CYBERINFRASTRUCTURE FRAMEWORK FOR 21st CENTURY SCIENCE AND ENGINEERING (CIF21)

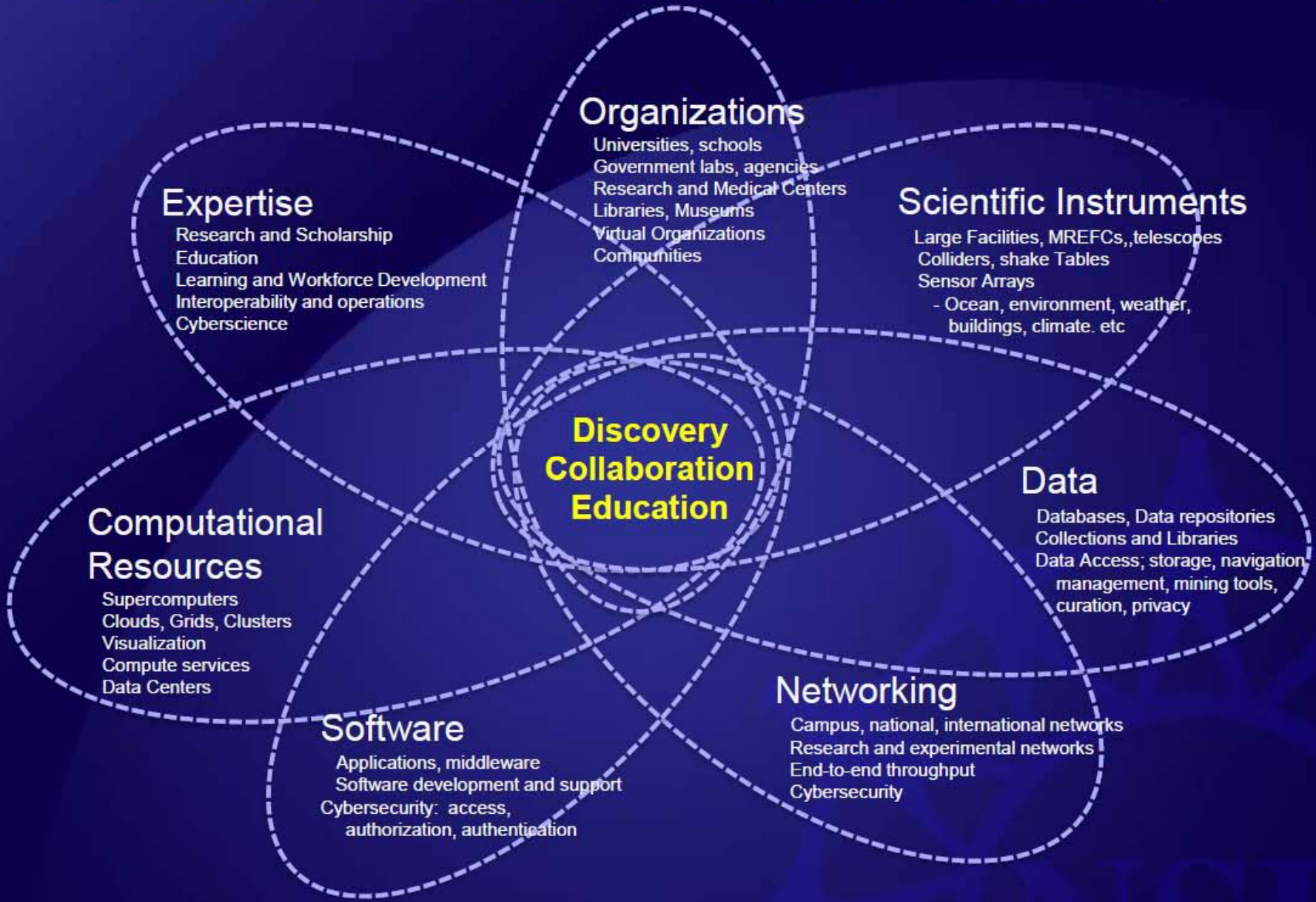
Goal

Develop and deploy comprehensive, integrated, sustainable, and secure cyberinfrastructure (CI) to accelerate research and education and new functional capabilities in computational and data-intensive science and engineering, thereby transforming our ability to effectively address and solve the many complex problems facing science and society.

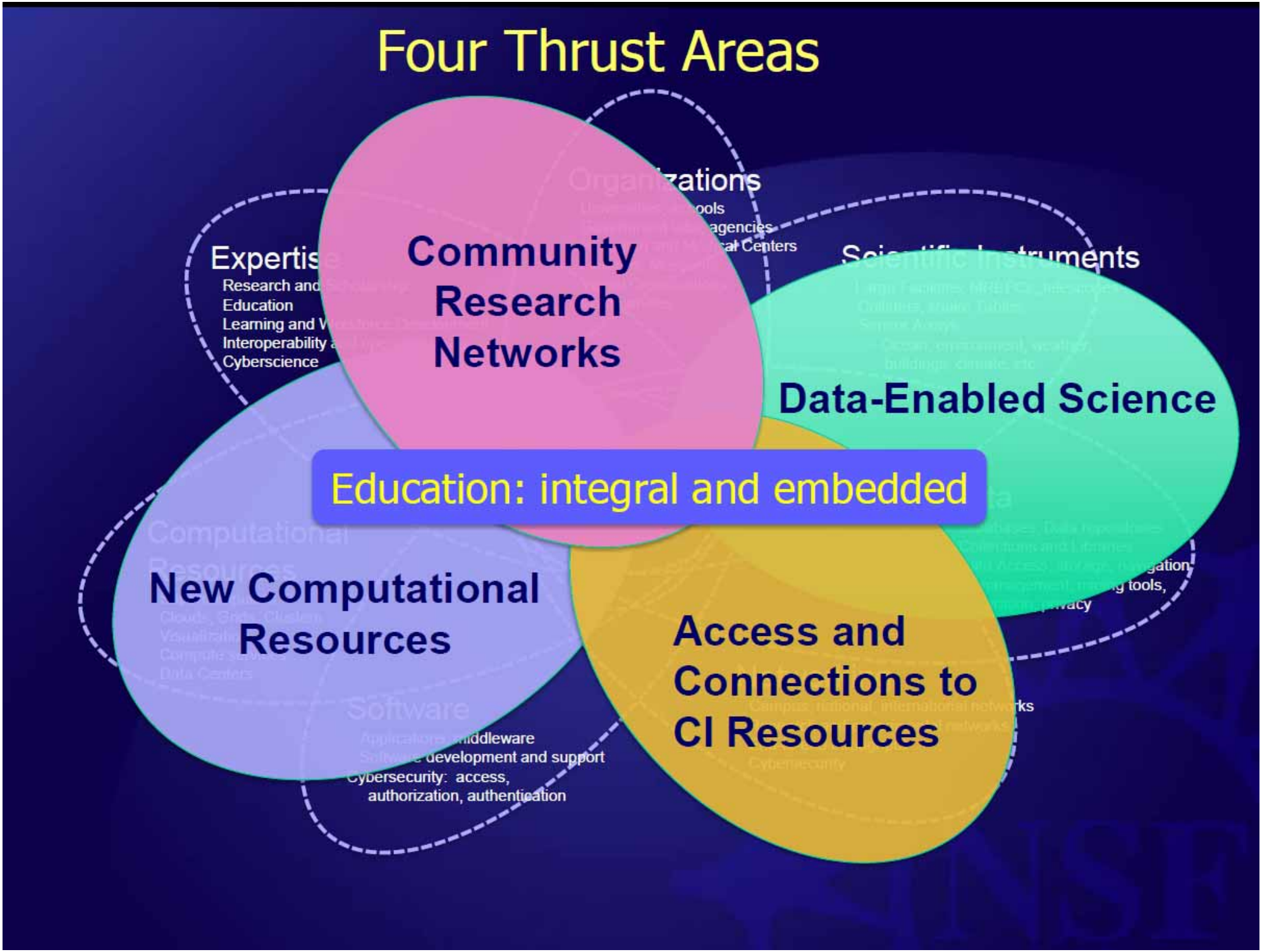
Framing the Challenge:
Science and Society Transformed by Data

- Modern science
  - Data- and compute-intensive
  - Integrative, multiscale
- Multi-disciplinary Collaborations for Complexity
  - Individuals, groups, teams, communities
- Sea of Data
  - Age of Observation
  - Distributed, central repositories, sensor-driven, diverse, etc

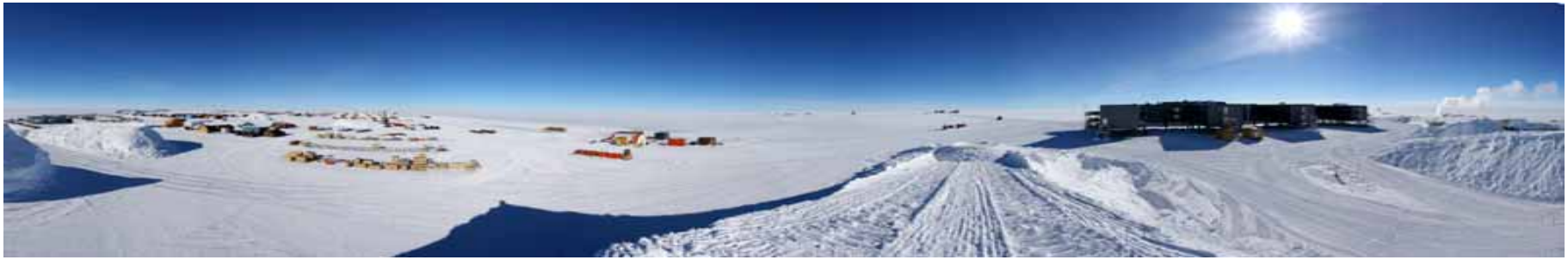
Cyberinfrastructure Ecosystem (CIF21)



Maintainability, sustainability, and extensibility


Four Thrust Areas
Community Research Networks
Data-Enabled Science
New Computational Resources
Access and Connections to CI Resources
Education: integral and embedded

How does OPP fit into this…?...OBSERVING



IceCube

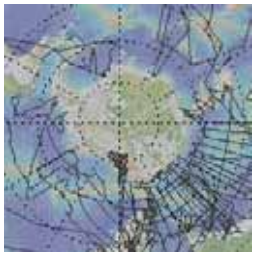
~500 Tb

PGC
Polar Geospatial Center

~400 Tb

AMRC & AWS

~20 Tb



Marine Geoscience Data System

~2 Tb

CReSIS
Center for Remote Sensing of Ice Sheets

~250 Tb

Cooperative Arctic Data and Information Service
of the ARCTIC OBSERVING NETWORK
CADIS

AON

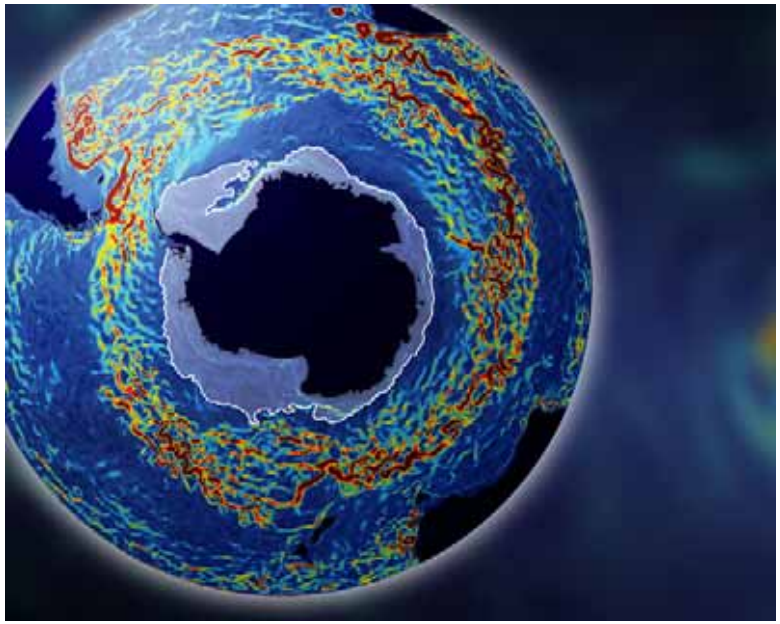
SEARCH

~5 Tb

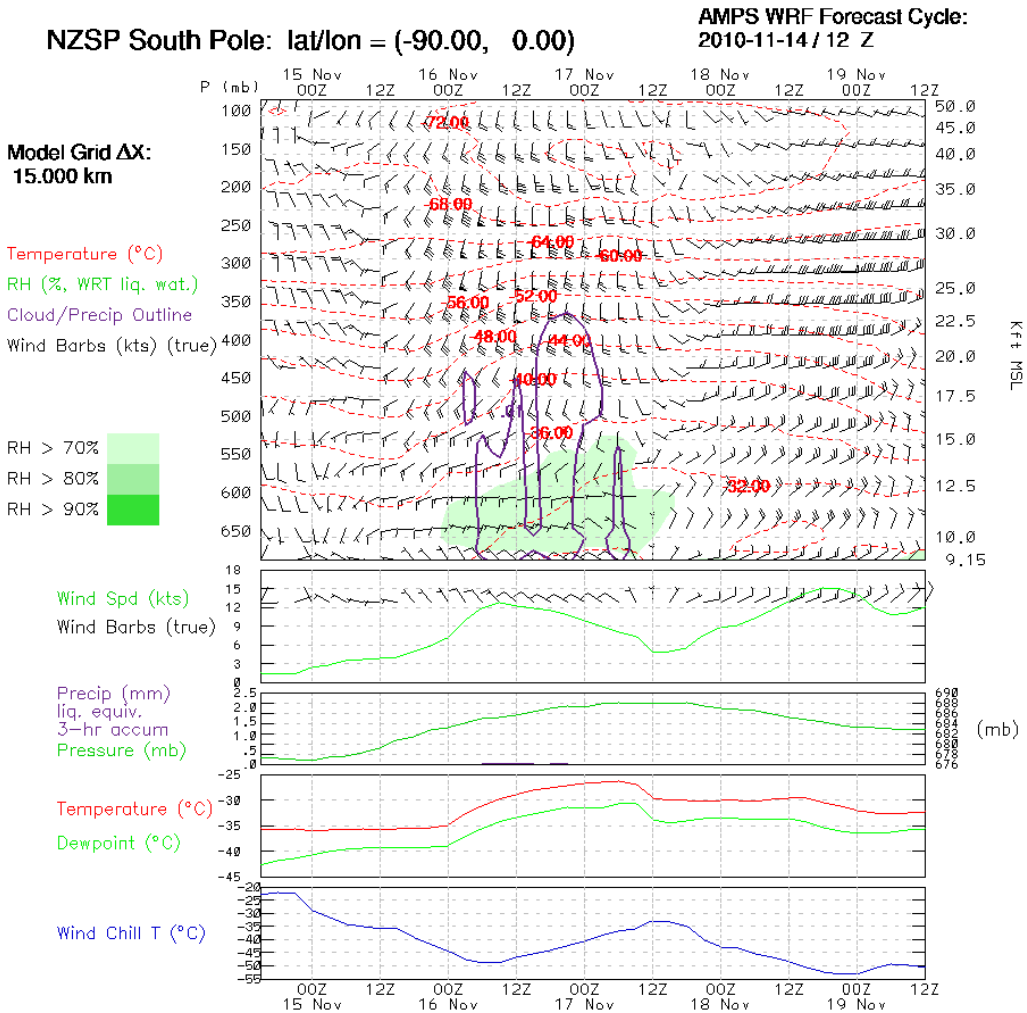
IPYDIS
International Polar Year
Data and Information Service

How does OPP fit into this…?...MODELLING

Southern Ocean State Estimation



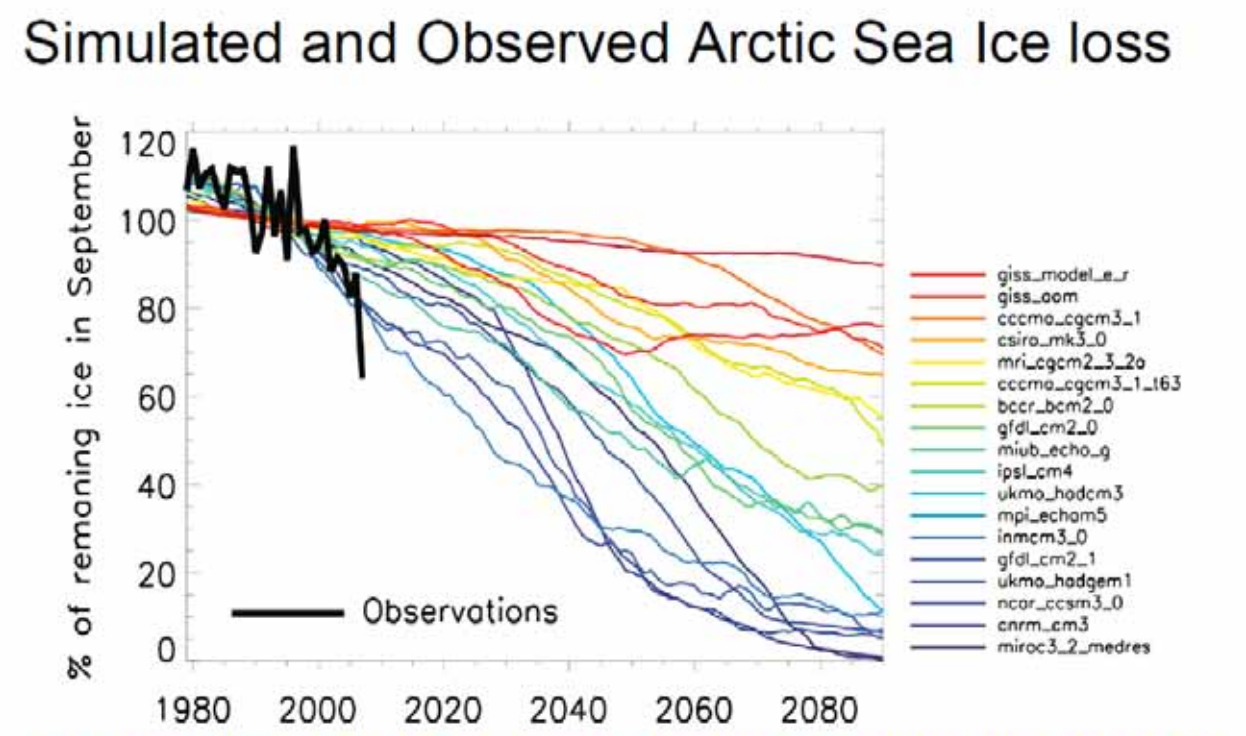
SPole Weather “Estimation”



How does OPP fit into this…?...
COMPUTATIONAL DATA ENABLED SCIENCE

Theory and experimentation have for centuries been regarded as two fundamental pillars of science. It is now widely recognized that computational and data-enabled science forms a critical third pillar. CDS&E includes new methodologies for science and engineering that are indispensible to the nation's welfare, competitiveness, and standing in the international scientific community and global economy.

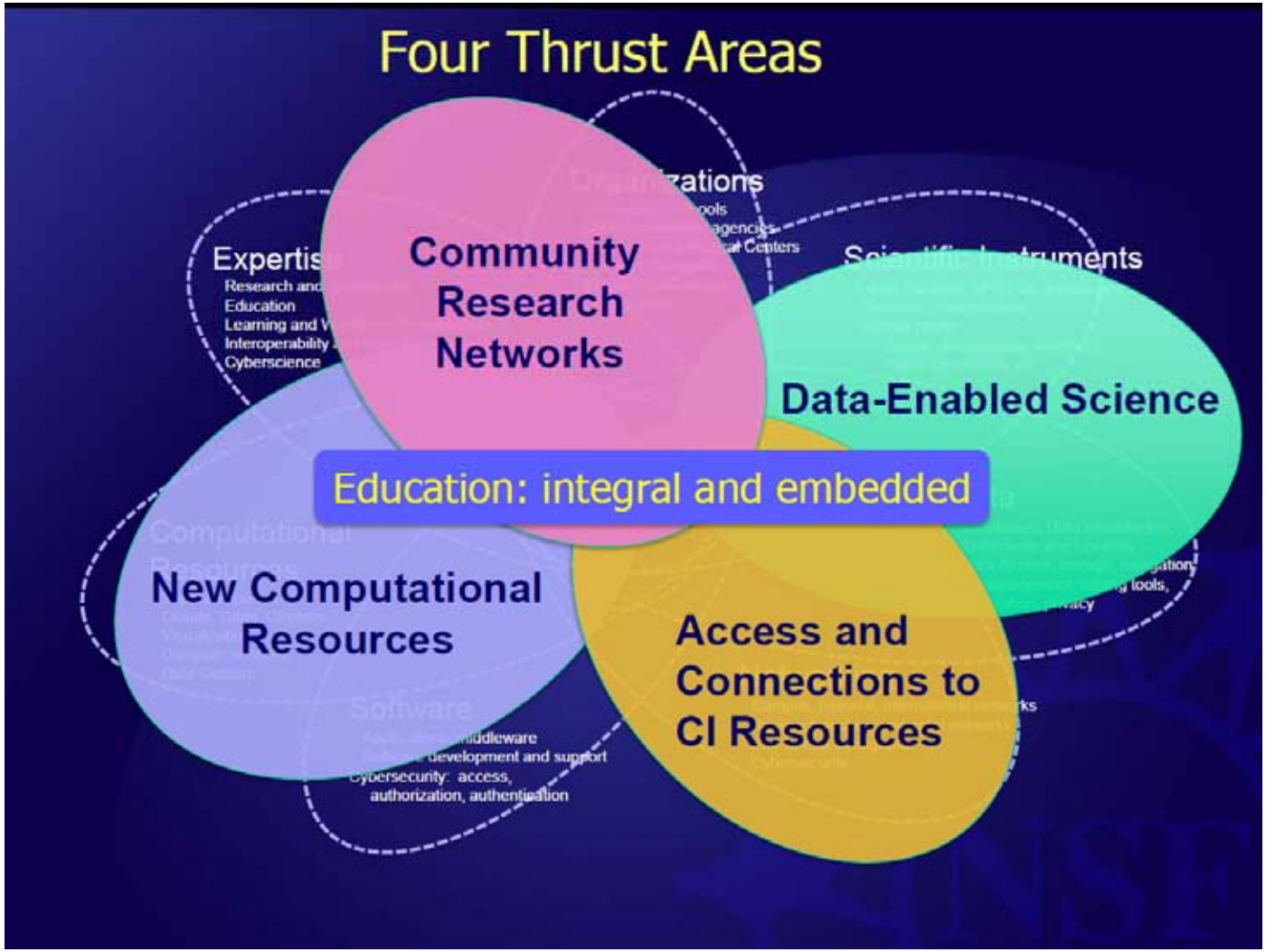
Earth System Model Projections



The models exhibit an enormous degree of spread, and generally undersimulate the observed sea ice loss over the past few decades.

(Stroeve et al. 2007)

How does OPP fit into CIF21?

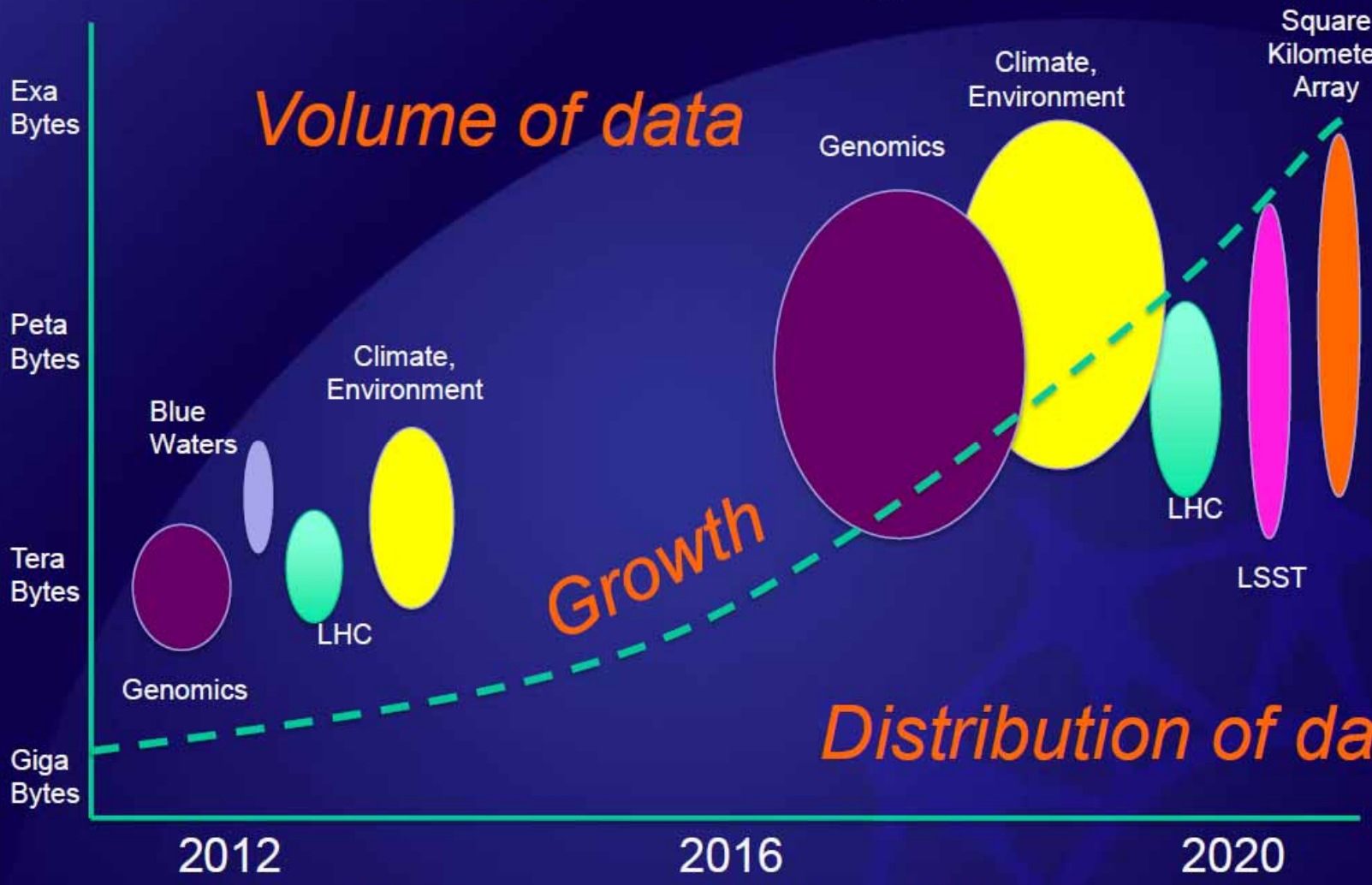


Questions for Discussion

- How can OPP participate in CIF21 to best meet emerging needs of the polar community? OPP's part of the NSF FY12 request includes funds in the first two areas. Does this seem appropriate or does the OAC see opportunities in the other areas? Does the OAC have specific ideas within these areas that OPP should consider?
- What incentives might there be to encourage greater participation at the PI level for sharing data? (The NSB recently noted the idea of requiring that shared data sets (citable) be included in proposal bio-sketch much like publications are listed.)
- Are there emerging opportunities important to polar research that could be enabled by Community Research Networks? If so, what can be done to foster polar involvement?
- OPP has not targeted funds for Computational Infrastructure, anticipating that polar sciences are not a major player in building and operating HPC resources but rather expect to benefit from infrastructure developed for scientific use more generally. Is this an appropriate approach? If so, what should OPP do to ensure that polar issues are taken into account by those developing the general infrastructure?
- What actions should OPP take to ensure appropriate polar input to future architectures that may emerge from the Access and Connections part?

Backup

Data Challenges



Creating Scalable Software Development Environments

- Create a software ecosystem that scales from individual or small groups of software innovators to large hubs of software excellence