

# Coding for Massive Computation in Science

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Foo Camp Ignite Series

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Sebastopol, CA

Scientific computation  
is emerging as  
*central*  
to the scientific method

# Community Climate Model (CCM)

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Community Climate System Model (CCSM): Home  
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**CCSM** about administration working groups research tools events news publications support

## Community Climate System Model

Search


### WELCOME TO CCSM

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- [About CCSM](#)
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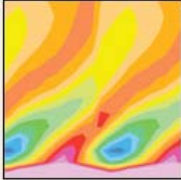
### CCSM PROJECT

#### Research Tools




- [models](#)
- [experiments](#)
- [support](#)

#### Administration



- [Scientific Steering Committee](#)
- [Advisory Board](#)


#### Working Groups



- [working groups](#)
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### ANNOUNCEMENTS

#### 15th Annual CCSM Workshop Announcement



We are pleased to announce that the 15th Annual CCSM Workshop will be held at the **Great Divide Lodge** in Breckenridge, Colorado the week of 6/28/10.

Welcome **Dr. Jim Hurrell** as chair of the CCSM Science Steering Committee (SSC), as part of his new position as Chief Scientist for Community Climate Projects in CGD.



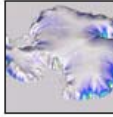
#### NSF Climate Process and Modeling Teams (CPT) Call for Proposal

The key aim of the Climate Process Modeling Team (CPT) concept is to speed development of global coupled climate models and reduce uncertainties in climate models. [\[more\]](#)

### ABOUT CCSM


CCSM belongs to an elite category of computer-based simulation models known as general-circulation models. Such models use mathematical formulas to recreate the chemical and physical processes that drive Earth's climate. What emerges from trillions of computer calculations is a picture of the world's climate in all its complexity. [\[More...\]](#) [\[CCSM Brochure\]](#)

### CLIMATE NEWS



#### Community Ice Sheet Model Will Aid Understanding of Sea Level Rise


Recently, scientists modified the Community Land Model (CLM), a component of CCSM, to compute ice sheet surface mass balance. [\[highlight\]](#) [\[CCSM\]](#) [\[CISM\]](#) [\[CLM\]](#)



#### Projecting Emperor Penguin Population in a Warming World

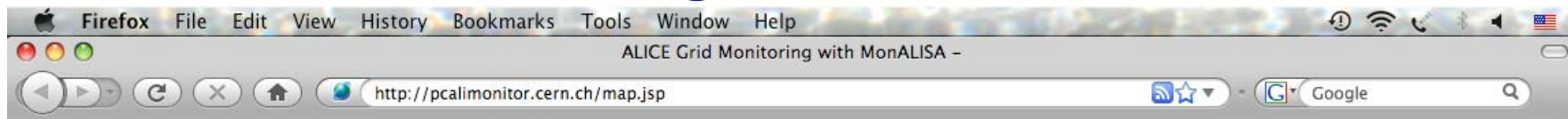
### CCSM DISTINGUISHED ACHIEVEMENT

**Gokhan Danabasoglu** is the recipient of the 2009 CCSM Distinguished Achievement Award. Gokhan has been instrumental in





# Grid Computing for ALICE at CERN



## MonALISA Repository for ALICE



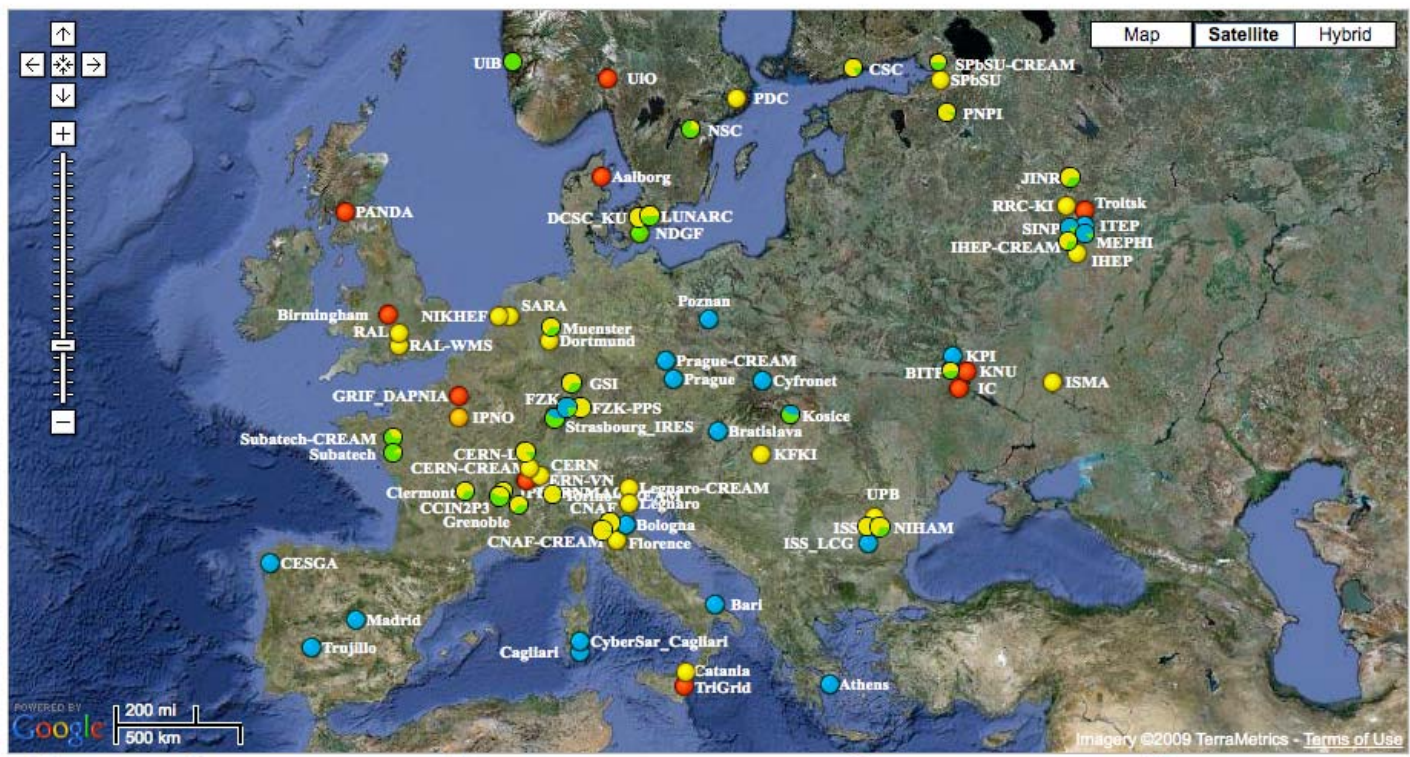
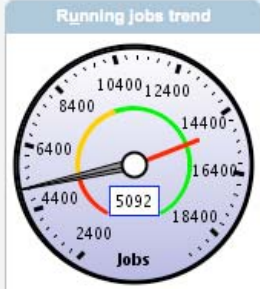
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**ALICE Repository**

- ALICE Repository
- Google Map
- Shifter's dashboard
- Running trend
- Production info
- Job Information
- SE Information
- Services
- Network Traffic
- FTD Transfers
- CAF Monitoring
- SHUTTLE
- Build system
- Bandwidth tests
- Dynamic charts

close all

This page: bookmark, URL



● Running jobs ● Running jobs but no ML info ● Site service problem(s) prevents job execution ● No jobs match the site resources ● ML service down & no running jobs

Running jobs trend


# Astrophysics Simulation Collaboratory

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The Astrophysics Simulation Collaboratory

http://wugrav.wustl.edu/ASC/project/progress.html

ulation collab



## Astrophysics Simulation Collaboratory

### A Laboratory For Large Scale Simulations Of Relativistic Astrophysics

**Project**

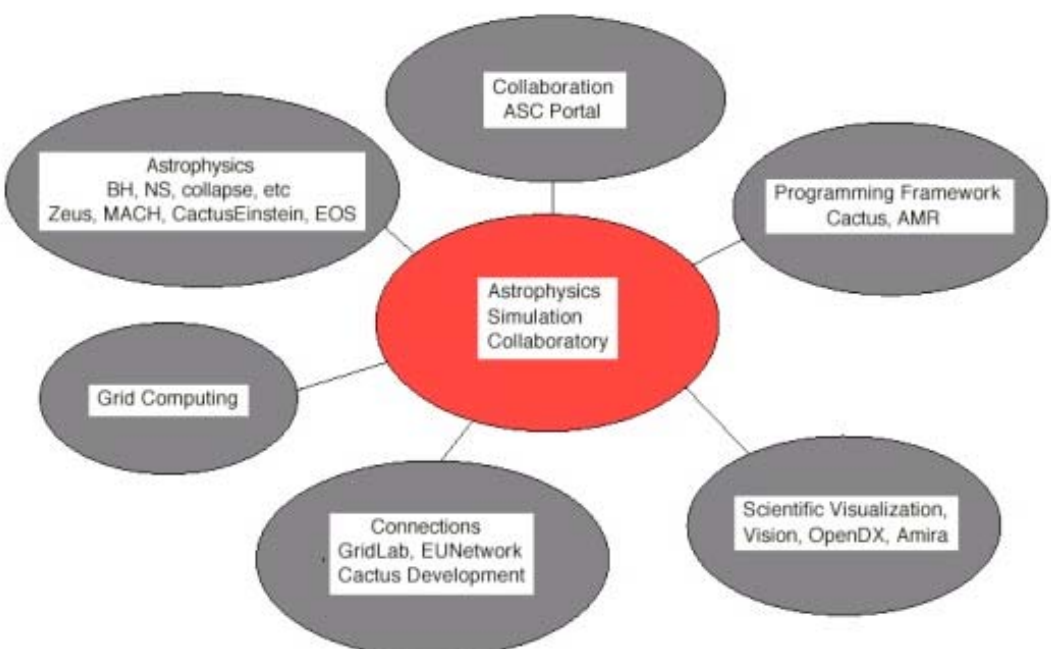
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**Grid/VMR**

- [Machines](#)

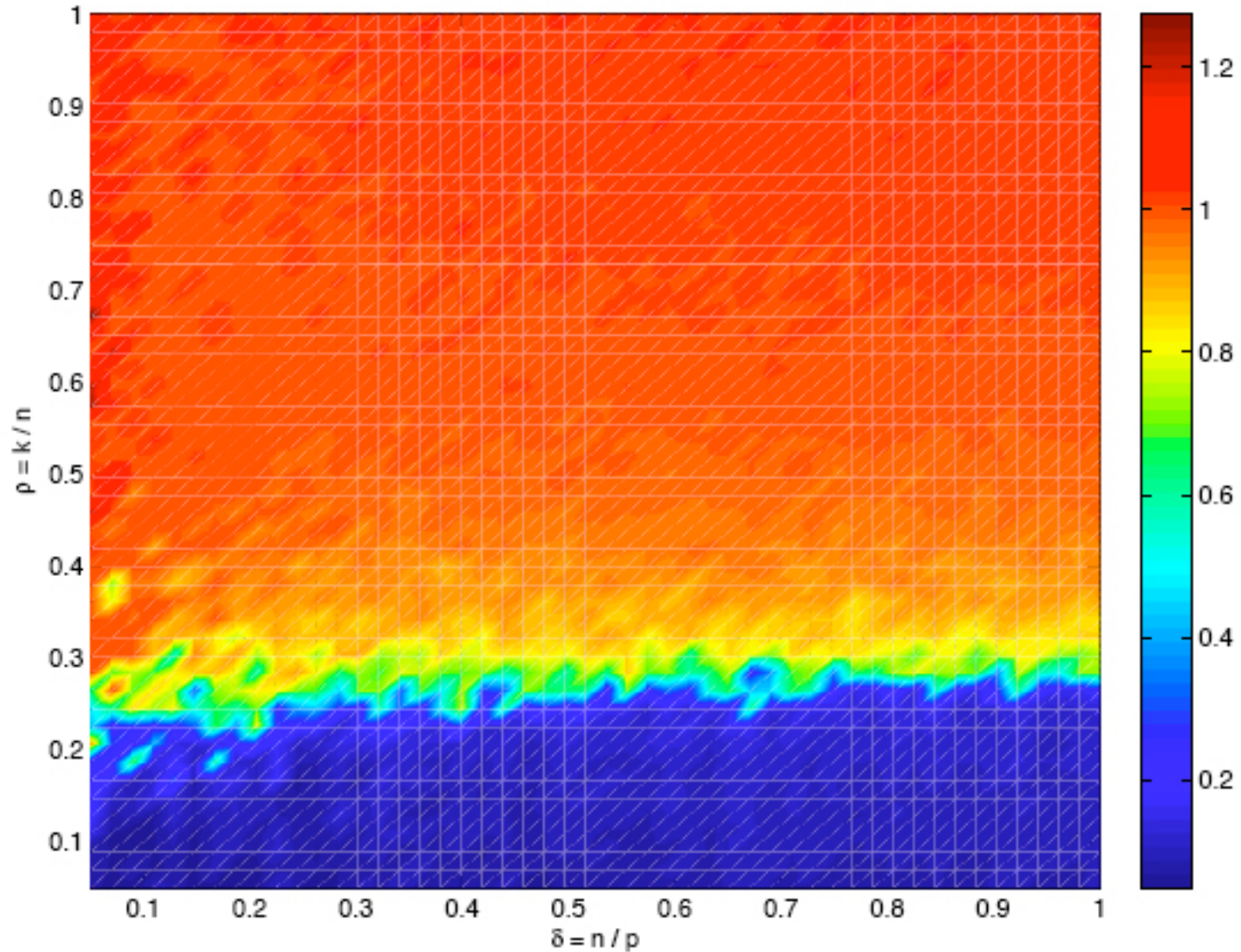


```
graph TD;
    Center((Astrophysics Simulation Collaboratory)) --- Top((Collaboration ASC Portal));
    Center --- TopRight((Programming Framework Cactus, AMR));
    Center --- BottomRight((Scientific Visualization, Vision, OpenDX, Amira));
    Center --- Bottom((Connections GridLab, EUNetwork Cactus Development));
    Center --- BottomLeft((Grid Computing));
    Center --- Left((Astrophysics BH, NS, collapse, etc Zeus, MACH, CactusEinstein, EOS));
```



# Computational Proofs

Normalized  $L_2$  Error,  $\sqrt{2\log(p)}$  threshold,  $z \sim N(0, 4^2)$



Computing is increasingly pervasive  
in scientific research

The Scientific Method's  
central motivation is the  
*ubiquity of error*



Deductive Branch?

Formal logic and  
mathematical proof

# Inductive Branch?

Hypothesis testing,  
standardized reproducibility  
information (data, material and  
methods)

Computational Science cannot yet  
be elevated to 3rd Branch status

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What are comparable standards?

What are comparable standards?

Must generate  
*routinely verifiable knowledge*

Majority of published  
computational science results  
*not* verifiable

Large and growing credibility gap



Reproducibility of results is  
essential

Open code and data

Tools to facilitate code and data sharing are key

Such tools are only emerging

provenance, workflow tracking,  
collaboration, open licensing..