Technology Development Division Update

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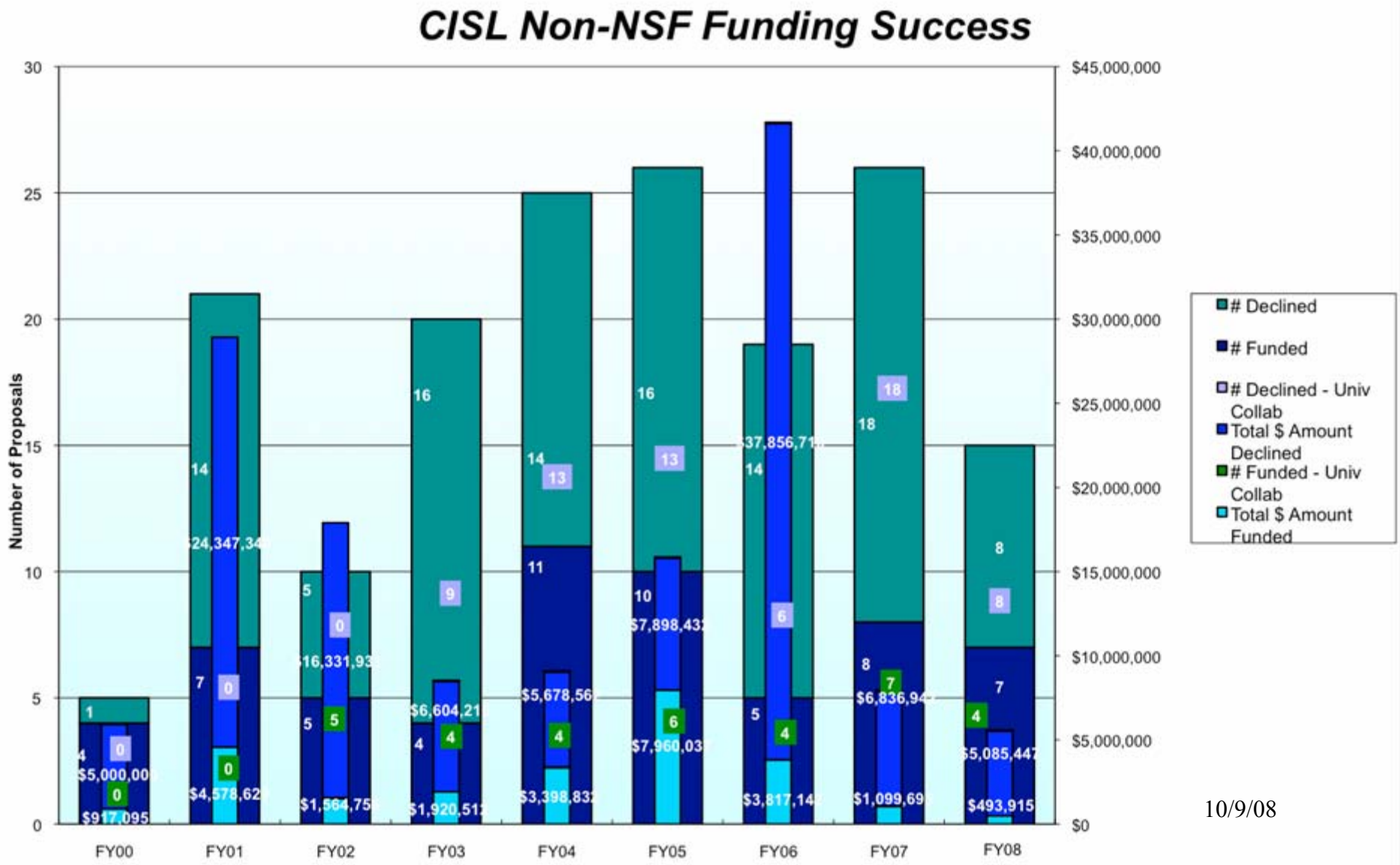
Technology Development Division, CISL
October 2008

Outline

- Proposal Status
- TeraGrid Update
- TDD Update
- SIParCS Program

CISL Proposal Funding History



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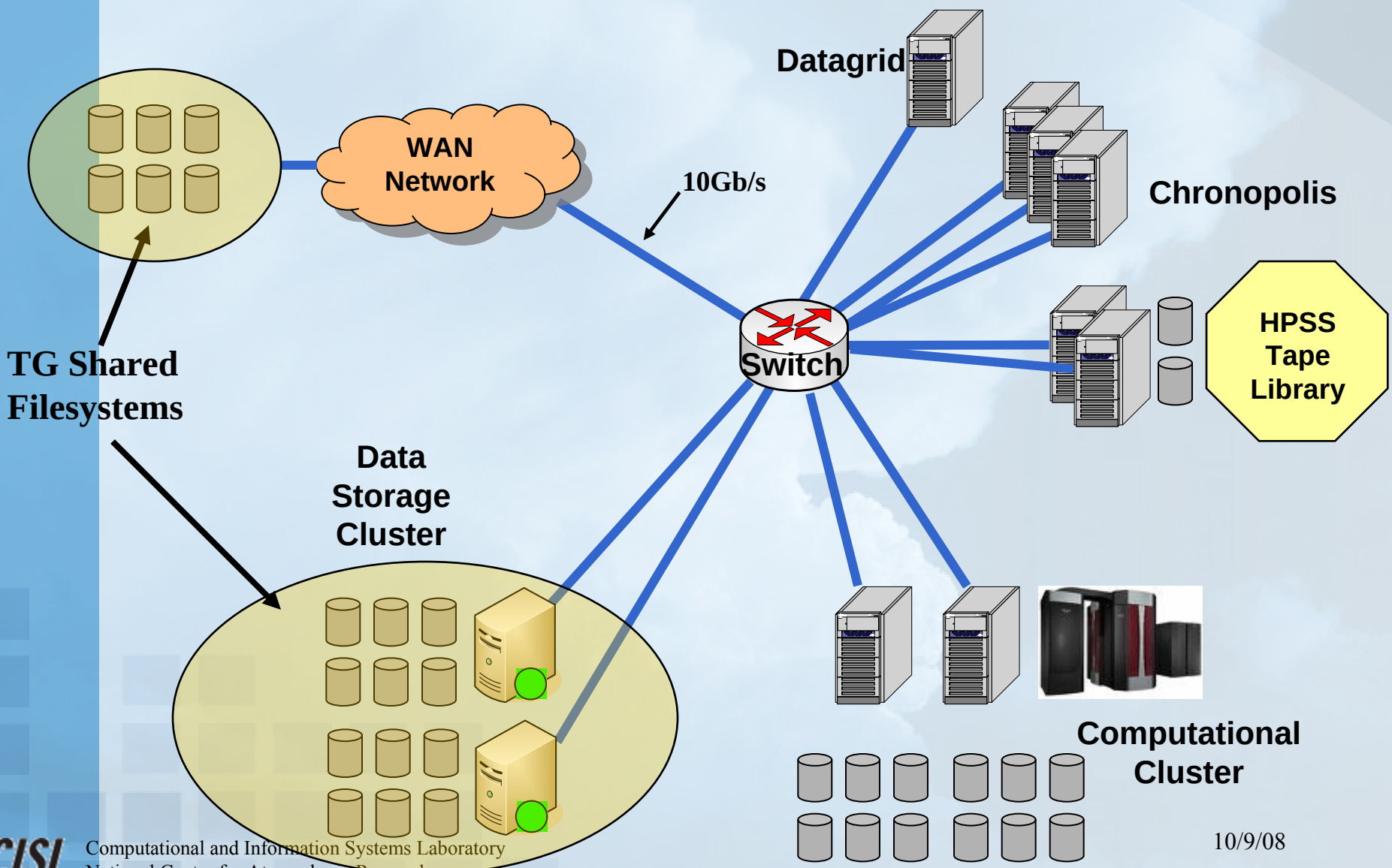
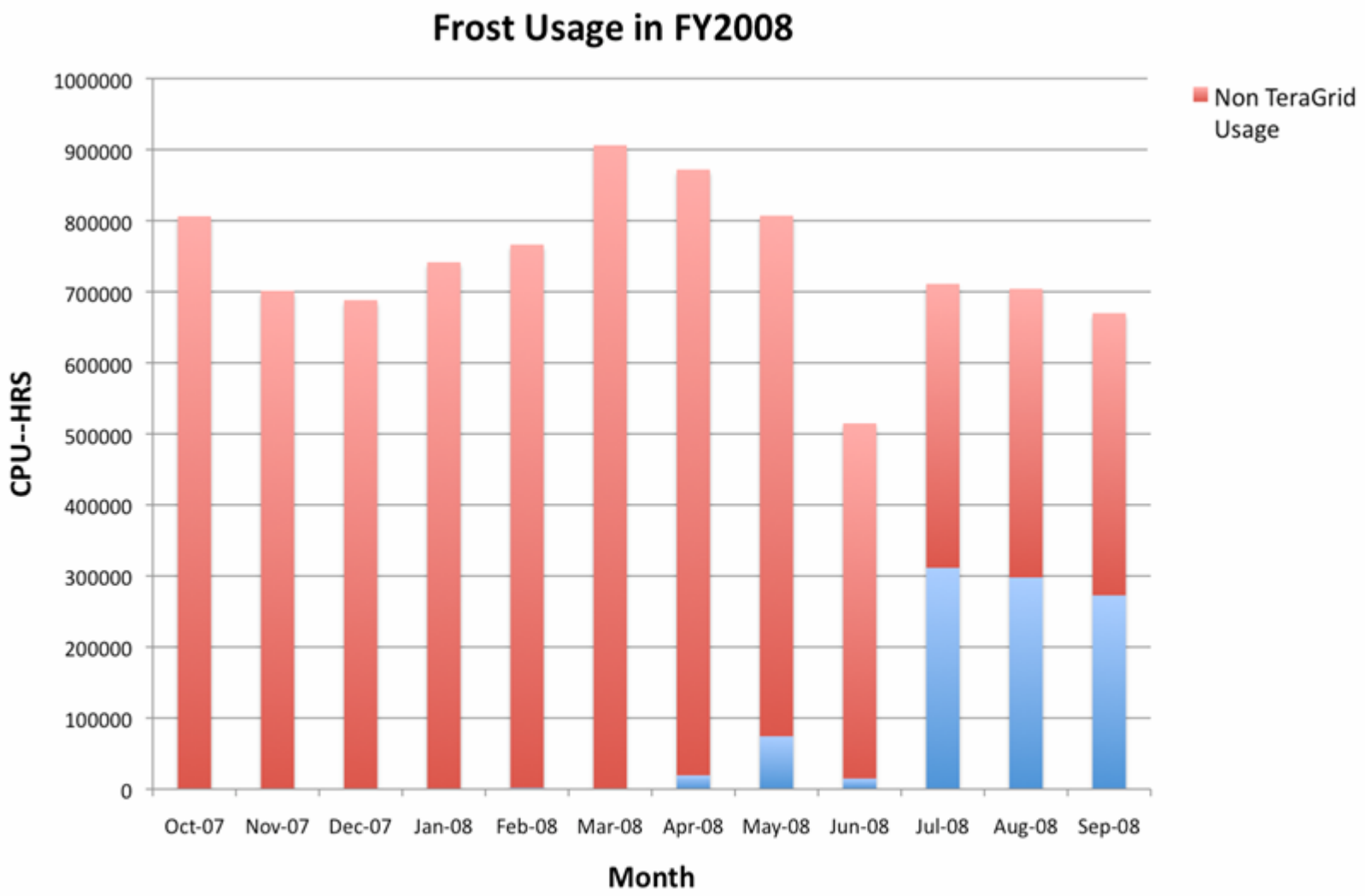
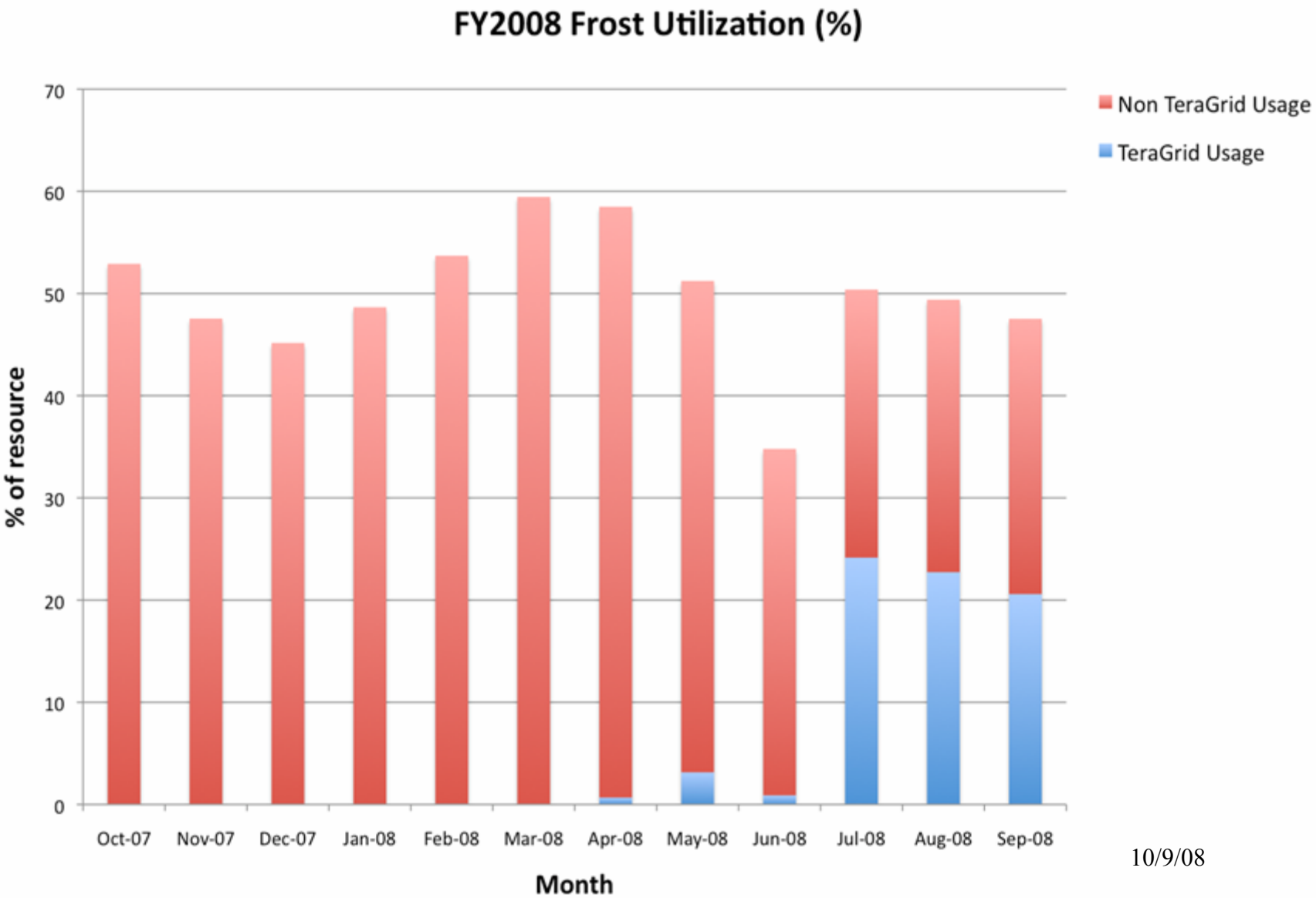
The NCAR TeraGrid Update



Blue Gene/L Resource Utilization (CPU-HRS)



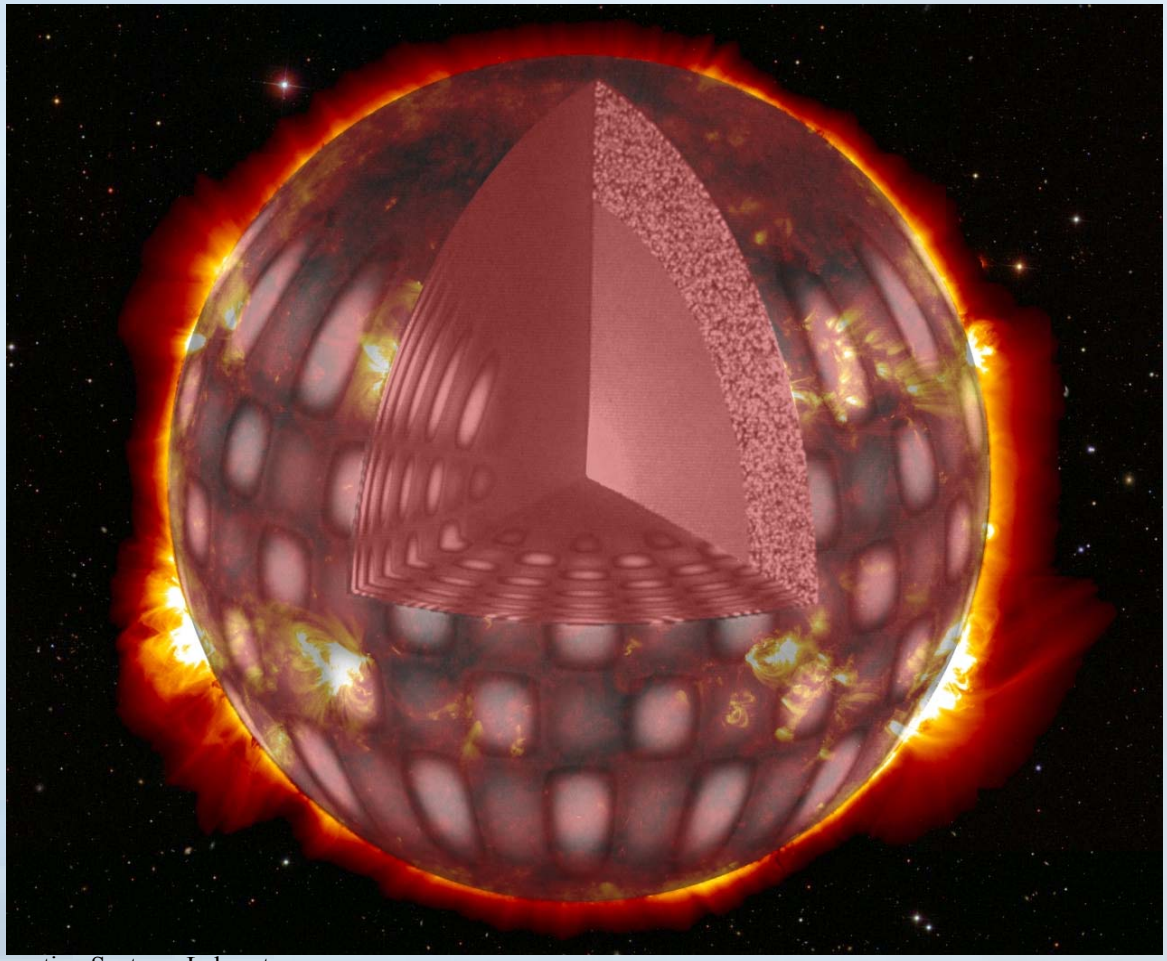
Percent BG/L Resource Utilization



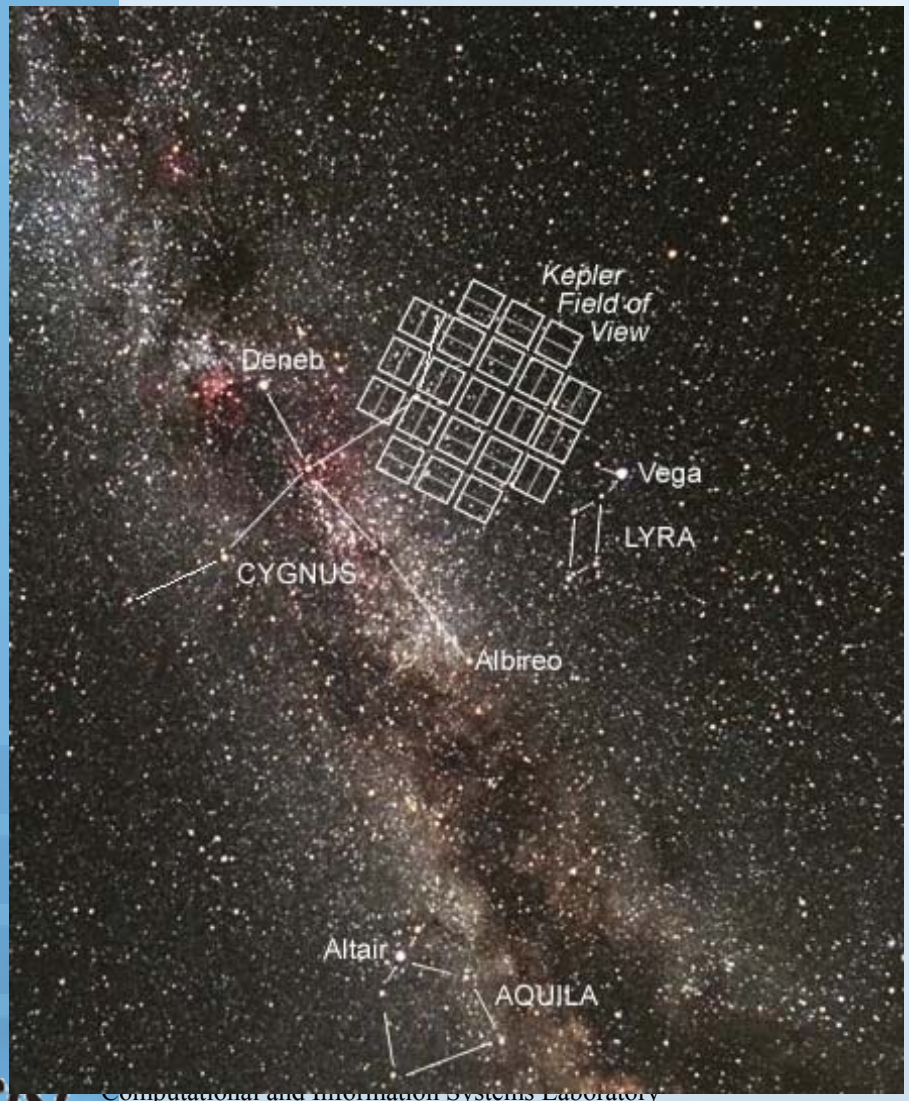
BG/L Fall XRAC Allocation Results: total of 773,000 SU's

- 5000 SU's: Chi Hu California State University, Long Beach *Foundation Applications of the Multichannel Scattering Theory Via the Modified Faddeex Equation*
  - Was granted 1M on ranger - this is a testing account.
- 65,000 SU's: David Schriver UCLA *Electron and Ion Particle Dynamics in Mercury's Magnetosphere* 65,000
- 300,000 SU's: Ian Parrish Princeton University *Simulations of Magnetized Astrophysical Plasmas with Anisotropic Conduction, Viscosity, and Energetic Particles*
- 403,000 SU's: Said Elghobashi UC-Irvine *Direct Numerical Simulation of Turbulent Boundary Layers Laden with Finite-Size Bubbles*

NCAR TeraGrid PY-4 Project: Asteroseismic Modeling Portal (AMP)

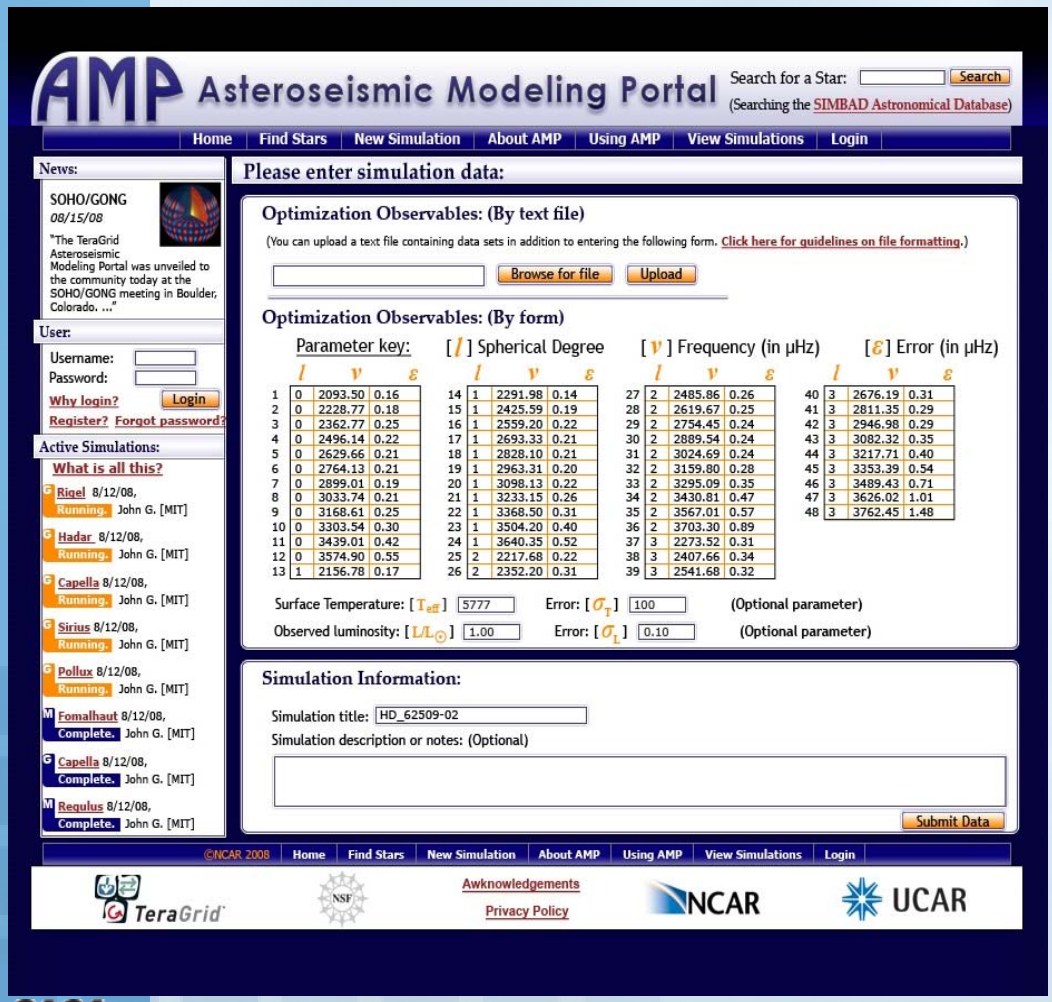


Kepler Mission Overview



- NASA mission currently scheduled for launch in mid-February 2009
- 105 square degrees just above galactic plane in the constellation Cygnus
- Single field for 4-6 years
  - 100,000 stars @ 30 minute sampling frequency
  - 512 @ 1 minute sampling frequency

NCAR TeraGrid PY-4 Project: Asteroseismic Modeling Portal (AMP)

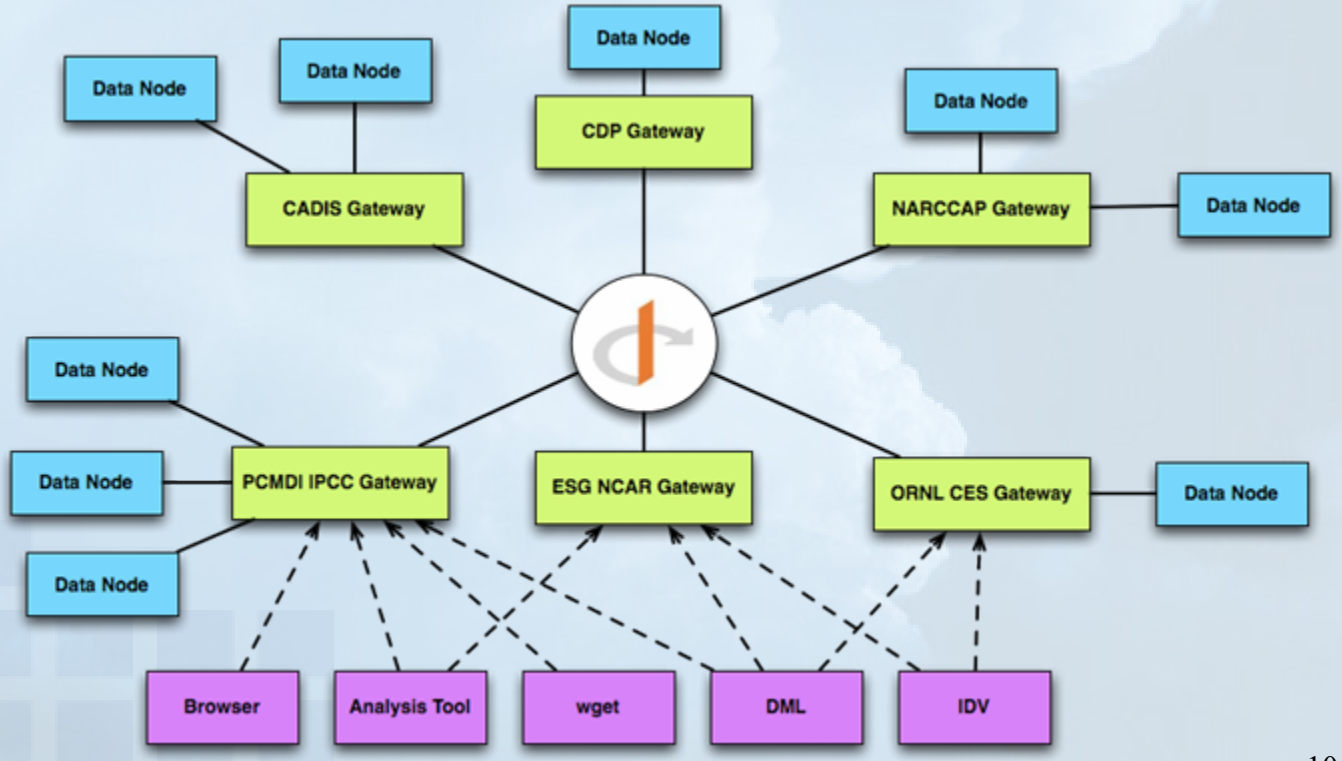


- Web interface to specify observations with errors, or upload as a text file
- Specify parameter values to run one instance of the model, results archived
- Source code available for those with access to large cluster or supercomputer

The ESKE Science Gateway Framework (SGF)

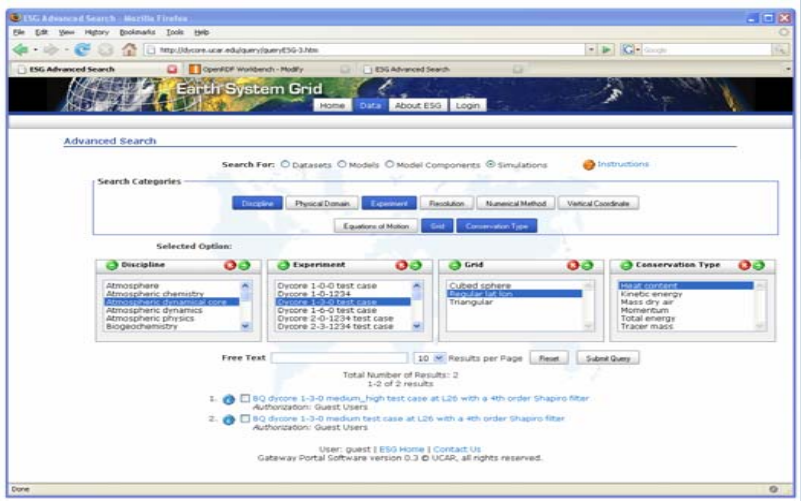
- The Science Gateway Framework is aimed at providing common infrastructure for a range of distributed, federated data management efforts
- ESG: will deploy the SGF in an early testbed for IPCC AR5/CMIP5 this Fall
- ASP/DyCore Workshop: A Curator, ESG, and SGF collaboration to provide a system that spans models, data, and tools
- CADIS: A new prototype Gateway for polar research is undergoing review

Federated Systems with the SGF



Earth System Curator

- NSF-funded Curator portal created in collaboration with DOE Earth System Grid, ESMF, GFDL, Georgia Tech, BADC, and other European partners
- Archival, faceted search, and distribution of models and datasets
- Links datasets with detailed descriptions of the models that ran to produce the datasets
- Dynamic comparison tables
- Longer term:
  - Compatibility checking
  - Auto-Generation of coupler components
  - Loosely coupled models using web services

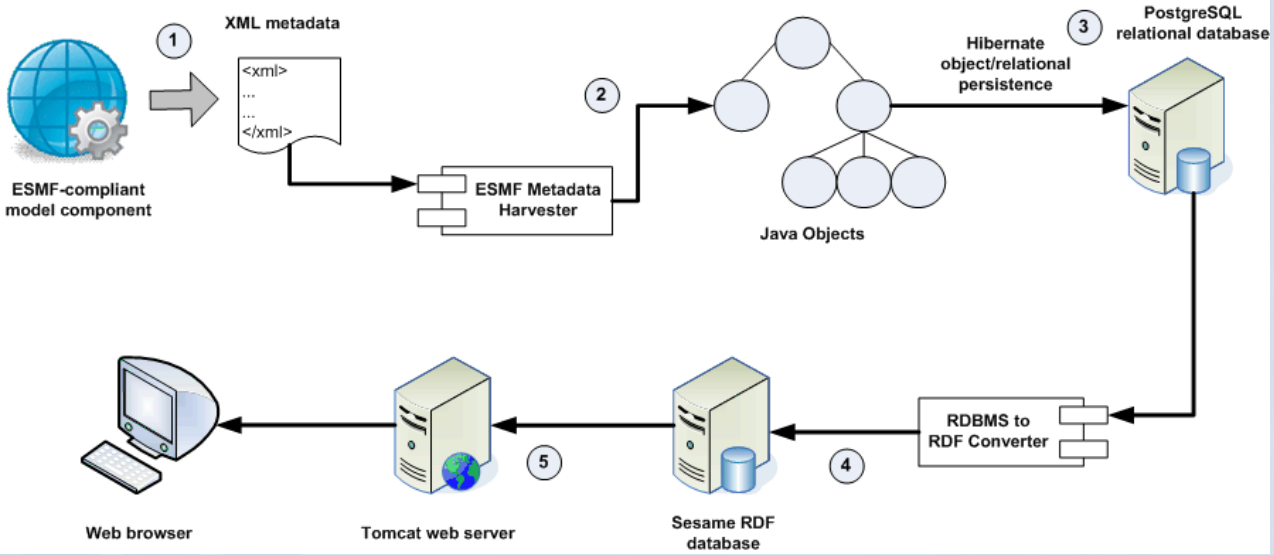


http://dycore.ucar.edu

Portal supported NCAR/NASA/DOE funded summer 2008 workshop on comparison of 13 atmospheric dynamical cores

Automated Model Documentation*

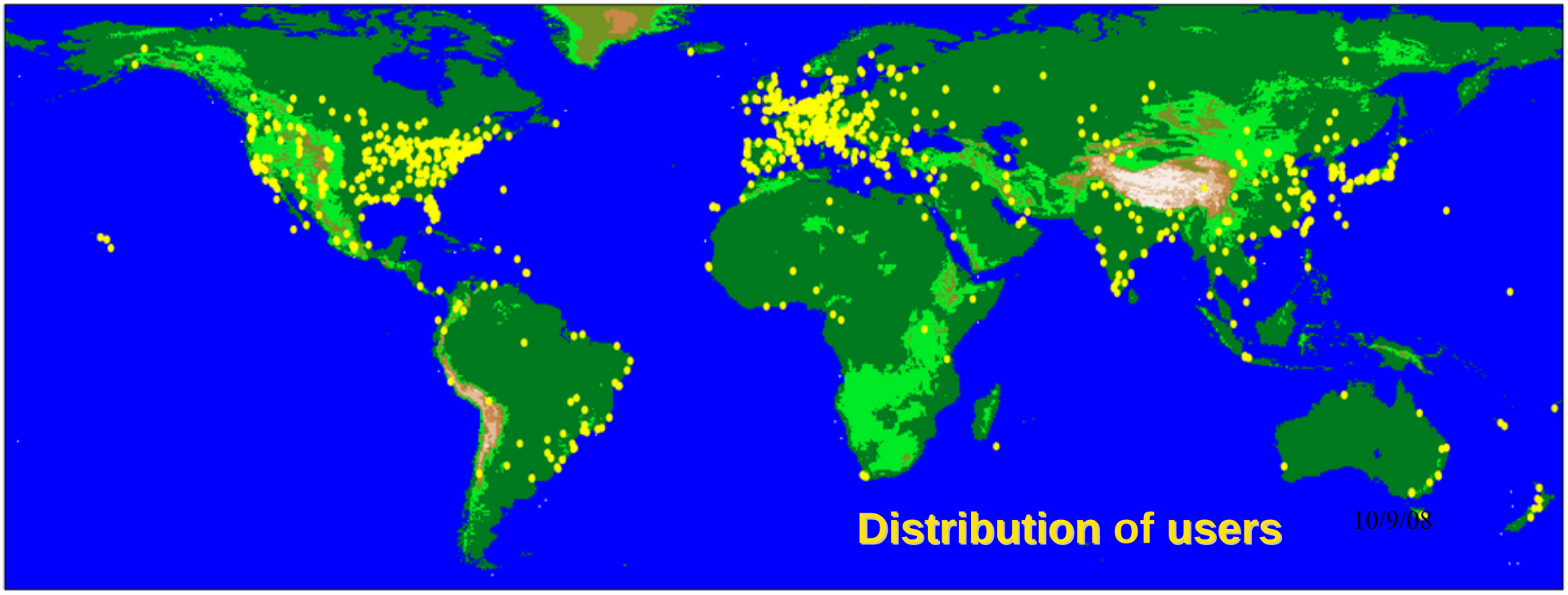
- ESMF v3.1.1 beta release holds information about grids, fields, and components in standard attribute packages
- Model metadata is exported from an ESMF component in XML format
- The XML is ingested into a version of DOE Earth System Grid (ESG) with expanded metadata and interfaces
- Users can search and browse components and datasets via the portal, create dynamic comparison tables for specific properties



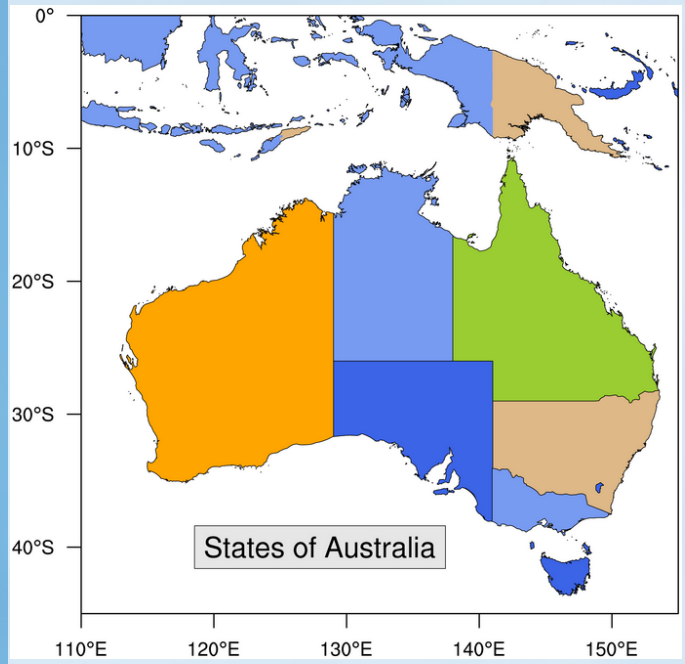
*SIParCS Project

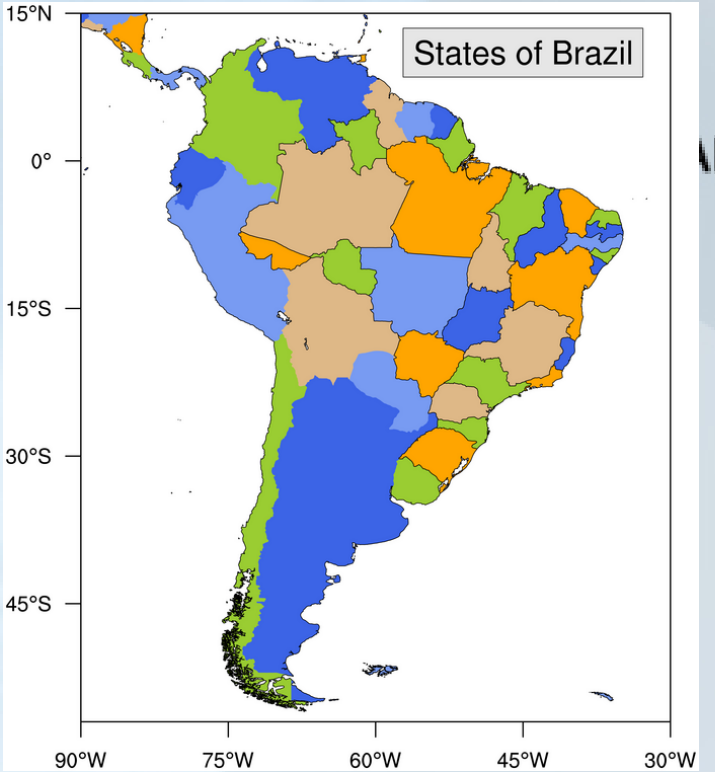
NCL, PyNGL, PyNIO Metrics

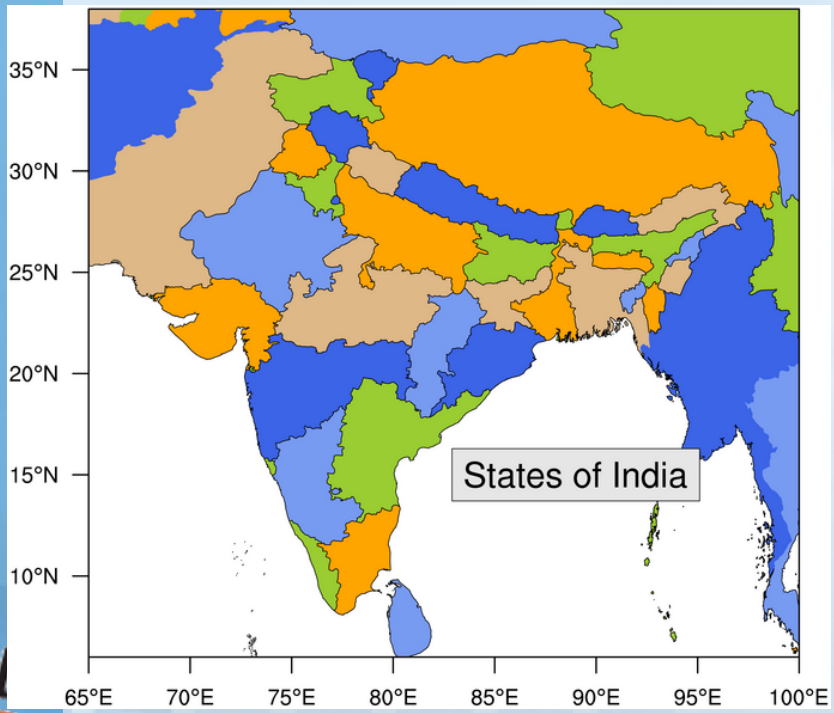
- 5300 registered users (4091 in Mar 2008)
  [US: 1966, other countries: 3000, unknown: 334]
- Users from 115 countries
- 8407 downloads since last CHAP update (Apr ’08 – Sep '08)
- 182 average email postings a month (Apr ’08 – Sep '08)

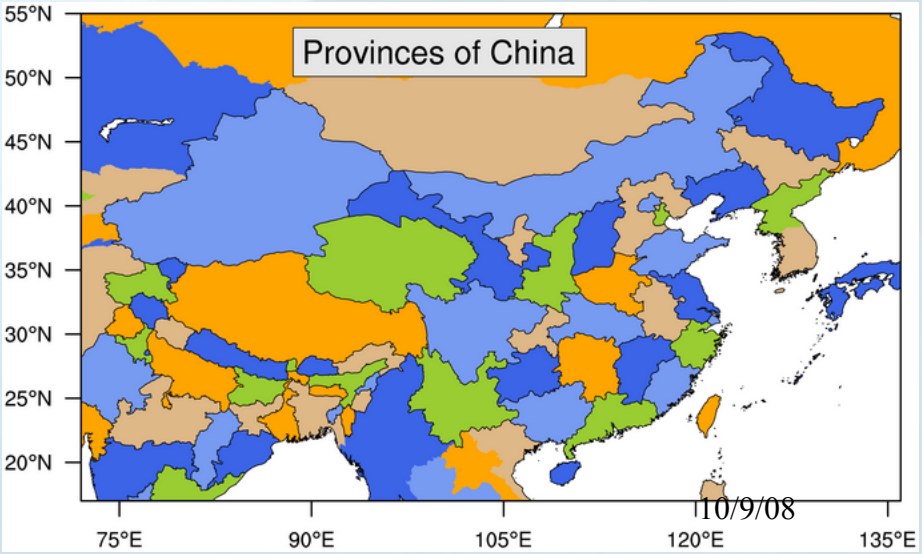


New map outlines in V5.0.1



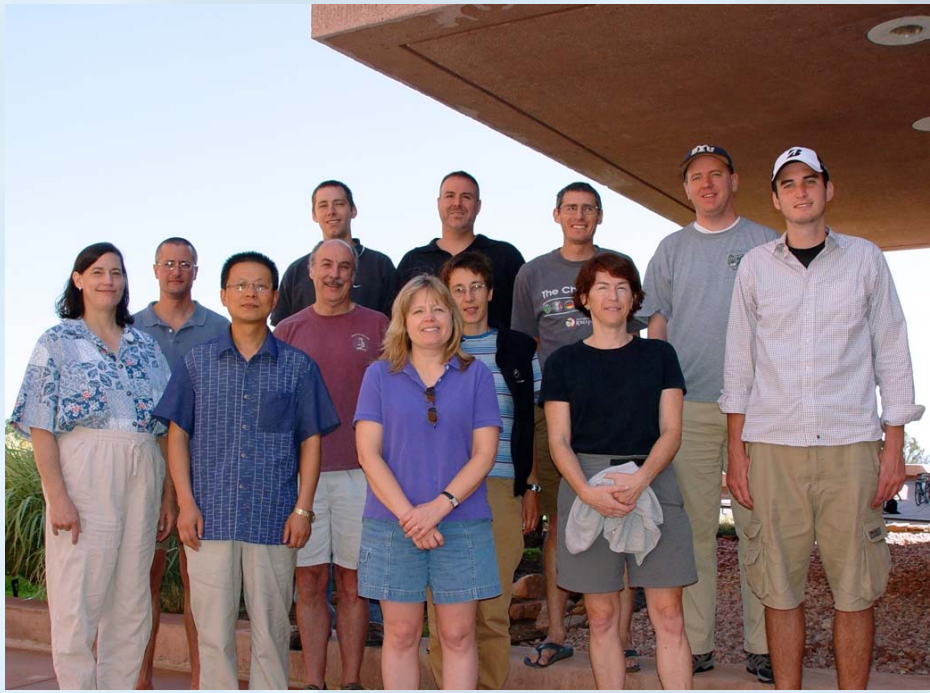






NCL Data Analysis and Visualization "Boot Camps"

- Local NCAR events in August and October
- NCAR-supported workshop at University of Wisconsin
- Max-Planck in Hamburg, Germany December 2008
- Another NCAR-supported university workshop and four local ones in FY2009

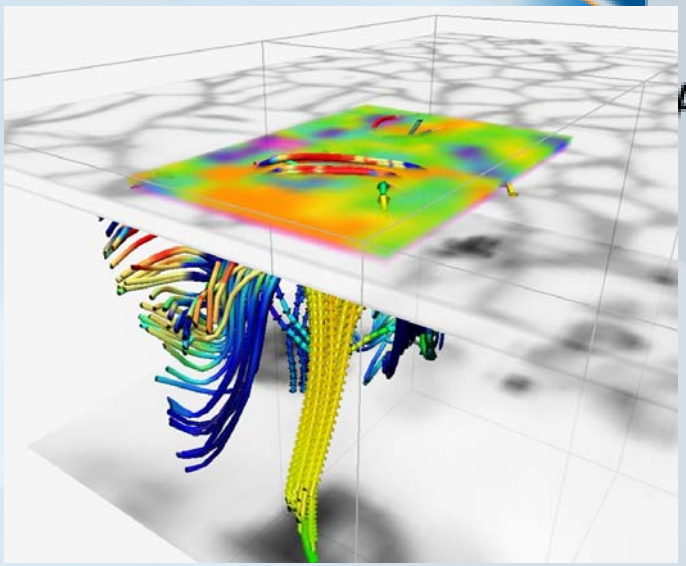


VAPOR 1.3 Released

Data Analysis Services Group

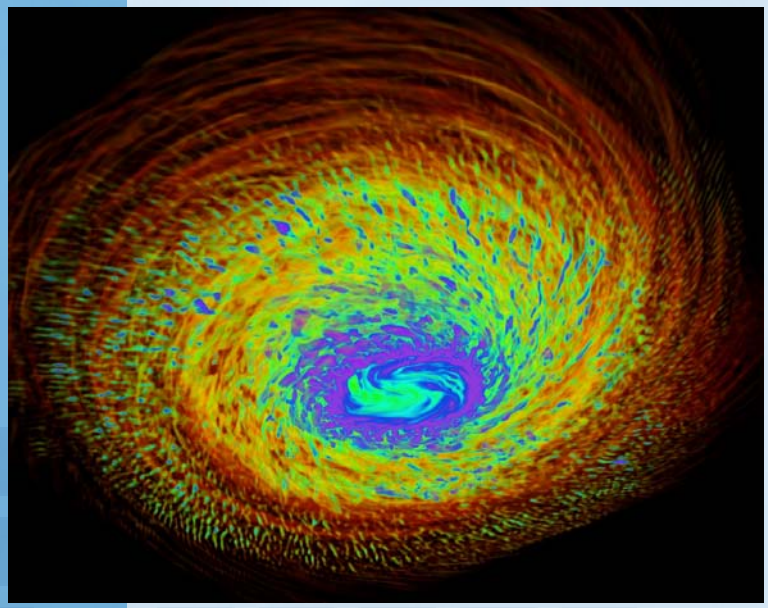
New features in VAPOR 1.3

Field line advection



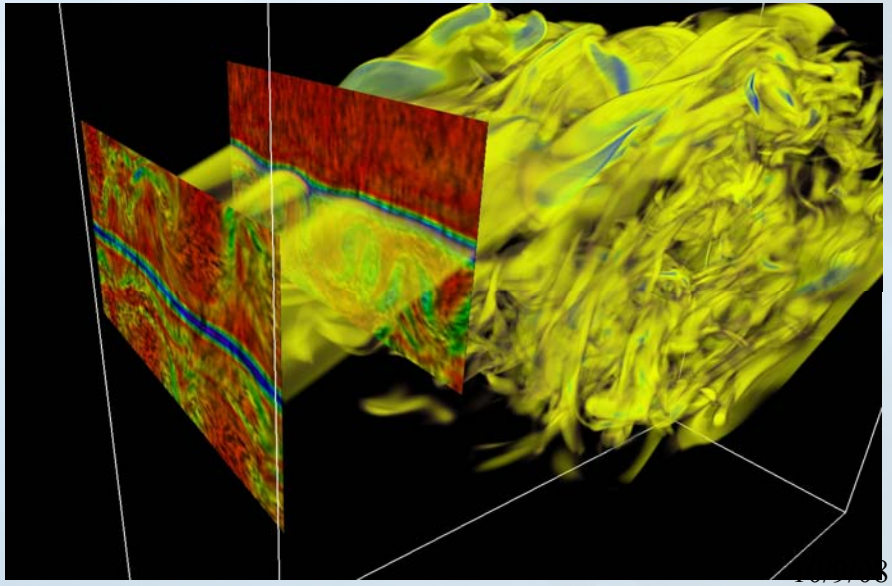
Åke Nordlund, Niels Bohr Institute

WRF Data Support



Yongsheng Chen, NCAR

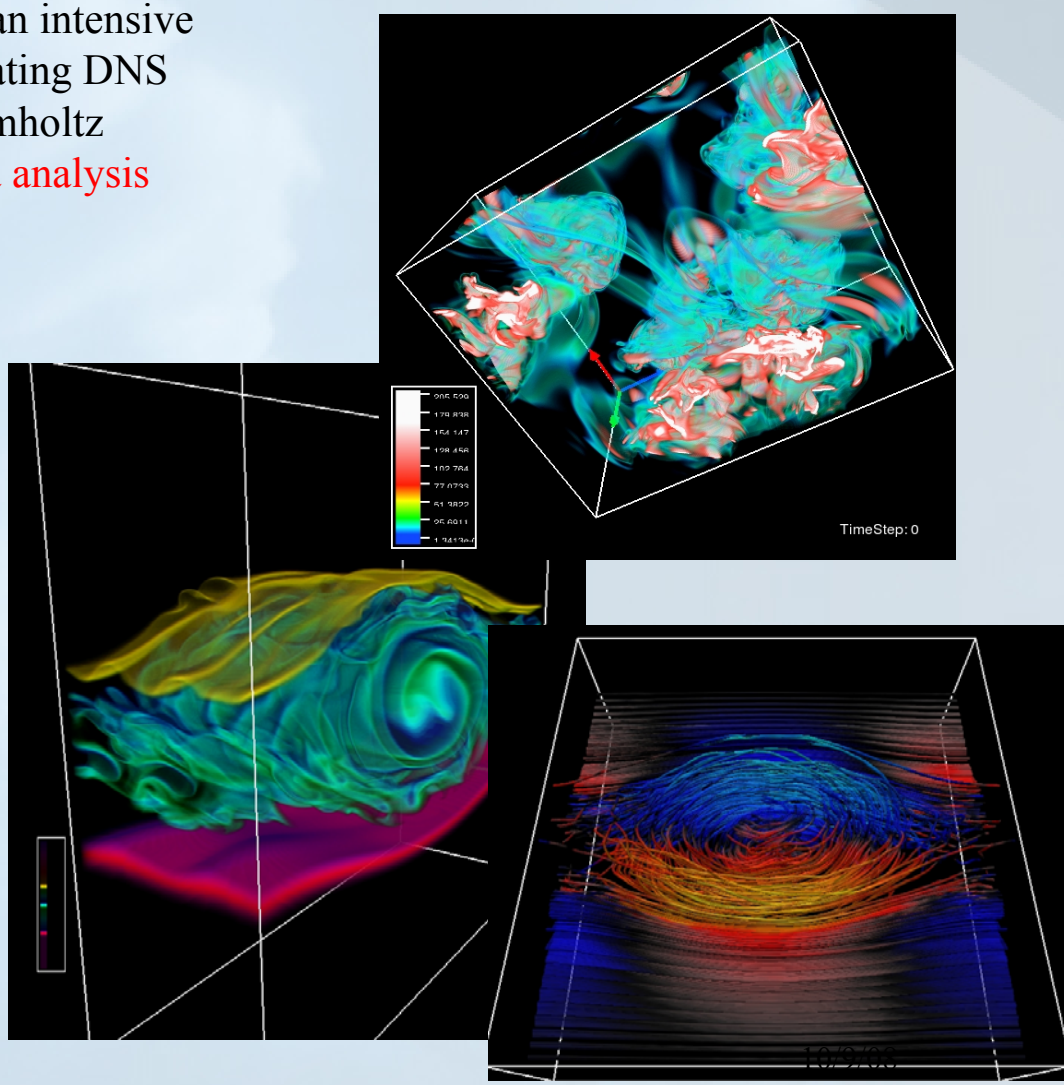
Image Based Flow Visualization



Joe Werne, CORA

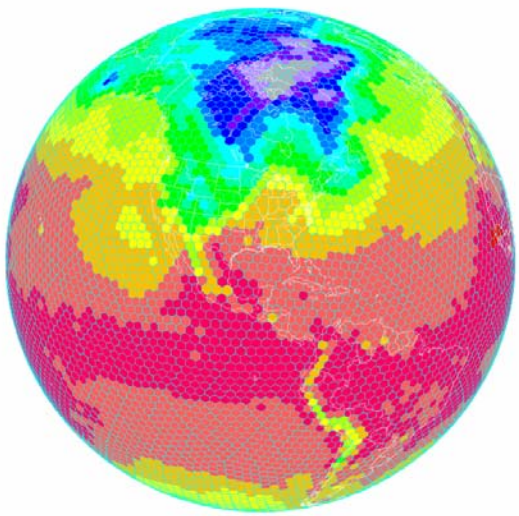
IMAGe/CU Geophysical Turbulence Summer School
Computational Sciences Lab

- 30 PhD students spent one week in an intensive computational sciences lab investigating DNS and LES simulations of Kelvin-Helmholtz instabilities and gravity waves. Data analysis was performed with VAPOR.



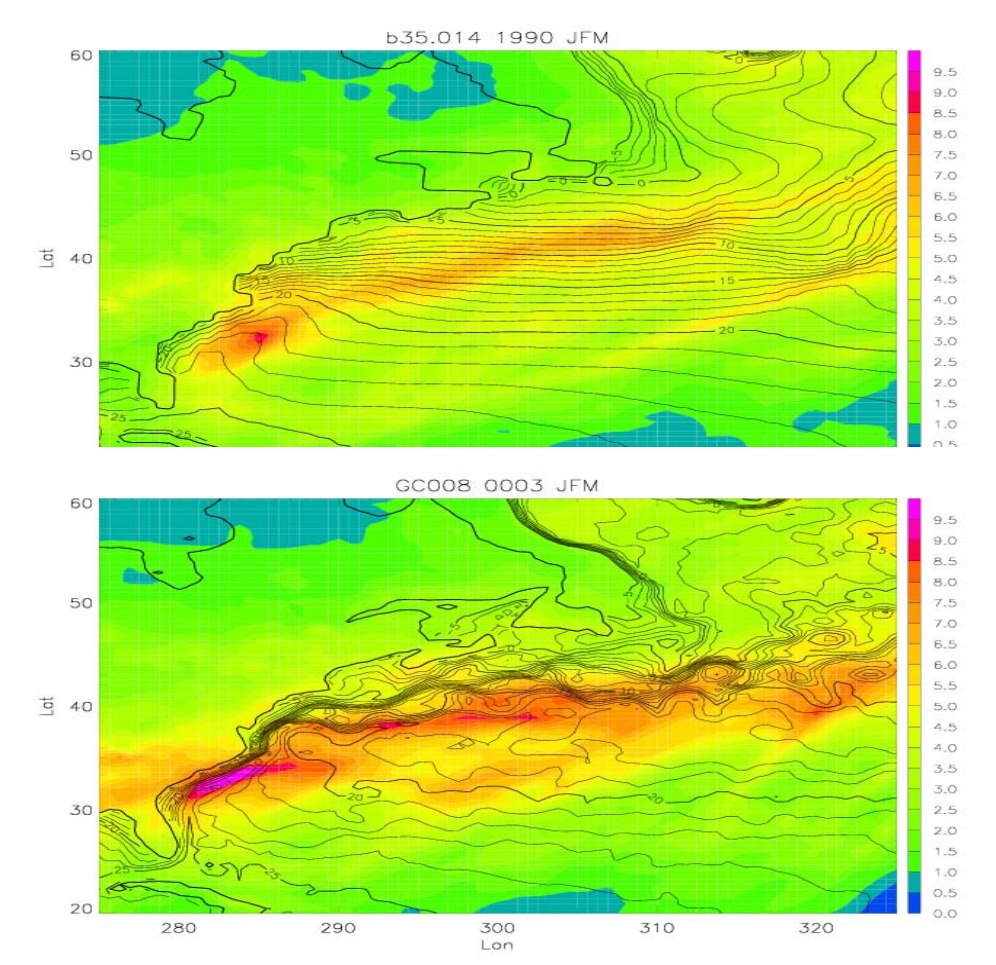
ESMF New Features and Applications

- ESMF v3.1.1 beta release includes unstructured meshes, observational data streams, on-line parallel regridding, recursive components for nesting
- Users include critical mass of NASA, NOAA, and DoD codes - 68 science components in diverse domains
- Consortium of U.S. operational centers - **National Unified Operational Prediction Capability (NUOPC)** – developing multi-model global ensemble of ESMF components



Grid used in the Flow-Following Finite Volume Icosahedral Model from NOAA GSD.

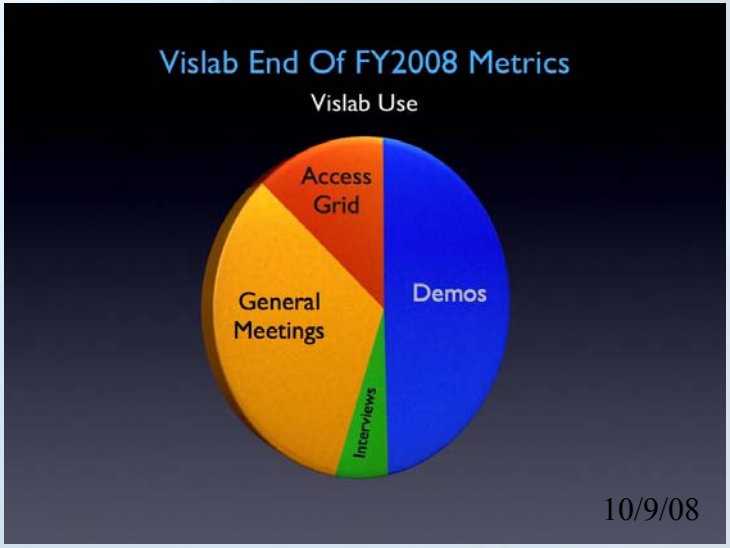
Ultra-high resolution CCSM



- Fully coupled simulation 0.1° POP & CICE to high resolution LND, CAM
  - LND & CAM @ 0.5°
    - 1712 processors at 0.58 SYPD
    - 2.5 years
  - LND & CAM @ 0.25°
    - 3280 processors at 0.42 SYPD
    - 3 years
- Code modifications a part of CCSM4
- Climate analysis underway
- Run at LLNL under grand challenge grant

VisLab Usage in FY2008

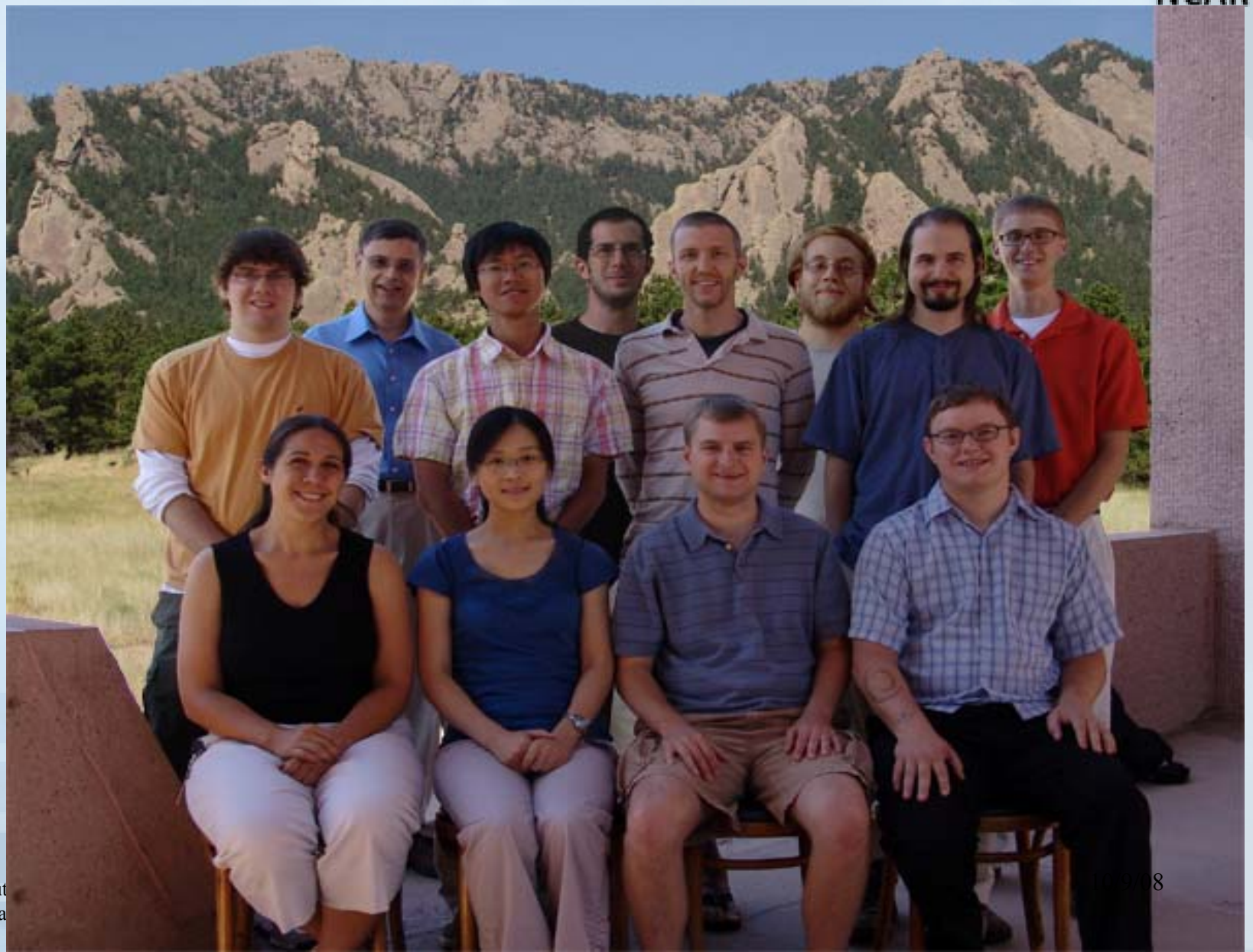
- Over 170 presentations, AccessGrid sessions, and general meetings
- Over 2,700 participants, a 30% increase over FY2007
- NSF, Democratic National Convention, Representative Hall, USDA, AMS, Russian Judicial System, Israeli Air Force, CNN, National Geographic, Discovery Channel, and ABC 20/20



SIParCS 2008 Status

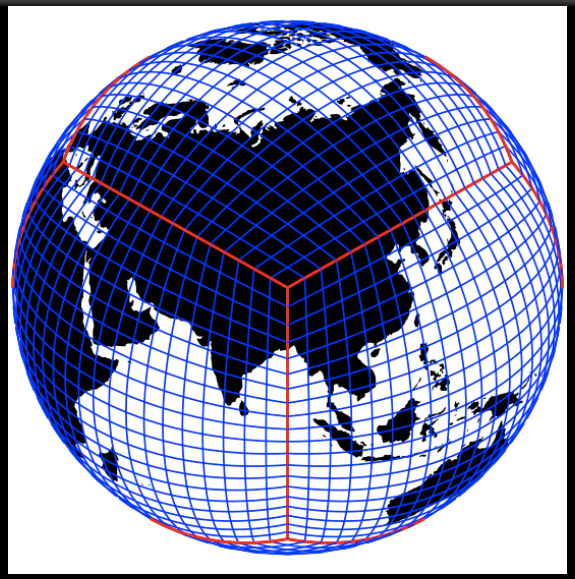
- SIParCS is wrapping up its application cycle for summer 2008.
- 17 Students Applied, 11 were accepted
- Diversity
  - 4 diversity candidates
    - 3 funded jointly by CISL/NCAR diversity funds
    - 1 by U. Wyoming
  - Breakdown
    - By sex: ☐2 women
    - By ethnicity: 1 hispanic, 2 asian
- Institutional Breakdown
  - In Region (Front Range) Institutions: 7
  - Out of Region: 4
- URL: http://www.cisl.ucar.edu/siparcs

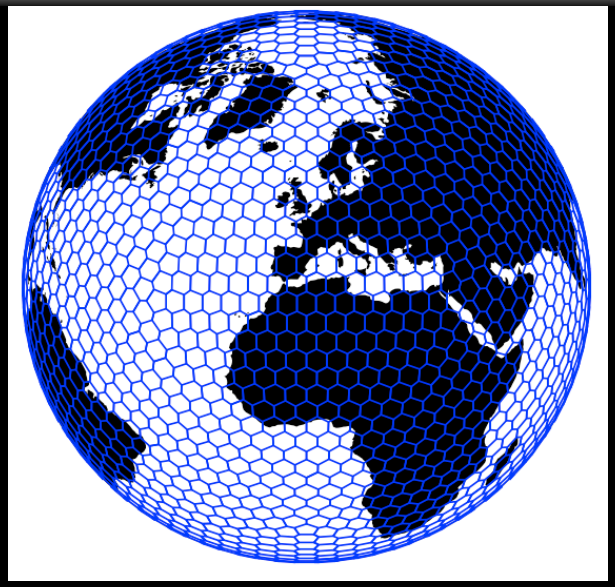
FY2008 SIParCS Interns



The Remapping Problem

- Can we improve on accuracy of remapping?
- Since discretization is a lossy process (that is, we lose information by performing the discretization), converting between separate discretizations (remapping) also cannot be exact. However, atmosphere, ocean and land models often use different grids (and hence different discretizations) and need conservative remappings.
- SIParCS Intern: Paul Ulrich; Mentor: Peter Lauritzen (CGD)
- Summer research resulted in publication (in preparation).

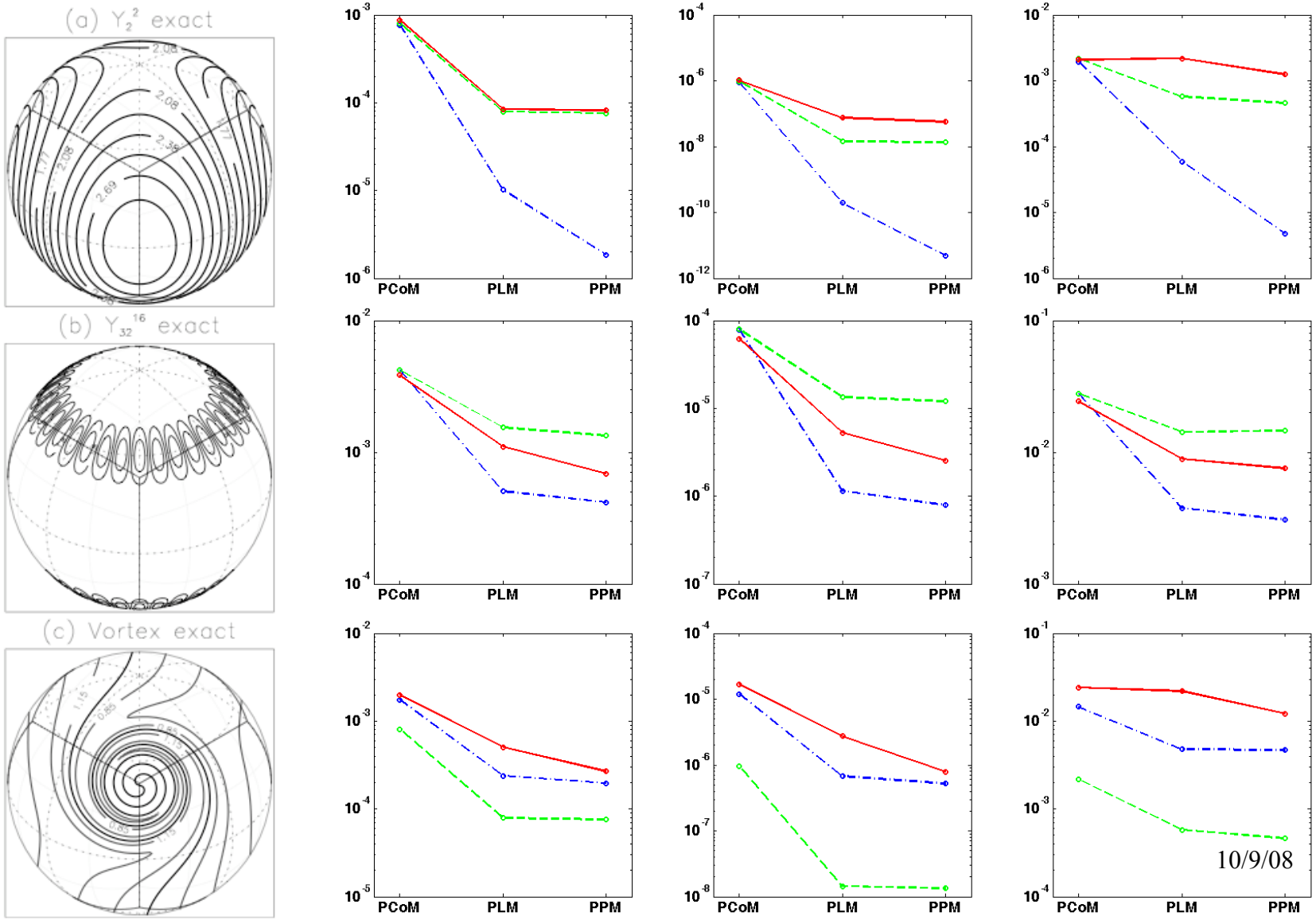




Results

CaRS SCRIP GECoRe

(N_c=40, N_{lon}=128, N_{lat}=64)



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Thanks!