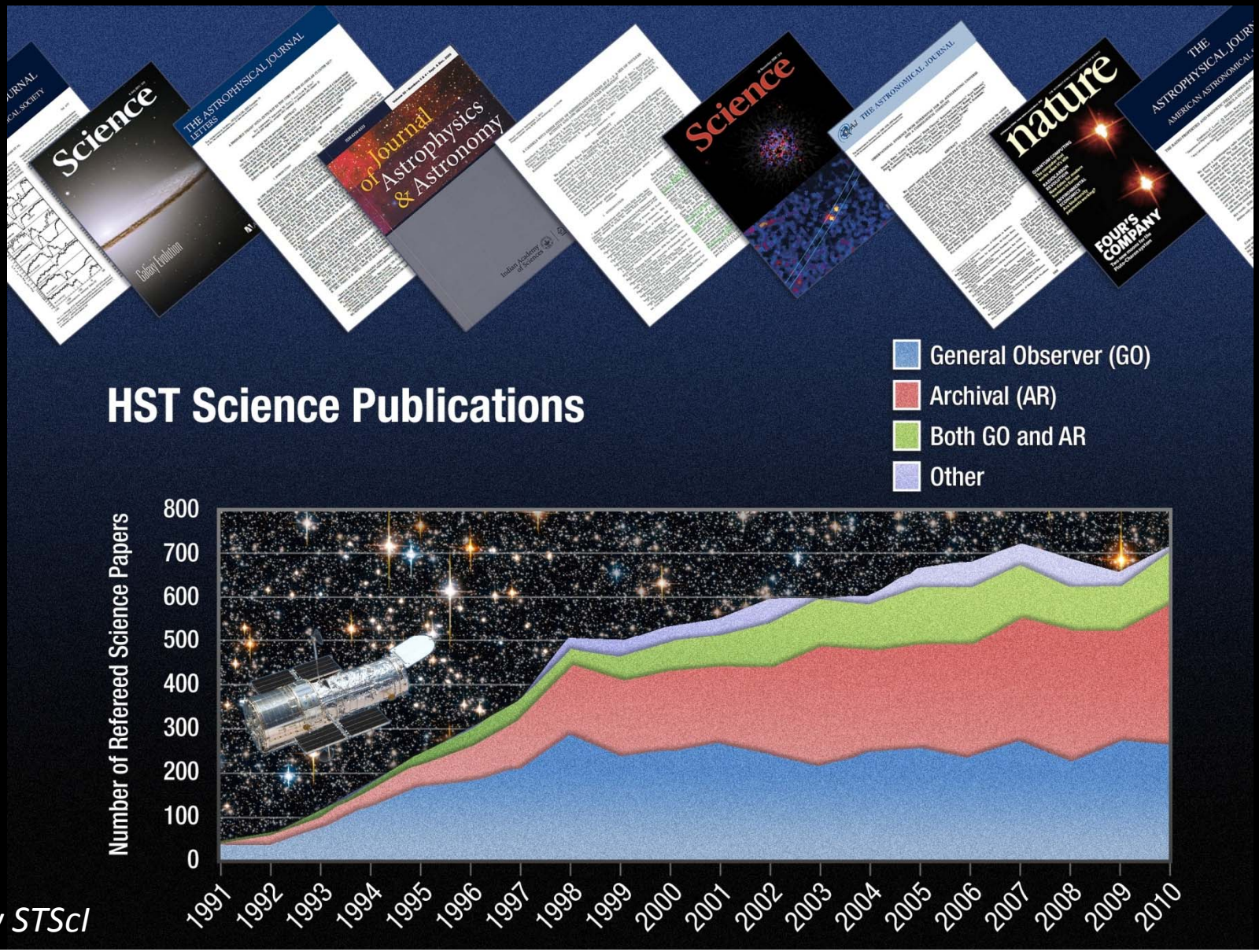
Global Class: Revelle (274’)

UCSD

Coastal/Local Class: Blue Heron (86’)

M. Ryan

Open Data Policies May Lead to Increased Publications and More Use by "Data Miners"



Courtesy STScI

At Some Facilities, New Users Have Different Skills and Backgrounds

Early Career Scientists:

- "Expect" to have data readily available
- Are more open to collaborative work
- Are more data savvy

Courtesy Facebook

Conclusions

- Facilities currently collect *a lot* of useful data on their users. However, across facilities, the data are variable and are not collected in a standardized or centralized way.

- Some facilities see changes in use over time, which may include unanticipated users.

- CI-enabled facilities are seeing more sophisticated users exploiting open data.

New Users Discover and Access Facilities via Different Paths

Informal

- Conferences
- Public Events
- Literature
- Facility Visits
- Websites
- Email/Listserves
- Social Media
- News/Media

FACILITY

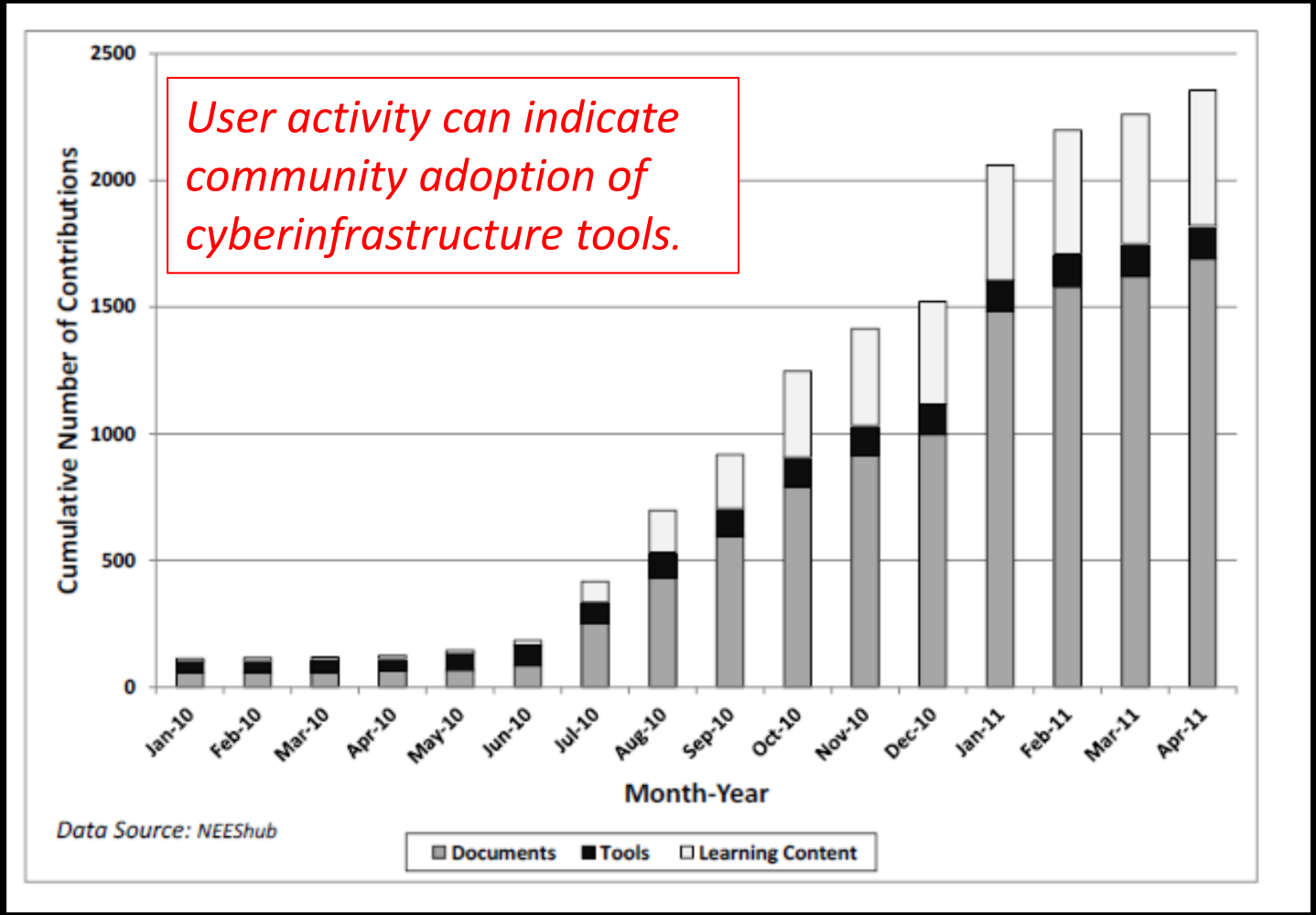
Formal

- Short Courses
- Workshops
- Student Training
- Internships
- Webinars
- Employment

AGU


UNAVCO

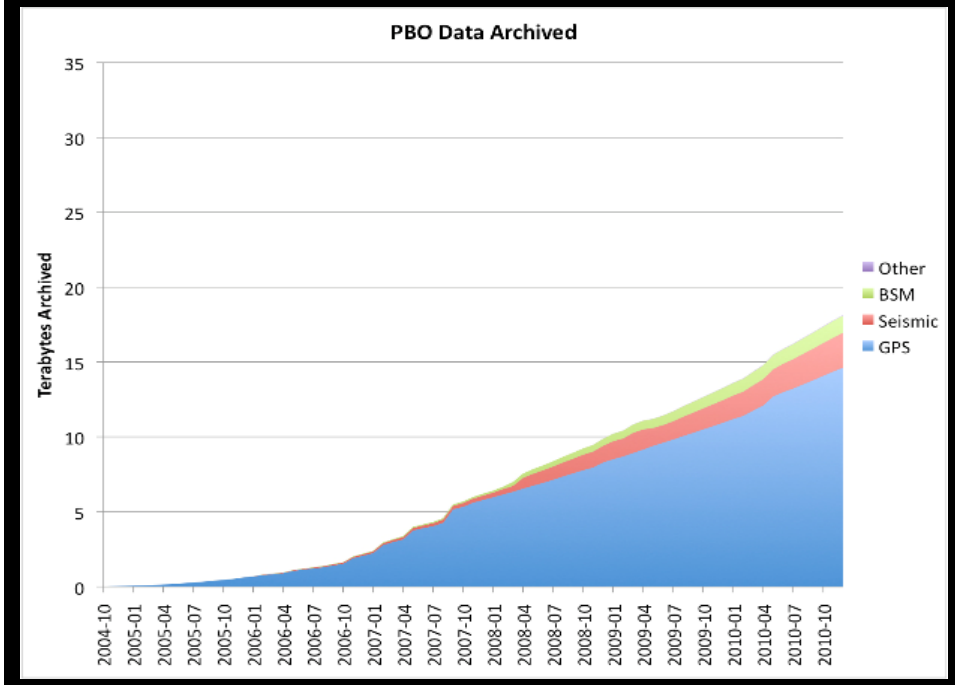
Registered Users of NEESHub Show Increase in User Contributions over Time



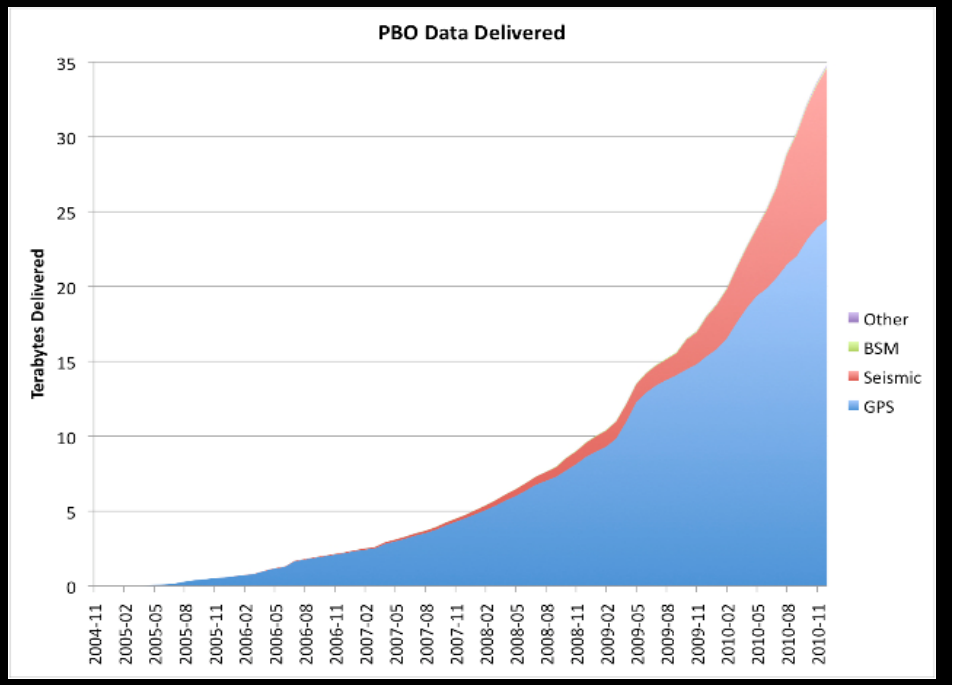
Hacker and Magana, 2011

Changes in Use Point to Increasingly Data-Intensive Research Environment

Data Archived



Data Delivered



Data drawdown from EarthScope's Plate Boundary Observatory has exponentially increased over time (data courtesy UNAVCO).

Some User Types Vary across Case Study Facilities

	Investigators	Grad Students	Under-grads	Educators	Comm/ Industry	Citizen Scientists/ Amateurs	Public
ARF	✓	✓	✓	✓			✓
EarthScope	✓	✓	✓	✓	✓		✓
NEES	✓	✓	✓	✓	✓		✓
NOAO/ KPNO	✓	✓	✓	✓		✓	✓

Why Analyze Facility Use?

- Optimize user support to maximize scientific return on investment
  - Trends in use may point to new needs
- Highlight partnerships/identify areas for collaboration
  - NSF facilities are under increasing pressure to maximize partnering with other agencies and across NSF directorates
- Demonstrate breadth of NSF investments
  - Use can show how NSF facilities are used within and outside academia
- Increase transparency in resource allocation
  - Annual and strategic budgeting do not provide much information on how resources are allocated

Activity: Wish List

Wish List

a) What you want to know or measure about your users?
b) Why?

Activity: Solution Mapping

Solution Mapping - Questions to Consider

- Choose 1 wish list item
- Develop actions needed to obtain information
  - What information is needed?
  - How would you get this information?
  - What would help/block progress?