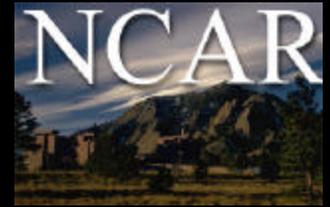


# Building Cyberinfrastructure for Collaboration in the Earth System Sciences

*Don Middleton*

August 6, 2001

Workshop on Advanced Collaboration Environments

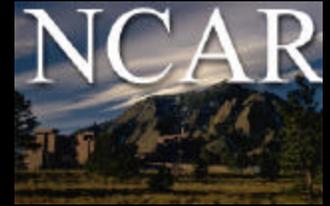


# NCAR – An NSF Center



**Scientific Computing Division**

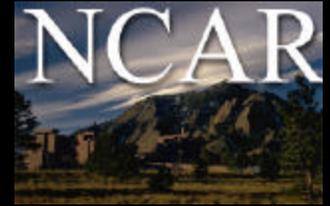
**visualization** + enabling technologies



# Once Upon a Time...

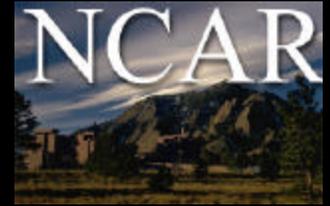
Researchers from around the world came to NCAR

***Our future is one as a virtual center, a collaboratory  
for the Earth System Sciences***



# Foundations

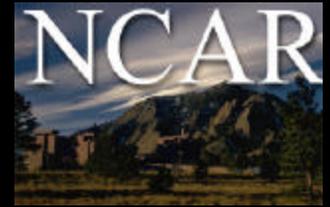
- SPARC Collaboratory
- DLESE
- New Visualization Lab and AG
- Collaborative Visualization
- The Community Data Portal
- The Earth System Grid



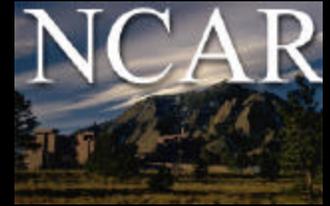
# SPARC: Space Physics and Aeronomy Research Collaboratory

- Successor to UARC (Upper Atmosphere Research Collaboratory)
- Origins at Univ. of Michigan
- Building environment at NCAR
- One foundation for a larger-scale earth system collaboratory...

# DLESE: The Digital Library for Earth System Education



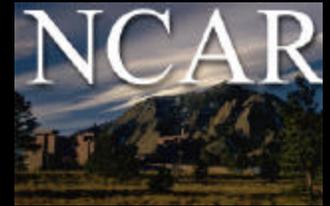
- Collections of instructional material
- Earth system data and imagery
- Discovery and distribution systems
- Communication networks for facilitating interaction and *collaboration*



# Visual Computing Lab

- A sophisticated physical workspace
- Visual supercomputing
- Wide-screen VR/3D Display
- Remote Visualization
- Collaboration (I.e. AccessGrid)

# Previsualization



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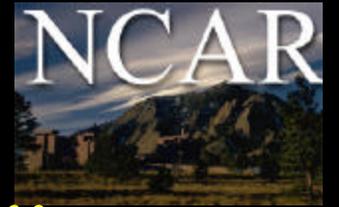
visualization + enabling technologies

Reality



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*“Rooms are becoming systems..”*



# A Framework for Collaborative Visualization



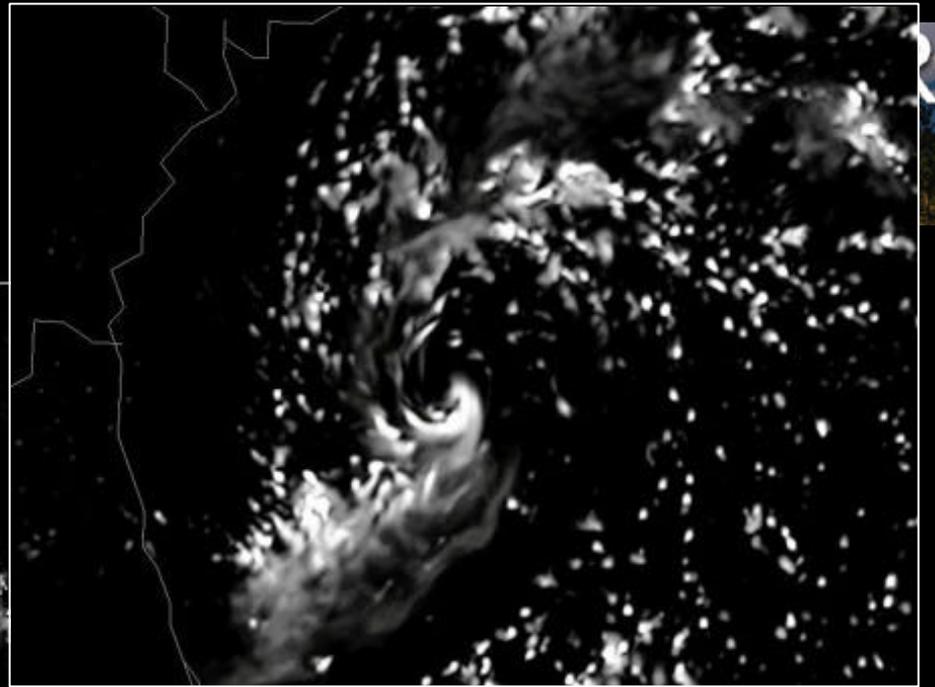
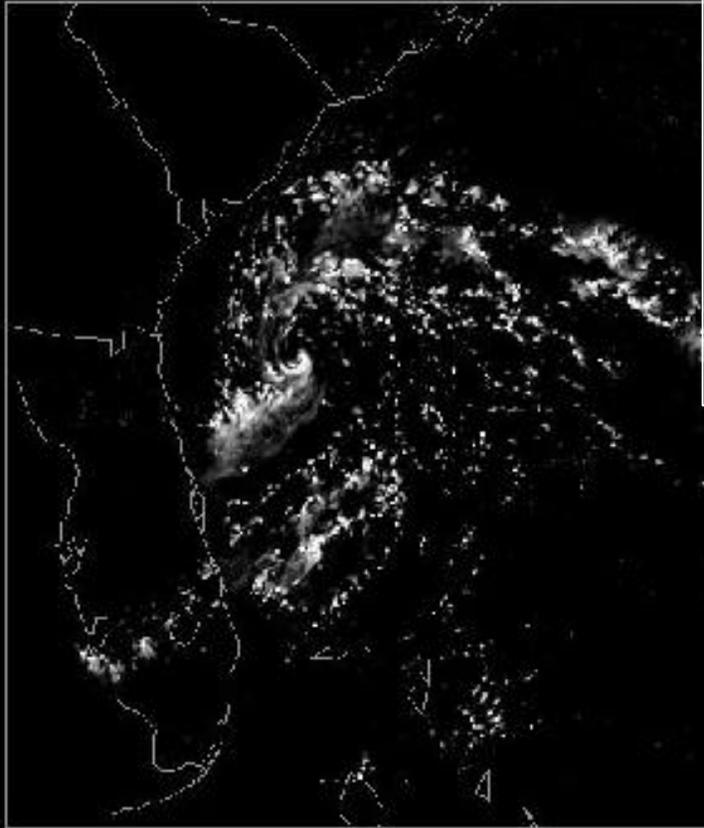
*Enabling group-to-group interaction in persistent electronic spaces  
And ultimately collaborative visual analysis*

The screenshot displays a complex multi-window interface for collaborative visualization. Key components include:

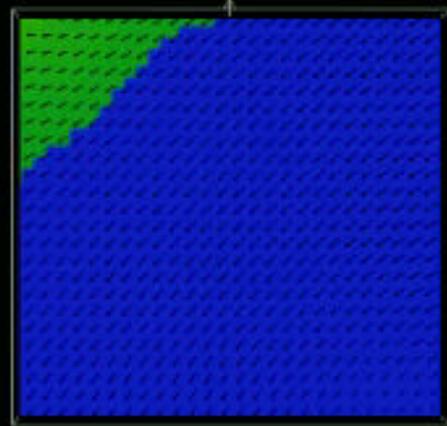
- Chat Window (top left):** A text-based chat interface with a list of participants and a message history.
- Slide Show (top center):** A presentation window titled "Runtime Adjustments" with a list of bullet points:
  - Backchannel Compression/fairshare adjustments
  - Priority Caching should be featured on web display
  - Lower sound levels on video audio streams
  - Change video transmission rates to improve audio
  - Make incoming video streams to use less on CPU
- Video Feed (top right):** A window showing a real-time video stream of two individuals in a meeting.
- 3D Model (center):** A large window displaying a 3D visualization of a fire model, with the text "Fire Model" and "NCAR" overlaid.
- Dashboard (bottom right):** A window containing a grid of smaller data visualizations and charts.
- Taskbar (bottom):** A Windows-style taskbar with various application icons and system tray elements.

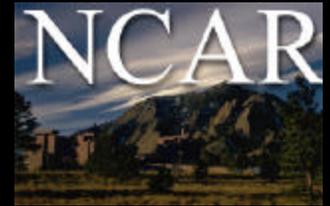
# Remote & Collaborative Visualization



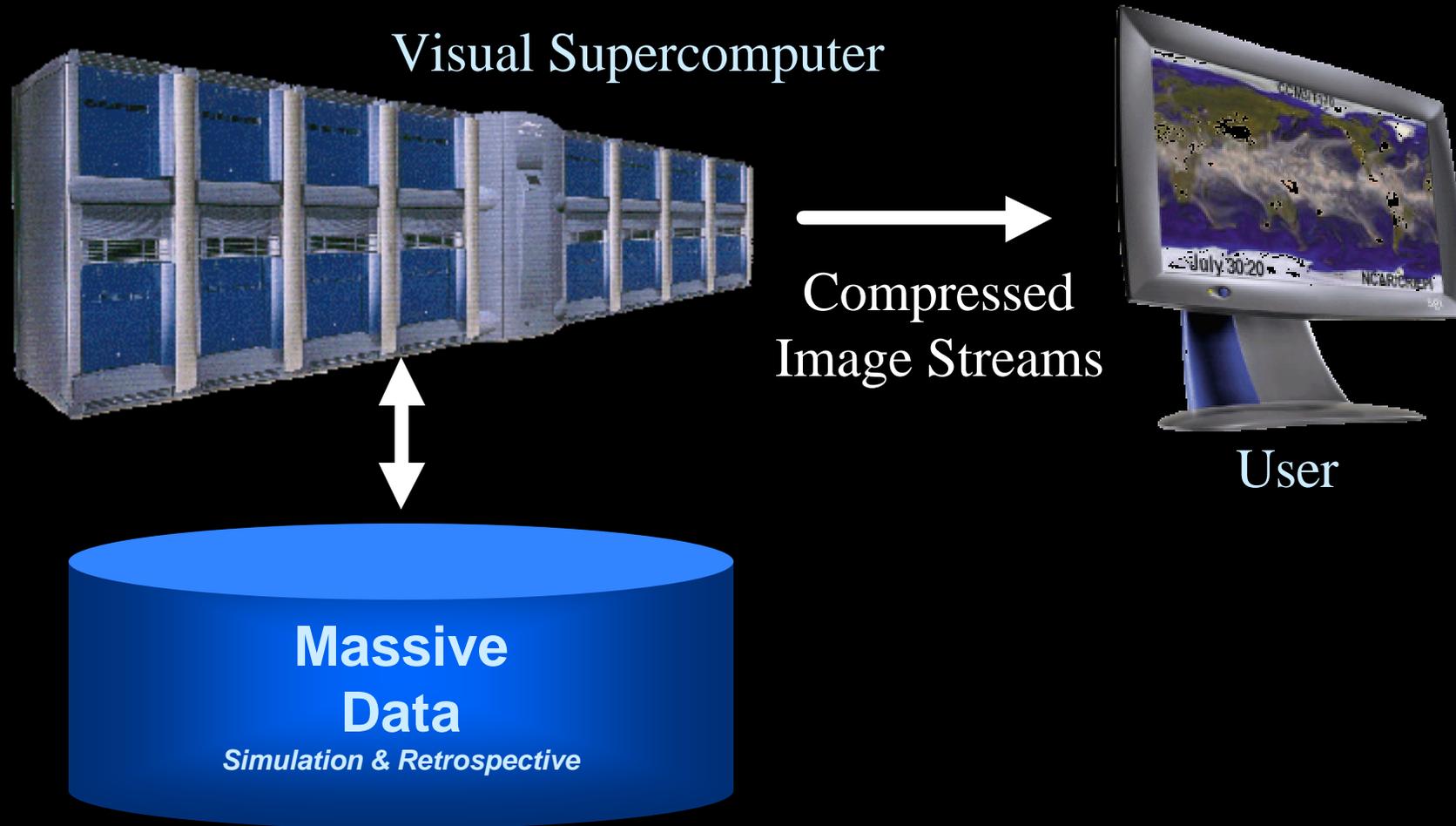


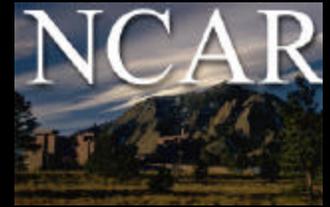
00:00:00  
84252  
1 of 48  
Saturday





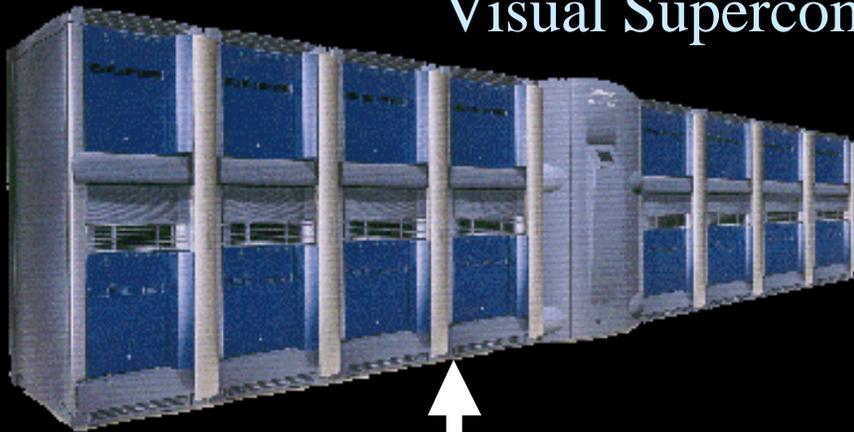
# Remote Visualization





# Remote Visualization

Visual Supercomputer



**Massive  
Data**

*Simulation & Retrospective*



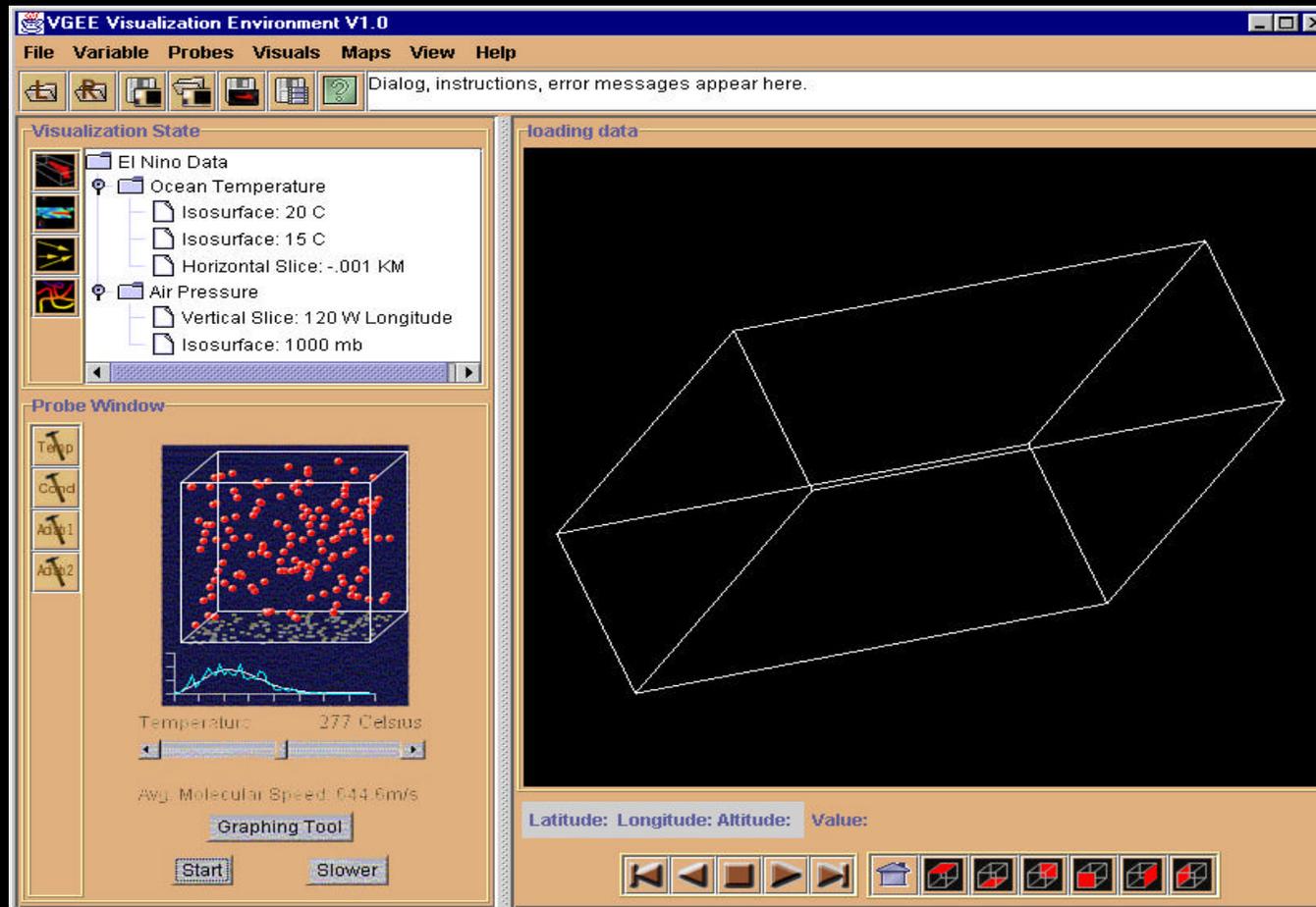
Compressed  
Image Streams  
(Hi-def,  
Stereo,  
Beyond demo's,  
Better tools!)

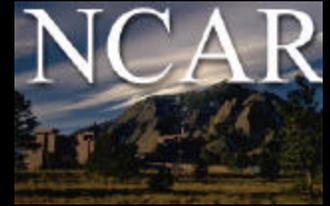


AccessGrid



# VGEE: Visual Geophysical Exploration Environment





# Data-sharing Communities

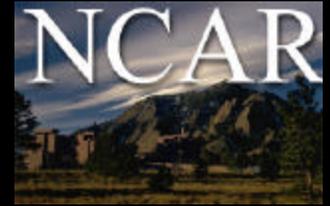
## Consumers

- Data Centers
- Research Programs
- Field Studies
- University Programs
- Impacts Assessment
- Education

## Providers

- Data Centers
- Research Programs
- Field Studies
- University Programs
- Impacts Assessment
- Education

COLLABORATORS



# The Community Data Portal

*A new environment and suite of services aimed at enabling both the consumers as well as the suppliers of important community datasets.*

- Integrated hardware/software environments that facilitate easy provision of data and broad access
- Browser and distributed client access
- A flexible multi-technology, multi-service approach



[ACACIA Home](#)  
[ARCAS Info](#)  
[About NCAR](#)  
[About LAS/Ferret](#)

# ACACIA Regional Climate Data Access System

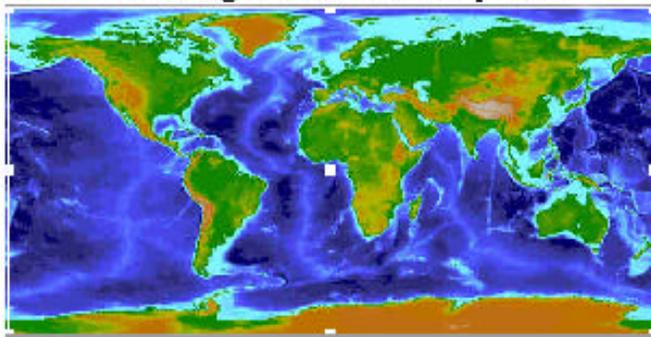
[Help](#)  
[Options](#)

PCM B05.15 (Business as usual) served by [SCD/NCAR](#)  
**Surface temperature**

Select view: xy (lat/lon) slice  
Select:  single variable  comparison

**Get Data**

Full Region



87.864 N  
180.0 W 180.0 E  
87.864 S  
Zoom In Zoom Out

Data Sets  Collapse  Expand

- CSM1.2 (Business as usual)
- CSM1.2 (Stabilization)
- PCM B05.09 (Historical)
- PCM B05.15 (Business as usual)
  - Convective precipitation rate
  - Large-scale (stable) precipita...
  - Reference height temperature
  - Reference height temperature, ...
  - Reference height temperature, ...
  - Surface temperature
  - Vertically-integrated, random ...

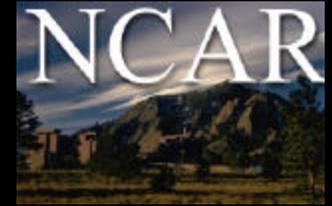
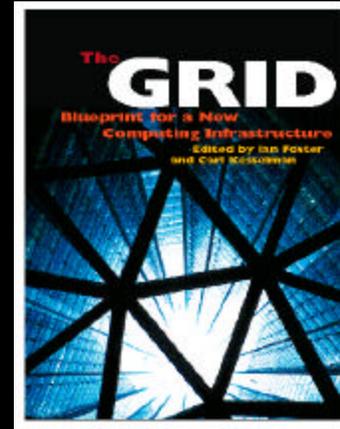
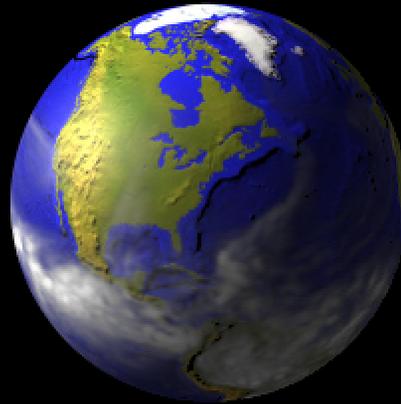
Select time: 01 Jan 2000 01-Jan-2000

Select product: Shaded plot (GIF) in 800x600 window

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visualization + enabling technologies

# The Earth System Grid



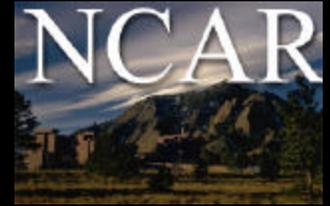
- DOE-sponsored collaborative project with LANL, LLNL, LBNL, and ANL
- Globus/Grid technologies
- Enable management and distributed access/processing of terascale climate data
- ESG-II

*Towards terascale and petascale data-sharing*



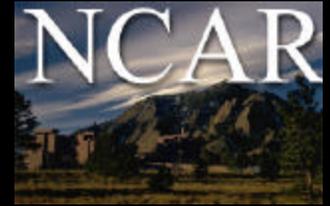
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# Futures - KEG: A Knowledge Environment for the Geosciences

- A Knowledge-Enabled
- Collaborative
- Problem-solving environment



# Putting it all together

## Cyberinfrastructure for Collaboration

Data Information Knowledge Experiences/Interaction

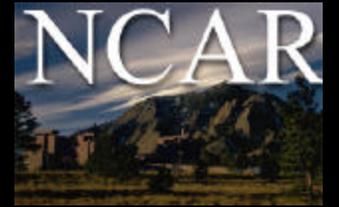
R&D Tools Models Virtual Exploration



## Communities

Us Researchers Universities Datasites Education

Soc. & Env Impacts Policy GeneralPublic Media



End