

A photograph of a server room with several black server racks. The racks are arranged in a row, and the floor is light-colored with a grid pattern. The racks have a landscape image on their front panels, showing a sunset over a body of water. The room is lit with overhead lights.

# Yellowstone early users and ASD update

**CHAP meeting — May 2, 2013**

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# Yellowstone user timeline

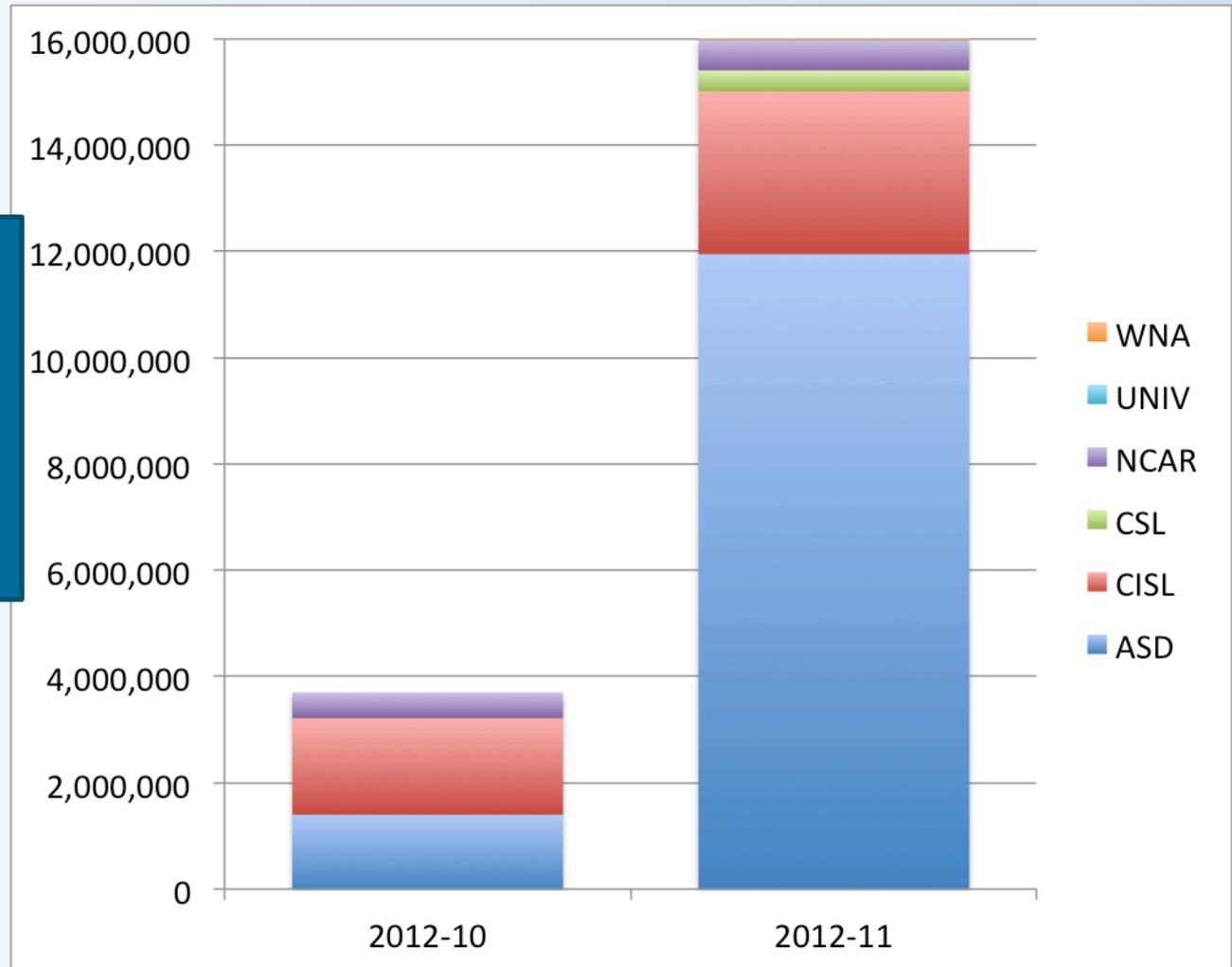
- **Oct. 8, 2012 — Early users first access**
- **Nov. 26, 2012 — General user access**
- **Dec. 1, 2012 — Official ASD start**
- **Jan. 31, 2013 — Last day of Bluefire**
- **Feb. 4, 2013 — End of primary ASD period**
- **April 4, 2013 — Last day of old GLADE**
- **April 8, 2013 — End of ASD ramp down**

# Ups and downs

- **Small-scale applications running as or better than expectations**
- **Large-scale runs (1,024+ nodes) have faced a variety of challenges**
- **PAPI availability finally resolved**
- **InfiniBand challenges with cables and routing**
- **Single jobs have demonstrated 50-60 GB/s reads from GLADE**

# Usage in early user period

*Approx. 100  
early users  
started Oct. 8,  
usage records  
start Oct 18.*



# University ASD projects

- **James Kinter, COLA — 21 million core-hours**
  - Towards seamless high-resolution prediction at intraseasonal and longer timescales (ECMWF models)
- **Lance Collins, Cornell U — 19 million core-hours**
  - DNS of cumulus cloud core processes over larger volumes and for longer times (HIPSTR)
- **B. Fox-Kemper, CU-Boulder — 16 million core-hours**
  - Arrest of frontogenesis in oceanic submesoscale turbulence (MITgcm)
- **Thomas Jordan, USC — 7.3 million core-hours**
  - Community computational platforms for developing 3-D models of earth structure (AWP-ODC, SPECFEM3D)
- **Michael Shay, U Delaware — 7.2 million core-hours**
  - Turbulence in the heliosphere: The role of current sheets and magnetic reconnection (P3D)

# NCAR ASD projects

- **Gabriele Pfister, ACD — 6.25 million core-hours**
  - Prediction of North American air quality (WRF-Chem, CAM5)
- **Annick Pouquet, IMAGE — 11 million core-hours**
  - Rotation and stratification at unit Burger number in turbulent flows (GHOST)
- **David Richter, MMM — 5.2 million core-hours**
  - Turbulence modification in the spray-laden atmospheric marine boundary layer (NCAR LES)
- **William Skamarock, MMM — 6.5 million core-hours**
  - Global cloud-permitting atmospheric simulations using MPAS (MPAS)
- **Justin Small, CGD — 25.2 million core-hours**
  - Meso- to planetary-scale processes in a global ultra-high resolution climate model (CESM—CAM5, POP2, CLM, CICE)
- **Andy Wyszogrodzki, RAL — 6.25 million core-hours**
  - Petascale simulation of physics and dynamics of turbulent clouds (HDNS, Bin EULAG)

# Tracking ASD progress

Lead	Code	Func. 1	Func. 2	Perform.	Thruput	Reliab.
Collins	HIPPSTR	Y	Y	Y	Y	Y
Fox-Kemper	MITgcm	Y	Y	Y	Y	Y
Jordan	AWP-ODC	Y	Y	Y	Y	Y
Jordan	SPECFEM3D	Y	Y	Y	Y	Y
Kinter	EPS	Y	Y	Y	Y	Y
Pfister	NRCM-Chem	Y	Y	Y	Y	Y
Pouquet	GHOST	Y	Y	Y	-	-
Richter	NCAR LES	Y	Y	Y	Y	Y*
Shay	P3D	Y	Y	Y	Y	Y
Skamarock	MPAS	Y	Y	N	N	N
Small	CESM	Y	Y	Y	Y	Y/N
Wyszogrodzki	HDNS	Y	Y	Partial	Y	-
Wyszogrodzki	Bin EULAG	Y	Y	Partial	-	-

# Science progress: Pfister, ACD

- The figure shows mean afternoon surface ozone for the NRCM-Chem and CAM-Chem simulations. While CAM-Chem and NRCM-Chem show some differences in absolute concentrations, they closely agree in the changes in surface ozone between present and future. The models estimate a reduction in surface ozone over the U.S. by 2050 with strongest reductions of up to 30 ppbV on the East Coast. This is largely due to reduced emissions over the U.S. (NO<sub>x</sub> emissions over the U.S. are reduced by about half by 2050 in RCP8.5). Over ocean we find increased surface ozone, specifically in the Pacific, likely due to pollution transport from Asia and enhanced ozone background, but also changes in ship emissions, which increased ~20% by 2050.

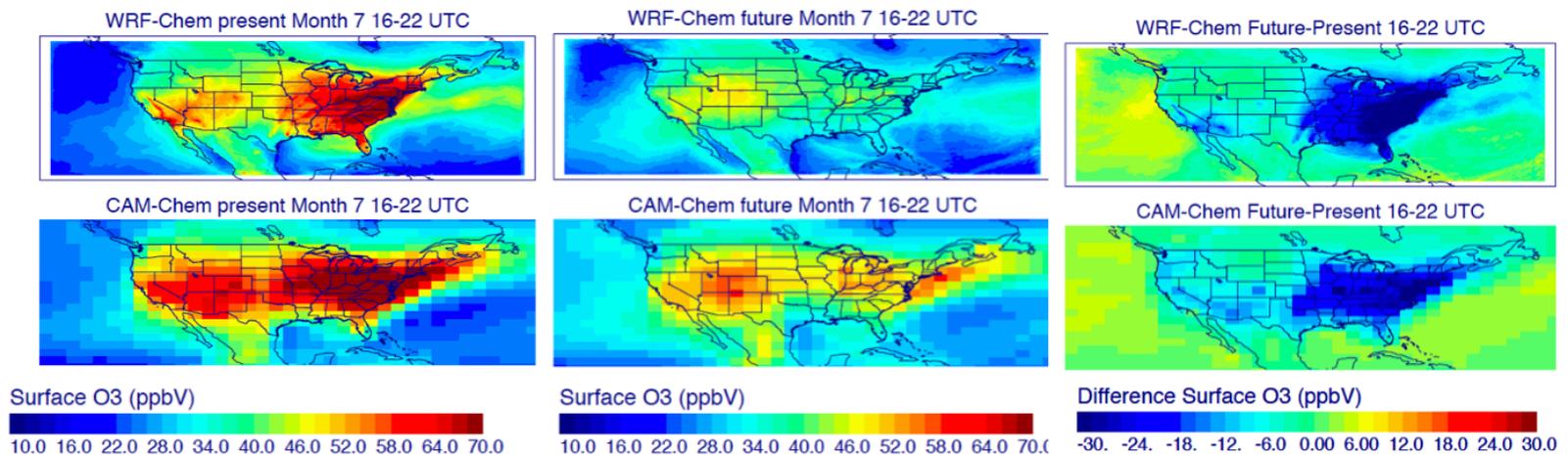
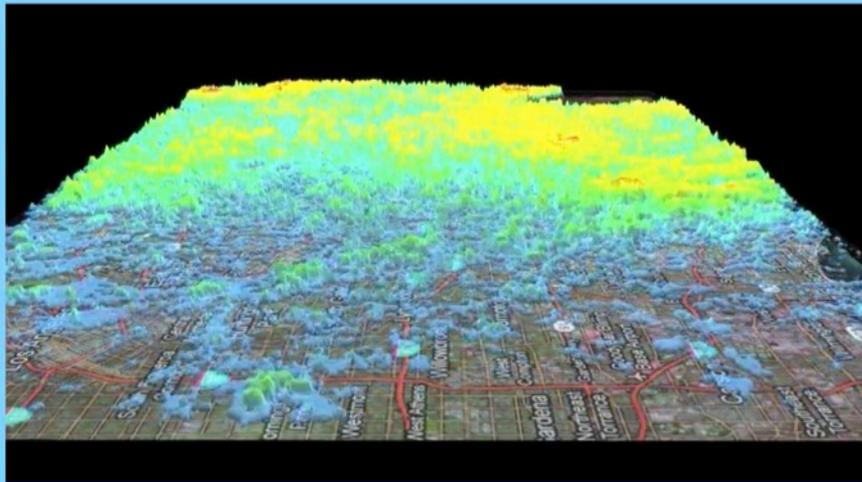


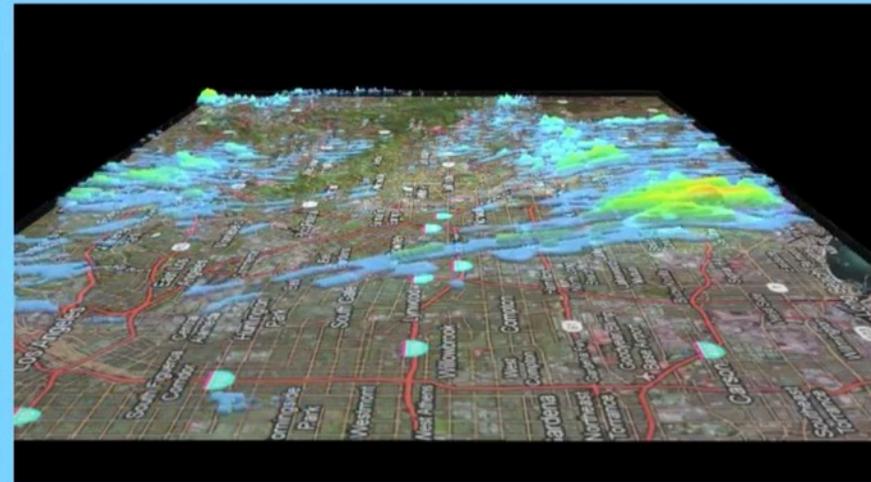
Figure: NRCM-Chem (upper row) and CAM-Chem (lower row) mean surface afternoon ozone for July for present time, future time (middle) and difference between future and present time (right).

# Science progress: SCEC

- **State-of-the-art community velocity models (CVMs) do not include small-scale, near-surface amplification effects. This project incorporates a statistical description of near-surface inhomogeneities into the CVMs. The simulation shows several new and interesting results. When compared to strong-motion seismic data from the Chino Hills earthquake, the results tend to predict the duration of ground motion better than the results in the same CVM. Near-future work includes additional simulations on Yellowstone to refine the parameters of the statistical model.**



Using California 3D geological model  
with added small-scale geological complexities



Using Standard California 3D geological model

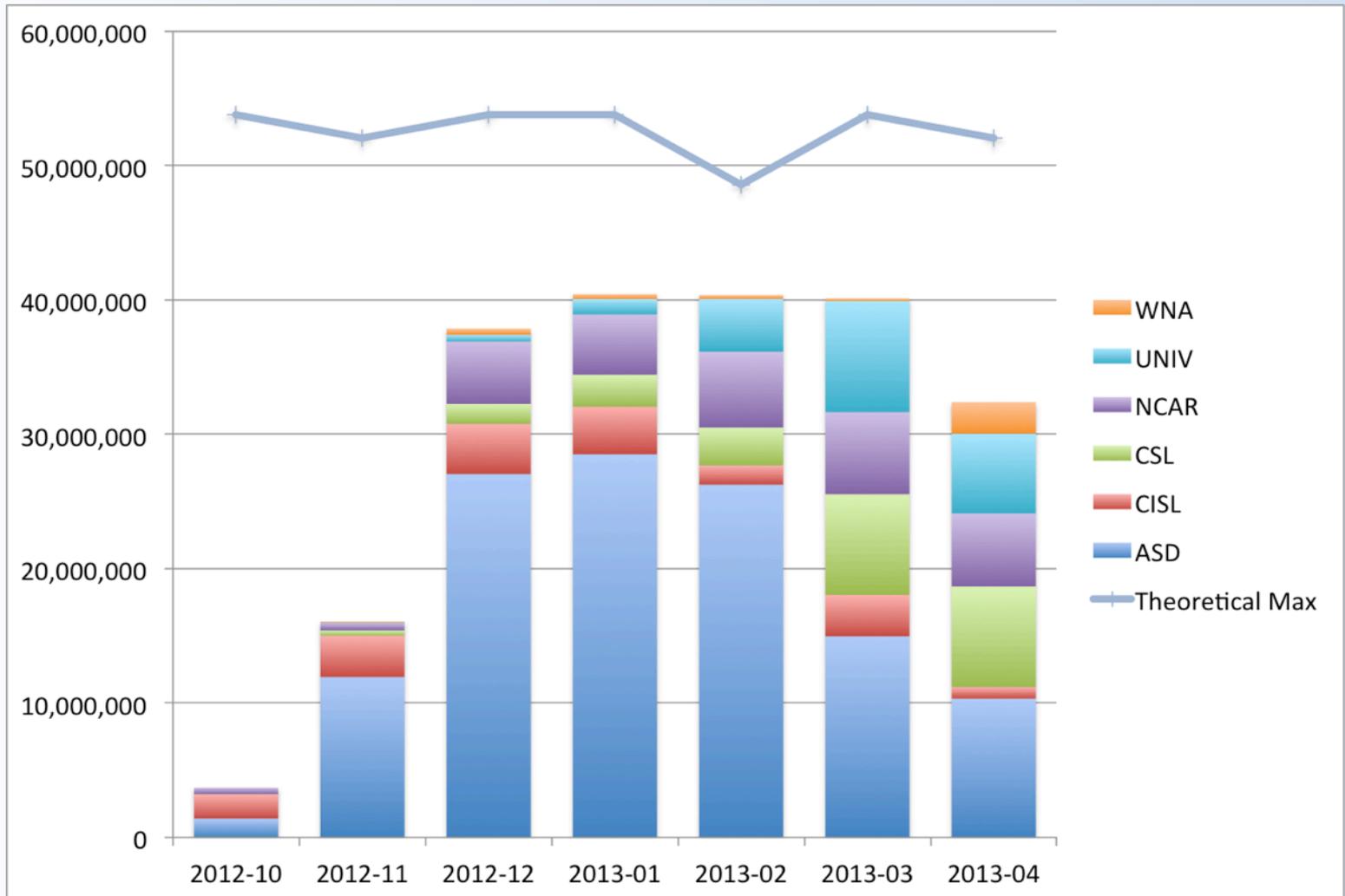
# Other outcomes

- **UCAR Atmos News ([www2.ucar.edu/atmosnews](http://www2.ucar.edu/atmosnews))**
  - Feature: [Yellowstone supercomputer delivers early results](#)
- **Baylor Fox-Kemper (CU)—Project cancelled with little progress. Primary reason was Yellowstone's slipping schedule coupled with his move from CU to Brown U.**
- **A. Wyszogrodzki (NCAR)—Project cancelled with little progress. Encountered some code difficulties along the way.**
- **A. Pouquet (NCAR)—Project cancelled officially. Got a late start due to staffing issues. Has since continued at a strong pace.**

# Final ASD usage levels

Project lead	Institution	Allocation	Usage	HPSS TB
J. Small	NCAR (CGD)	25,200,000	25,242,675 (102%)	54.84
J. Kinter	COLA	21,000,000	20,816,324 (99%)	449.83
L. Collins	Cornell	19,000,000	15,645,513 (82%)	-
A. Pouquet	NCAR (IMAGE)	11,200,000	11,339,982 (101%)	-
T. Jordan	USC	7,300,000	7,482,867 (103%)	9.19
D. Richter	NCAR (MMM)	5,600,000	5,564,288 (99%)	14.56
M. Shay	U Delaware	7,200,000	5,662,836 (79%)	28.45
G. Pfister	NCAR (ACD)	6,250,000	5,310,111 (85%)	138.04
W. Skamarock	NCAR (MMM)	6,500,000	4,631,175 (71%)	137.24
A. Wyszogrodzki	NCAR (RAL)	6,250,000	173,039 (3%)	-
B. Fox-Kemper	CU-Boulder	16,000,000	37,324 (0.2%)	-

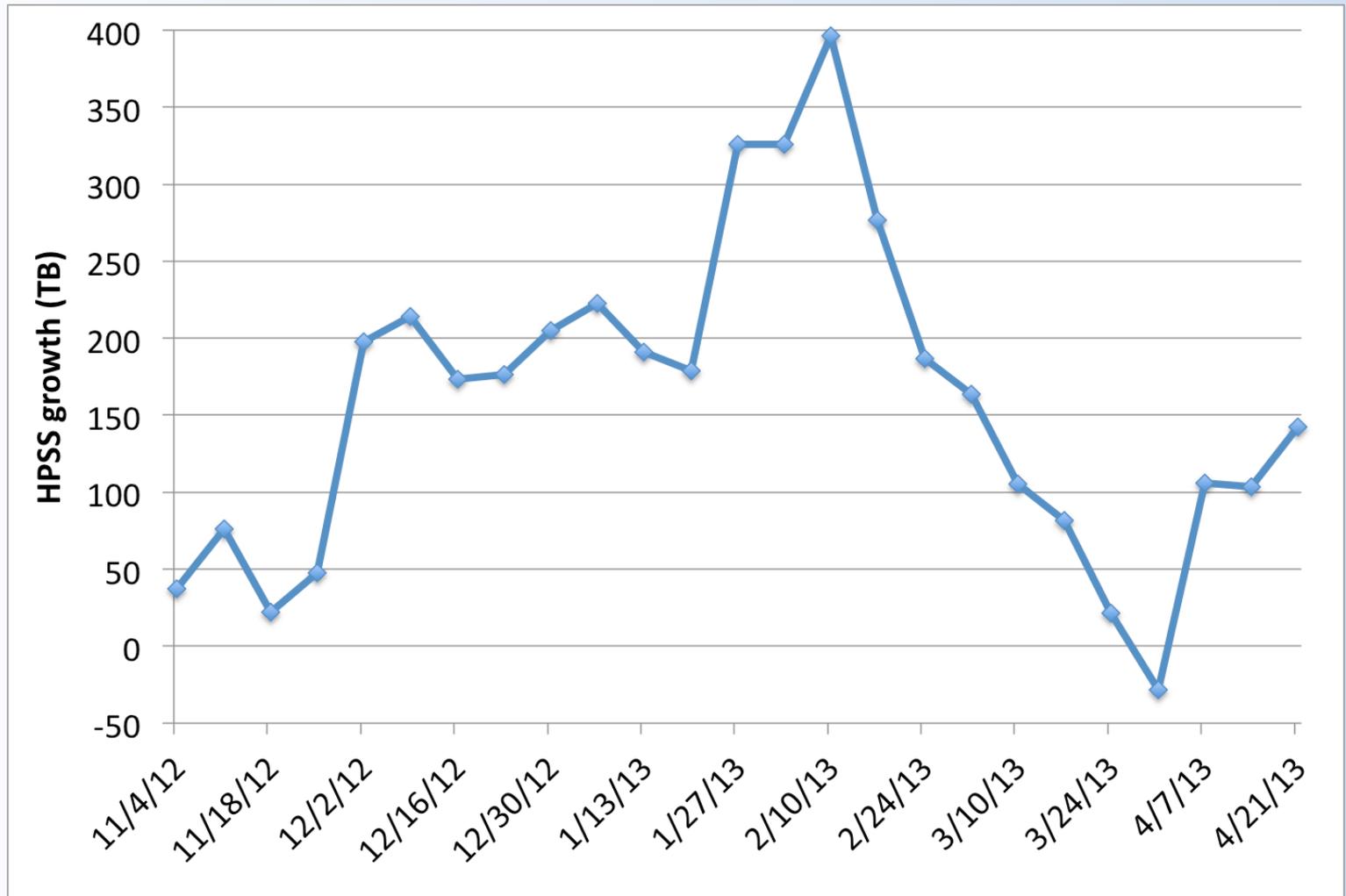
# Total monthly usage



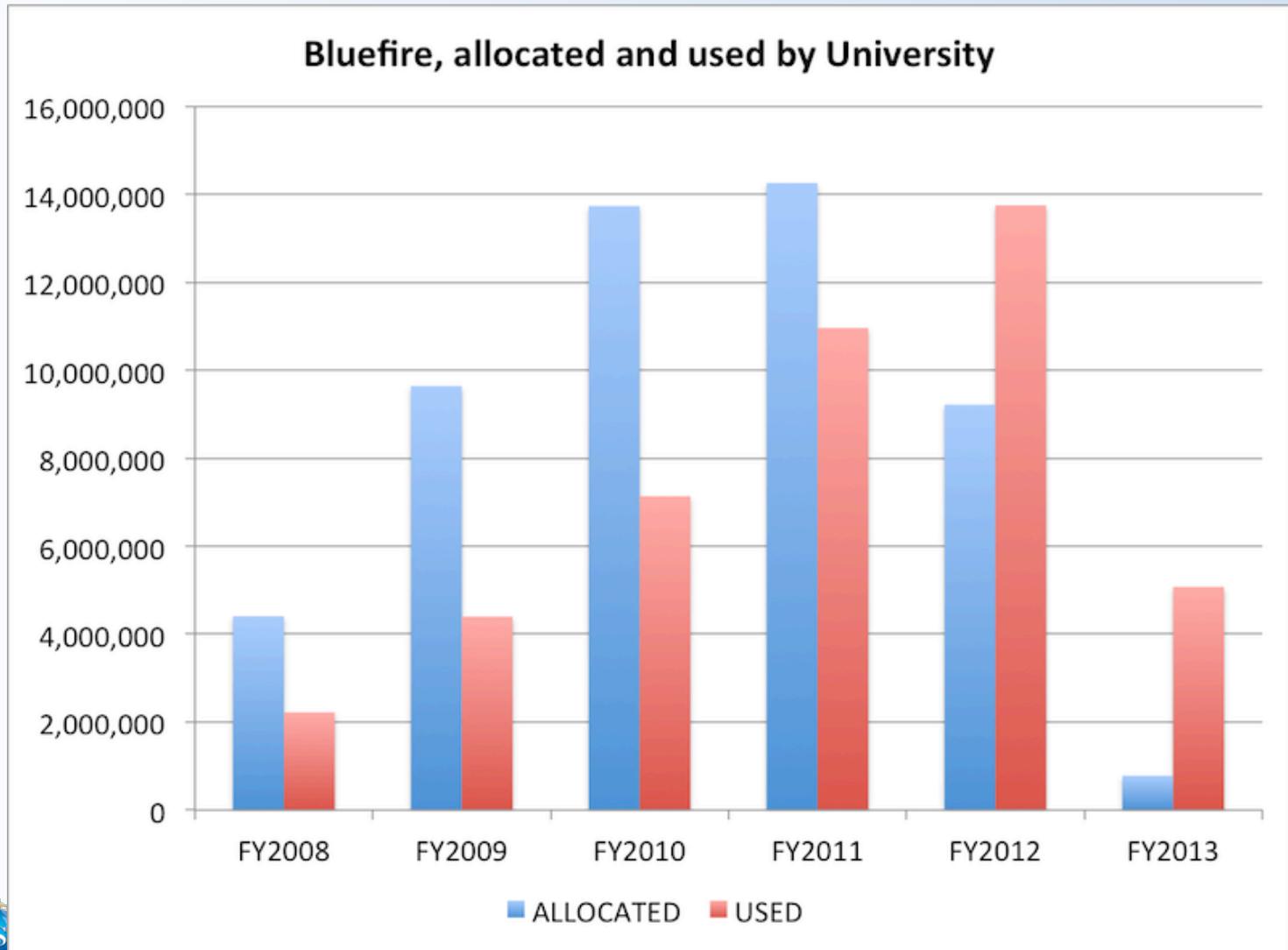
# Most active non-ASD projects

Project lead, Institution	Allocation	Usage
Brian Arbic, U Michigan (Univ)	9,500,000	9,669,626
M. Vertenstein, NCAR (CSL)	6,827,000	4,864,816
Cecile Hannay, NCAR (CSL)	7,800,000	4,783,580
Glen Romine, NCAR (NSC)	8,626,000	4,191,150
Peter Sullivan, NCAR (NSC)	12,000,000	3,213,429
Po Chen, U Wyoming (WNA)	17,280,000	2,535,728
J-F Lamarque, NCAR (ACD)	9,715,000	2,101,195
Yuhong Fan, NCAR (NSC)	5,680,000	2,548,198
J. Small, NCAR (NSC)	21,900,000	1,702,848
Cecile Hannay, NCAR (CSL)	2,100,000	1,665,337
(#22) John Marshall, MIT (Univ)	2,844,000	925,433

# HPSS growth since Dec. 2012

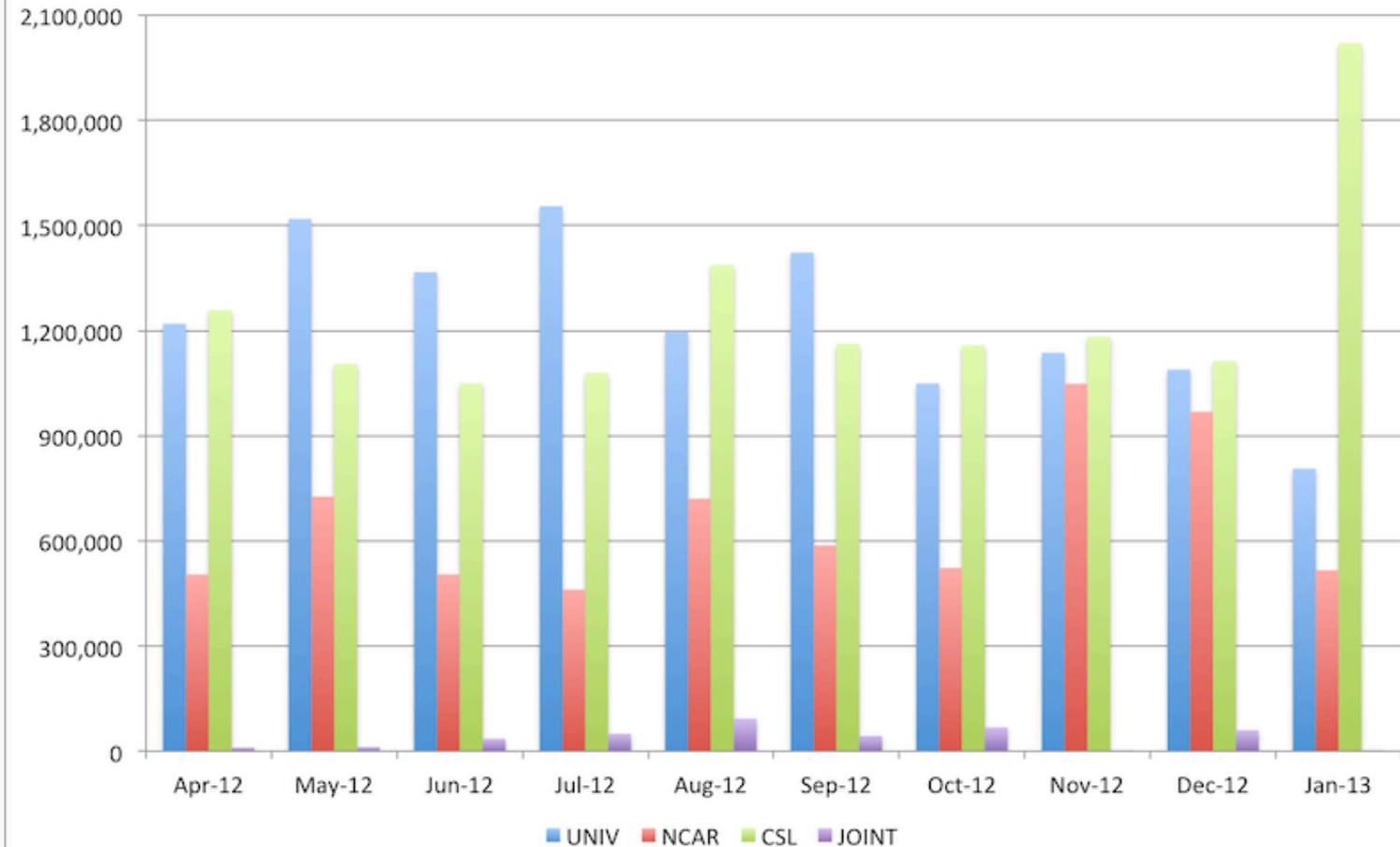


# Bluefire university use



# Last months of Bluefire

Bluefire charged GAUs by community, to 1/31/2013



<http://www2.cisl.ucar.edu/resources/yellowstone>



**QUESTIONS?**