NSF EarthCube Initiative

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National Science Foundation

A joint venture between the NSF Geosciences Directorate and the CISE Division of Advanced Cyberinfrastructure

Big Questions, Big Issues!!

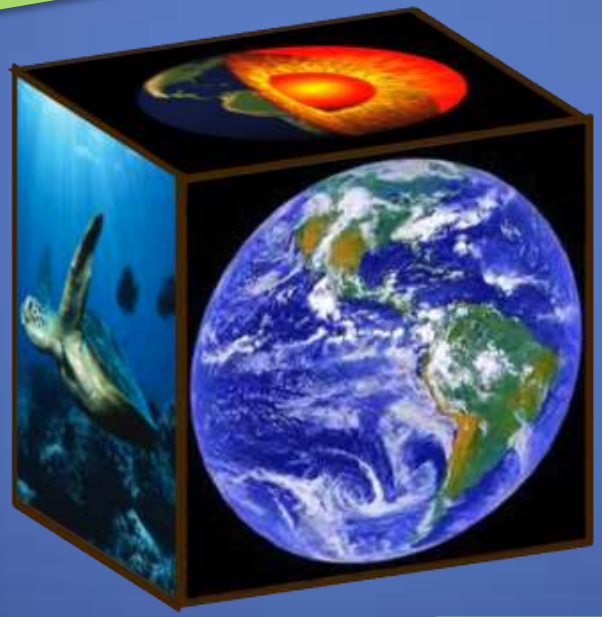
environmental change & resilience

formation & evolution of the atmosphere & oceans

human-earth interactions

the origin of life

climate change



deep – surface earth Interactions & feedbacks

extreme events – causes, periodicity, & implications

resource discovery & abundance

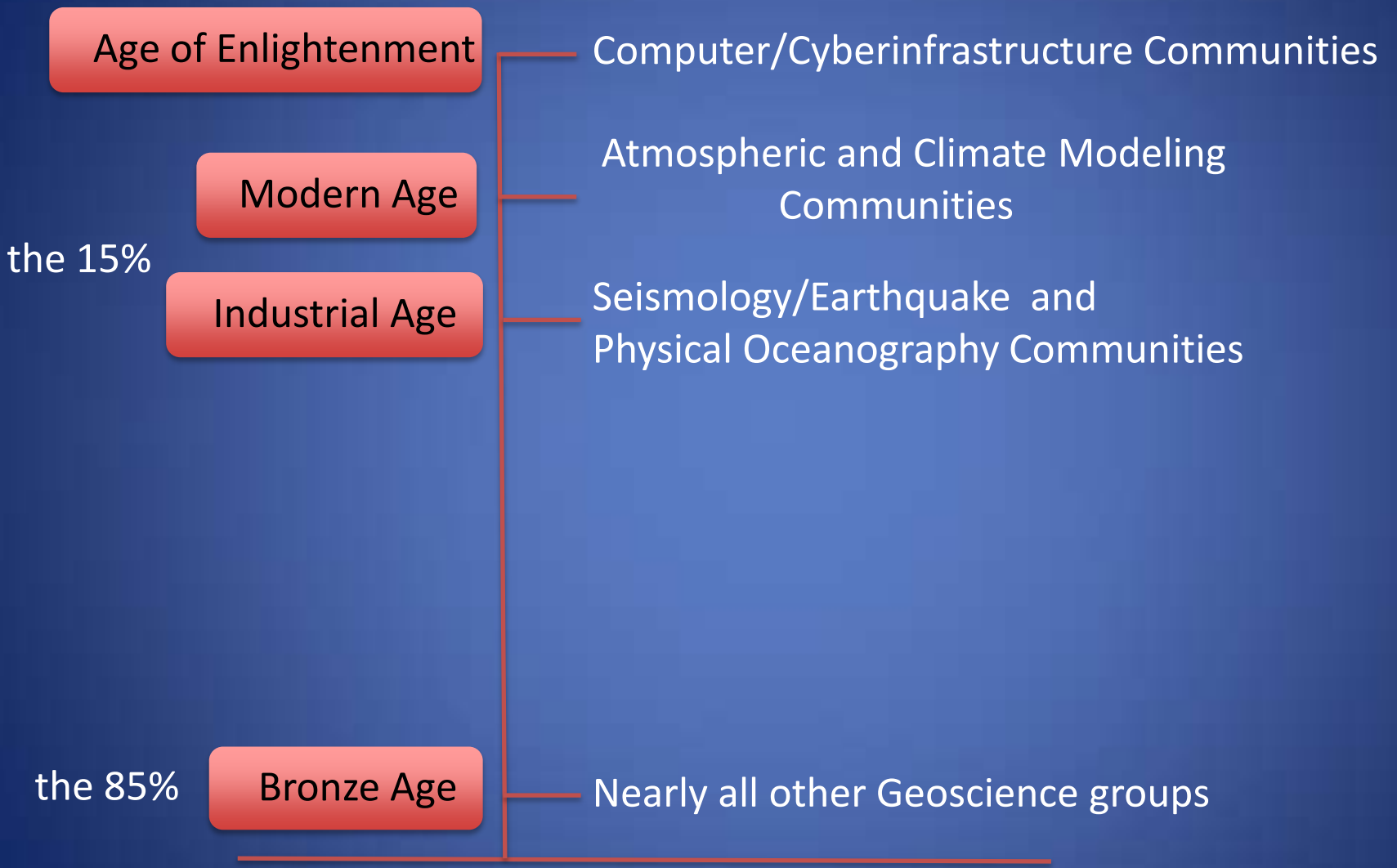
geohazards

life as a geologic agent

continental evolution & changes thru time

future world

Community: Complicated and Multi-Faceted



Present Relative State of Cyber-Sophistication and Knowledge in the Geosciences

The Problem (the 15% vs the 85%)

Two very different types of data

- sensor, bit-stream, real-time: GB/TB size (satellite, radar, seismic)
- sample-based, observations, images, multi informational, hard to describe

Two very different relationships with data

- Array-based: no ownership, don't care about any given data point, computationally intensive processing and modeling
- Sample/observation-based: intense ownership, care deeply about each point, can interpret directly or simply

Two different levels of investment

- HPC, big iron, federal archives, modeling centers, data repositories, dedicated personnel and facilities
- spreadsheets, hero code, dark data, cultural issues, no sustainability

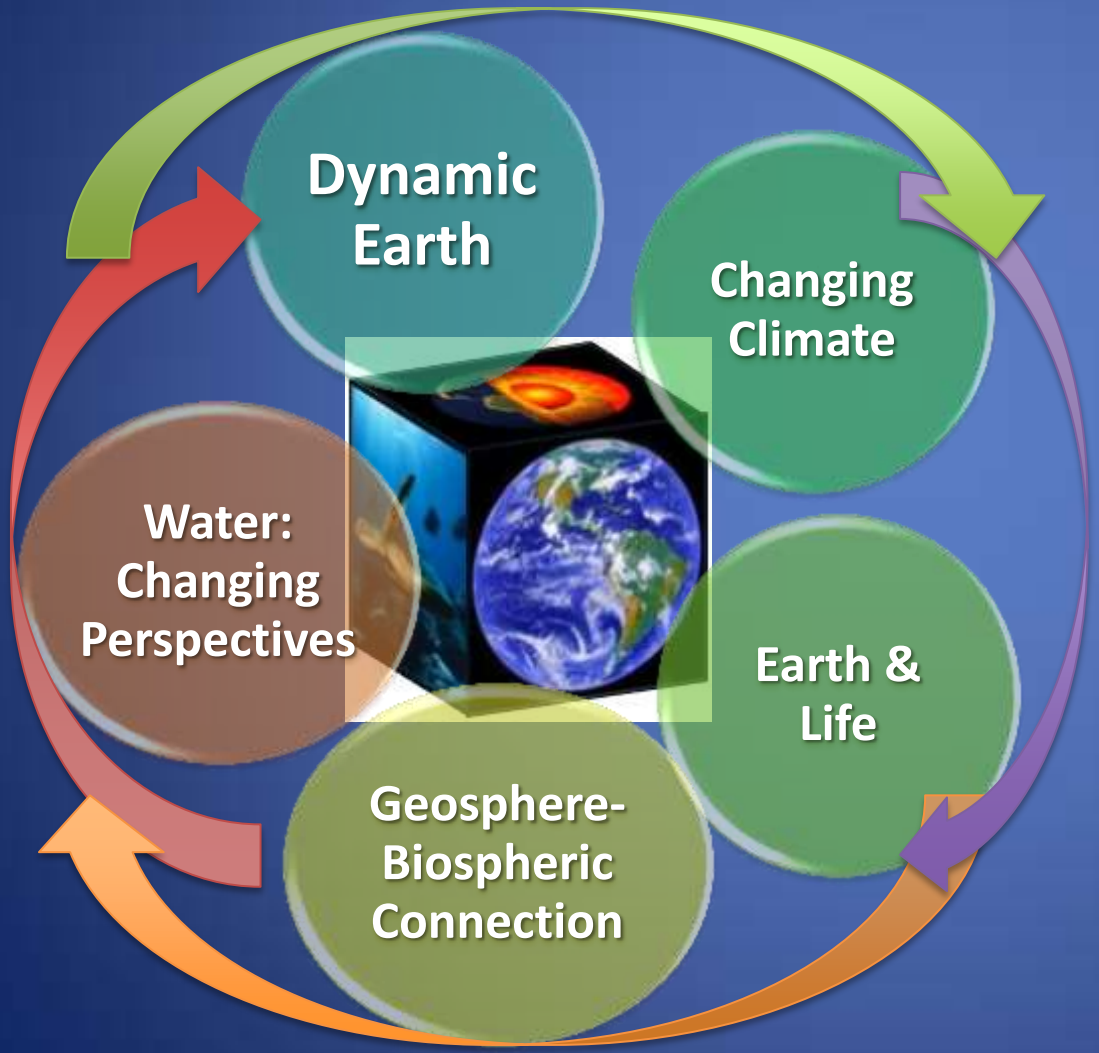
Read It and Weep

The 85% spend about 80% of their time looking for, collecting, and getting the necessary data together in a format they can use and about 20% of their time actually thinking/doing science

The 15% spend an increasing amount of time having problems wrestling with unmanageably large data arrays and problems scaling from global to regional or local scales

Neither are well integrated with each other and both types of data (array vs. point) and all of the areas of geoscience are required to solve the complex, inter-related, and pressing environmental problems we and the Earth are facing

What Is EarthCube?

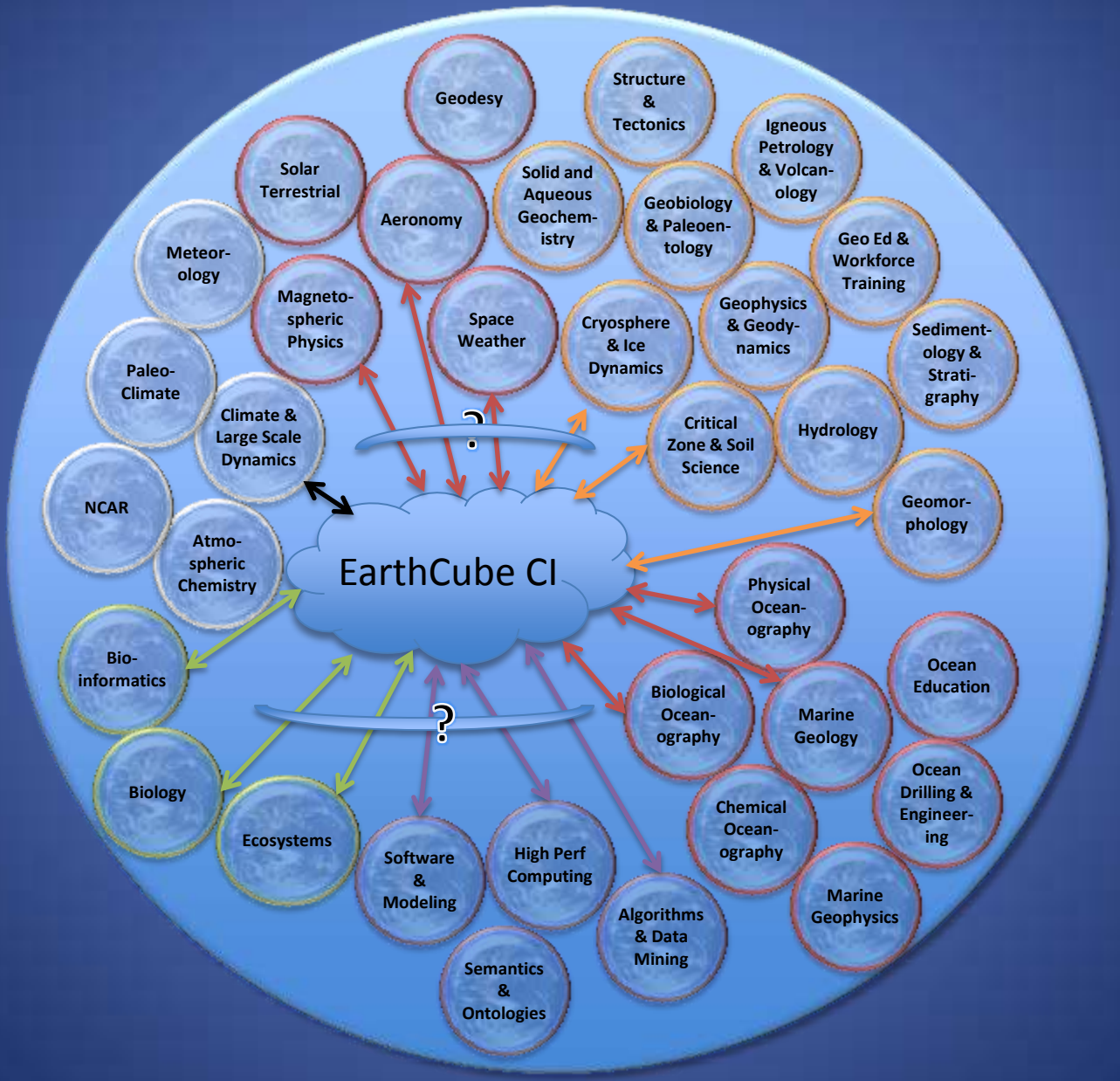


- Transform the conduct of data-enabled geoscience-related research.
- Create effective community-driven cyberinfrastructure.
- Allow global data discovery and knowledge management.
- Achieve interoperability and data integration across disciplines.

Why EarthCube?

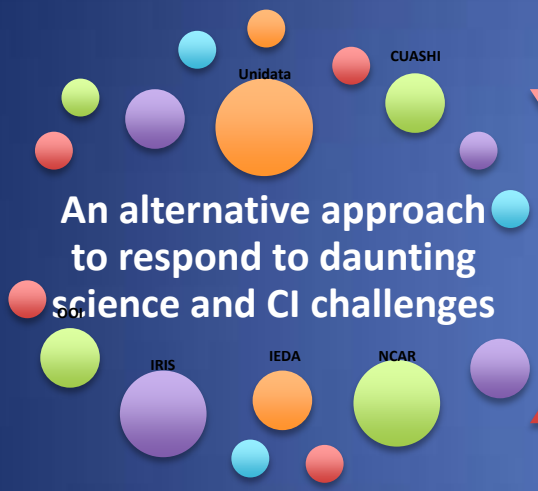
- Nature does not recognize separate disciplines.
- EarthCube will democratize access to data.
- EarthCube will increase research time by reducing time needed to find, access, and analyze data.
- EarthCube will enable more interdisciplinary research and the pursuit of new questions.
- EarthCube will accelerate the pace of discovery.
- EarthCube will give all scientists the same chance of making major contributions regardless of institution size or institutional endowment.

Who Is EarthCube? You Are!

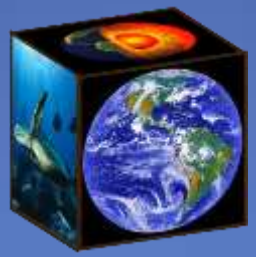


Path to the Vision

Its All about the Connections



An alternative approach to respond to daunting science and CI challenges



EarthCube is an outcome AND a process

EarthCube will require NSF and broad community involvement; new ways of doing

Important Features:

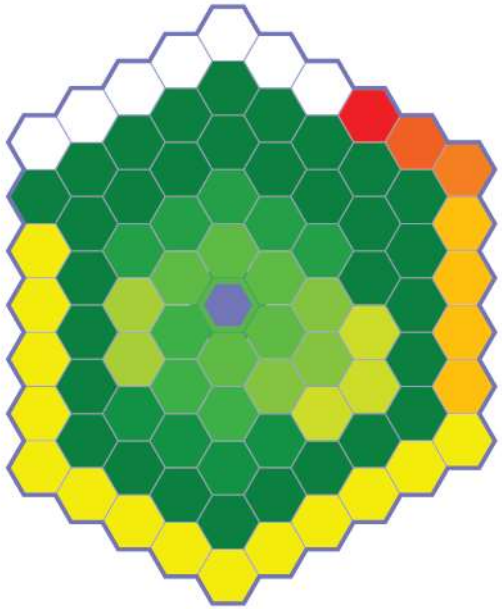
- Builds off existing data/modeling systems/cyberinfrastructure investments
- Provides tools/approaches that enhance modeling results, visualization, and data discovery, access, and integration
- Leverages investments across fields
- Allows for more integrative and interdisciplinary science

Feel Our Pain!

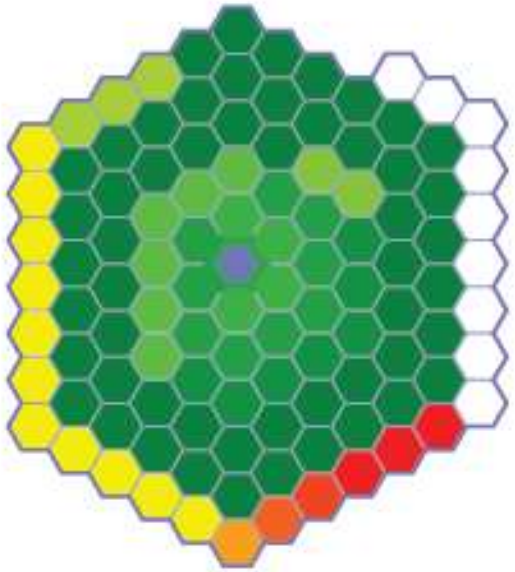
help me!

IMPORTANCE of integrating multiple datasets, models, observations, and/or visualization tools from different fields

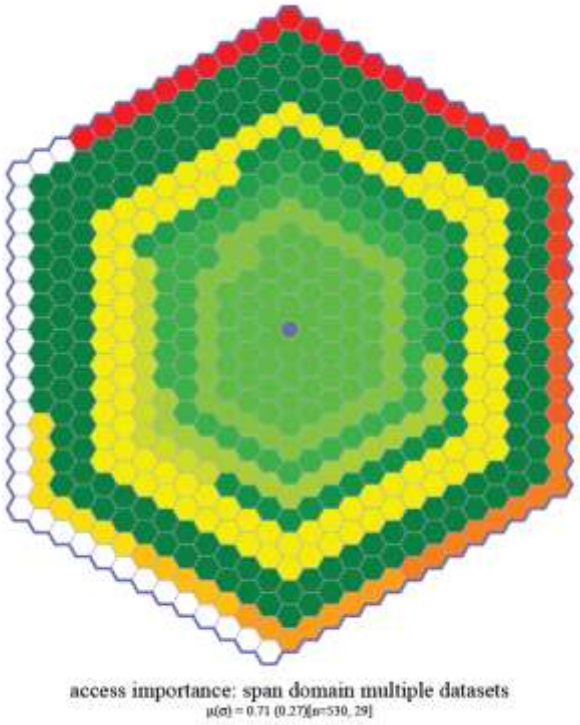
Early Career



EarthCube Active



All Others

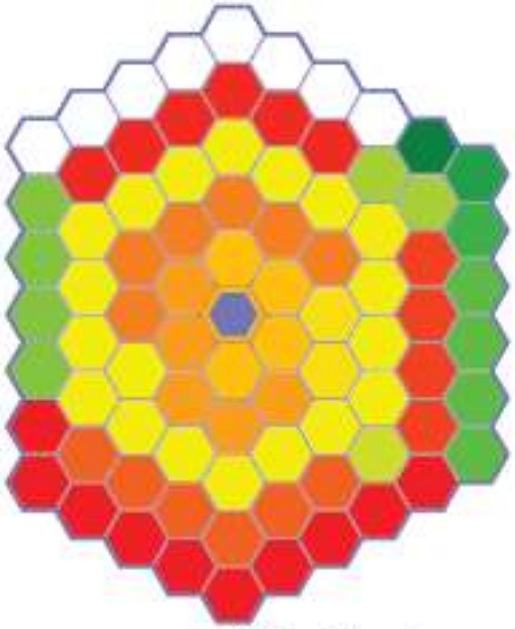


Many very positive, with some neutral
Only a few negative

	Early Career μ (α)	EC Active μ (α)	All Others μ (α)
Data from Joel Cutcher-Gershenfeld (social science, U Illinois) stakeholder alignment study of EarthCube community	0.76 (0.25)	0.83 (0.24)	0.71 (0.27)

EASE of integrating multiple datasets, models, observations, and/or visualization tools in your field

Early Career



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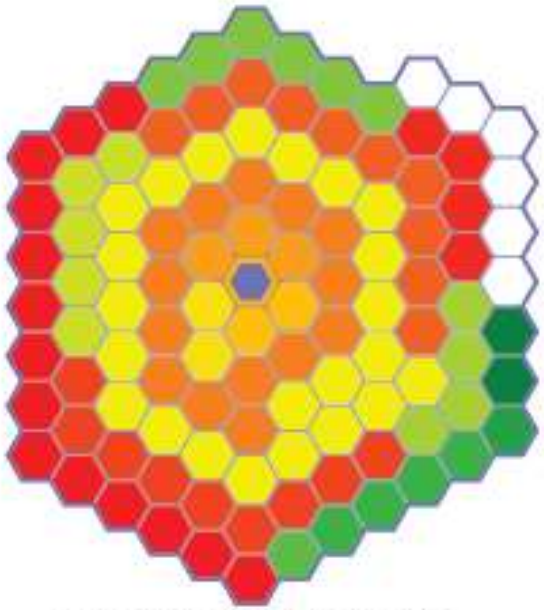

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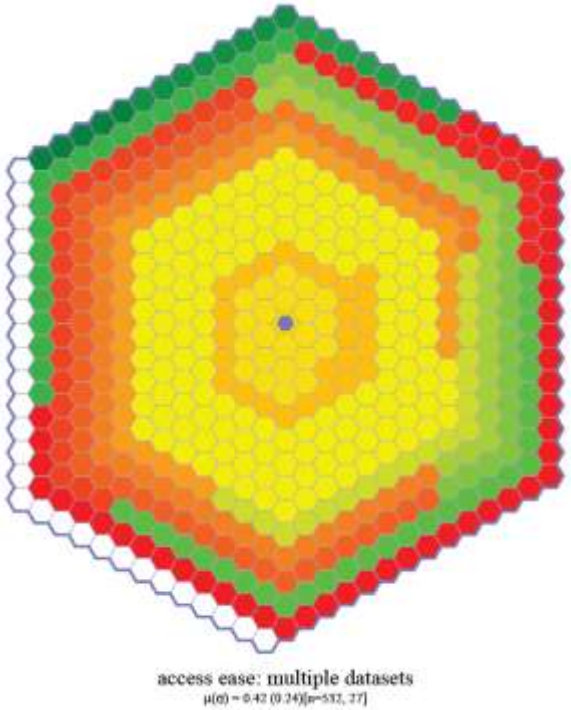

Vast majority negative, with some neutral Only a few positive	Early Career μ (α)	EC Active μ (α)	All Others μ (α)
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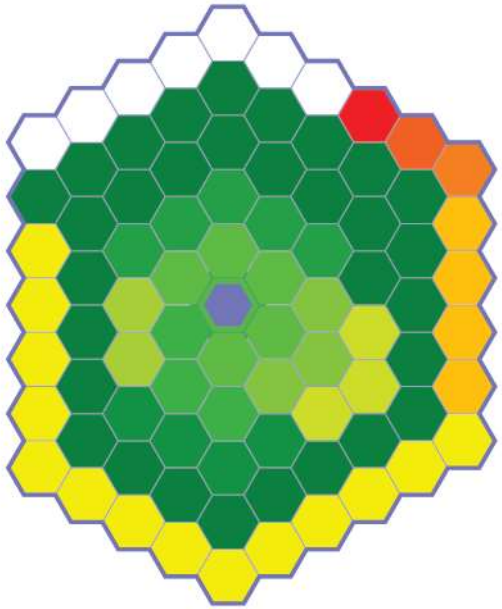
IMPORTANCE of integrating multiple datasets, models, observations, and/or visualization tools from different fields

Early Career



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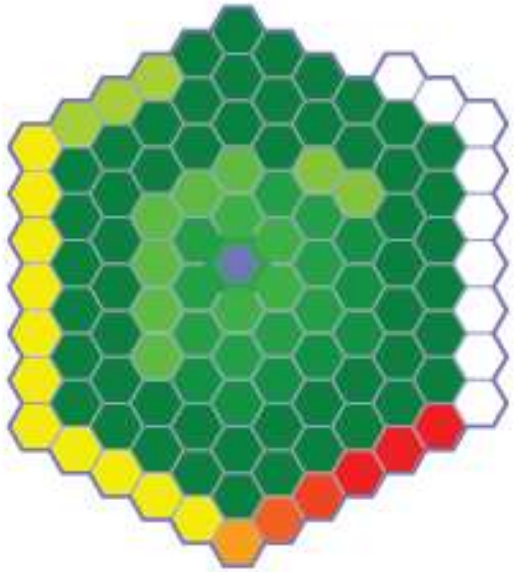
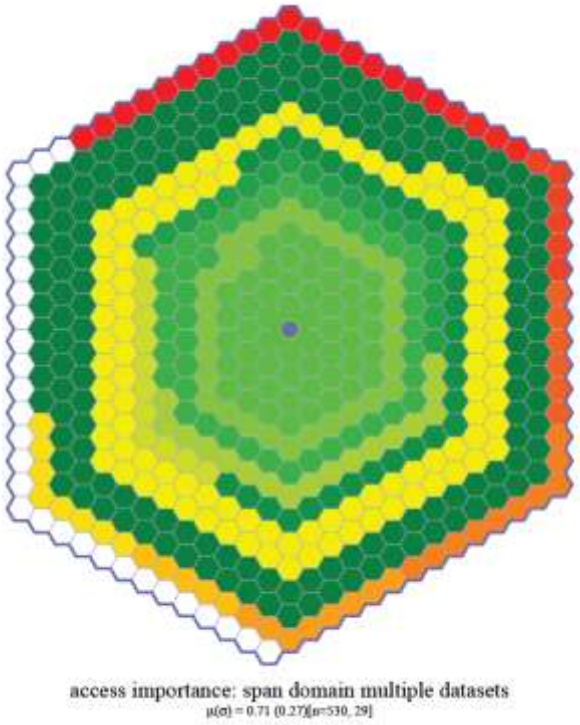


All Others



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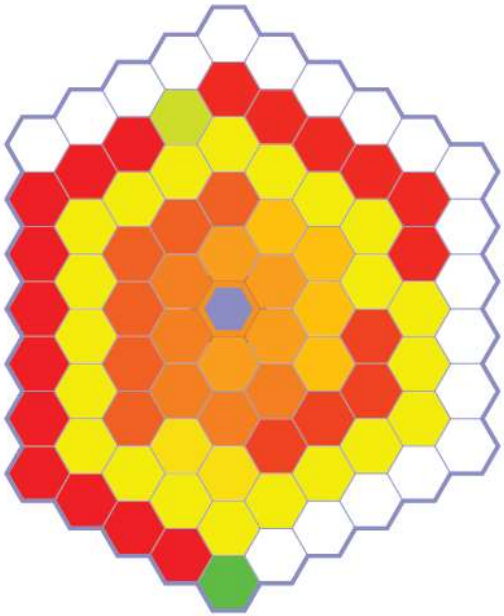

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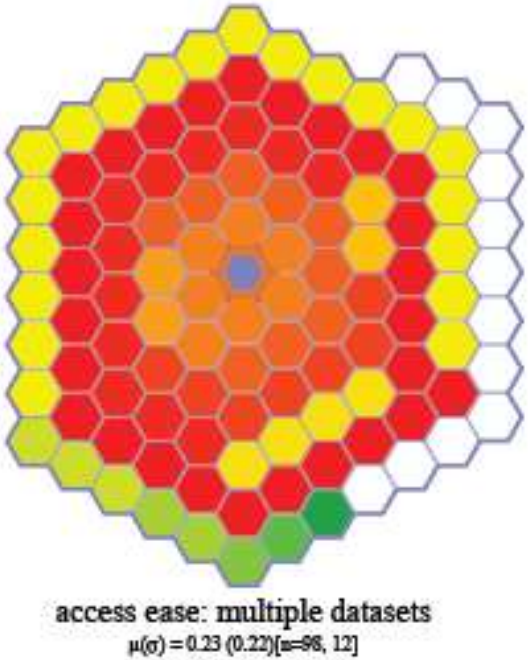
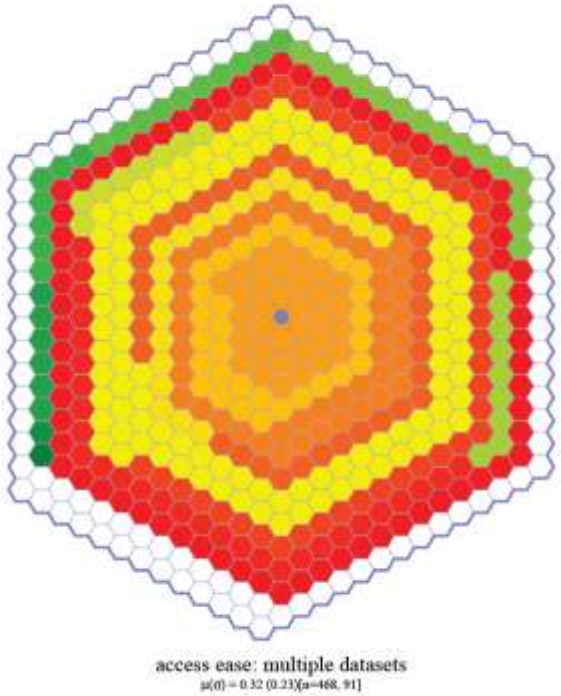


All Others



Vast majority negative, some neutral	Early Career μ (α)	EC Active μ (α)	All Others μ (α)
Data from Joel Cutcher-Gershenfeld (social science, U Illinois) stakeholder alignment study of EarthCube community	0.28 (0.20)	0.23 (0.22)	0.32 (0.23)

Blue Skying the EarthCube Future

Imagine:

- A world without laptops and WiFi - 22 yrs ago
- A world without cell phones – 20 yrs ago
- A world without digital cameras - 11 yrs ago
- A world without public GPS - 9 yrs ago
- A world without iPhones - 6 yrs ago
- A world without iPads – 3 yrs ago

Think of how much you depend on these tools!

Imagine:

- What would your life/science be without them?
- What the next advance will make possible!

Blue-Skying the Future

Now:

- Imagine a world where people can easily model their results and explore any ideas they might have.
- Imagine a world where anyone can easily plot data of interest and display it any way they want.
- Imagine a worldwhere with easy, unlimited access to scientific data from any field.

What science could you do?

What discoveries could you make?