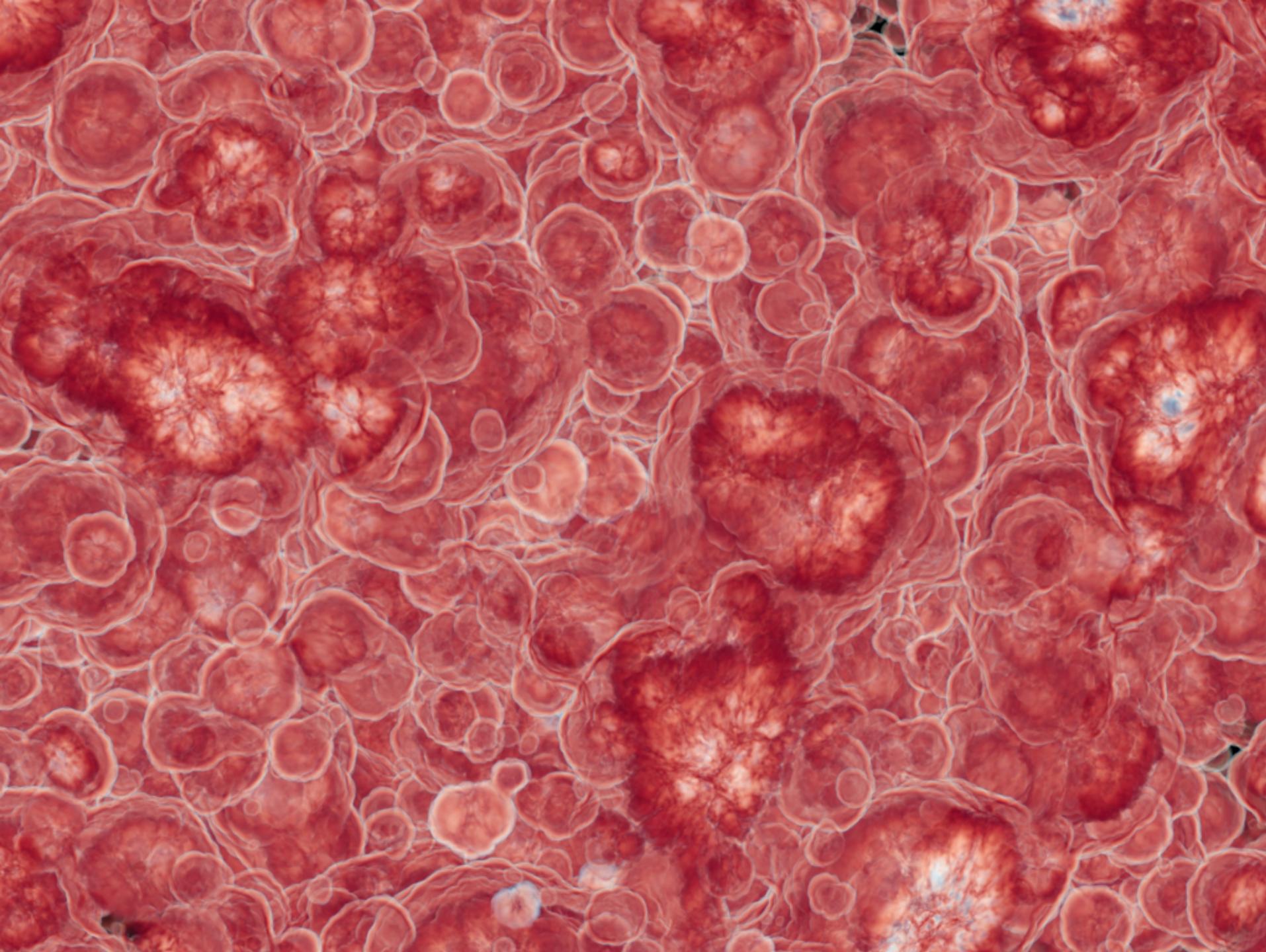


The yt Project

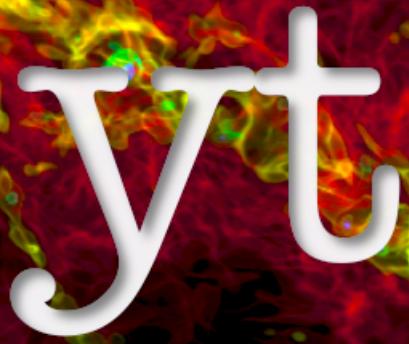
Growing & Engaging a community of practice



Matthew Turk
Columbia University



What is yt?

The logo consists of the lowercase letters "yt" in a white, sans-serif font. The letter "y" is positioned above the letter "t", with its vertical stroke intersecting the top of the "t". The background of the logo is a circular frame containing a vibrant, abstract simulation visualization. This visualization depicts a complex network of red and yellow filaments against a dark background, resembling a star-forming region or a filamentary structure in space.

[astro-ph/1011.3514](https://arxiv.org/abs/1011.3514)
[astro-ph/1112.4482](https://arxiv.org/abs/1112.4482)

yt-project.org

HOME
COMMUNITY
GET YT
EXAMPLES
DEVELOP
HELP!
DOCS
BLOG
HUB



DETAILED DATA ANALYSIS AND VISUALIZATIONS, WRITTEN BY **WORKING ASTROPHYSICISTS** AND DESIGNED FOR PRAGMATIC ANALYSIS NEEDS.



DATA-DRIVEN

Inspect your data

yt is designed to provide a consistent, cross-code interface to analyzing and visualizing



COMMUNITY

Participants welcome!

yt is composed of a friendly community of users and developers. We want to make it



FREE SOFTWARE

Open Source, Open Science

yt is developed completely in the open, released under the GPL license. The developers are

yt Overview

yt is a community-developed analysis and visualization toolkit for astrophysical simulation data. yt provides full support for the [Enzo](#), [Orion](#), [Nyx](#), and [FLASH codes](#), with preliminary support for [RAMSES](#), ART, and Maestro. It runs both interactively and non-interactively, and has been designed to support as many operations as possible in parallel. For more detailed information, see our [ApJS paper](#).

To install `yt`, see [Quickstart Guide](#) or [Installing yt](#). To see what's new since the last version, check out [ChangeLog](#).

If you use `yt` in a paper, you are highly encouraged to submit the repository containing the scripts you used to analyze and visualize your data to the [yt Hub](#), and we ask that you consider citing our [method paper](#), as well. If you are looking to use `yt`, then check out the [yt Hub](#) for ideas of how other people used `yt` to generate worthwhile analysis. We encourage you to explore the source code and even consider [contributing](#) your enhancements and scripts.

For more information, please visit [our homepage](#) and for help, please see [Asking for Help](#).

Getting Started

[Welcome to yt!](#)

What's yt all about?

[yt Orientation](#)

Quickly get up and running with yt: zero to sixty.

[How to Ask for Help](#)

Some guidelines on how and where to ask for help with yt

[Workshop Tutorials](#)

Videos, slides and scripts from the 2012 workshop covering many aspects of yt, from beginning to advanced.

[The Cookbook](#)

A bunch of illustrated examples of how to do things

[FAQ](#)

Frequently Asked Questions: answered for you!

There are many simulation codes.

There are many simulation codes,
but there is only one sky.

Fully-Supported

Semi-Supported

In-Progress

Enzo

FLASH

Orion

Nyx

Raw Data

Piernik

Chombo

Athena

ART

RAMSES

GDF

Cactus

Gadget

GAMER

PENCIL

yt is designed to address physical,
not computational,
entities and questions.

yt is supposed to get out of the way.

```
from yt.mods import *
pf = load("galaxy0030/galaxy0030")
p = SlicePlot(pf, 2, "Density", "c", (200, "kpc"))
p.show()
```

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from yt.mods import *
pf = load("galaxy0030/galaxy0030")
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p.show()
```

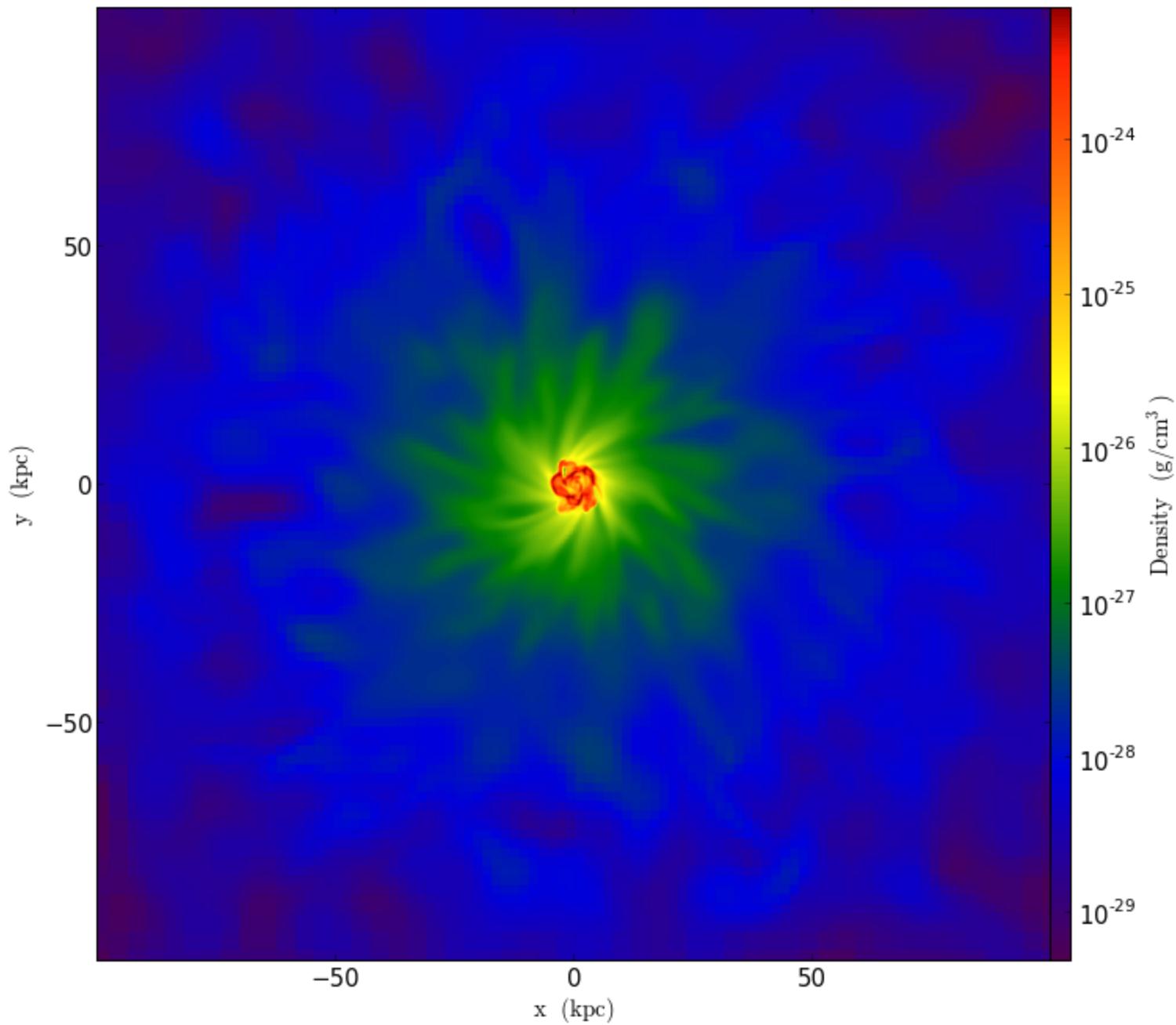
Load from disk, determine IO format, parse
parameters, set up mesh, initialize IO, and create
geometric objects.

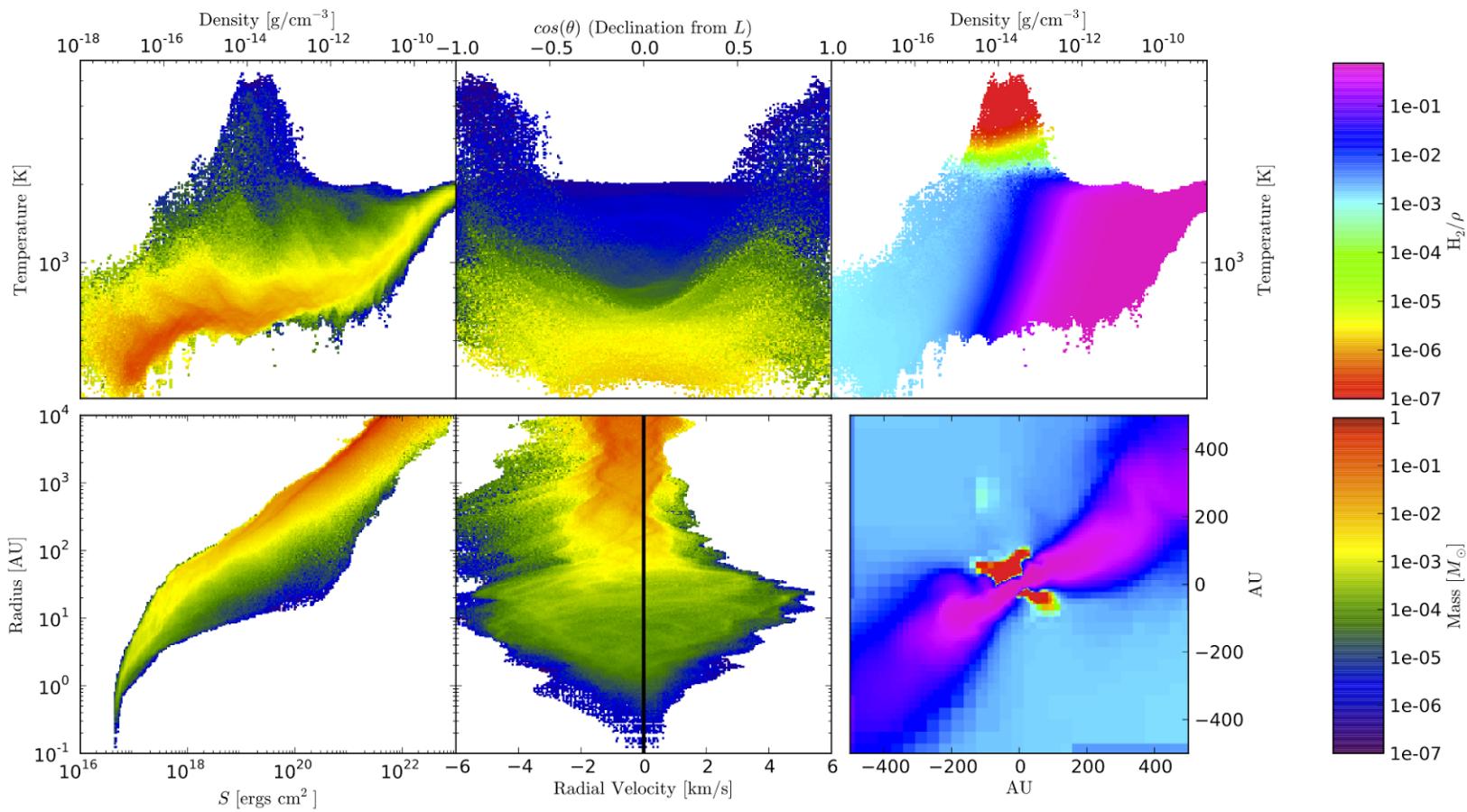
```
from yt.mods import *
pf = load("galaxy0030/galaxy0030")
p = SlicePlot(pf, 2, "Density", "c", (200, "kpc"))
p.show()
```

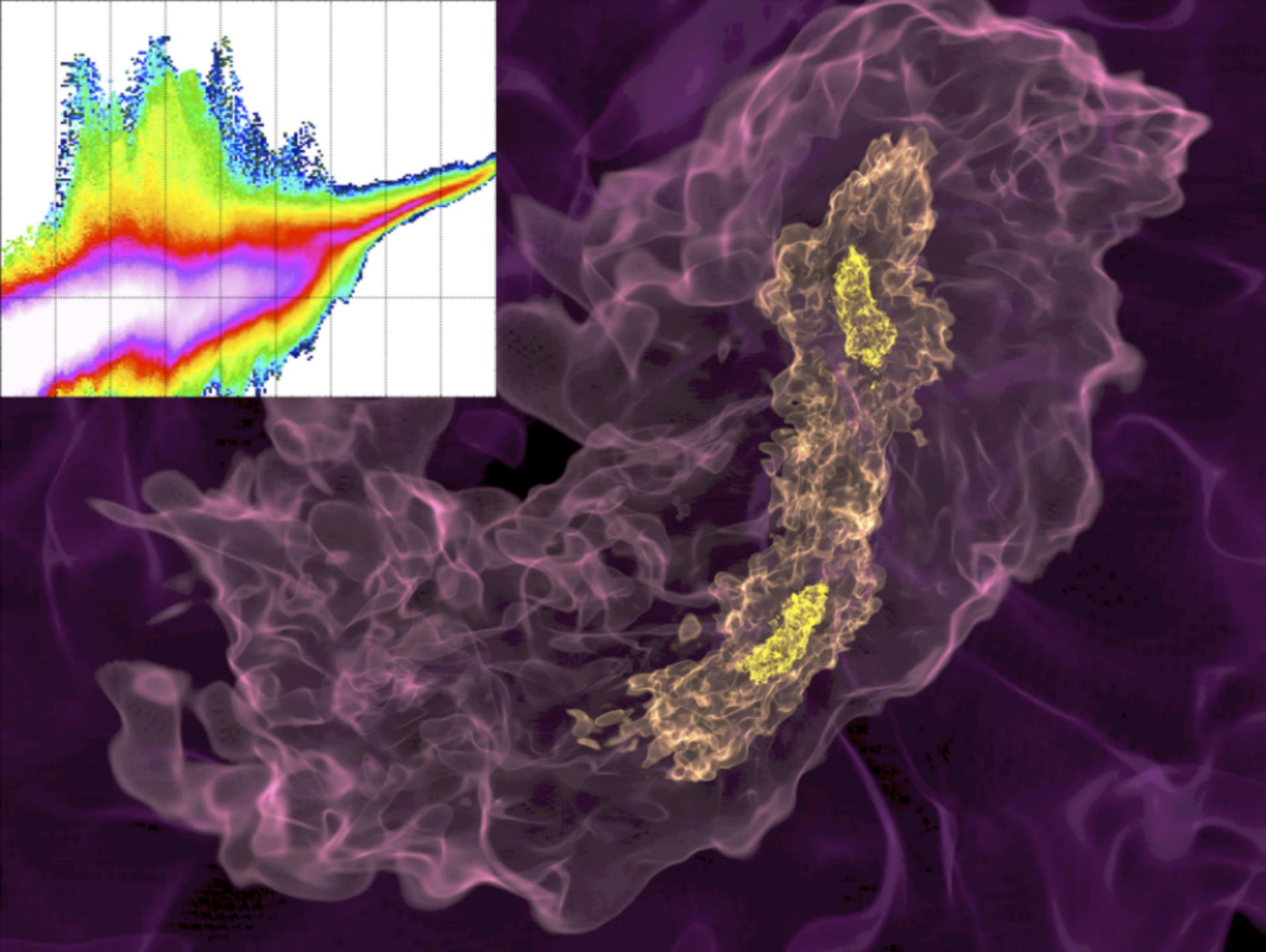
Identify appropriate subregions of data, mask
out overlapping data, convert to CGS,
concatenate, pixelize, and return plot.

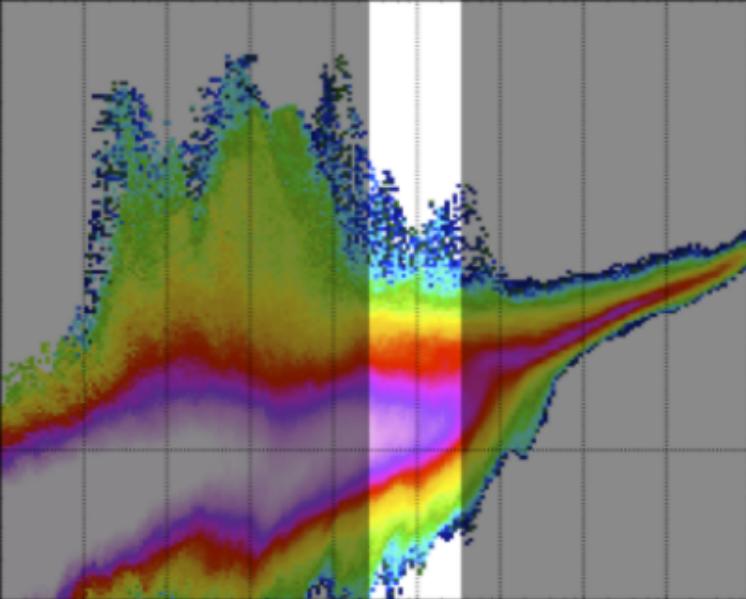
```
from yt.mods import *
pf = load("galaxy0030/galaxy0030")
p = SlicePlot(pf, 2, "Density", "c", (200, "kpc"))
p.show()
```

Ship it over to IPython!

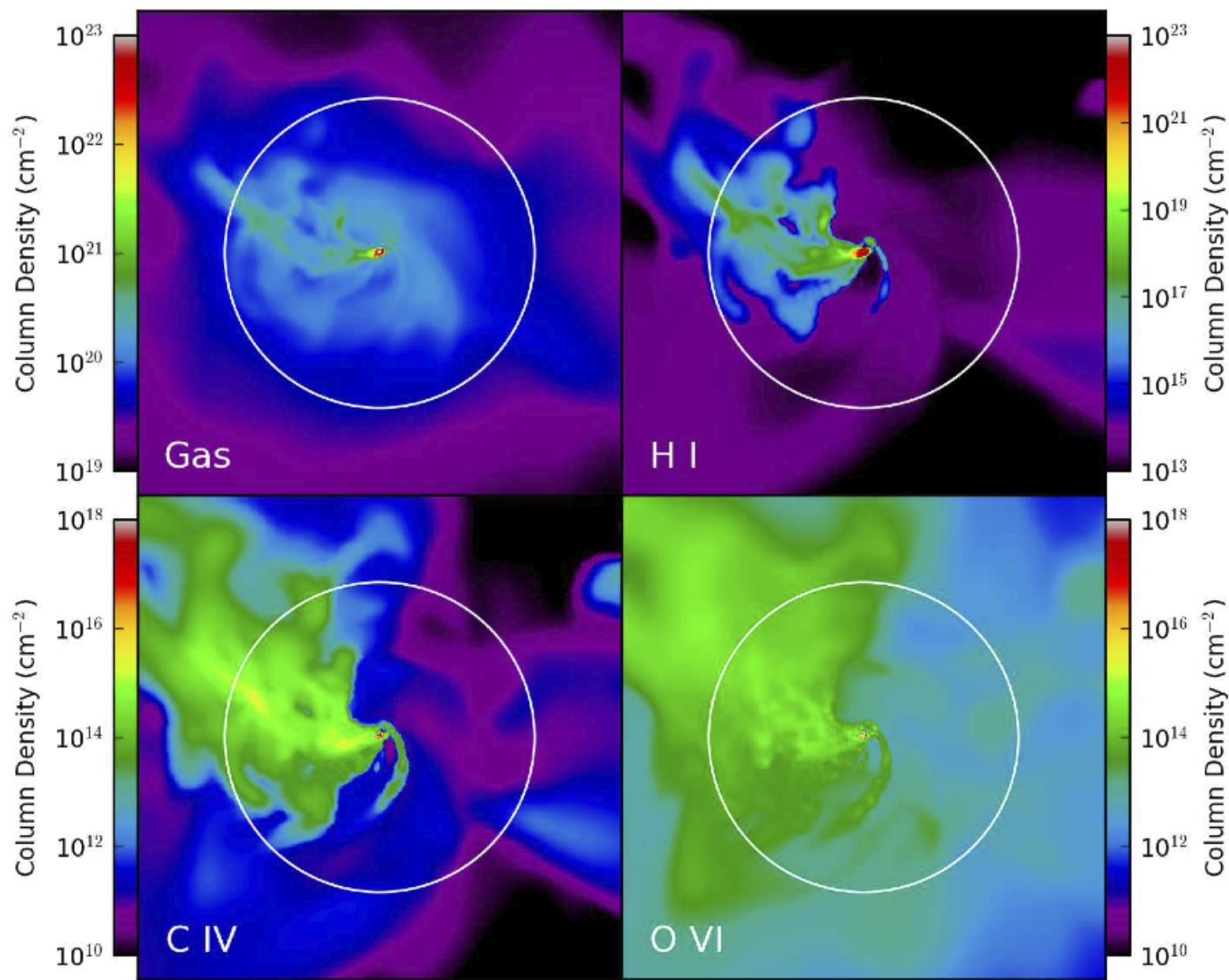








10^{-12} g/cc



Low-Level Data Handling

Objects and Physical Quantities

Canned Analysis Tasks

(advanced)

Low-Level Data Handling

(intermediate)

Objects and Physical Quantities

(beginner)

Canned Analysis Tasks

"Community"?

Traditional View of Scientific Development

"Users"

"Developers"

Most Scientific Development

"Developers"

"Users"

Community of Practice

"Devusers"

"Developers"

Inspection and verification
Tracking modifications
Sharing information
Doing new and interesting things

"Users"

Uncritical acceptance of code?

"Users"

"These are the people we give the code
to that don't care how it works."



Challenges

Academic Reward Structure

Academic Reward Structure

de facto & de jure

de facto & de jure

Utilization of developed tools

Respect from community

Project involvements

Invitations and opportunities to speak

de facto & de jure

Funding

Publications

Citation count

Influence

Traditional astrophysics does not
favor tool builders.

Chores

Documentation,
testing,
outreach,
infrastructure development.

Chores

Tasks not fully-aligned with reward structure present great motivational challenges.

Co-opetition

Funding

Publications

Citation count

Influence

The "citation economy" for community
codes is broken, and this
disproportionately impacts new and
junior contributors.

The "citation economy" for community codes is broken, and this disproportionately impacts new and junior contributors.

(It's bad for us, but even worse for infrastructure.)

How developer community
engagement, cohesion, excitement
and energy is affected by funded
improvements remains unclear.

Strategies

Design the community you want.

Design the community you want.

Diversity. Tone. Enthusiasm. Congeniality.

Design the community you want.

This is an investment.

Technical
& Social

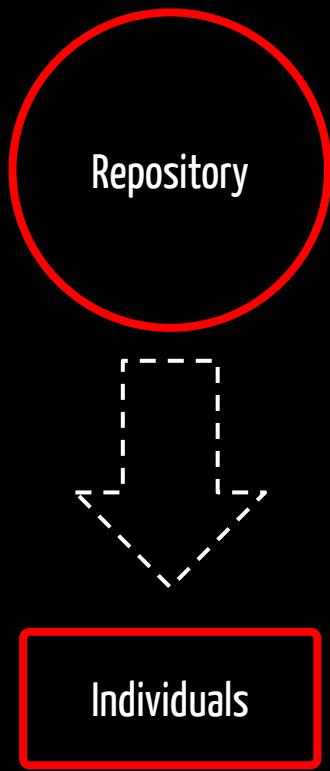
Technical & Social

Reduce barrier to entry
Test on every push
Review every changeset

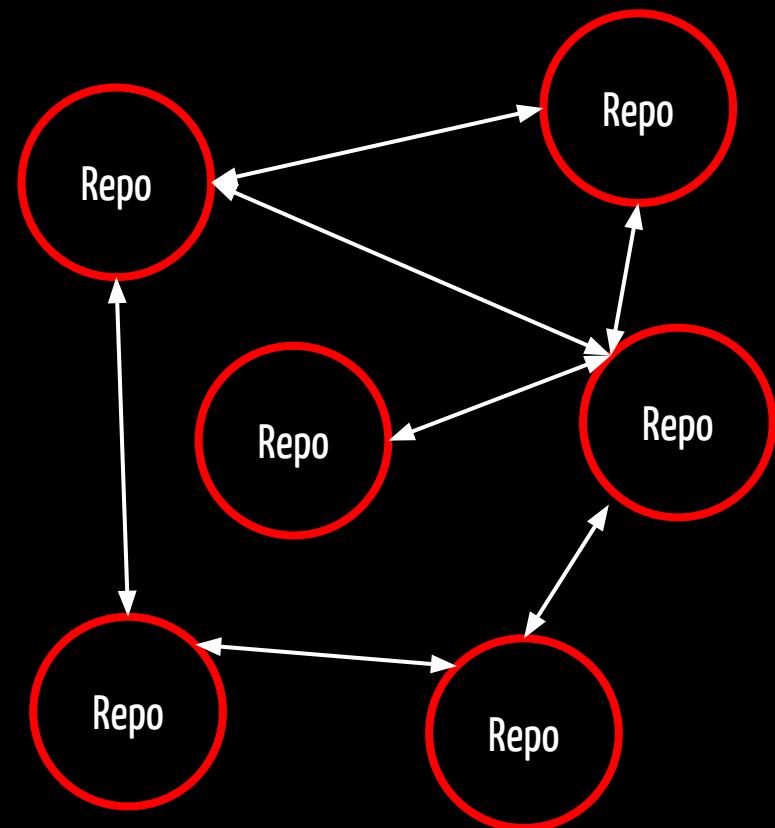
Reduce barrier to entry
Test on every push
Review every changeset

Everything comes in the box: version control, extensions,
sample data, dependencies, and tutorials.

CVCS



DVCS



Reduce barrier to entry
Test on every push
Review every changeset

Shining Panda for unit tests & small data answer tests,
ReadTheDocs.org, and an auto-deployed ReST blog.

Reduce barrier to entry
Test on every push
Review every changeset

Pull requests and mentoring of new developers, through
IRC, mailing list, and code comments.



An upstream path...

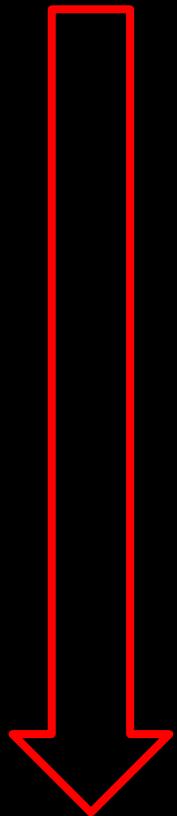
Happy Application

Itch-Scratching

Pull Request Submission

Code Review & Mentoring

Participation



Happy Application

Itch-Scratching

Pull Request Submission

Code Review & Mentoring

Participation

Accept contributions of data,
scripts, images, projects

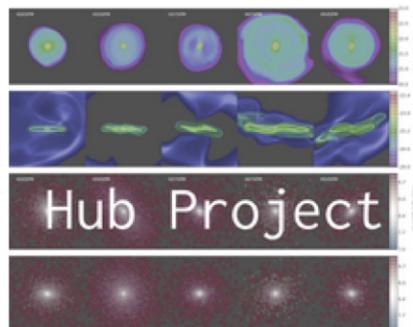
The yt Data Hub

This is the yt Data Hub, a place to upload and share data and images generated by and from [yt](#).

Right now we have widgets for variable maps (projections, slices), 3D vertex exploration, simulation parameter display, and collections of images.

To get started, [register a user](#) and follow the [quickstart](#) to upload data.

Recent Projects

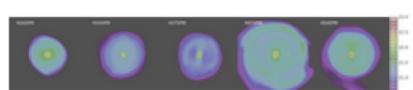


rprof2d: Simple radial profiles of 2D images

By [Matthew Turk](#) in Analysis and Visualization.

[Project Home](#) / [Hub Page](#)

This is just a simple tool that uses numpy to create a radial profile of a 2d image, optionally weighted by a second image. Takes as input the image, central x and y pixel locations, and a few keyword arguments. Requires numpy. Needs to be placed in your PYTHONPATH to be used.



Using Rockstar & consistent-trees with yt

By [Christopher Moody](#) in Astrophysical Utilities.

Communication

All project business is conducted openly.

Immediate

Hangouts with extras - Google Chrome

<https://talk.google.com/talk/gchat/extra/104405515914405505944952850-Hengots with extras>

Hangouts with extras

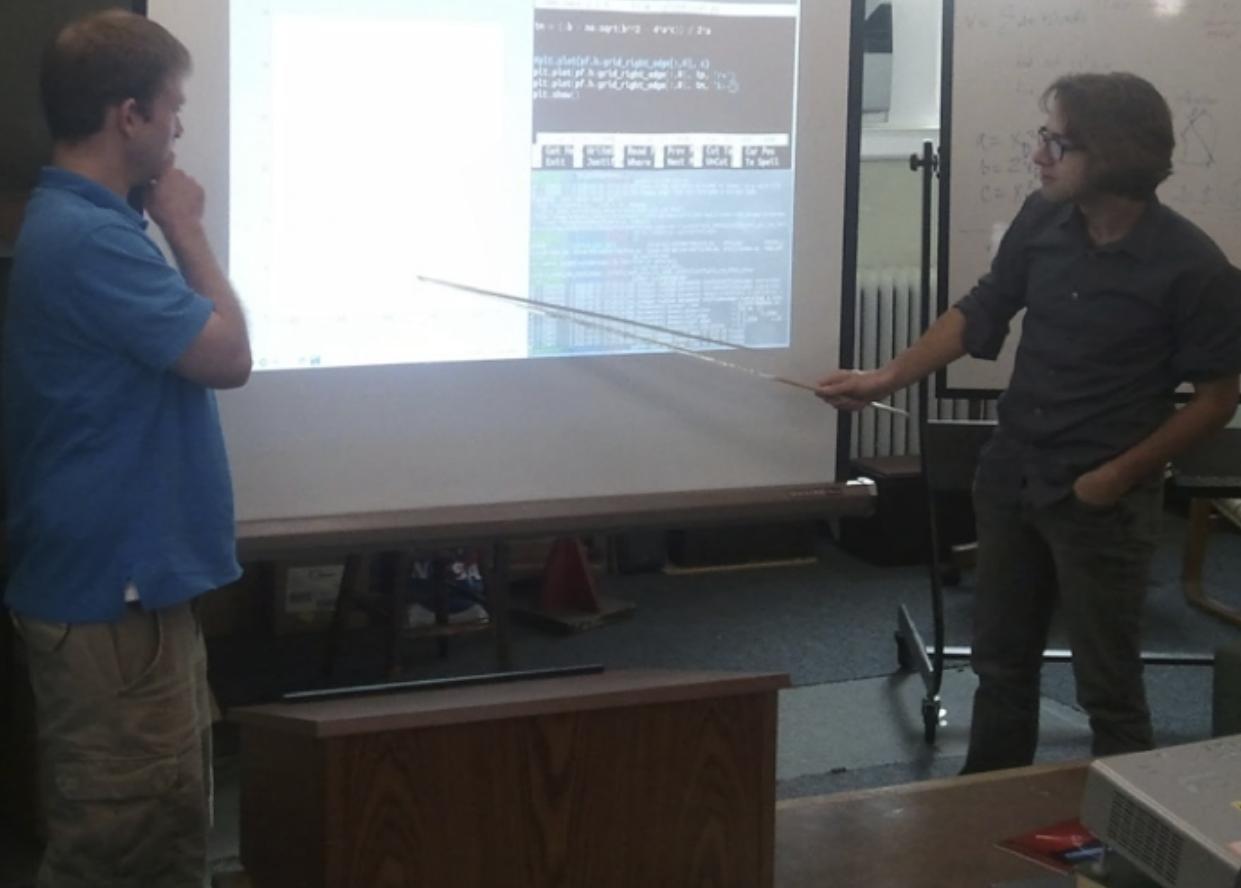
Documents

File Edit View Insert Format Stats Tools Help

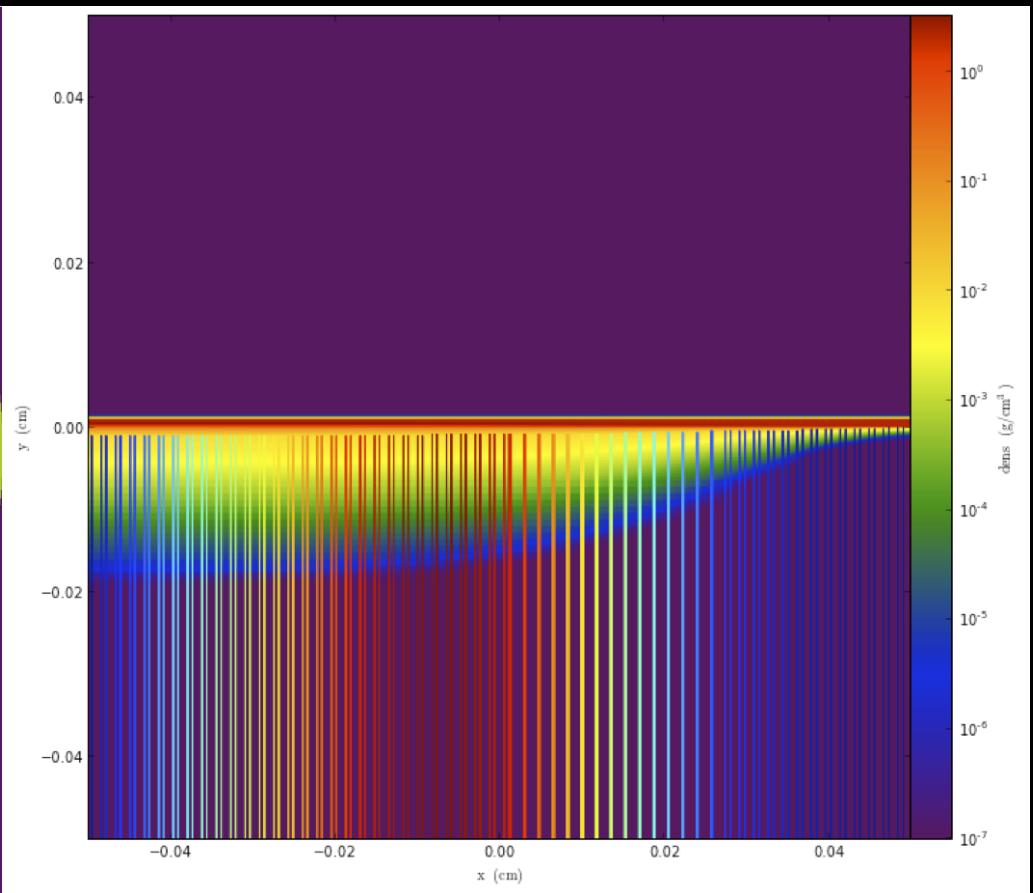
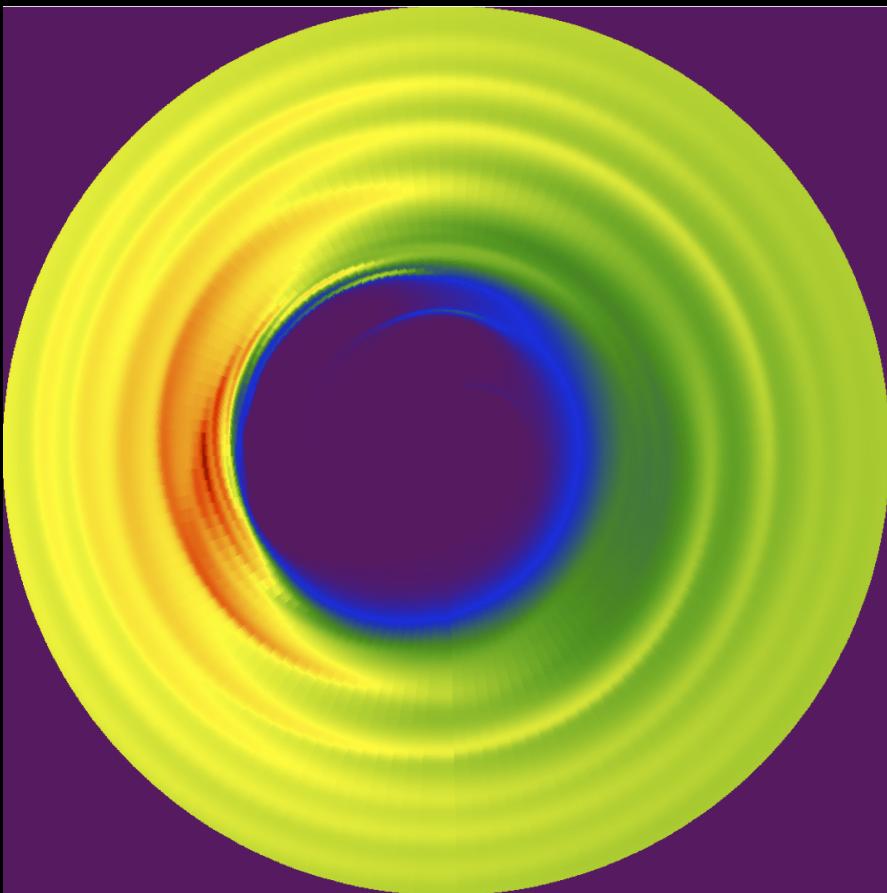
Fx Editor

#	Title	Date	Presenter	Description	Length (in minutes)	URL
1	Welcome	1 Dec	Everyone	Welcome to the FLAASH center!	10	
2	Introduction: project building, documentation (Over to use it)	1 Mar	Everyone	Welcome to the workshop, and a brief introduction of terms. What is the main purpose we're looking at? What does it mean when it talks about an object?	30	https://flaash.org/MatthewTuck/2012/workshop2012/introduction.html
3	Nature of gcf objects	1 Mar	Jeffrey or Stephen	Show projections and phase plots. Hand-on with provided angular datasets. Line-by-line, description of what goes on in the most important. Watcher script-like teaching materials.	30	
4	Simple visualization and hand-on	1 Mar	John or Stephen	Simple, non-complex stuff: axis ticks, averages, peak value, angular momentum, and so on. Mostly visual quantities and object creation.	30	
5	Very general analysis	1 Mar	Everyone	Show off this lab, along with the cookbook, and talk about the availability of these scripts. Show how to upload to the hub.	30	
6	Analyser: Hands-on	1 Mar	All	Some homework assignments: compare with angular momentum, circular velocity, slices, etc. Other general cosmological analysis.	30	
7	Showcase of scripts	1 Mar	Everyone	What are the different types of parallelism? What can parallel? How do you know what kind of task size to use? What's a field, how do we define a new field, how do you access parameters and spatial information. Derived quantities: how do you make one, what is available, how do you use them?	30	
8	Lab	1 Mar	Jeffrey or Stephen	Scripting: how to it to constrain complex data objects and to manipulate their data. Initiates derived fields as well as accessing and inspecting data. Move between data objects and C++ raw arrays, dictionaries, fluxes, and connected sets. Show how to do time-series analysis, and what to do with it when you're done. Cover both TimeSeries and Broadbandization, as well as event planning and handling.	30	
9	Parallelism	1 Mar	Jeffrey or Stephen	Using the basic off-axis projection tool and countmap function, show how to where needed.	30	
10	Fields and Derived Quantities	1 Mar	Jeffrey or Stephen	How to take a plot and make it ready for a paper. How do you access or create plot data? What is a callback? Perhaps: Sharepoint.	30	
11	Advanced Data Objects and hand-on	1 Mar	Jeffrey or Stephen	What does it do with the data for derived analysis processes? Star analysis, connected axis/fluxes, subfinding (Use this as an intro to the challenging lab)	30	
12	Time Series Analysis	1 Mar	Jeffrey or Stephen			
13	Beginning Volume Rendering	1 Mar	Jeffrey or Stephen			
14	Advanced Visualization and hand-on	1 Mar	Jeffrey or Stephen			
15	Challenging lab	1 Mar	Jeffrey or Stephen			
16	Advanced Visualization and hand-on	1 Mar	Jeffrey or Stephen			
17	Carrot analysis and hand-on	1 Mar	Jeffrey or Stephen			
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210	Advanced Visualization and hand-on	1 Mar	Jeffrey or Stephen			
211	Advanced Visualization and hand-on	1 Mar	Jeffrey or Stephen			
212	Advanced Visualization and hand-on	1 Mar	Jeffrey or Stephen			
213	Advanced Visualization and hand-on	1 Mar	Jeffrey or Stephen			
214	Advanced Visualization and hand-on	1 Mar	Jeffrey or Stephen			
215	Advanced Visualization and hand-on	1 Mar	Jeffrey or Stephen			
216	Advanced Visualization and hand-on	1 Mar	Jeffrey or Stephen			
217	Advanced Visualization and hand-on	1 Mar	Jeffrey or Stephen			
218	Advanced Visualization and hand-on	1 Mar	Jeffrey or Stephen			
219	Advanced Visualization and hand-on	1 Mar	Jeffrey or Stephen			
220	Advanced Visualization and hand-on	1 Mar	Jeffrey or Stephen			
221	Advanced Visualization and hand-on	1 Mar	Jeffrey or Stephen			
222	Advanced Visualization and hand-on	1 Mar	Jeffrey or Stephen			
223	Advanced Visualization and hand-on	1 Mar	Jeffrey or Stephen			
224	Advanced Visualization and hand-on	1 Mar	Jeffrey or Stephen			
225	Advanced Visualization and hand-on	1 Mar	Jeffrey or Stephen			
226	Advanced Visualization and hand-on	1 Mar	Jeffrey or Stephen			
227	Advanced Visualization and hand-on	1 Mar	Jeffrey or Stephen			
228	Advanced Visualization and hand-on	1 Mar	Jeffrey or Stephen			
229	Advanced Visualization and hand-on	1 Mar	Jeffrey or Stephen			
230	Advanced Visualization and hand-on	1 Mar	Jeffrey or Stephen			
231	Advanced Visualization and hand-on	1 Mar	Jeffrey or Stephen			
232	Advanced Visualization and hand-on	1 Mar	Jeffrey or Stephen			
233	Advanced Visualization and hand-on	1 Mar	Jeffrey or Stephen			
234	Advanced Visualization and hand-on	1 Mar	Jeffrey or Stephen			
235	Advanced Visualization and hand-on	1 Mar	Jeffrey or Stephen			
236	Advanced Visualization and hand-on	1 Mar	Jeffrey or Stephen			
237	Advanced Visualization and hand-on</					

Immediate



Immediate



Low-Latency

```
yt: analysis and viz. home: http://yt-project.org/ (and still not in any app stores!)
23:49:55 < CIA-62> yt: Nathan Goldbaum <goldbaum@ucolick.org> * 358092443a92 r5992
                  /yt/visualization/plot_modifications.py:
23:49:55 < CIA-62> yt: Fixing a bug in convert_to_pixel, which I've renamed to
23:50:12 < CIA-62> yt: convert_to_plot since it should convert to plot coordinates (not
23:50:12 < CIA-62> yt: necessarily the same as pixel coordinates).
23:50:12 < CIA-62> yt: Nathan Goldbaum <goldbaum@ucolick.org> * 5c7b2095ee5a r5993
                  /yt/visualization/plot_window.py: Need to cast this to a string
23:50:12 < CIA-62> yt: Matthew Turk <matthewturk@gmail.com> * 148b51ad39af r5994 /yt/ (3 files in 2 dirs):
                  Merged in ngoldbaum/yt-ngoldbaum (pull request #194)
23:50:19 < ngoldbaum> awesome, thanks matt
Day changed to 11 Jul 2012
00:22:00 < mjturk> np
00:22:03 < mjturk> thank you for the changes
00:22:52 < xarthisius> mjturk: is this a typo or there's some magic behind that I don't understand?
                  http://paste.lugons.org/show/2824/
00:24:00 < xarthisius> without that patch I get weird axis labels for non-square domains
00:27:06 < xarthisius> oh, ngoldbaum that ^^ should be directed to you :)
00:27:33 < ngoldbaum> it's a type
00:27:41 < ngoldbaum> thanks for testing on non-square domains
00:27:55 < ngoldbaum> if anything doesn't work it's a bug (and probably a typo)
00:28:06 < ngoldbaum> thanks xarthisius
[08:00] [mjturk(+Zi)] [2:#yt(+cnt)]
```

High-Latency

August 2012 Archives by thread

- Messages sorted by: [\[subject \]](#) [\[author \]](#) [\[date \]](#)
- [More info on this list...](#)

Starting: *Wed Aug 1 06:33:13 PDT 2012*

Ending: *Fri Aug 31 12:30:40 PDT 2012*

Messages: 99

- [\[yt-users\] error in light ray periodic ray creation](#) *Britton Smith*
- [\[yt-users\] Quiver normalization](#) *Massimo Gaspari*
 - [\[yt-users\] Quiver normalization](#) *Jean-Claude Passy*
 - [\[yt-users\] Quiver normalization](#) *Massimo Gaspari*
 - [\[yt-users\] Quiver normalization](#) *Jean-Claude Passy*
- [\[yt-users\] yt 2.4 release announcement](#) *Nathan Goldbaum*
- [\[yt-users\] YT installation](#) *Sherwood Richers*
 - [\[yt-users\] YT installation](#) *Matthew Turk*
 - [\[yt-users\] YT installation](#) *Sherwood Richers*
 - [\[yt-users\] YT installation](#) *j s oishi*
 - [\[yt-users\] YT installation](#) *j s oishi*
 - [\[yt-users\] YT installation](#) *Sherwood Richers*
 - [\[yt-users\] YT installation](#) *Nathan Goldbaum*
 - [\[yt-users\] YT installation](#) *Sherwood Richers*
 - [\[yt-users\] YT installation](#) *Matthew Turk*
- [\[yt-users\] yt update error](#) *Latif*
 - [\[yt-users\] yt update error](#) *Matthew Turk*
 - [\[yt-users\] yt update error](#) *Latif*
 - [\[yt-users\] yt update error](#) *Matthew Turk*

Technical
& Social

Culture self-propagates.
So, it must be seeded directly.

Foster a community of peers,
not a community of elites.

H

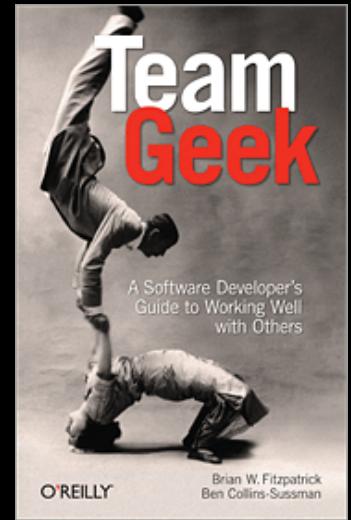
R

T

H

R

T



Fitzpatrick & Collins-Sussman

Humility

R

T

Humility

Respect

T

Humility

Respect

Trust

Humility

I think there might be a bug in ...

It's like that for a good reason. Don't
touch it.

I think there might be a bug in ...

It behaves that way because ...

Respect

I've noticed something is acting
strangely with ...

You're probably doing it wrong.

I've noticed something is acting
strangely with ...

Can you tell us how you'd expect it to
act?

Trust



Letting go...

By emphasizing pride over ownership, we've found projects can move between people without smothering through control.



Successes

In a Nutshell, yt...

...has had 7,345 commits made by 42 contributors representing 113,588 lines of code

...is mostly written in Python with an average number of source code comments

...has a well established, mature codebase maintained by a large development team with stable year-over-year commits

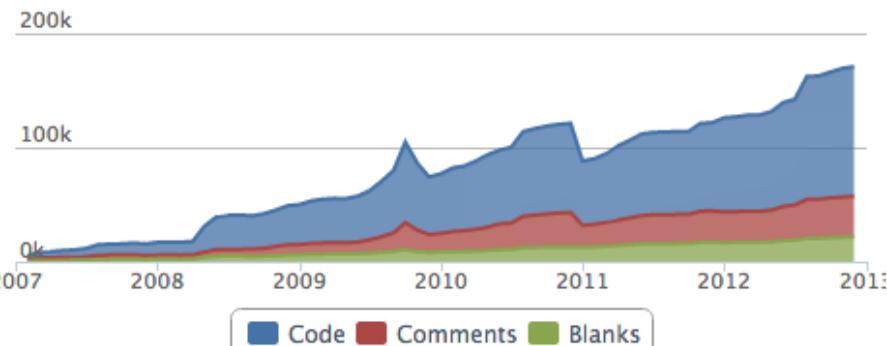
...took an estimated 29 years of effort (COCOMO model) starting with its first commit in February, 2007 ending with its most recent commit about 17 hours ago

Languages



Python	77%	C	12%
JavaScript	5%	8 Other	6%

Lines of Code



Activity

30 Day Summary

Nov 14 2012 — Dec 14 2012

219 Commits

12 Contributors including 1 new contributor

1 New Language : TeX/LaTeX added Dec 13

12 Month Summary

Dec 14 2011 — Dec 14 2012

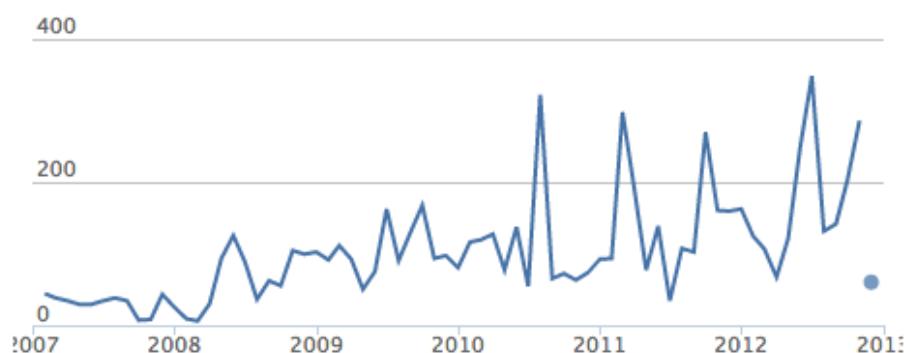
2057 Commits

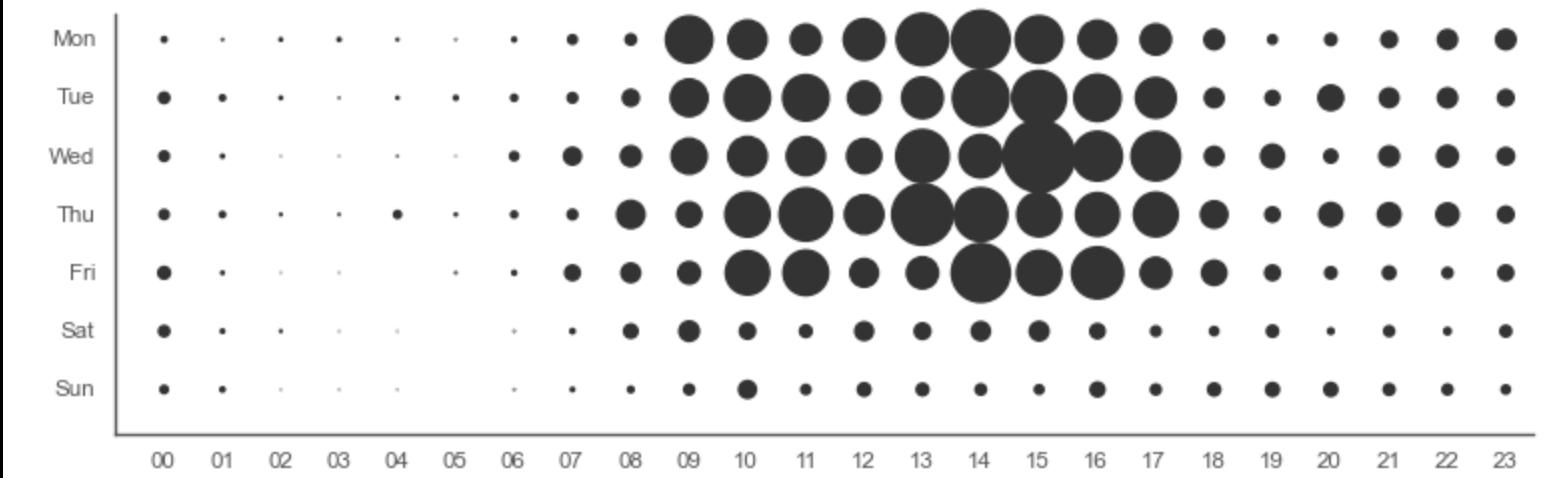
Up +384 (22%) from previous 12 months

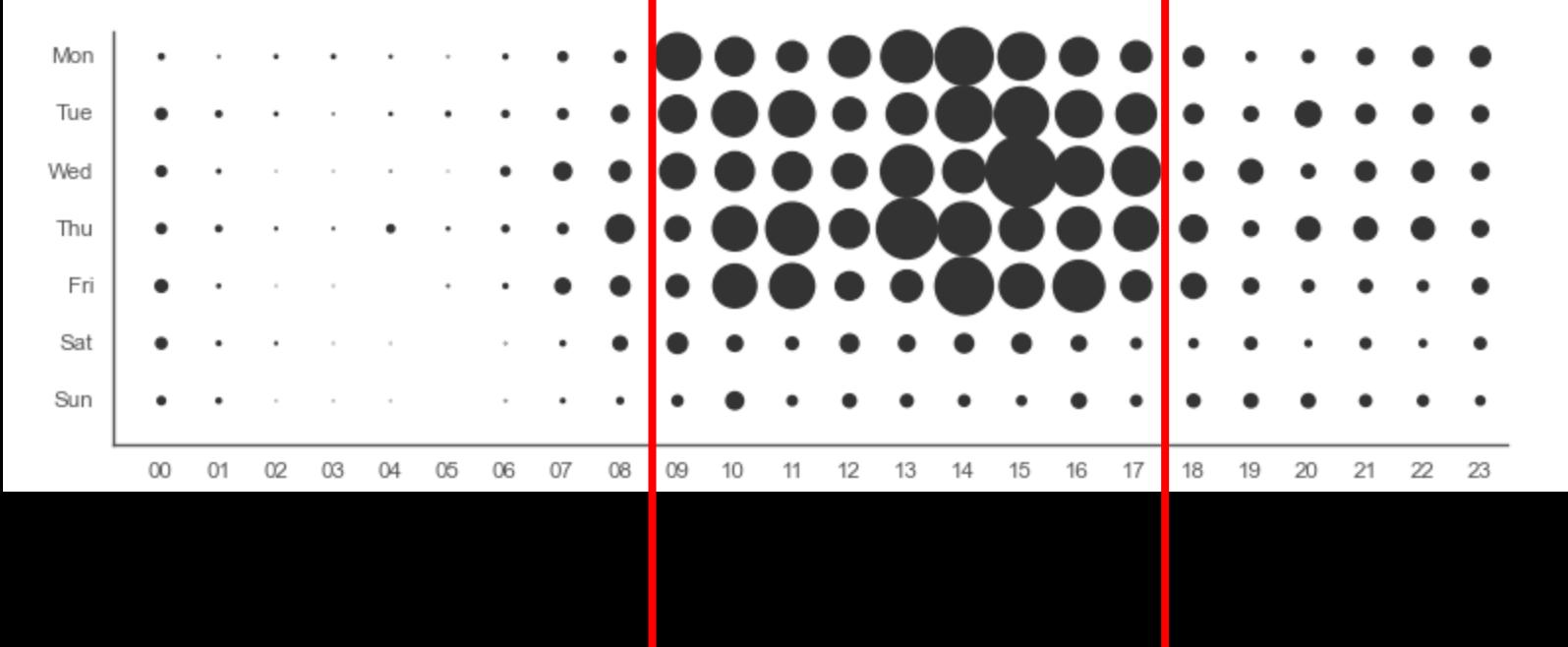
26 Contributors

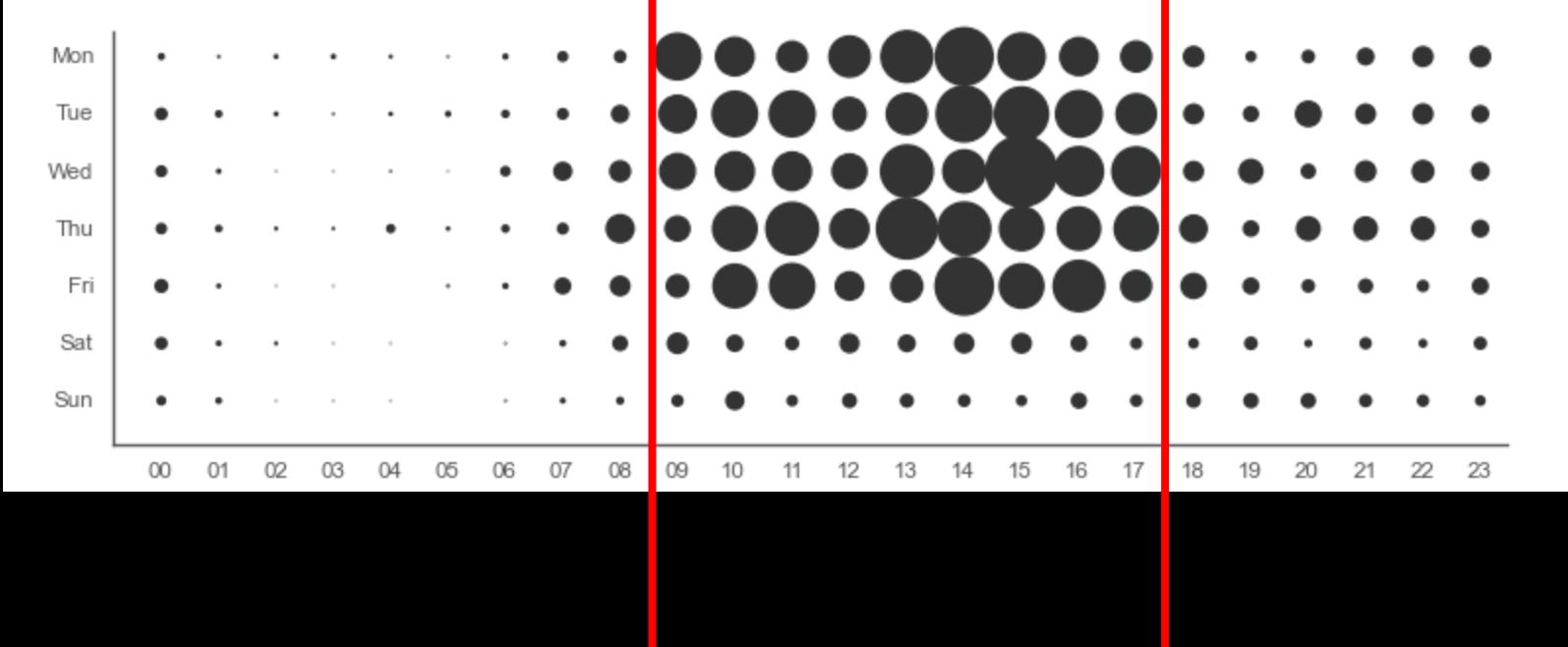
Up +3 (13%) from previous 12 months

Commits per Month

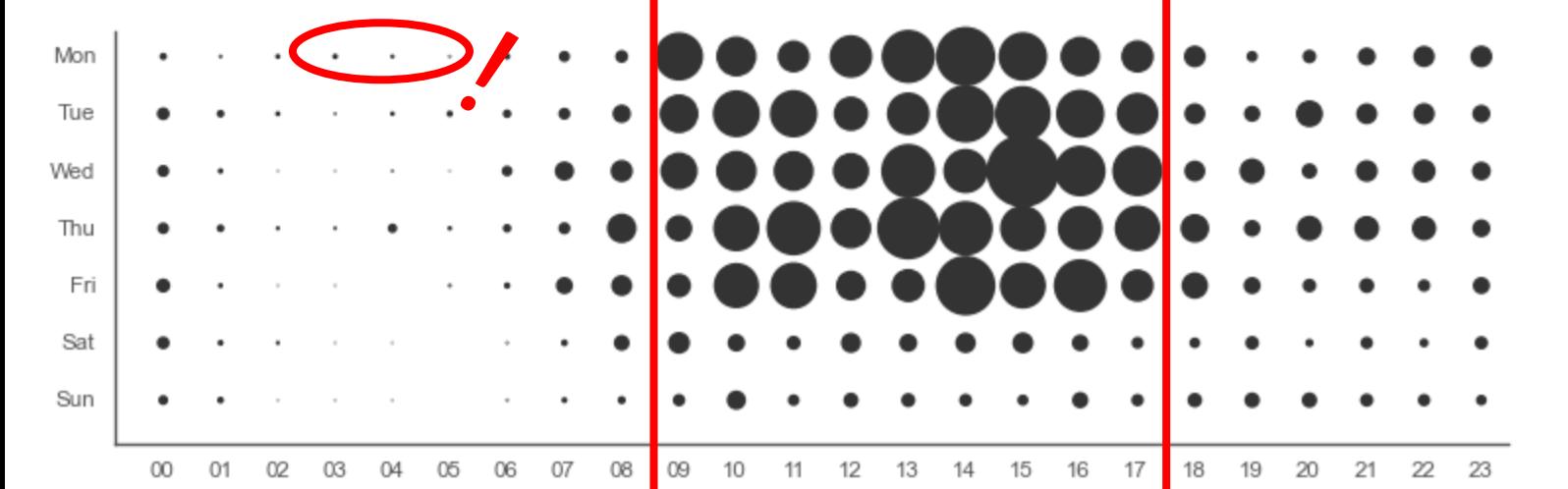




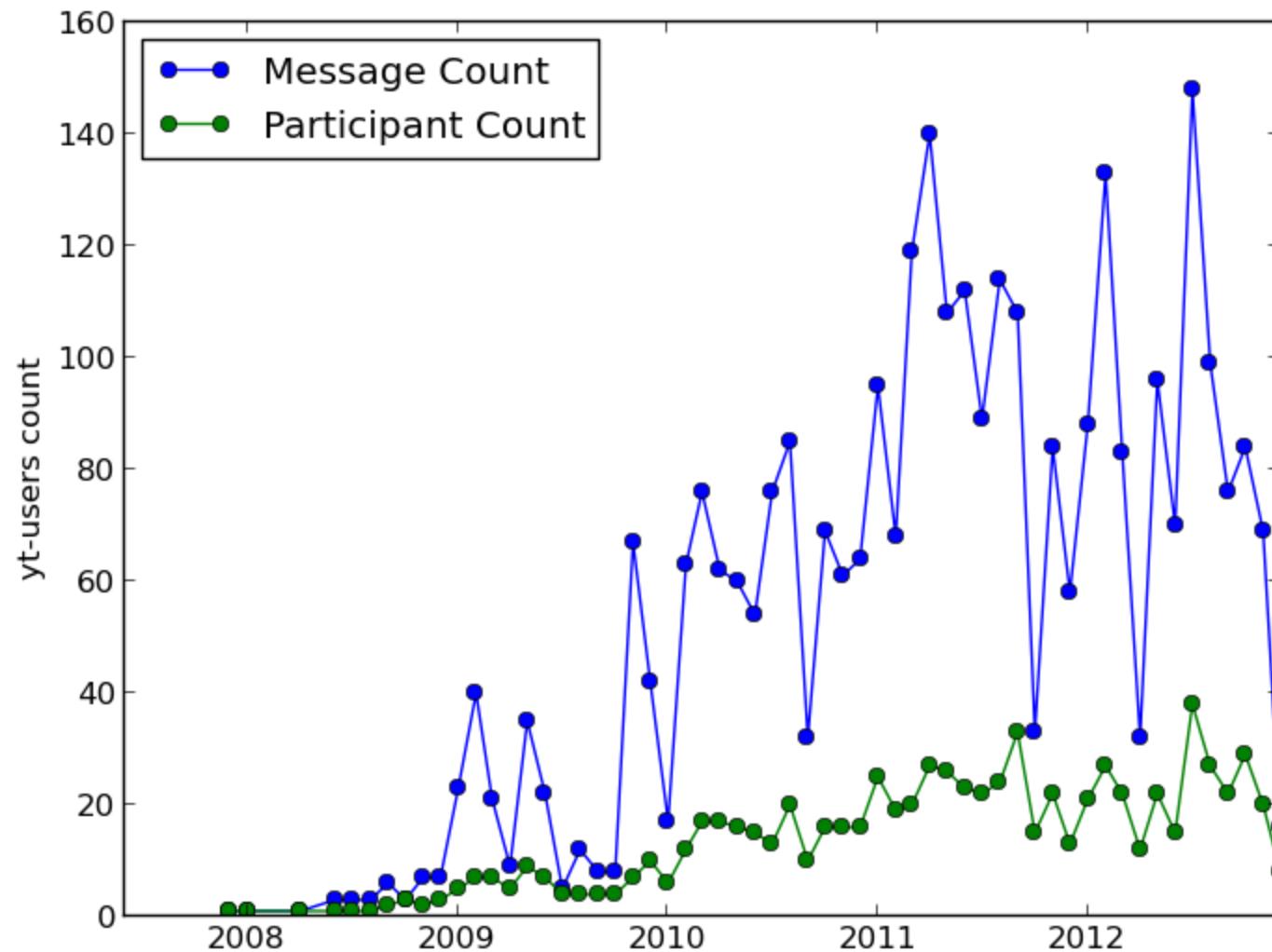


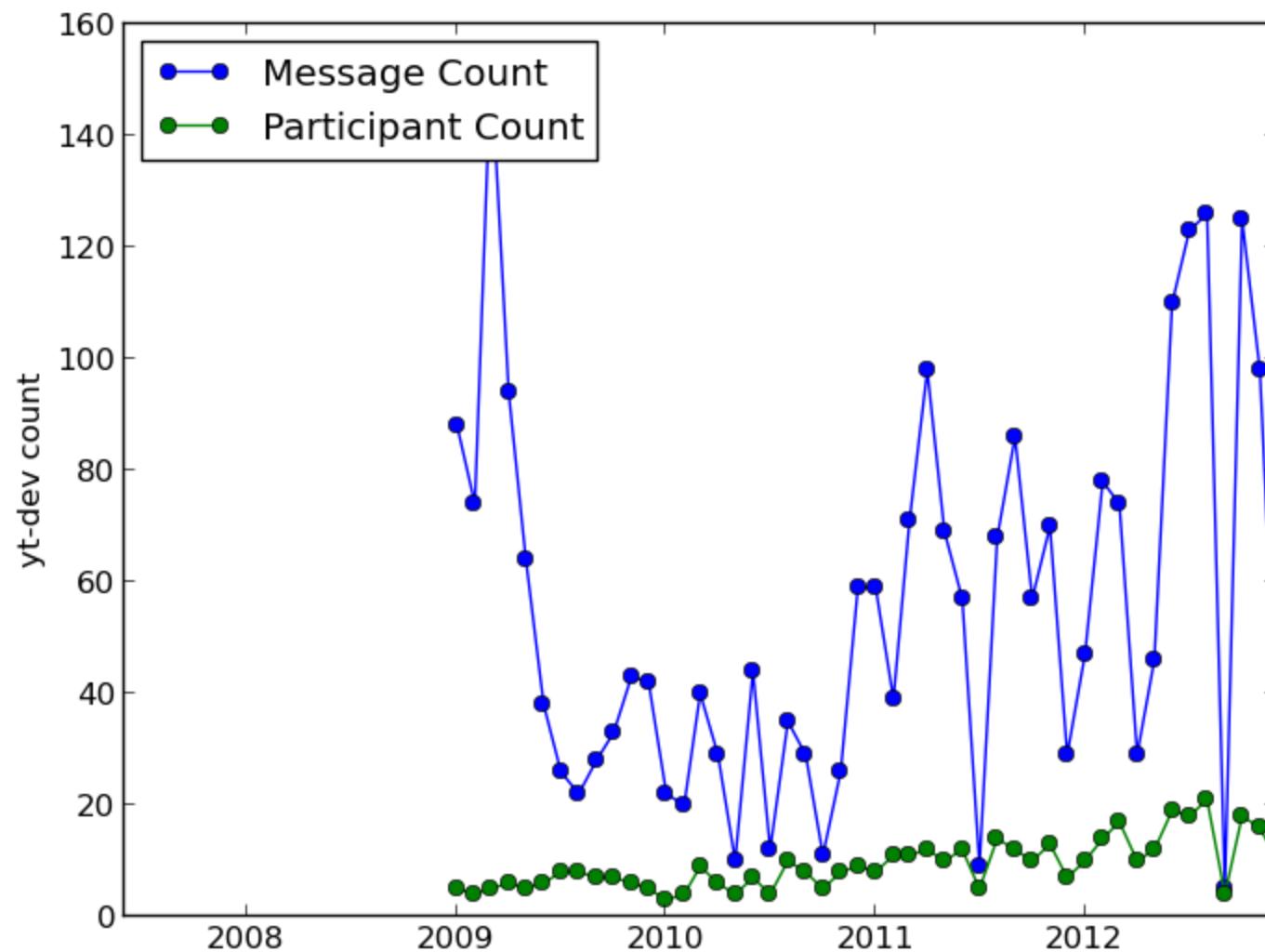


Developed by working astrophysicists.



Developed by working astrophysicists.



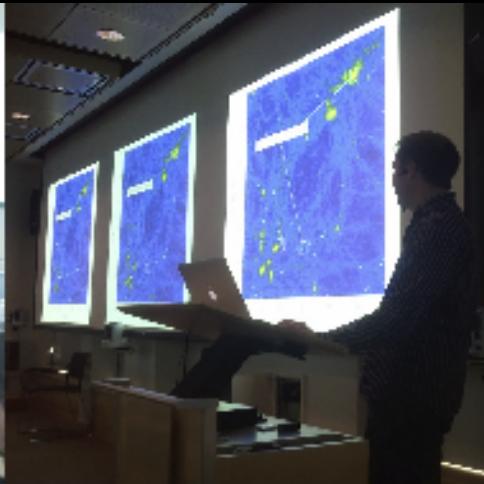


Usage on XSEDE Nautilus



	count	CPU hours	users	projects
matlab	24852	464244.83	14	8
cctm	3577	210446.84	1	2
cdio	1592	101810.32	1	1
gen.v4	1588	391359.18	3	1
cam	1559	45894.90	11	5
yt	1231	121396.69	13	12
sigma	641	24622.21	3	2
grads	541	161510.58	3	1
mm5	400	459.18	4	2
eden	384	42798.52	6	4
grib	346	87726.47	6	2
milc	326	2377.34	3	2
grmhd	303	531167.83	2	3
ncl	259	2675.59	2	2
sses	184	9948.52	1	1
paraview	177	34682.84	8	3
swift	169	2325.34	4	2
visit	101	4869.59	8	8
pop	100	209565.51	3	3
wrf	100	398.94	4	3
enzo	87	24014.62	4	3
tsc	74	105.90	1	1
R	70	24628.78	2	2
partadv	69	2062.75	1	1
a_out	56	158.65	4	4
hsi	48	2716.69	7	5
hmc	45	5.08	2	1
caactus	42	157.10	1	1
ior	42	79503.02	2	2
hy3s	39	53.02	4	3
idl	38	1971.62	6	6
music	29	7032.03	1	1

Szczepanski et al, 2012





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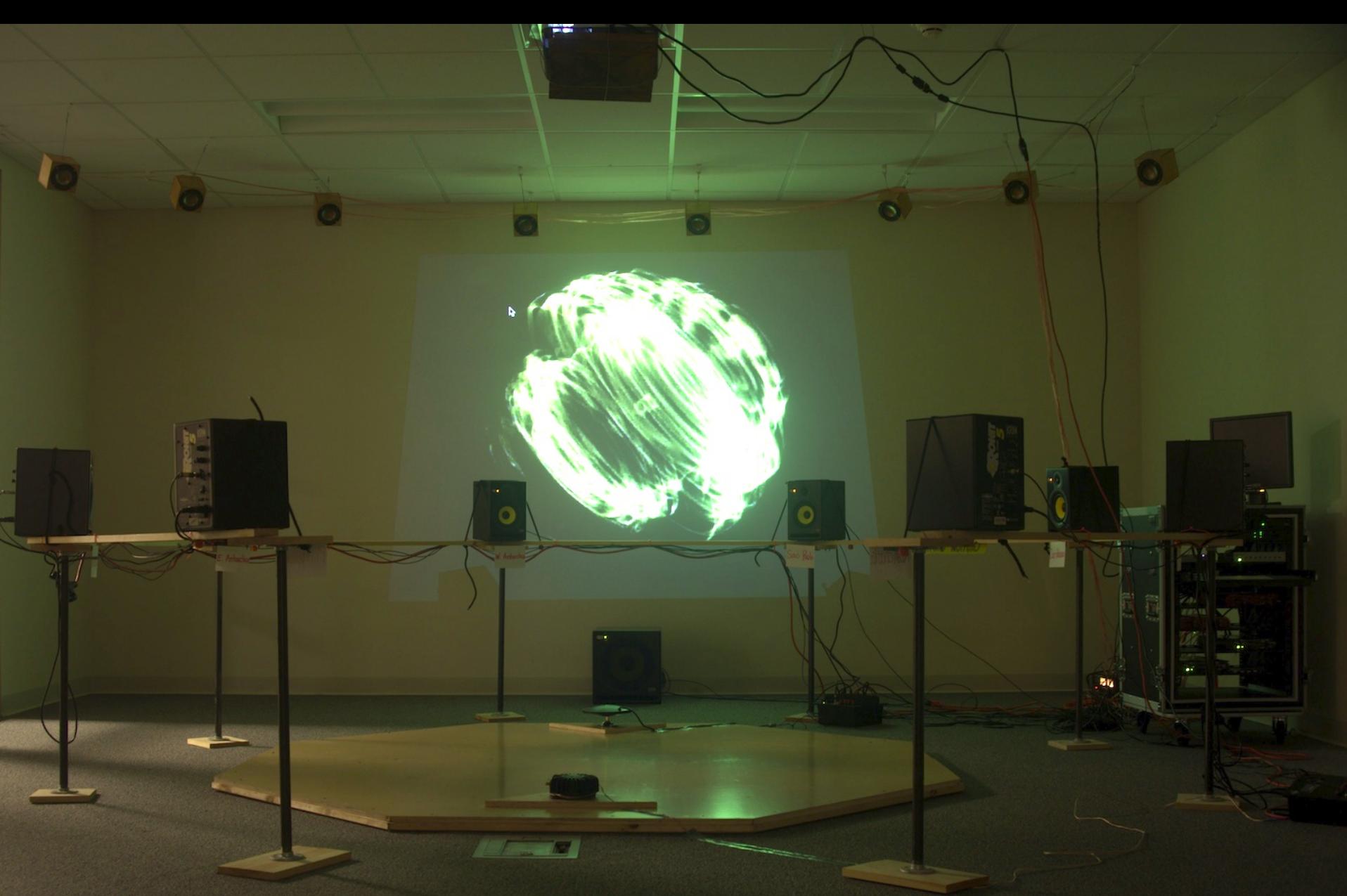
Jan 31, 2012

Date Joined

Sep 27, 2011

Country

United States



Moving beyond astrophysics.

Our first major litmus test, a 3.0
release with major infrastructure
overhauls, is on the horizon.

"... it seems likely that significant software contributions to existing scientific software projects are not likely to be rewarded through the traditional reputation economy of science. Together these factors provide a reason to expect the over-production of independent scientific software packages, and the underproduction of collaborative projects in which later academics build on the work of earlier ones."

Howison & Herbsleb (2011)

Thank you.

(Short) Bibliography

"The Art of Community" by Jono Bacon

"Producing Open Source Software" by Karl Fogel

"Team Geek" by Brian Fitzpatrick & Ben Collins-Sussman

"Organizing Simulation Code Collectives" by Mikaela Sundberg

"Scientific Software Production" by James Howison & James Herbsleb

"Your Community is your Best Feature" by Gina Trapani

"The Proof of the Pudding" by John Allsopp

"Standing Out in the Crowd" by Skud

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Christian Karch	Stephen Skory
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