The Role of Flagship Observatories in the Advancement of Polar CI

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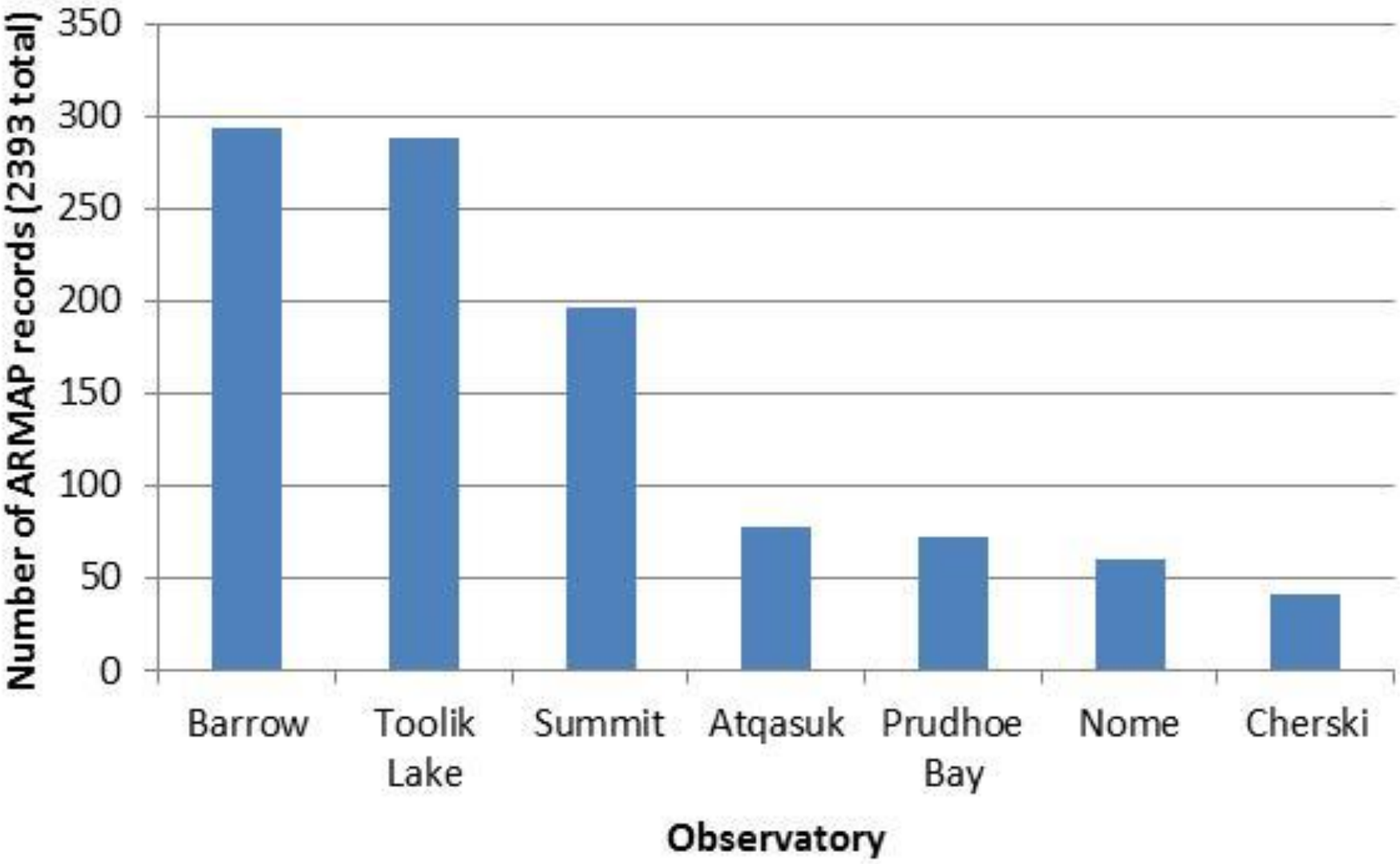
Flagship Observatories….

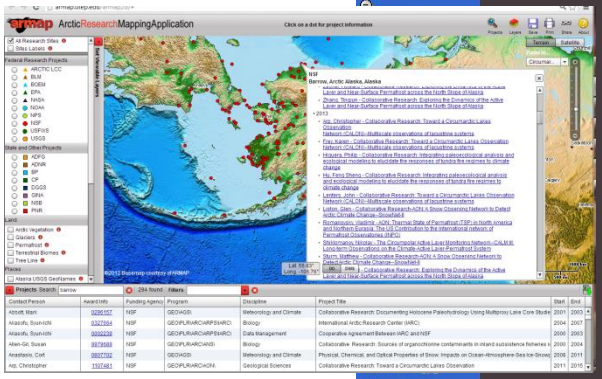
- **Coined in lead-up to AON** – SEARCH, IASC.
- **Offers good '*bang for buck*' for advancing CI** – science legacy, large experiments, plethora of technology, opportunity for synergistic activity, strong human presence, education and training.
- *Not to say extensive sites are not important.

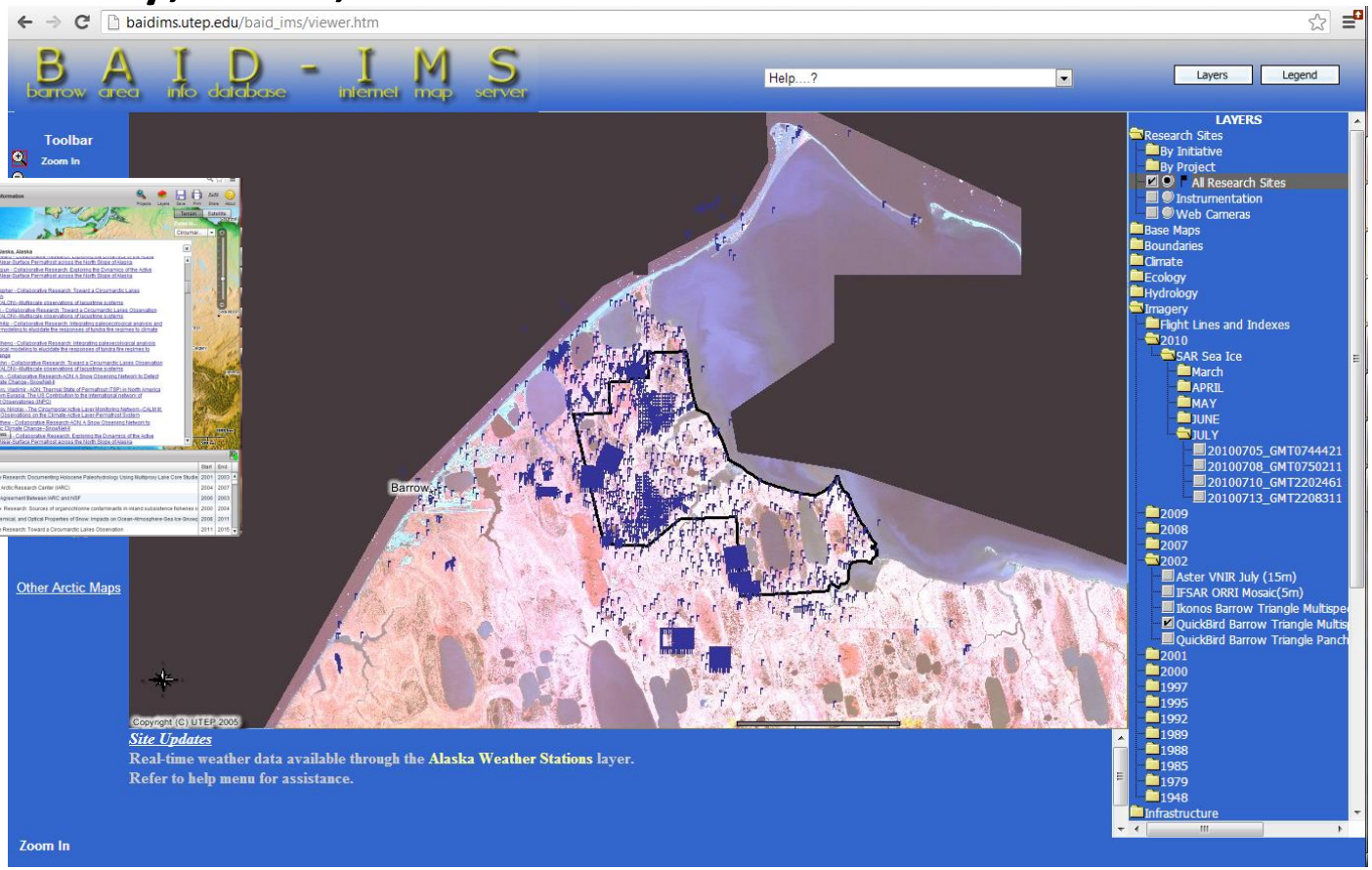
Flagship Observatories….



Barrow as a Flagship Observatory….

- **Northern-most Alaska**, largest US arctic observatory, >12,000 sites since 1940's





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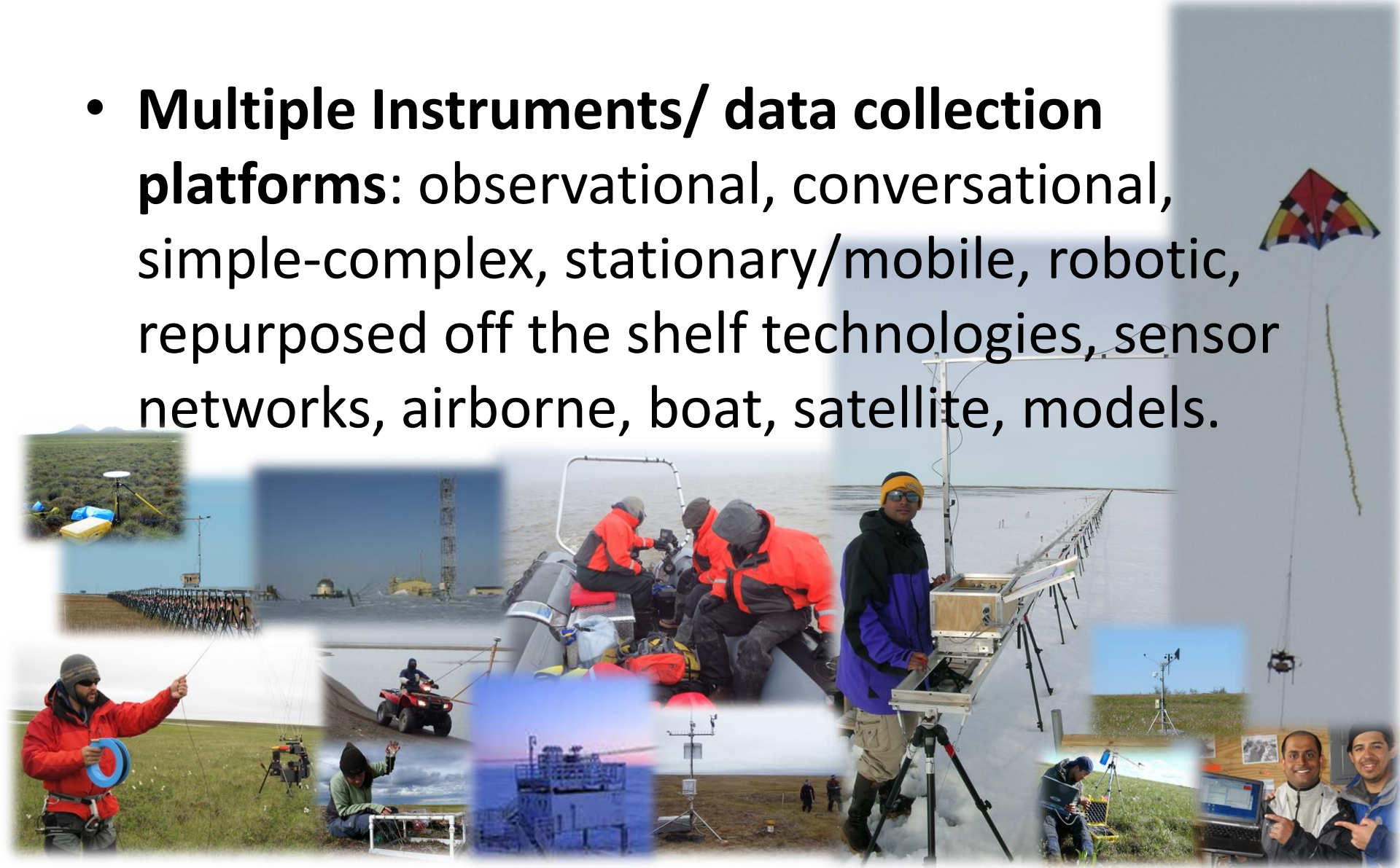
- **Stakeholders**: Multiple agencies, disciplines, industry, networks/ initiatives, visiting ships/planes.
- **Measurements**: operational/year round, observational, experimental, serendipitous (i.e. event driven), social, biomedical, from collections (e.g. archeological, biological).

Barrow as a Flagship Observatory….

- **Multiple Instruments/ data collection platforms**: observational, conversational, simple-complex, stationary/mobile, robotic, repurposed off the shelf technologies, sensor networks, airborne, boat, satellite, models.



Barrow as a Flagship Observatory….

- **Multiple Instruments/data collection platforms**: observational, conversational, simple-complex, stationary/mobile, robotic, repurposed off the shelf technologies, sensor networks, airborne, boat, satellite, models.
- Frequent industry testing, R&D.

Barrow as a Flagship Observatory….

- Substantial engineering and operational challenges – cold, power, dark, animals, ice, erosion, current, wind, moisture, icing, wireless conflict.

Barrow as a Flagship Observatory….

- Substantial engineering and operational challenges – cold, power, dark, animals, ice, erosion, current, wind, moisture, icing, wireless conflict.
- Varying data QAQC, sample analyses, modes of post processing – *provenance poorly documented.*
- Varying need for data privacy/security/restricted access.
- Varying levels of expertise in who makes/ maintains measurements.
- Native, state, federal owned/managed holdings.

Data Transfer and Storage….

- Relatively **little real time data** access/transfer.
- **Limited internet connectivity** – USPS/Courier just as important for data transfer.
- Data Export and storage:
  - Local hard drives
  - Institutional servers
  - Project/network servers
  - Data centers
- i.e. **highly distributed**, multiple standards, little connectivity between entities, unknown rate of ‘decay’ through the data life cycle.

Factors Associated with Success….

- **Big ideas** implemented by interdisciplinary teams using simple, scale-able approaches and technologies underpinned by a plan for sustainability.
- Key motivation is to **answer a science question** not address and engineering challenge alone.
- **People** (diverse) with diverse skillsets (good communicators) who promote student learning and involvement.

Factors Limiting Success….

- **Pie in the sky ideas** that were overly complex, that did not offer scale-able solutions, feasibility testing, and a sustainability plan.
- **Heavy hammer approach** prevailed without enough grass roots involvement or scientific goal.
- Local **expertise ignored** or lessons learned elsewhere not adopted.
- Where there was **duplication** of effort.
- A '***Build it and they will come***' attitude prevailed.
- **Attention to humans** was low priority.

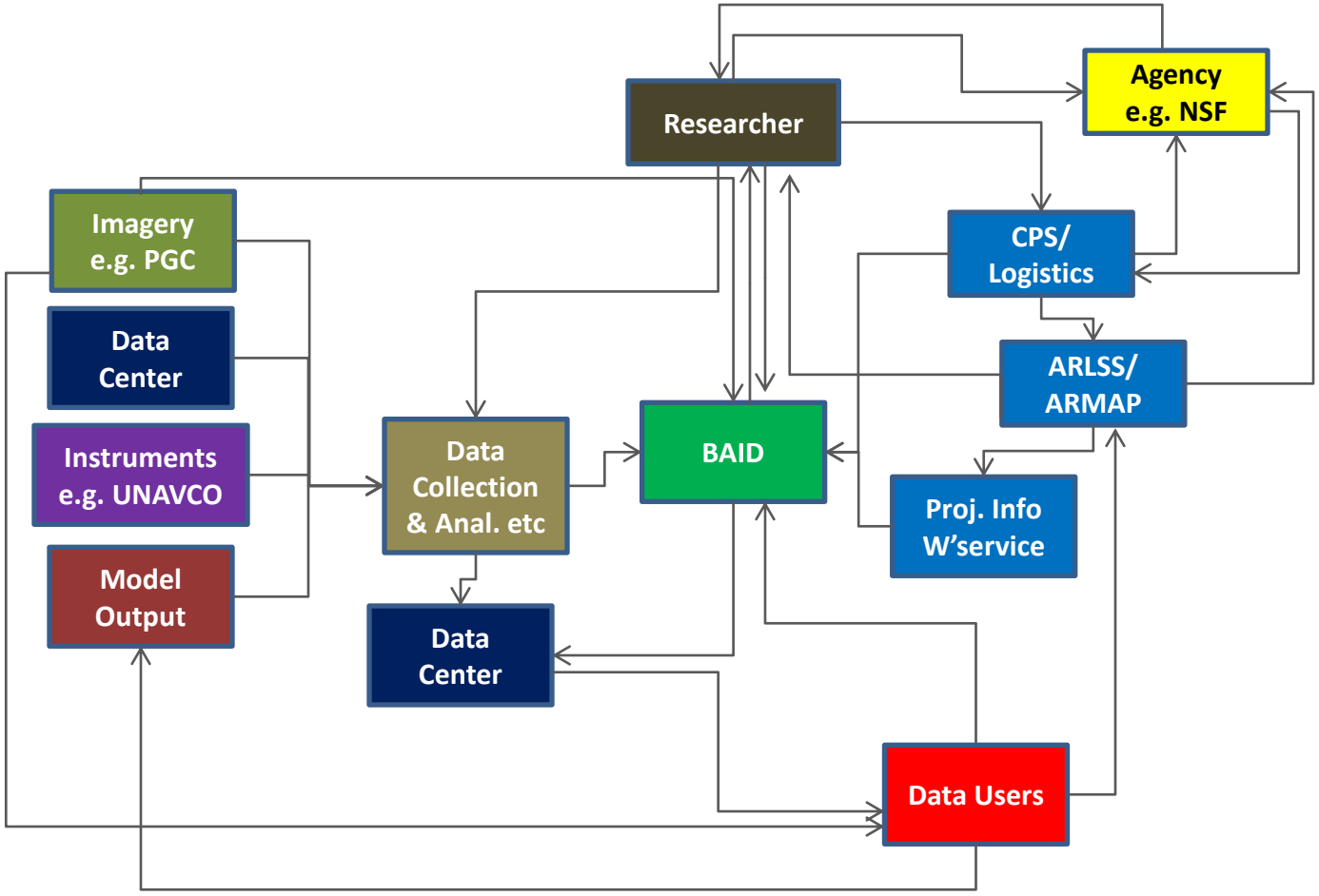
Frontiers of Science….

- Several **large project/network activities**: DOE-NGEE, NASA-ABOVE, NSF-NEON, AON/SEARCH, BOEM near shore endeavor etc.
- A LOT of **long tail science**…..
- Sustained **environmental observations**.
- Land-ocean-ice-atmosphere-human-global **interactions**.
- **Validation/verification** of models and remote sensing.
- Response of biodiversity to change.
- Applications for **local decision making**, policy, management etc.
- Expect the unexpected…..

Priorities for Next 5-10 years….

- **Advance data collection** – more, further, cheaper, faster etc.
- Develop fundamental **baseline datasets** for which high re-usability should be expected e.g. topography, bathymetry, image time series etc.
- Improve **efficiencies**, capture science **legacy** and **lessons learned**.
- **Automate** data transmission, QA/QC, documentation, and publication.
- Improve **data discoverability and access** across distributed data archives.
- **Link** projects-people-sites-data-papers-knowledge.
- Build common vocabularies, provenance, prepare for the **Semantic Web**.
- Data integration, quantify uncertainty, advance modeling and computational science.
- Improve **human capacities and diversity**.
- Apply new technologies and draw new expertise and link local experience.
- **Couple scientific discovery with innovations in CI**.
- Avoid duplication -

Framework for Data/Info Flow….



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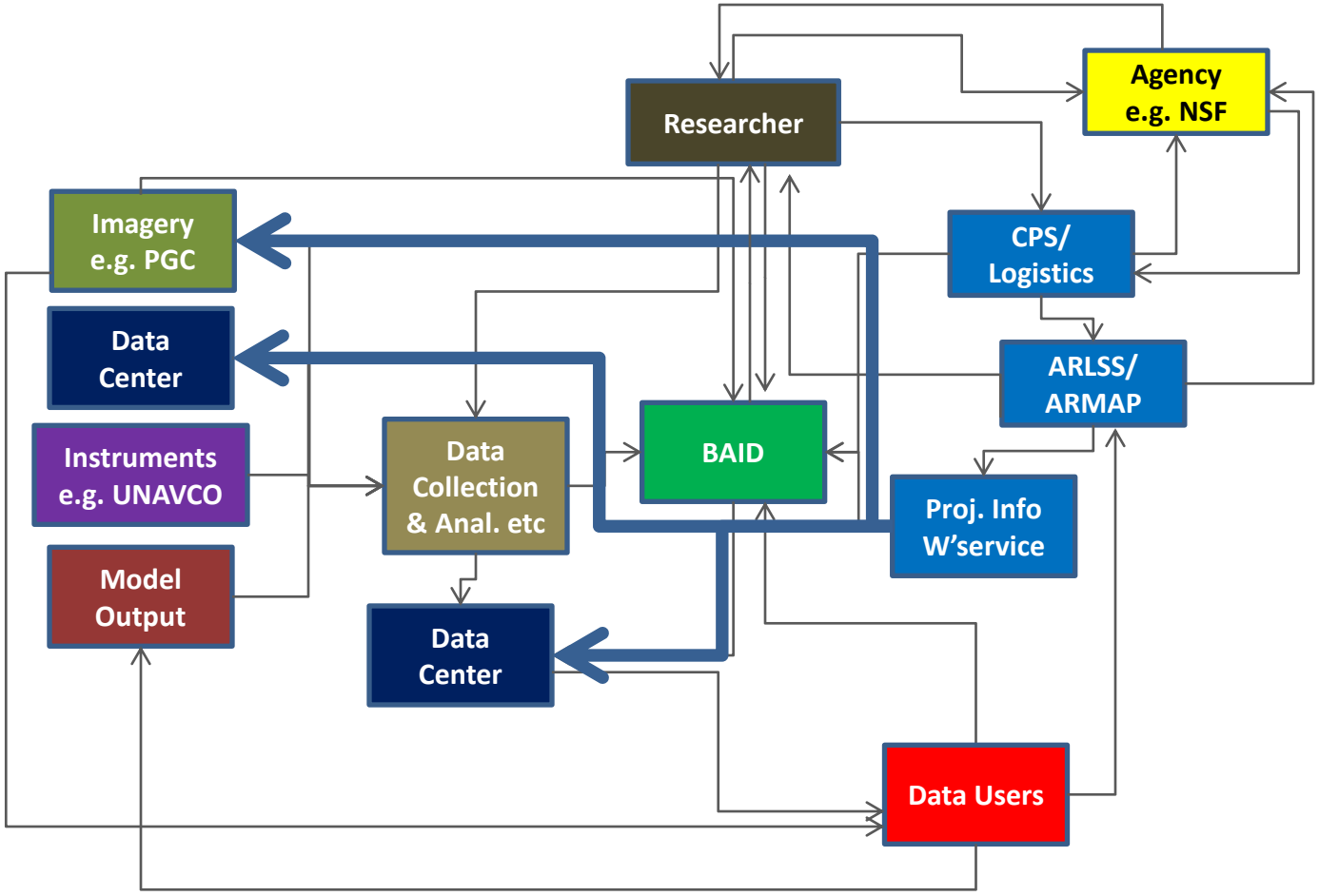

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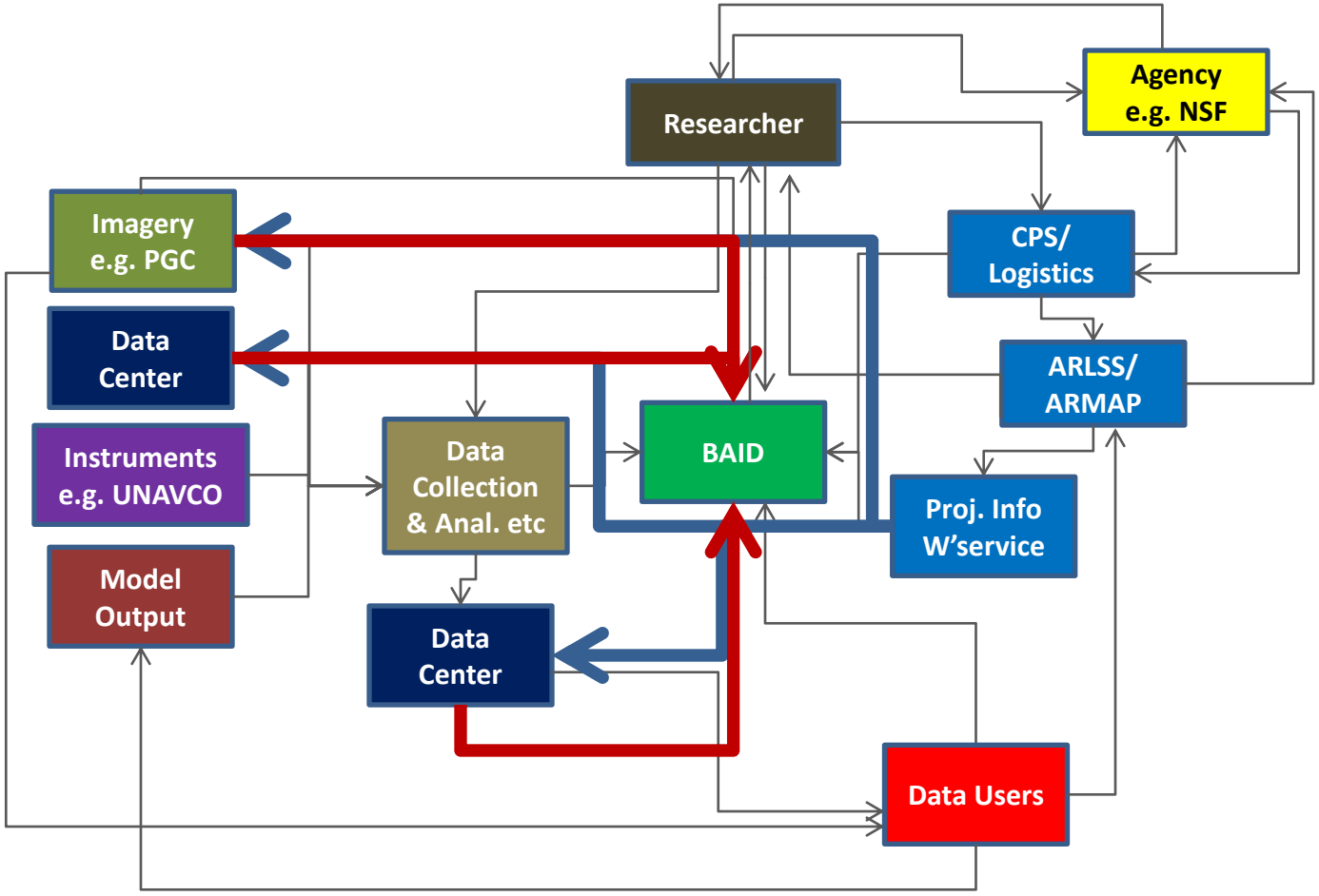

Additional Resources for Barrow and other Arctic Flagship Observatories….

- www.armap.org – Arctic Research Mapping Application
- www.baid.utep.edu – Barrow Area Information Database
- http://toolik.alaska.edu/ - Toolik Lake Field Station
- www.eu-**interact**.org - International Network for Terrestrial Research and Monitoring in the **Arctic**

Caveats and Cautionary Notes….

- **Ecological perspective** – bias toward Arctic NSF-funded research, Barrow, landscape and coastal zone, and summer.
- **Not all CI-activities** in/near Barrow will be showcased.
- **Terminology** – look for generalized meaning not semantics.
- **Not focus on some important details** such as security, internet connectivity etc.
- Have been asked to be **critical**
- **Cyberinfrastrucure** - *coordinated aggregate of software, hardware and other technologies, as well as human expertise, required to support current and future discoveries in science and engineering*. Berman 2005.