

# 3500 years of Observing

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*Stonehenge, 1500 BC*



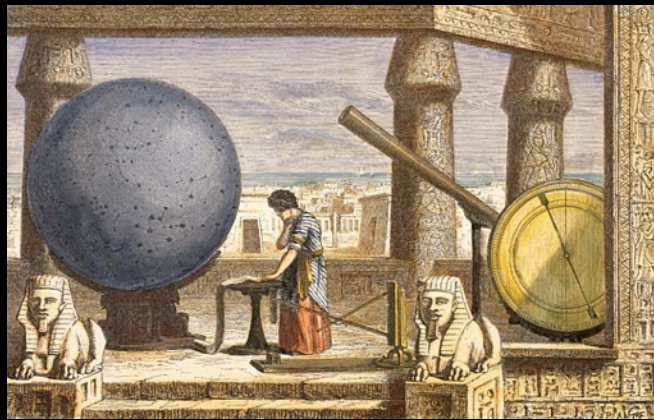


# 3500 years of Observing

*Stonehenge, 1500 BC*



*Ptolemy in Alexandria, 100 AD*

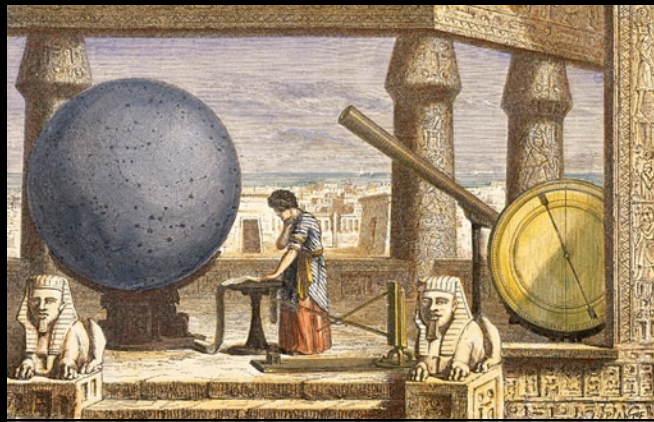


# 3500 years of Observing

*Stonehenge, 1500 BC*



*Ptolemy in Alexandria, 100 AD*



*Observatory Tower,  
Lincolnshire, UK, c. 1300*





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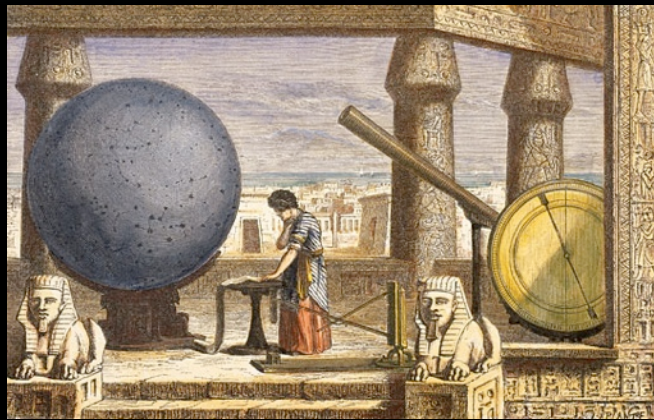
*Stonehenge, 1500 BC*



*Galileo, 1600*



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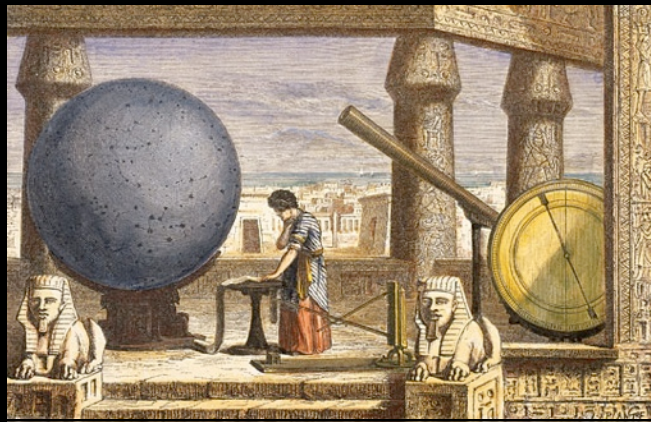
*Stonehenge, 1500 BC*



*Galileo, 1600*



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*Observatory Tower,  
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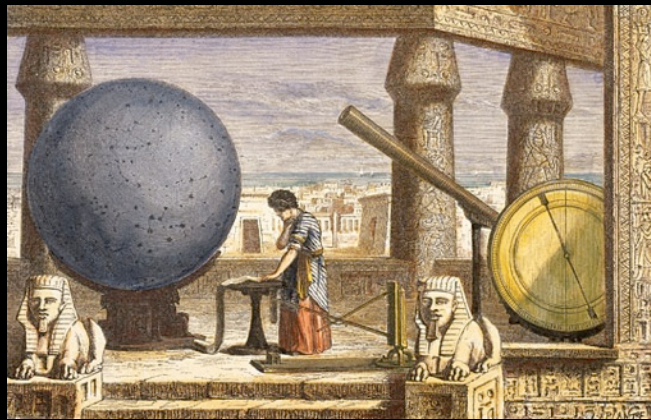


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Observatory Tower,  
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Galileo, 1600



— The “Scientific Revolution” —

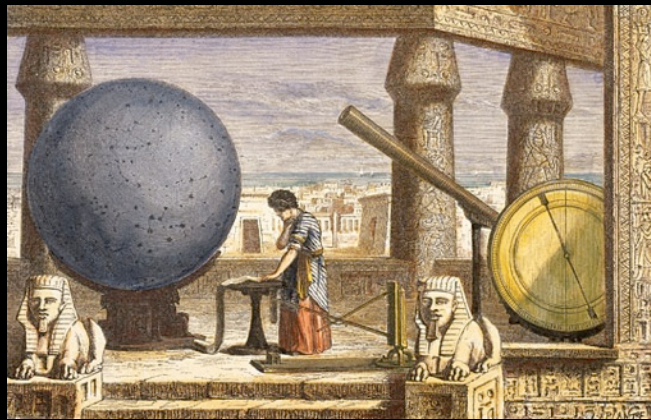


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Galileo, 1600



— The “Scientific Revolution” —

Reber's Radio  
Telescope, 1937



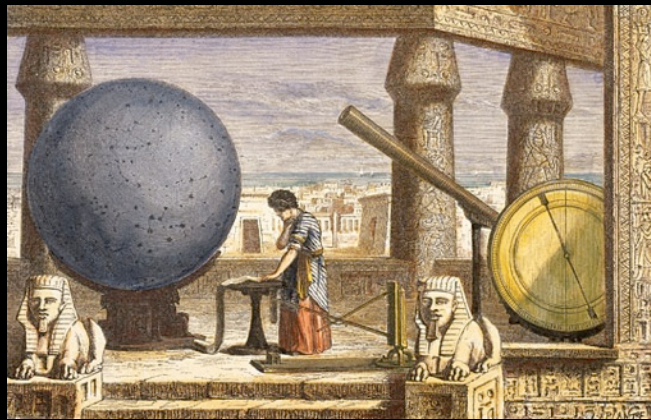


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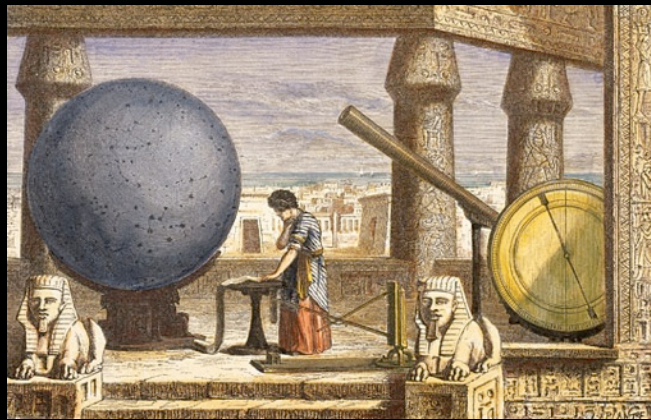


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NASA/Explorer 7  
(Space-based  
Observing)  
1959





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The "Scientific Revolution"

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"The Internet"

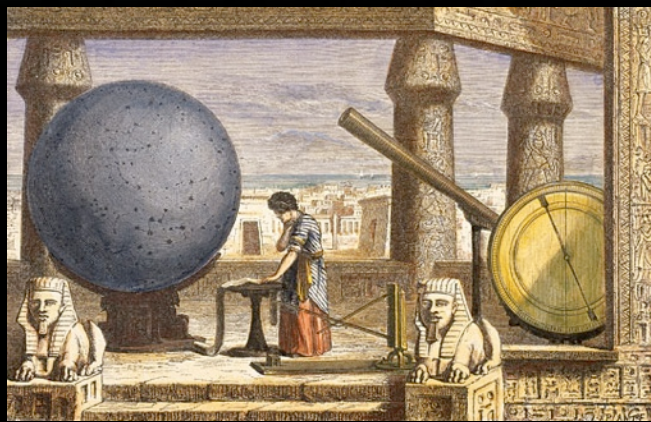


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— The “Scientific Revolution” —

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— “The Internet” —



Long-distance  
remote-control/  
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telescopes  
1990s

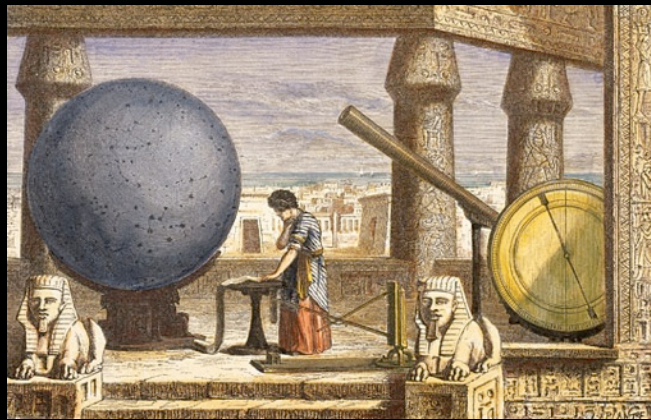


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"Virtual  
Observatories"  
21st century



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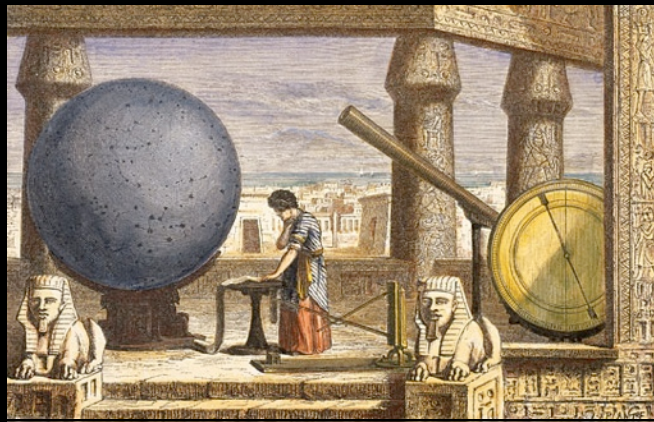


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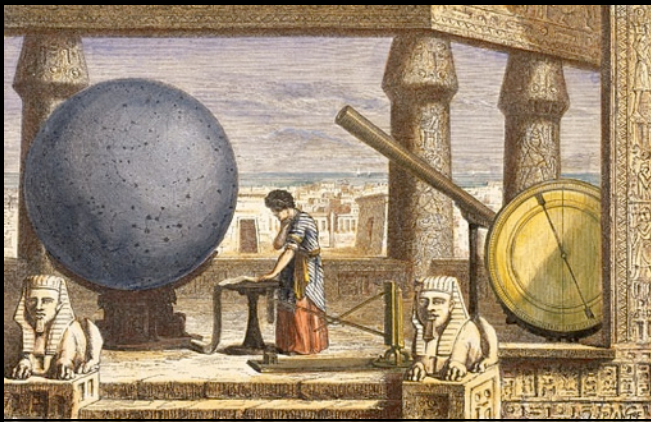


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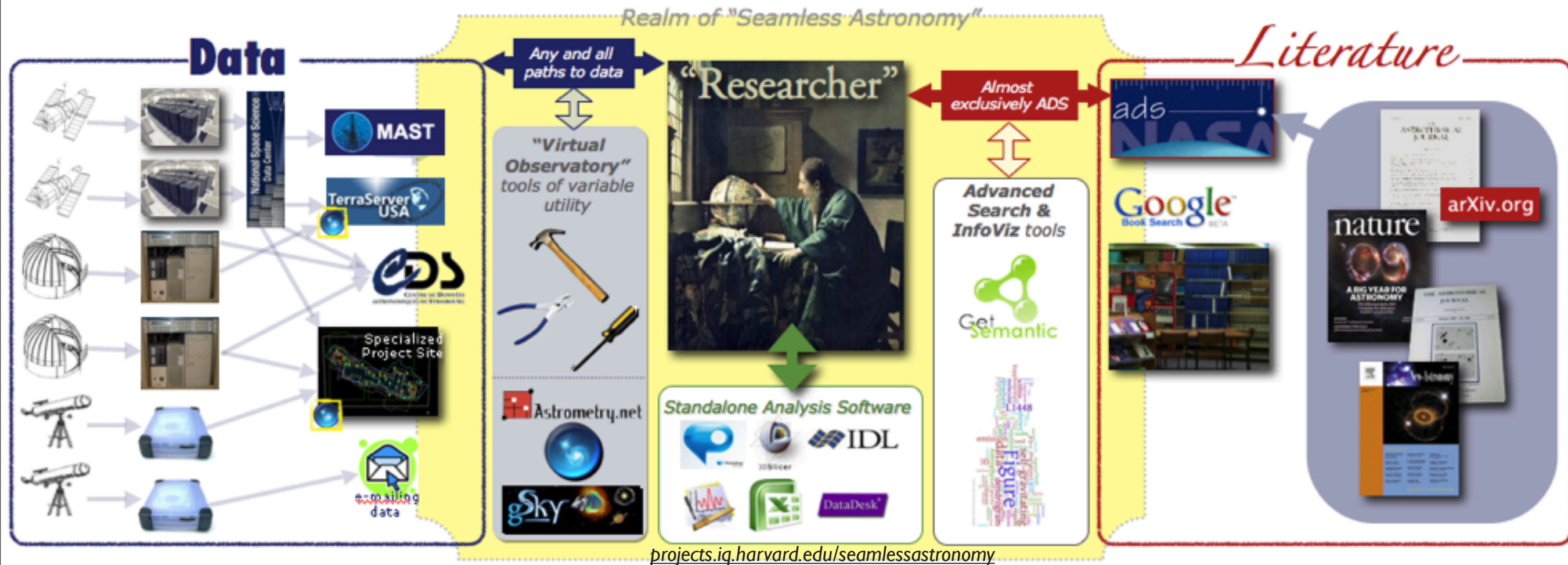


"Virtual  
.astronomy  
Heidelberg 2012"



# SEAMLESS ASTRONOMY+

Alyssa A. Goodman, Harvard-Smithsonian Center for Astrophysics



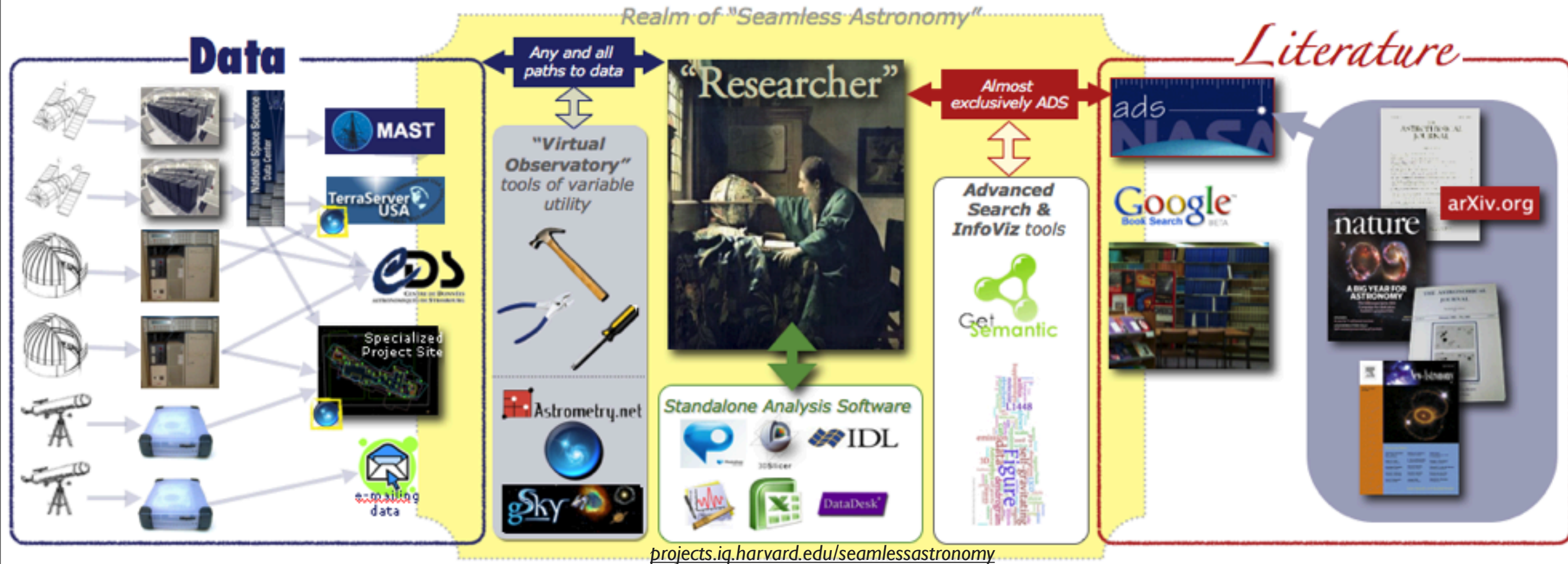
with

Alberto Accomazzi, Douglas Burke, Raffaele D'Abrusco, Rahul Davé, Christopher Erdmann, Pepi Fabbiano, Edwin Henneken, Jay Luker, Gus **Muench**, Michael Kurtz, Max Lu, Victoria Mittelbach, Alberto **Pepe**, Arnold Rots, Patricia Udomprasert (Harvard-Smithsonian CfA); Christopher **Beaumont** (CfA & U. Hawaii); Michelle **Borkin** (Harvard SEAS); Mercé Crosas (Harvard Institute for Quantitative Social Science); Christine Borgman (UCLA); Thomas **Robitaille** (MPIA); Jonathan Fay & Curtis Wong (Microsoft Research); Alberto Conti (Space Telescope Science Institute)



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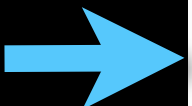
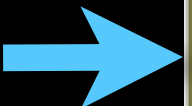
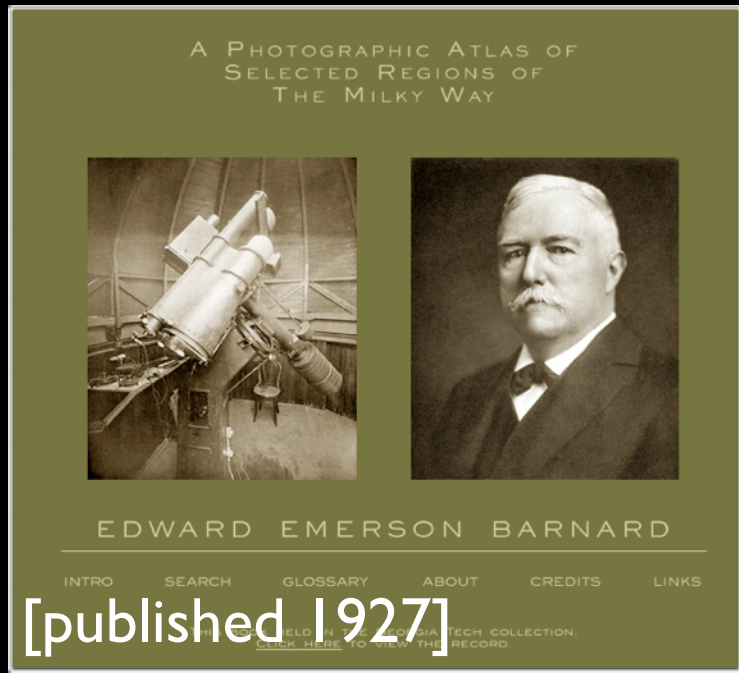
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# “Seamless Astronomy” [a cute example]

astrometry.net + flickr + WWT



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Actions Share this

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barnardoph

E.E. Bamard's image of Ophiuchus  
[www.library.gatech.edu/bpdi/bpdi.php](http://www.library.gatech.edu/bpdi/bpdi.php)

Comments and faves **astrometry.net**

 **astrometry.net** (6 days ago | reply | delete)

Hello, this is the blind astrometry solver. Your results are:  
(RA, Dec) center:(246.421365149, -23.6749819397) degrees  
(RA, Dec) center (H:M:S, D:M:S):(16:25:41.128, -23:40:29.935)  
Orientation:178.34 deg E of N

Pixel scale:52.94 arcsec/pixel  
Parity:Reverse ("Left-handed")  
Field size :9.41 x 9.41 degrees

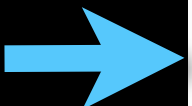
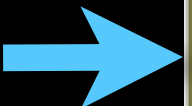
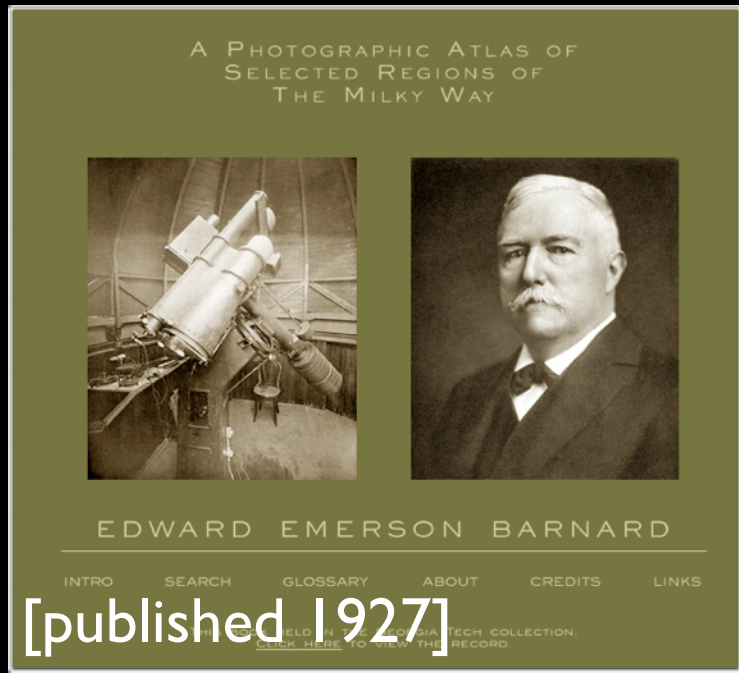
Your field contains:  
The star Antares ( $\alpha$ Sco)  
The star Graffias ( $\beta$ 1 Sco)  
The star Al Niyat ( $\sigma$ Sco)  
The star  $\iota$ Sco  
The star  $\omega$ 1 Sco  
The star  $\nu$ Sco  
The star  $\omega$ 2 Sco  
The star  $\omega$ Oph  
The star 13 Sco  
The star  $\rho$ Sco  
IC 4592  
IC 4601  
NGC 6121 / M 4  
IC 4603  
IC 4604 / rho Oph nebula  
IC 4605

[View in World Wide Telescope](#)



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barnardoph

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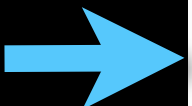
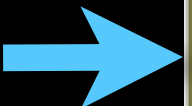
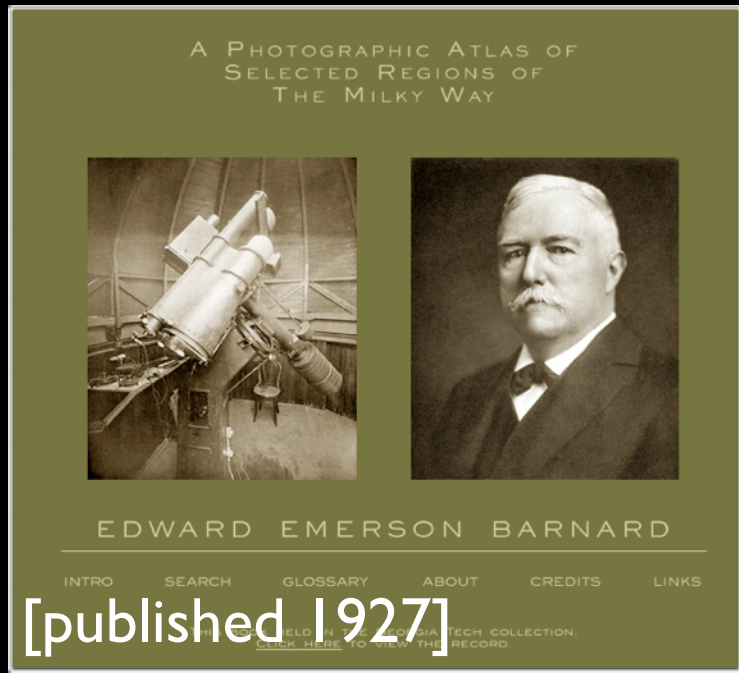
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 IC 4592  
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 IC 4603  
 IC 4604 / rho Oph nebula  
 IC 4605

[View in World Wide Telescope](#)

Explore Guided Tours Search View Settings

Collections > Open Collections > barnardoph >

Look At Sky Imagery Digitized Sky Survey (Color) Info Image Crossfade

Ophiuchus 09:41:29

RA : 16h25m41s

Ophiuchus 09:41:29

Ophiuchus IC4634 IC4603 IC4604 M19 NGC6235 NGC6273 NGC6284

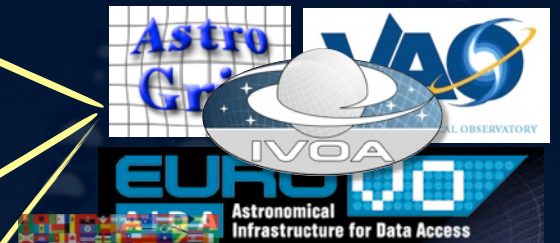




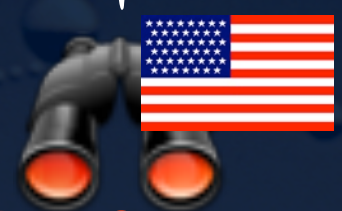
# Literature

# “Seamless Astronomy” (Tools)

# Data



Registries”

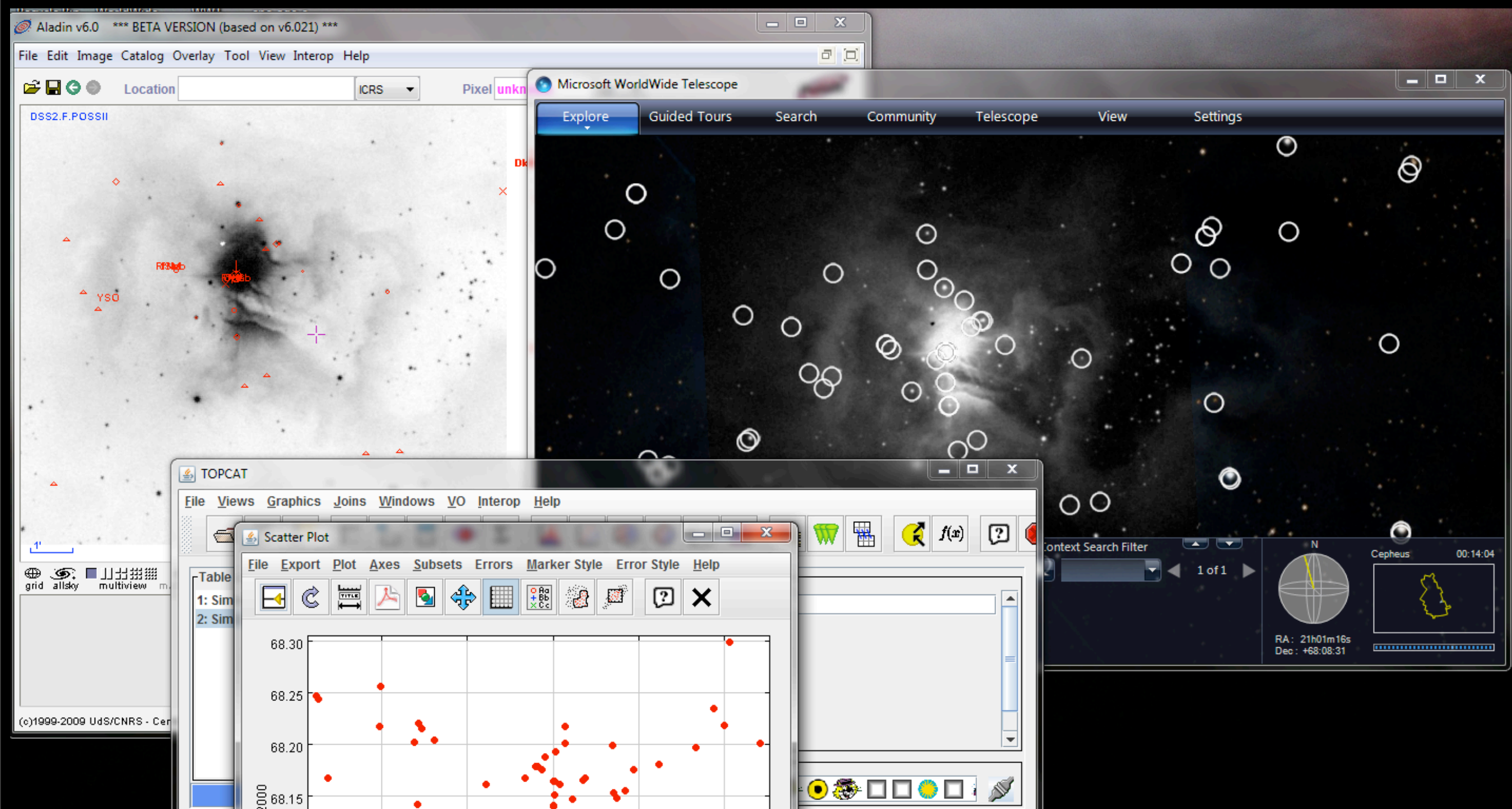


**Disclaimer:** This slide shows key excerpts from within the astronomy community & excludes more general s/w that is used, such as Papers, Zotero, Mendeley, EndNote, graphing & statistics packages, data handling software, search engines, etc.



# SAMP

(Simple Application Messaging Protocol)



[link](#) to I2/2010 IVOA recommendation

# SAMP

(Simple Application Messaging Protocol)

The image shows a desktop environment with three overlapping windows:

- Aladin v6.0** (\*\*\* BETA VERSION (based on v6.021) \*\*\*): A window with a French flag icon. It displays a grayscale astronomical image of a star-forming region with red triangles marking specific objects. The title bar includes "File Edit Image Catalog Overlay Tool View Interop Help".
- Microsoft WorldWide Telescope**: A window with an American flag icon. It shows a dark sky with white circles highlighting various stars. The title bar includes "Explore Guided Tours Search Community Microsoft View Settings".
- TOPCAT**: A window with a British flag icon. It displays a scatter plot of red data points. The plot has a y-axis ranging from 68.15 to 68.30 and an x-axis with a "2000" label. The title bar includes "File Views Graphics Joins Windows VO Interop".

[link](#) to I2/2010 IVOA recommendation





# SEAMLESS ASTRONOMY

Linking scientific data, publications, and communities



ABOUT PROJECTS PEOPLE RESOURCES DATAVERSE

## SEAMLESS ASTRONOMY

### About



The **Seamless Astronomy Group** at the **Harvard-Smithsonian Center for Astrophysics** brings together astronomers, computer scientists, information scientists, librarians and visualization experts involved in the development of tools and systems to study and enable the next generation of **online astronomical research**.

Current projects include research on the development of systems that seamlessly integrate scientific data and literature, the semantic interlinking and annotation of scientific resources, the study of the impact of social media and networking sites on scientific dissemination, and the analysis and visualization of astronomical research communities. Visit our [project page](#) to find out more.

SHARE [social media icons]

Latest Announcements

Introducing the Astronomy Dataverse

Latest Feed Items

@rahuldave there is a writeboard with my notes... More at next #seamlessastronomy next week.

Thanks to @astrobites and @astroknight06 for great summary <http://t.co/jWWFT0CD> of our High-D Data Viz work! #ivoa #seamlessastronomy



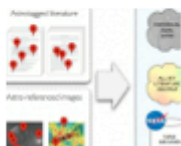
# SEAMLESS ASTRONOMY

## Projects



### Seamless integration of scientific data and literature

Astronomical data artifacts and publications exist in disjointed repositories. The conceptual relationship that links data and publications is rarely made explicit. In collaboration with [ADS](#) and [ADSLabs](#), and through our work in conjunction with the [Institute for Quantitative Social Science \(IQSS\)](#), we are working on developing a platform that allows data and literature to be seamlessly integrated, interlinked, mutually discoverable.



### ADS All-Sky Survey (ADSASS)

The ADS All-Sky Survey (ADSASS) is an ongoing effort aimed at turning the NASA Astrophysics Data System (ADS), widely known for its unrivaled value as a literature resource for astronomers, into a data resource. The ADS is not a data repository per se, but it implicitly contains valuable holdings of astronomical data, in the form of images, tables and object references contained within articles. The objective of the ADSASS effort is to extract these data and make them discoverable and available through existing data viewers. The resulting ADSASS data layer promises to greatly enhance workflows and enable new research by tying astronomical literature and data assets into one resource. More information can be found on this [conference paper](#).



### Astronomy Dataverse

Astronomers use, peruse and produce vast amounts of scientific data. Making these data publicly available is important because it supports the reproducibility of results, and ensures their long term preservation and reuse. While raw astronomical data are normally stored and made public available via large-scale archives, reduced data are often left out entirely from both astronomical archives and related publications.

In a pilot study in 2011, we are evaluating the [Dataverse](#), an open data archive hosted by Harvard University and managed by the [Institute for Quantitative Social Science \(IQSS\)](#), as a project-based repository for the storage, access, and citation of reduced astronomical data. We have interviewed a set of 10 astronomers about their needs, and the [prototype CfA Dataverse](#) is now online.



### WorldWide Telescope (WWT)

[WorldWide Telescope](#) provides a rich contextual visualization environment for astronomical data. Our group collaborates with the [WWT Team at Microsoft Research](#) both to enrich WWT for use in research as well as in teaching. On the research end, we seek to integrate WWT "Seamlessly" with [VAO](#)-sponsored projects, as well as with [ADS Labs](#). On the teaching end, we founded and now run the [WorldWide Telescope Ambassadors](#) outreach effort.



### Viz-e-Lab

Established in 2011, the [Viz-e-Lab](#) was established as a testing ground for new software efforts in visualization and e-Science at the CfA. Seamless Astronomy projects are [piloted and tested on users](#) in this space, located on the third floor of the 160 Concord Avenue building of the CfA. The lab is used to test new hardware--primarily input devices--as well as new software. At present, two main foci are the development of sophisticated tools "linked view" visualization of [high-dimensional data](#), and the integration of [WorldWide Telescope](#) into research and teaching paradigms.



### Study of the impact of social media and networking sites on scientific dissemination

Astronomers, and more broadly, the scientific community, are increasingly using blogging, micro-blogging, and other social media for both discovering and disseminating scientific knowledge. We are exploring several avenues for studying the impact of Twitter and other social networking sites on scientific readership.



### Network analysis and visualization of astronomical research communities

We use network analytic techniques to mine the astronomical bibliographic archives and detect disciplinary and geographical clusters, and communities of practices of scientists. A network visualization of co-authorship networks in Physics and Astronomy is being implemented on the [ADSLabs](#) platform and is currently available. Try this out on [ADS Labs](#) by doing a search and then choosing "View as Author Network."



### Data citation practices in Astronomy

How do astronomers cite scientific data? Are astronomical reduced data included in scholarly papers as supplemental material? Are cited data discoverable and reusable? We are performing link and content analyses of bibliographic repositories in astronomy to understand whether astronomical data used for the publication of scientific research can be discovered, accessed, and reused. On [ADS Labs](#), choose "View as Paper Network" after a search to get a feel for the data available.



### Semantic description and annotation of scientific resources

RDF store and facets, and links to semantic ADS.



# SEAMLESS ASTRONOMY

## Projects



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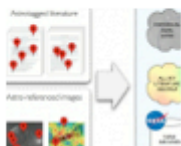
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RDF store and facets, and links to semantic ADS.





# SEAMLESS ASTRONOMY

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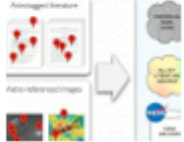


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### ADS All-Sky Survey (ADSASS)

The ADS All-Sky Survey (ADSASS) is an ongoing effort aimed at turning the NASA Astrophysics Data System (ADS), widely known for its unrivaled value as a literature resource for astronomers, into a data resource. The ADS is not a data repository per se, but it implicitly contains valuable holdings of astronomical data, in the form of images, tables and object references contained within articles. The objective of the ADSASS effort is to extract these data and make them discoverable and available through existing data viewers. The resulting ADSASS data layer promises to greatly enhance workflows and enable new research by tying astronomical literature and data assets into one resource. More information can be found on this [conference paper](#).



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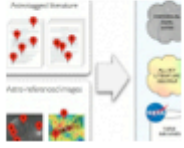


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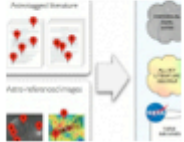
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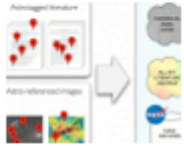
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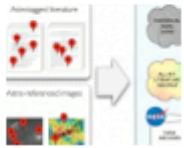


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Astronomy Dataverse




Collaboration Networks




Data Citation



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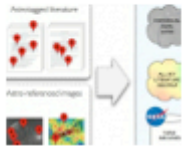
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Astronomy  
Dataverse



Collaboration  
Networks

Data  
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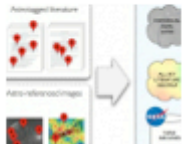


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Astronomy  
Dataverse



Collaboration  
Networks



Data  
Citation



WorldWide  
Telescope



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# SEAMLESS ASTRONOMY


## Projects



**ADS Labs**



**ADS All Sky Survey**



**Astronomy Dataverse**




**WorldWide Telescope**



**High-D Visualization**

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**Collaboration Networks**



**Data Citation**



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# SEAMLESS ASTRONOMY


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### ADS Labs



### ADS All Sky Survey



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### WorldWide Telescope



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### Collaboration Networks

Collaboration Networks



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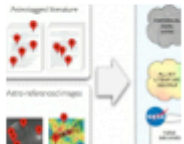


# SEAMLESS ASTRONOMY



Projects




ADS Labs



ADS All Sky Survey






Astronomy Dataverse



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High-D Visualization



Social Networks



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## Projects




### ADS Labs



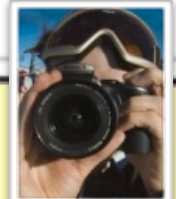
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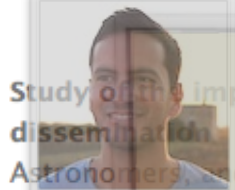
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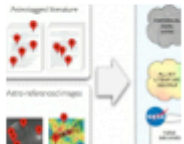


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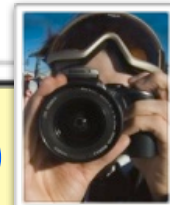
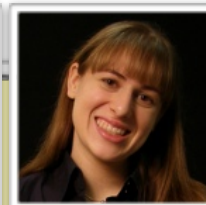
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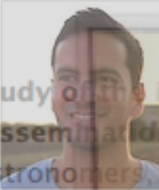
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Collaboration Networks



Data Citation



Semantic Search





Experience WWT at [worldwidetelescope.org](http://worldwidetelescope.org)



# The WorldWide Telescope Ambassadors Program

WorldWide Telescope Ambassadors

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**Spring 2012 Update**  
Submitted by patudom on May. 9

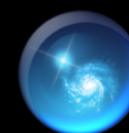
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[wwtambassadors.org](http://wwtambassadors.org)

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Alyssa Goodman & Patricia Udomprasert  
Harvard-Smithsonian Center for Astrophysics



Curtis Wong & Jonathan Fay  
Microsoft Research





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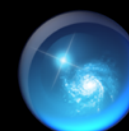
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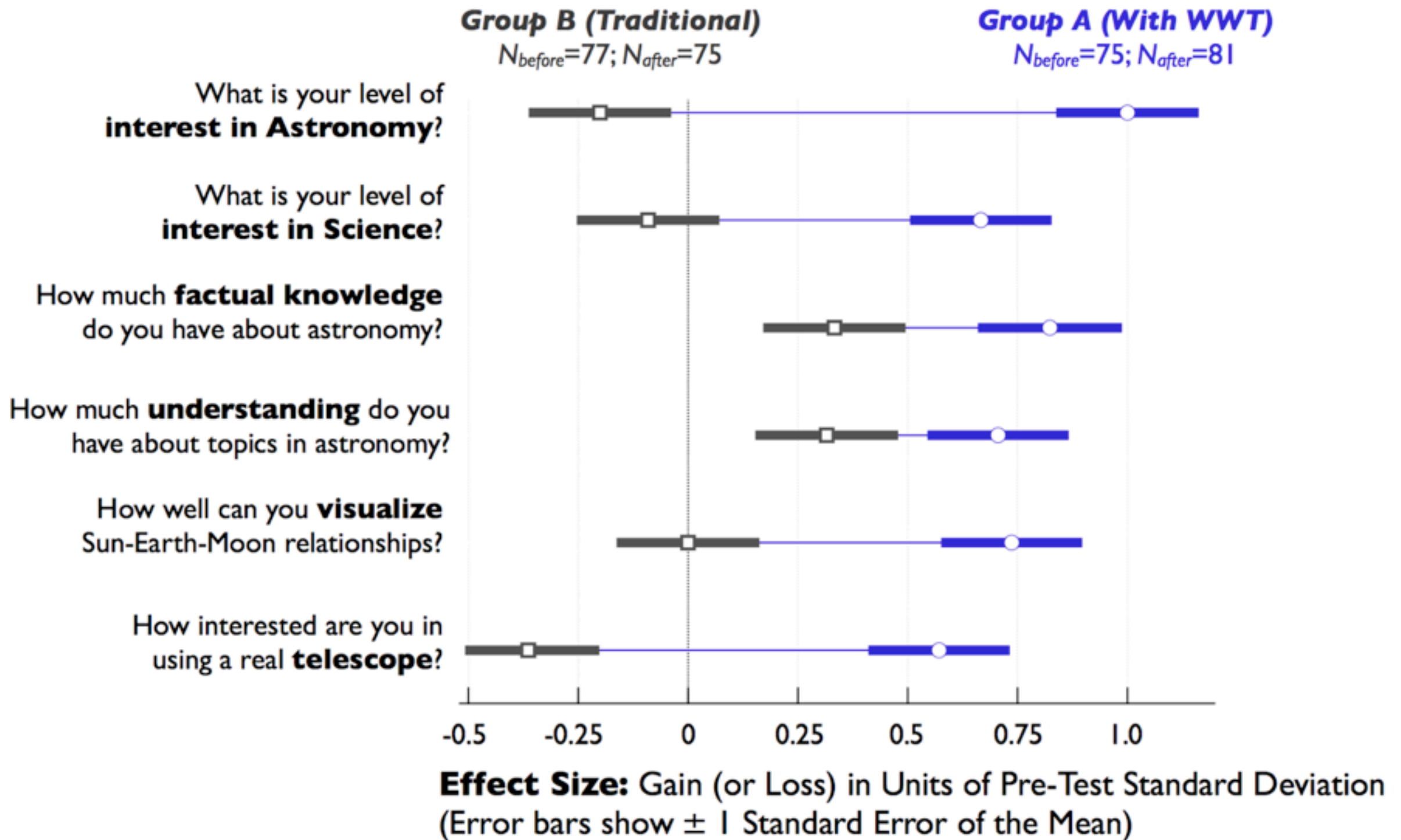


Curtis Wong & Jonathan Fay  
*Microsoft Research*



# Gains in Student Interest and Understanding

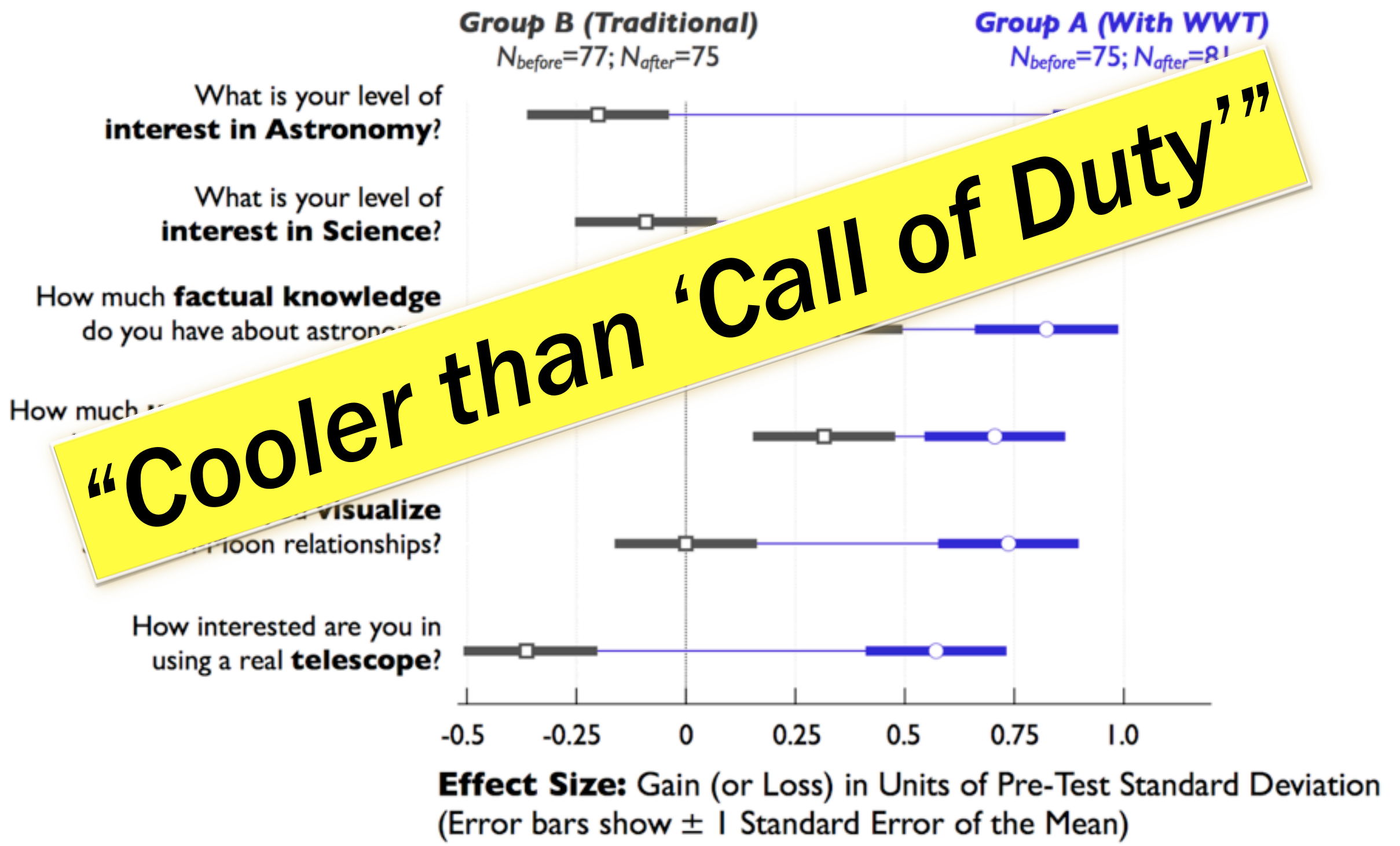
(“Traditional Way” vs “WWT Way”)





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**What I did (or want to do) on my Summer Vacation...**

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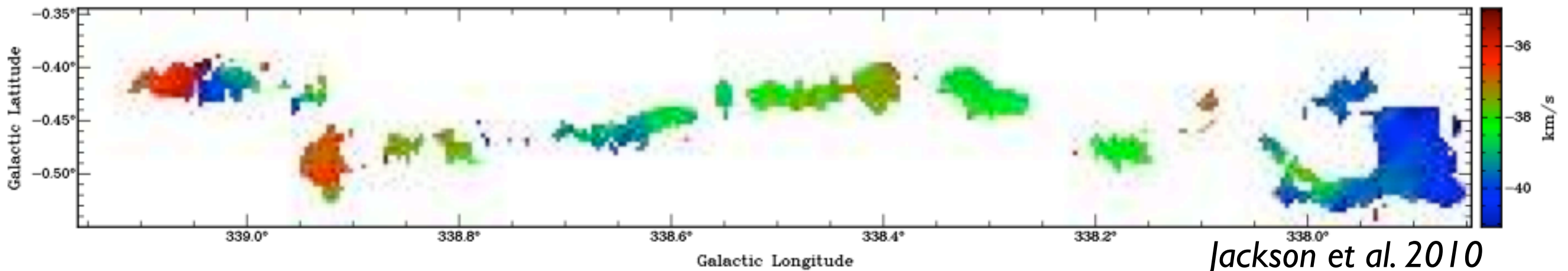
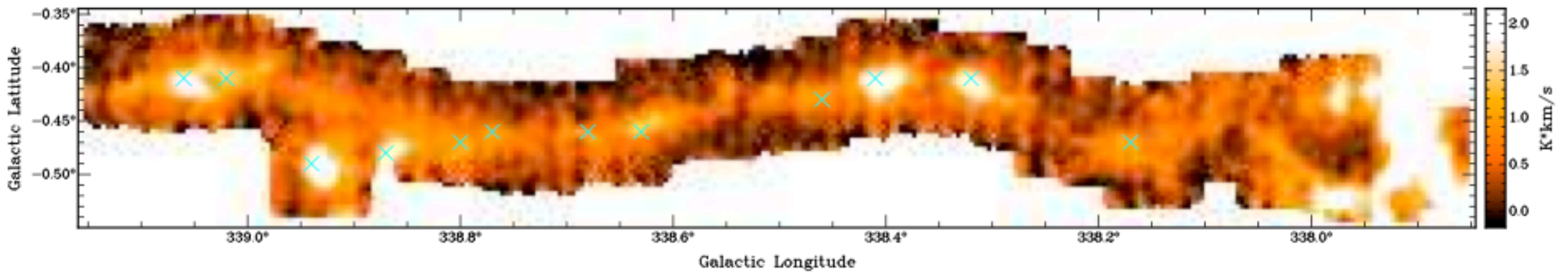
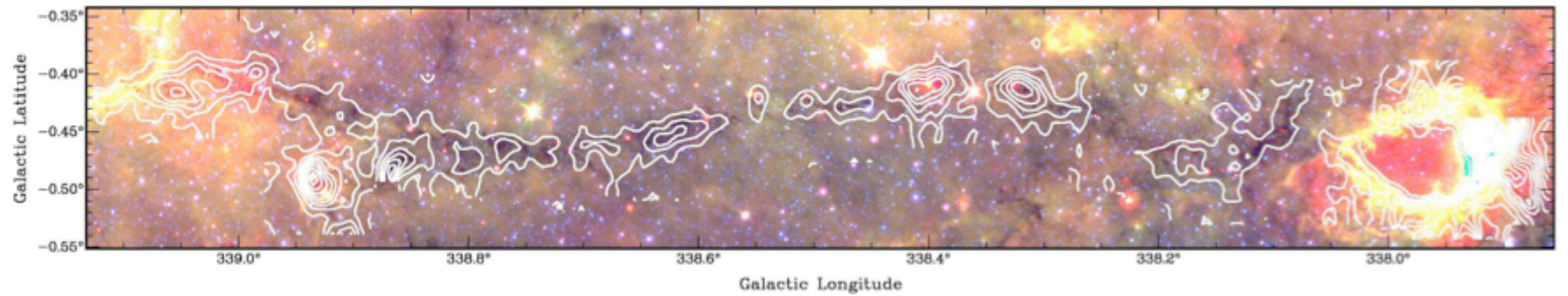
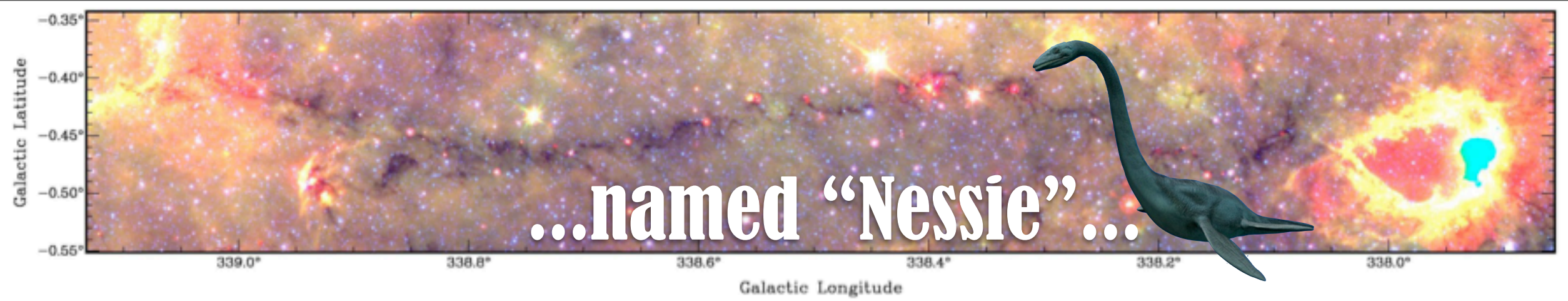
**A “Seamless Astronomy” Story about the Galaxy**



**Once upon a time in an enchanted castle by a lake, a sea monster...**







Jackson et al. 2010





...named "Nessie"...



THE ASTROPHYSICAL JOURNAL LETTERS, 719:L185–L189, 2010 August 20

doi:10.1088/2041-8205/719/2/L185

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## THE "NESSIE" NEBULA: CLUSTER FORMATION IN A FILAMENTARY INFRARED DARK CLOUD

JAMES M. JACKSON<sup>1</sup>, SUSANNA C. FINN<sup>1</sup>, EDWARD T. CHAMBERS<sup>2</sup>, JILL M. RATHBORNE<sup>3</sup>, AND ROBERT SIMON<sup>4</sup>

<sup>1</sup> Institute for Astrophysical Research, Boston University, Boston, MA 02215, USA; [jackson@bu.edu](mailto:jackson@bu.edu), [sfinn@bu.edu](mailto:sfinn@bu.edu)

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*Received 2010 April 13; accepted 2010 July 21; published 2010 August 3*

### ABSTRACT

The "Nessie" Nebula is a filamentary infrared dark cloud (IRDC) with a large aspect ratio of over 150:1 ( $1^{\circ}5 \times 0^{\circ}01$  or  $80 \text{ pc} \times 0.5 \text{ pc}$  at a kinematic distance of 3.1 kpc). Maps of HNC (1–0) emission, a tracer of dense molecular gas, made with the Australia Telescope National Facility Mopra telescope, show an excellent morphological match to the mid-IR extinction. Moreover, because the molecular line emission from the entire nebula has the same radial velocity to within  $\pm 3.4 \text{ km s}^{-1}$ , the nebula is a single, coherent cloud and not the chance alignment of multiple unrelated clouds along the line of sight. The Nessie Nebula contains a number of compact, dense molecular cores which have a characteristic projected spacing of  $\sim 4.5 \text{ pc}$  along the filament. The theory of gravitationally bound gaseous cylinders predicts the existence of such cores, which, due to the "sausage" or "varicose" fluid instability, fragment from the cylinder at a characteristic length scale. If turbulent pressure dominates over thermal pressure in Nessie, then the observed core spacing matches theoretical predictions. We speculate that the formation of high-mass stars and massive star clusters arises from the fragmentation of filamentary IRDCs caused by the "sausage" fluid instability that leads to the formation of massive, dense molecular cores. The filamentary molecular gas clouds often found near high-mass star-forming regions (e.g., Orion, NGC 6334, etc.) may represent a later stage of IRDC evolution.

*Key words:* ISM: clouds – stars: formation

*Jackson et al. 2010*



**Ringberg Castle, Bavaria**  
**“Early Phases of Star Formation”**  
**July 2012**



**Question** *Andi Burkert*: Is Nessie “parallel to the Galactic Plane”?

**Answer** *no one* immediately knew the answer!

**AG** decides to look into this and...



# Quick GLIMPSE (thanks Tom Robitaille)

<http://www.alienearths.org/glimpse/>

The screenshot shows the 'GLIMPSE | MIPSGAL VIEWER' interface. At the top left is a logo and the text 'GLIMPSE | MIPSGAL VIEWER'. To the right are three buttons: 'LINK TO CURRENT VIEW', 'TOGGLE PINS', and 'QUESTIONS?'. Below these is a horizontal bar with a green progress indicator. The main area is a large image of a star field with a green box highlighting a specific region. A blue dinosaur-like creature is overlaid on the right side of the image. In the top right corner of the image area, there is a 'COORDINATES' button with a left-pointing arrow. At the bottom left, there is a filter selection bar with a question mark icon, 'IRAC', a white slider, 'IRAC/MIPS', and another question mark icon. At the bottom right, there is a navigation bar with zoom in (+) and zoom out (-) buttons, four directional arrow buttons (up, down, left, right), and a refresh/clock icon.

©2008 Space Science Institute

back to: [alienearths.org/glimpse](http://alienearths.org/glimpse)



# Quick GLIMPSE (thanks Tom Robitaille)

<http://www.alienearths.org/glimpse/>

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GLIMPSE / MIPS GAL VIEWER

LINK TO CURRENT VIEW TOGGLE PINS QUESTIONS?

COORDINATES

IRAC IRAC/MIPS

©2008 Space Science Institute

back to: [alienearths.org/glimpse](http://www.alienearths.org/glimpse/)



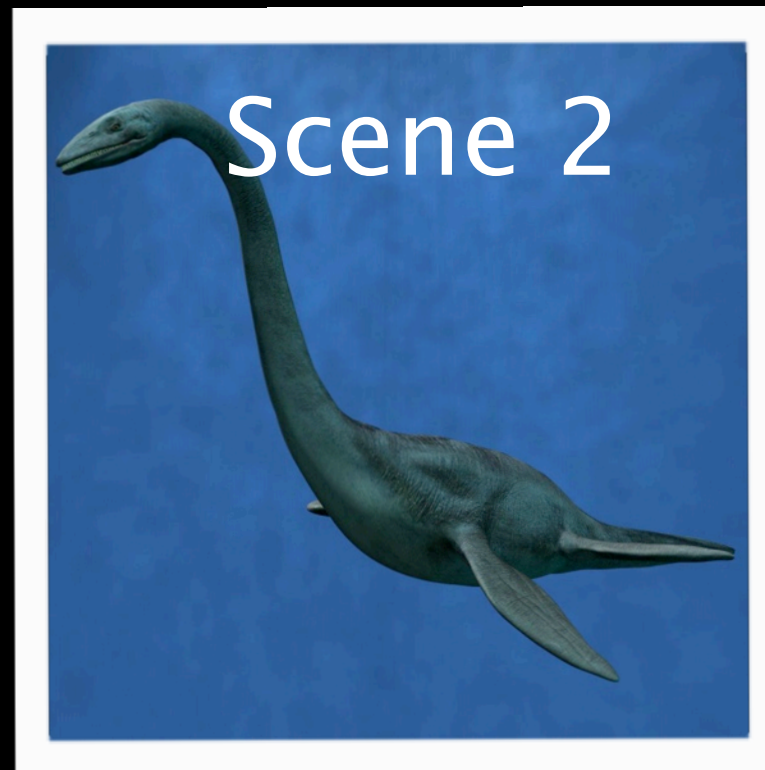
# Quick GLIMPSE (thanks Tom Robitaille)

<http://www.alienearths.org/glimpse/>

The screenshot displays the 'GLIMPSE / MIPS GAL VIEWER' interface. At the top left is the NASA logo and the text 'GLIMPSE / MIPS GAL VIEWER'. To the right are three buttons: 'LINK TO CURRENT VIEW', 'TOGGLE PINS', and 'QUESTIONS?'. The main area shows a wide-field view of a star field with a green box highlighting a specific region. Below this is a zoomed-in view of the same region, showing individual stars and nebulae. A 'COORDINATES' button is visible on the right side of the zoomed-in view. At the bottom, there is a control bar with a '?' icon, a slider for 'IRAC' (set to 'IRAC/MIPS'), another '?' icon, and navigation buttons for zooming (+, -) and panning (up, down, left, right, and a refresh icon). A copyright notice '©2008 Space Science Institute' is at the bottom center, and a 'back to: [alienearths.org/glimpse](http://www.alienearths.org/glimpse/)' link is at the bottom right.







**Question** *Andi Burkert*

Is Nessie “parallel to the Galactic Plane”?

**Answer** *Alyssa & Friends*

**Yes**, but it seems to be about 0.4 degrees below it...and, we wonder...



**Yes**, but it seems to be about 0.4 degrees below it... thus, we\* wonder...

What happens if we look more broadly?



**Quantitative Analysis**  
of Peretto & Fuller 2009 **Catalog**



Just **“look”**

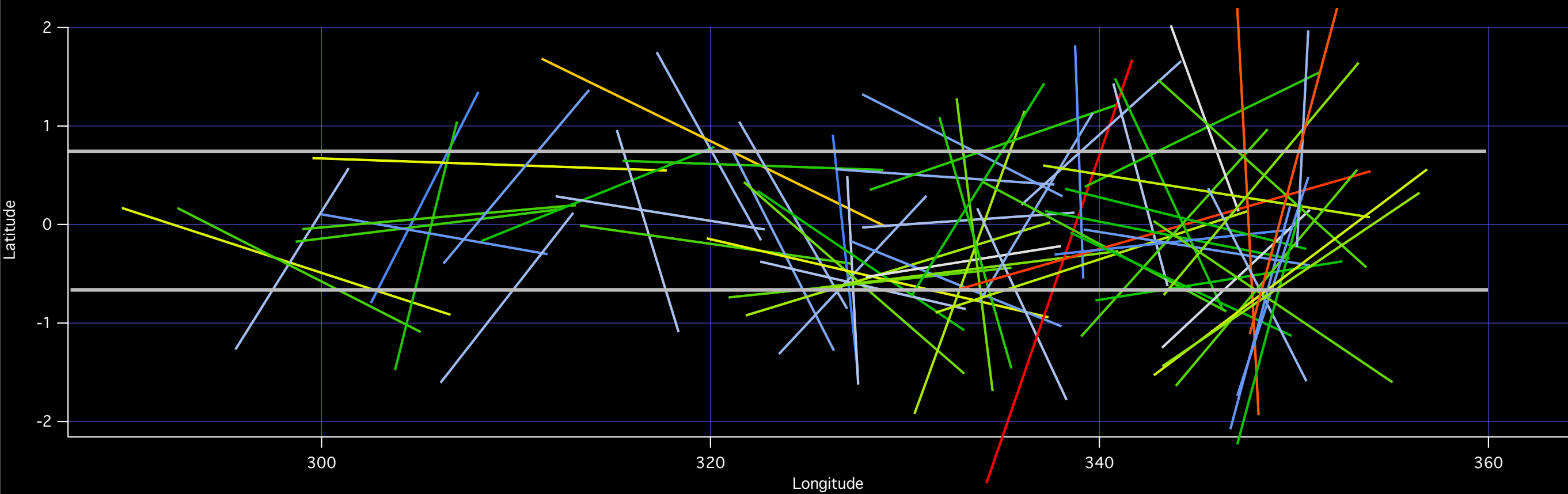
\* “we” later includes Robitaille, Bressert, Alves & Kauffmann (+AG and Burkert)





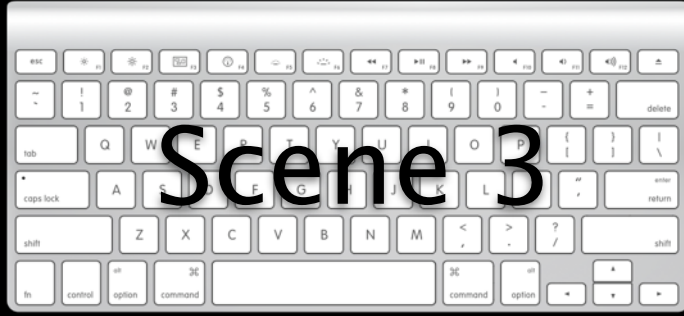
Scene 3

# Igor (GUI + scripting)



*filtering out only “long” Peretto & Fuller clouds, and showing their orientation (color~length)*





# Scene 3 Huh? Let's look...



Microsoft WorldWide Telescope

Explore Guided Tours Search Community Telescope View Settings hops test

Run Time 0:30

3D Milky Way 0:10.0 With beer 0:10.0 **No beer 0:10.0** Add New Slide

Tour Properties Save Music Browse... Show Safe Area Text Shapes Picture Voiceover: Browse...

Layers

- Sun
  - Mercury
  - Venus
  - Earth
  - Mars
  - Jupiter
  - Saturn
  - Uranus
  - Neptune
  - Pluto
- Sky
  - Overlays
  - 3d Solar System
    - perettoww/long.xml
    - peretto.xml
    - HOPS
  - Dome

Name	Value
Glon	340.2600
Glat	-0.2237
RAJ2000	252.22437
DEJ2000	-45.19194
Seq	10358
Name	340.260-0.223
RAJ2000	16 48 53.85
DEJ2000	-45 11 31.0
lmin	49.8
lMIR	99.2
lMIP	1.70

Time Scrubber  
9999/12/31 23:59:59 0001/01/01

Time Series Auto Loop

Delete Add Paste Reset

Look At Sky Imagery Digitized Sky Survey (Color)\* Image Crossfade

Context Search Filter All 1 of 1

RA: 16h48m02s Dec: -46.34.15

01:13:01





# Aladin view

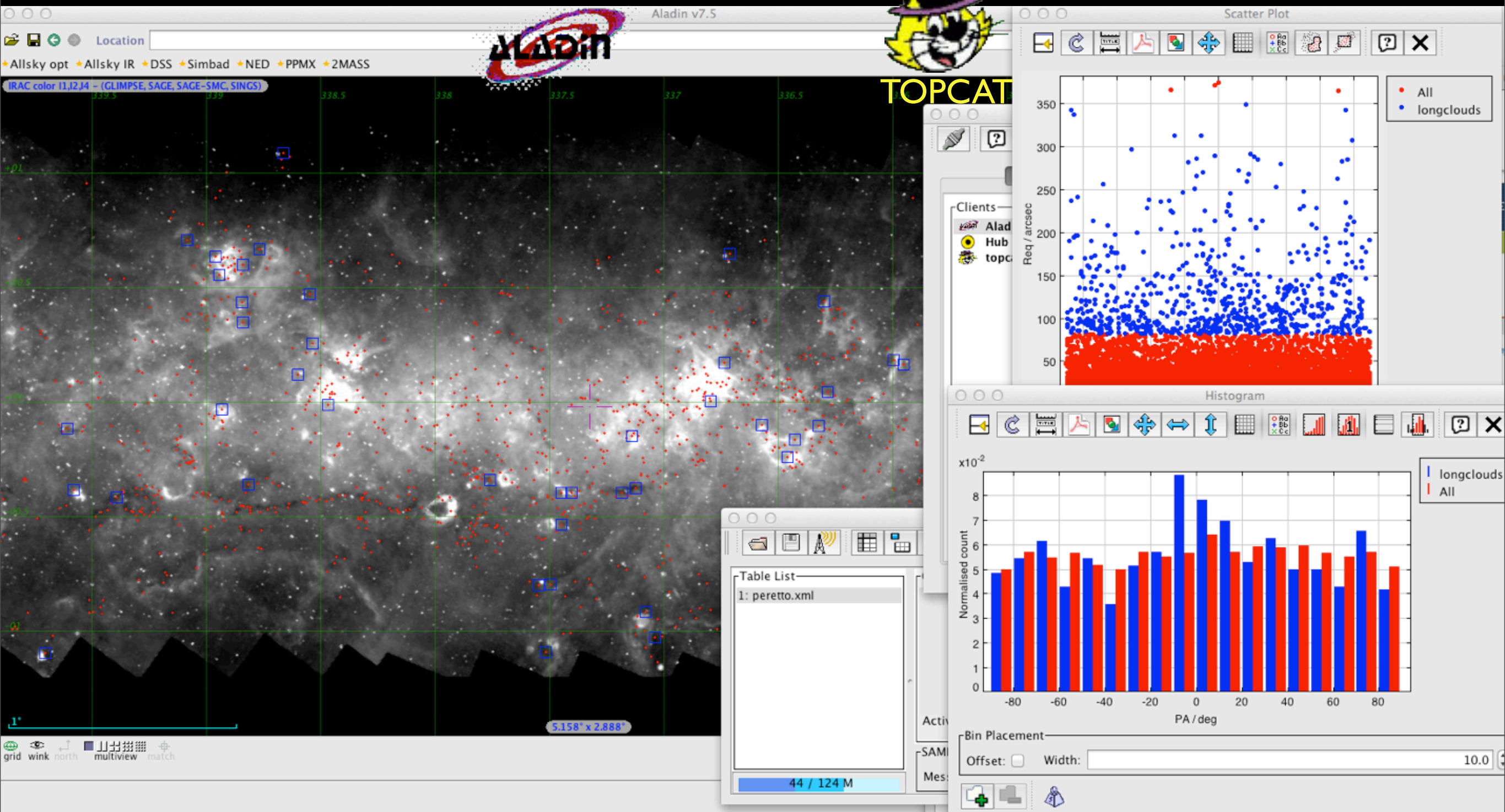
The screenshot shows the Aladin web interface. At the top, there is a 'Location' search bar and a 'Frame' dropdown set to 'Gal'. Below this is a row of star catalog filters: Allsky opt, Allsky IR, DSS, Simbad, NED, PPMX, and 2MASS. The main display area shows a grayscale image of a star field with a green grid. A blue box at the top left of the grid indicates the filter: 'IRAC4 - 8.0mu (GLIMPSE, C2D, Taurus2, SAGE, SAGE-SMC, SINGS)'. The grid has numerical labels at the top and left. A toolbar on the right side contains various icons for 'select', 'pan', 'zoom', 'dist', 'phot', 'draw', 'tag', 'filter', 'cross', 'x-y', 'rgb', 'assoc', 'crop', 'cont', 'pixel', 'prop', 'zoom', and 'del'. At the bottom right, there is a 'peretto.vot' panel with checkboxes for 'IRAC4 - 8.0mu' and 'IRAC color 11,12,14', along with sliders for 'size', 'prop', and 'opac'. A small inset map shows the current field's location on a celestial sphere. At the bottom left, there are icons for 'grid', 'wink', 'north', 'multiview', and 'match'. A search bar is at the bottom right. The footer contains the text '© 2012 UDS/CNRS - by CDS - Distributed under GNU GPL v3' and '0 sel / 11303 src - 23fps / 101Mb'.

**SAMP**



# Scene 3

# Aladin + TOPCAT + SAMP







# Aladin view

Location Frame Gal

Allsky opt Allsky IR DSS Simbad NED PPMX 2MASS

IRAC4 - 8.0mu (GLIMPSE, C2D, Taurus2, SAGE, SAGE-SMC, SINGS)

**ALADIN**

Scene 4

peretto.vot

IRAC4 - 8.0mu

IRAC color 11,12,14

size - +

prop opac - +

zoom - +

del

Frame: Gal

338.48644 -00.38905

37.29' x 23.07'

1'

37.29' x 23.07'

grid wink north multiview match

Search

© 2012 UDS/CNRS - by CDS - Distributed under GNU GPL v3

0 sel / 11303 src 23fps / 101Mb



Scene 3

# Aladin view

The screenshot displays the Aladin web interface for astronomical data visualization. The main window shows a grayscale image of a star field with a green grid overlay. The grid lines are labeled with coordinates: RA values (338.59993, 338.5, 338.41667, 338.33333, 338.25) and Dec values (-00.38905, -00.38897, -00.38889, -00.38881). A scale bar at the bottom indicates a size of 37.29' x 23.07'. The interface includes a top navigation bar with 'Location' and 'Frame Gal' dropdowns, and a toolbar on the right with icons for select, pan, zoom, dist, phot, draw, tag, filter, cross, x-y, rgb, assoc, crop, cont, pixel, prop, zoom, and del. A search bar is located at the bottom right. The bottom status bar shows '0 sel / 11303 src 23fps / 101Mb'. A copyright notice at the bottom left reads '© 2012 UDS/CNRS - by CDS - Distributed under GNU GPL v3'. A logo for 'ALADIN Scene 4' is visible on the right side of the interface.



# Huh? Let's look...

WWT



The screenshot shows the Microsoft WorldWide Telescope (WWT) interface. The main window displays a colorful star field. The top navigation bar includes 'Explore', 'Guided Tours', 'Search', 'Community', 'Telescope', 'View', 'Settings', and a 'hops test' tab. Below the navigation bar, there are three slide thumbnails: '3D Milky Way', 'With beer', and 'No beer' (which is selected and highlighted with a yellow border). To the right of the slides are buttons for 'Tour Properties', 'Save', 'Music', 'Show Safe Area', 'Text', 'Shapes', 'Picture', and 'Voiceover'. On the left side, there is a 'Layers' panel with a tree view showing 'Sun', 'Mercury', 'Venus', 'Earth', 'Mars', 'Jupiter', 'Saturn', 'Uranus', 'Neptune', 'Pluto', 'Sky', 'Overlays', '3d Solar System', 'perettowwiflong.xml', 'peretto.xml', 'HOPS', and 'Dome'. Below the layers panel is a table with columns 'Name' and 'Value':

Name	Value
Glou	340.2600
Glou	-0.2237
RAJ2000	252.22437
DEJ2000	-45.19194
Seq	10358
Name	340.260-0.223
RAJ2000	16.48.53.85
DEJ2000	-45.11.31.0
lmin	49.8
IMIR	99.2
IMIR	1.70

Below the table is a 'Time Scrubber' with a slider and the dates '9999/12/31 23:59:59' and '0001/01/01'. There are also 'Time Series' and 'Auto Loop' checkboxes, and 'Delete', 'Add', 'Paste', and 'Reset' buttons. At the bottom, there is a 'Look At' section with 'Sky' selected, an 'Imagery' section with 'Digitized Sky Survey (Color)\*' selected, and an 'Image Crossfade' slider. On the right side, there is a 'Context Search Filter' set to 'All', a '1 of 1' indicator, a compass, and a 'Ara' panel showing a star field with coordinates 'RA: 16h44m02s' and 'Dec: -46.34.15'. The bottom right corner shows the time '01:13:01'.

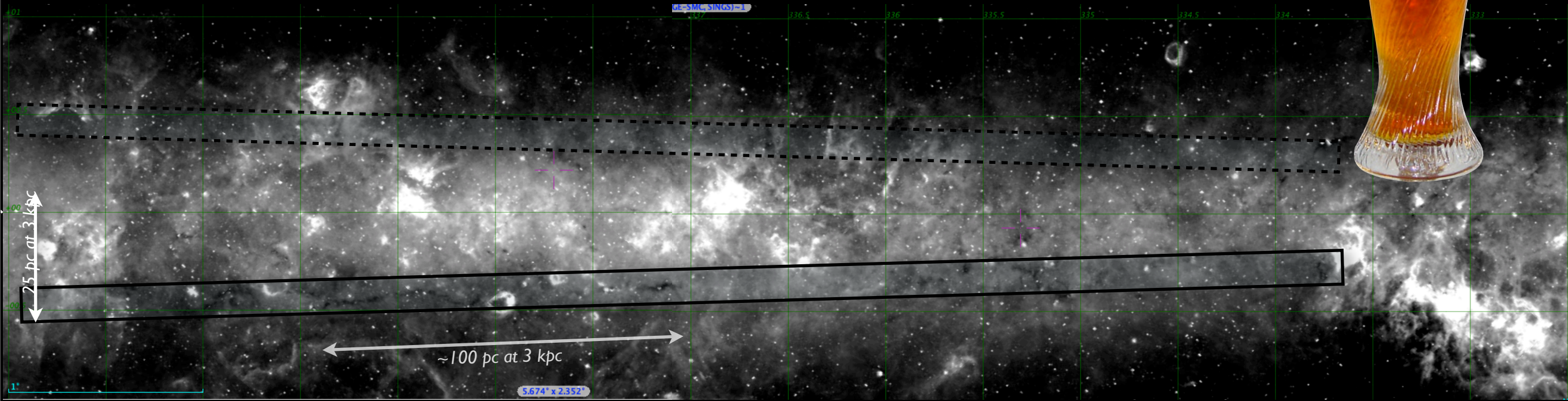
Scene 4

e 4





# Pre-publication Composite for Analysis

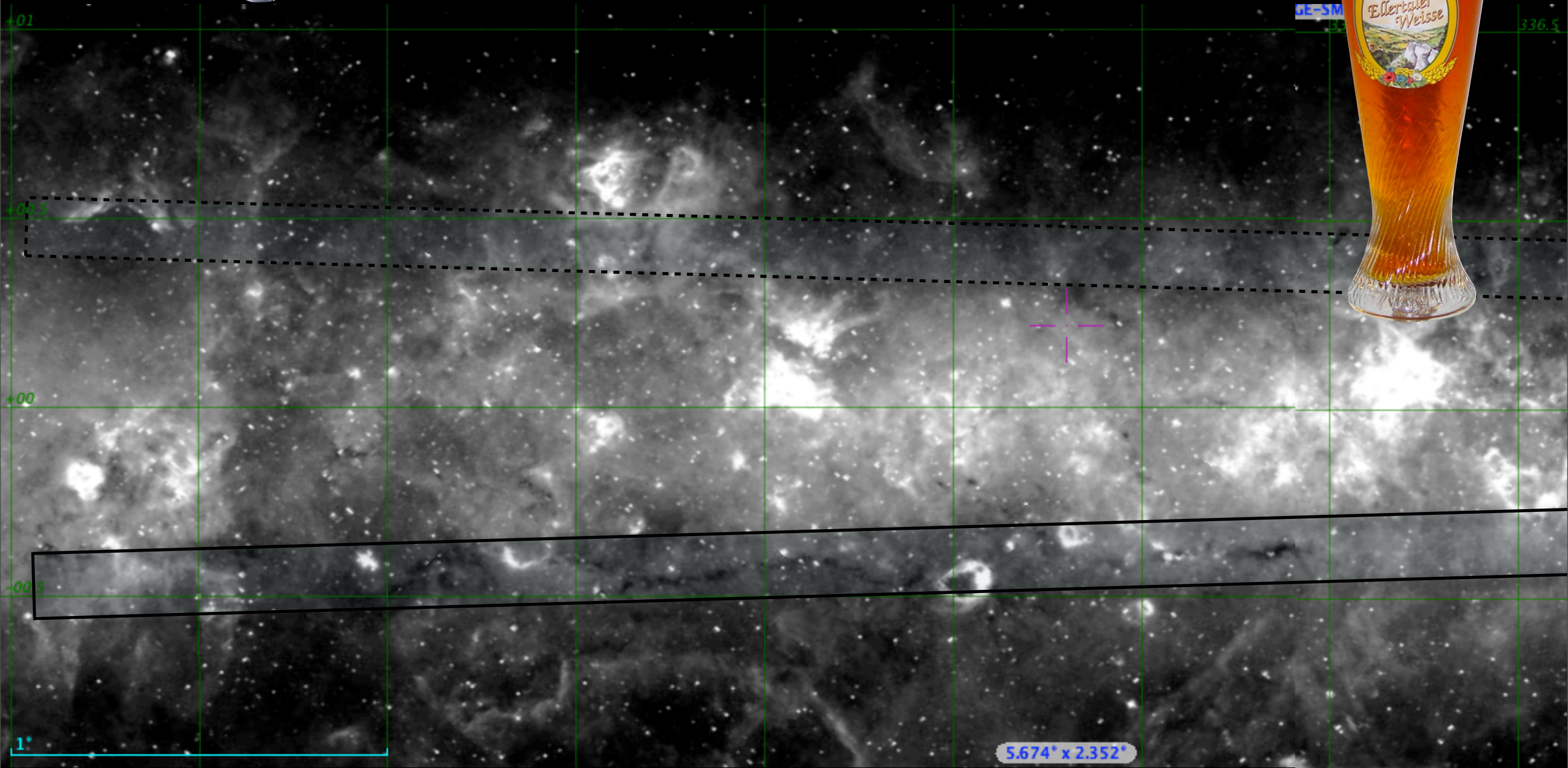


full box length  $\sim 7$  degrees  $\sim 350$  pc at 3 kpc





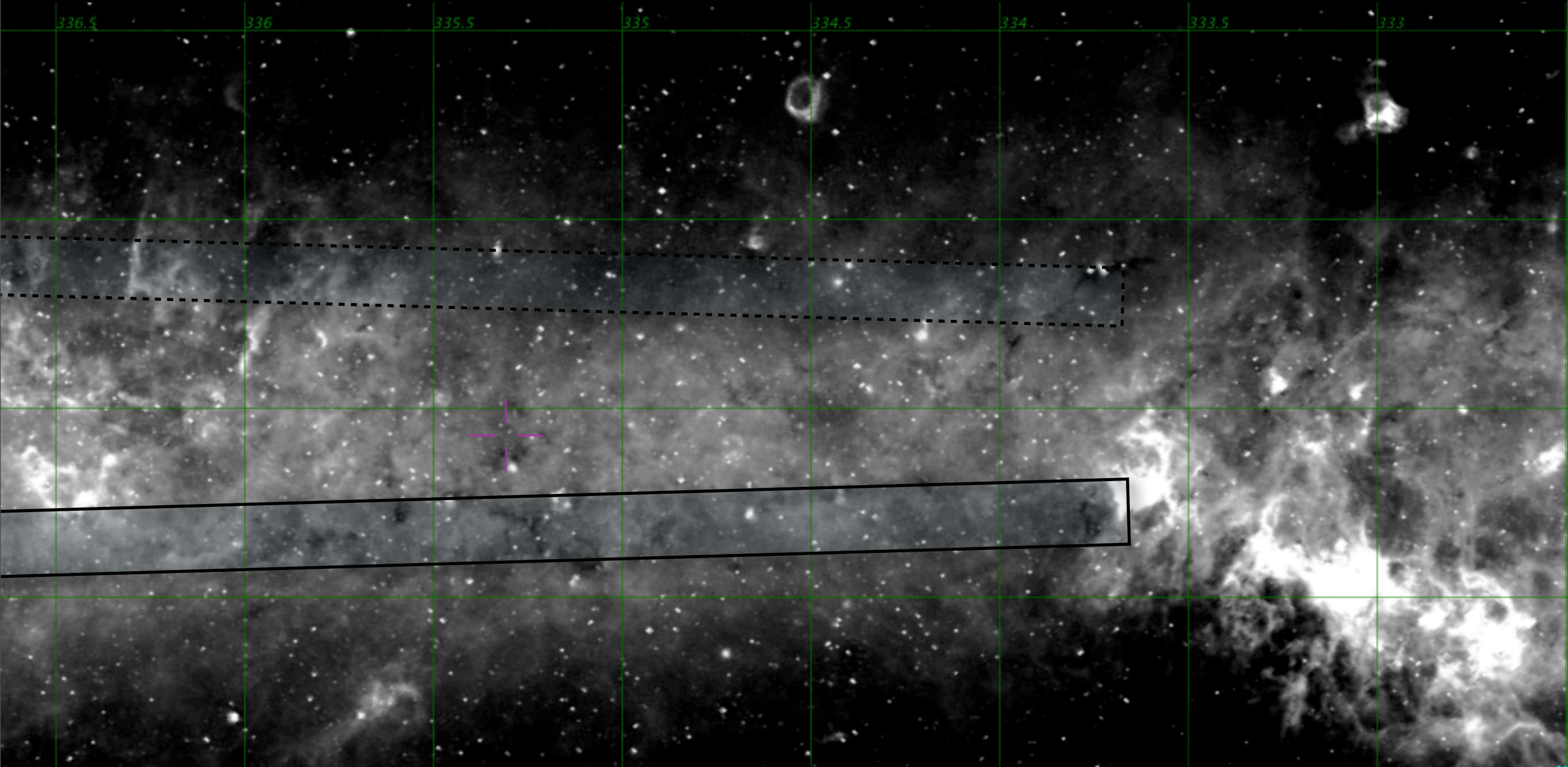
# Pre-publication Composite for Analysis



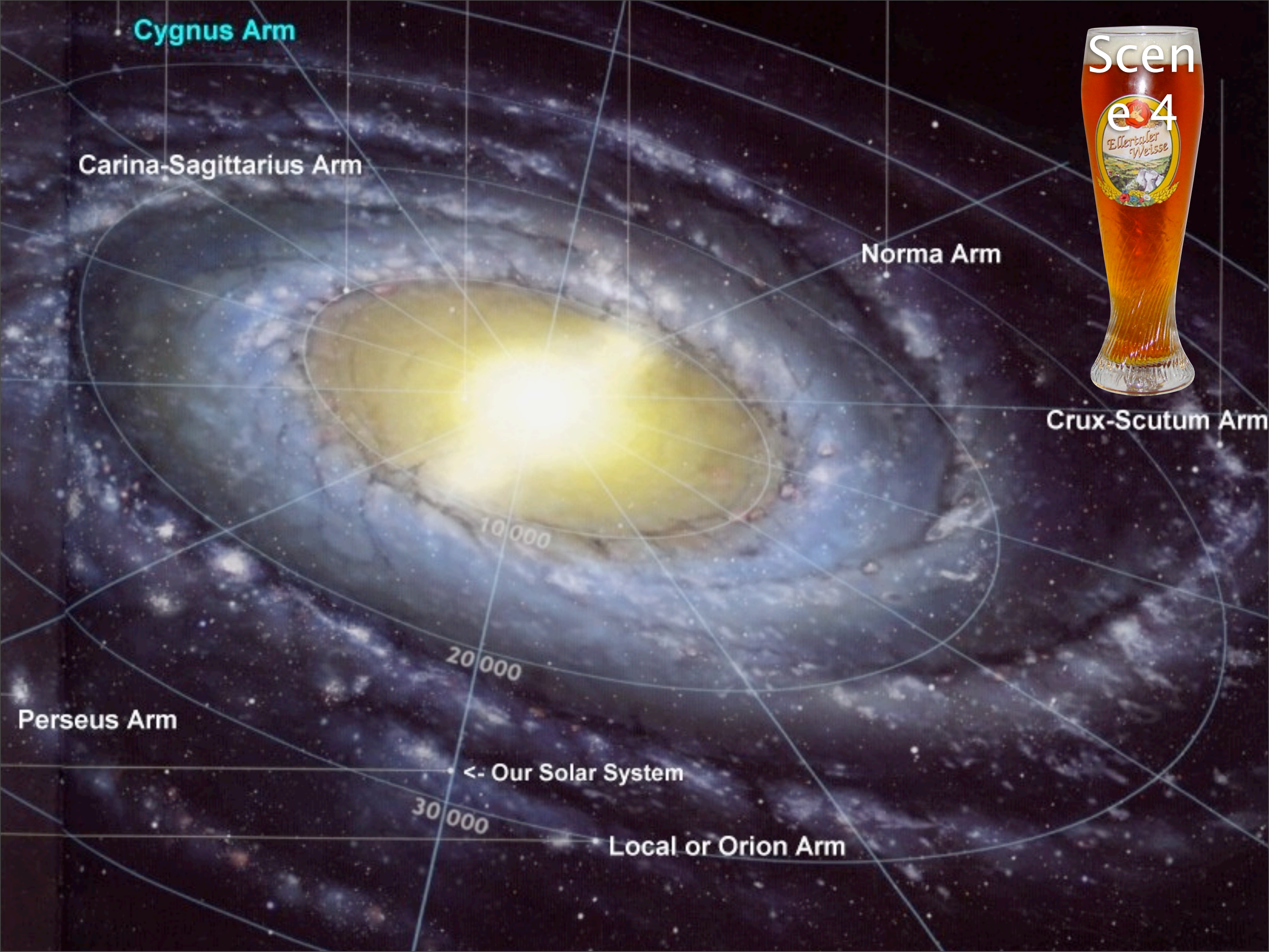




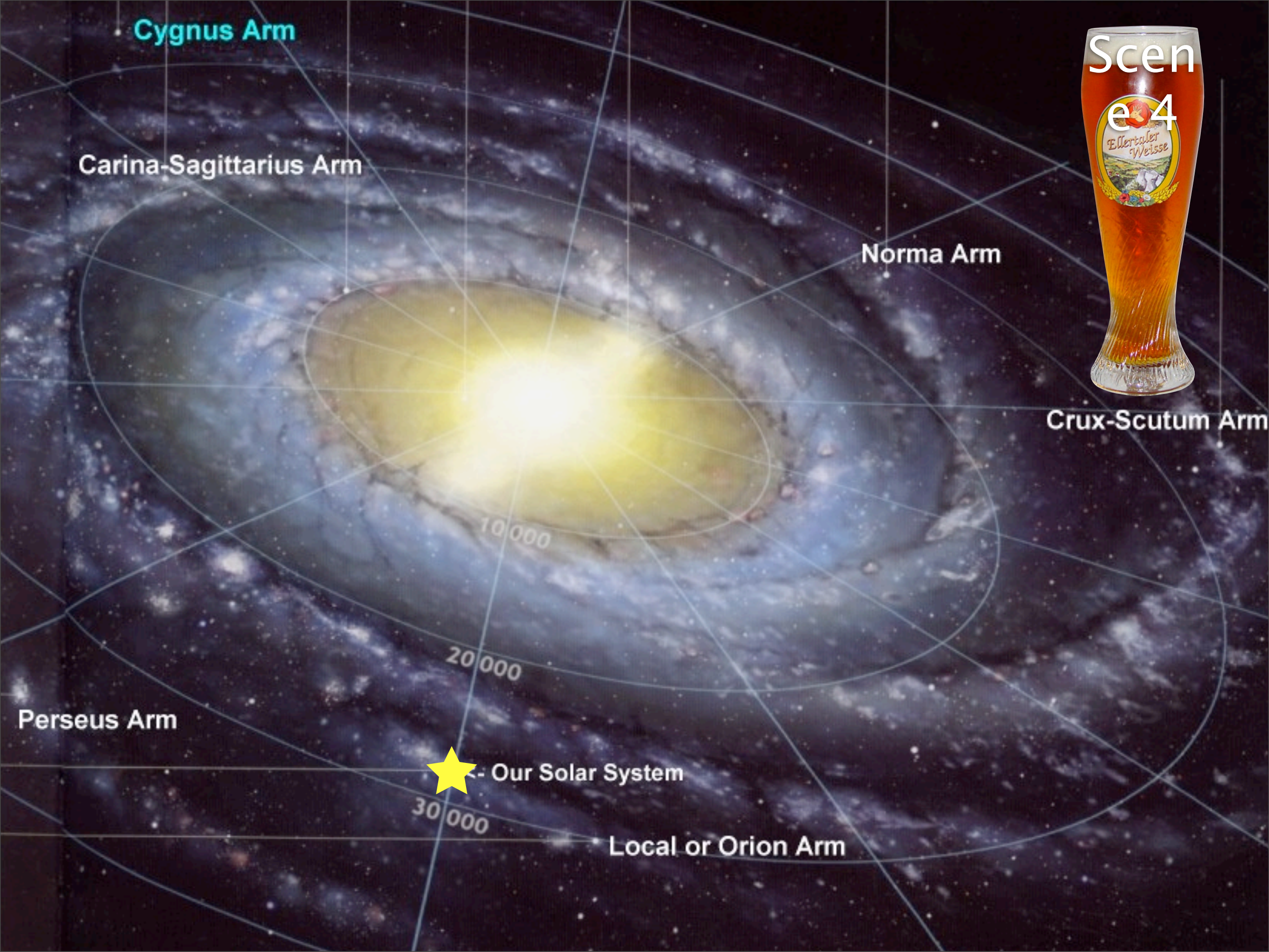
# Pre-publication Composite for Analysis



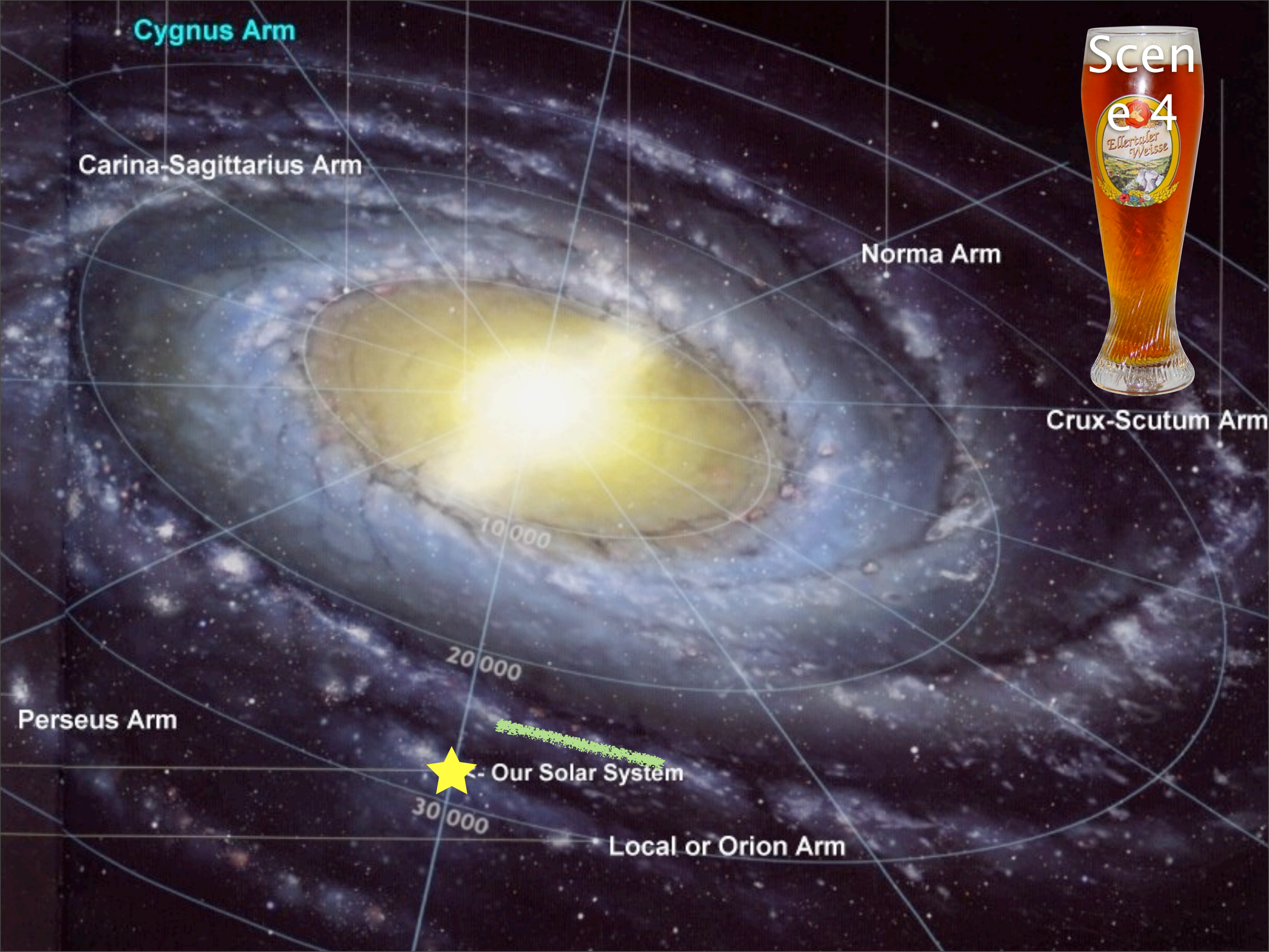














Cygnus Arm

Carina-Sagittarius Arm

Norma Arm

Crux-Scutum Arm



Scene 4

# Preliminary Interpretation... A Galactic "Skin"

Perseus Arm

10,000

20,000

<- Our Solar System

30,000

Local or Orion Arm



Cygnus Arm

Carina-Sagittarius Arm

Norma Arm

Crux-Scutum Arm



Scene 4

*Preliminary Interpretation...*

A Galactic "Skin"

**WRONG!**

Perseus Arm

20,000

<- Our Solar System

30,000

Local or Orion Arm



Cygnus Arm

Carina-Sagittarius Arm

Norma Arm

Crux-Scutum Arm

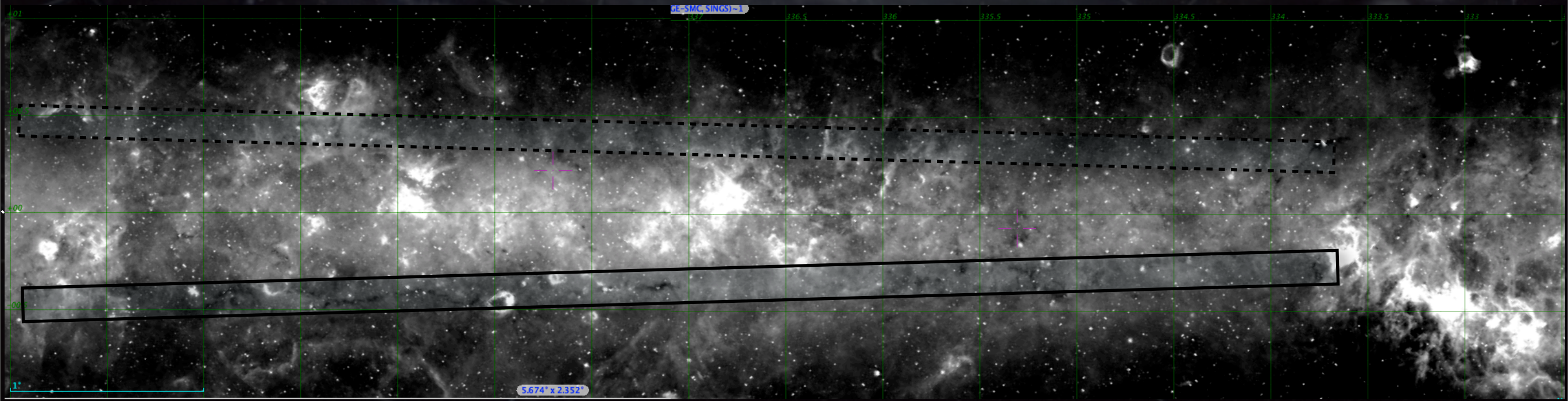


Scene 4

*Preliminary Interpretation...*

A Galactic "Skin"

**WRONG!**





# Scene 5 *Wising up...(thanks to Jens Kauffmann)*



# Scene 5

## Wising up...(thanks to Jens Kauffmann)

**From:** Kauffmann, Jens (3266-Affiliate) <Jens.Kauffmann@jpl.nasa.gov> [Hide](#)  
**Subject:** IRDC Distribution [Inbox - CfAGoogle](#) **1**  
**Date:** July 6, 2012 7:44:54 AM GMT+02:00  
**To:** Alyssa Goodman , Andreas (Andi) Burkert

---

Hi Alyssa & Andi,

I made a quick calculation about the latitude distribution of your IRDCs. They are about 4 kpc away, and the sun is roughly 30 pc above the Galactic Plane. Thus, if the IRDCs were in the plane at  $z=0$ , they would appear to reside at a projected latitude of order  $\arcsin(-30 \text{ pc} / 4000 \text{ pc}) = -0.4 \text{ deg}$ . The true angle will be a bit smaller, given the definition of galactic coordinates. This is enough to affect your analysis in some fashion.

You should have a look at ATLASGAL papers, where they actually see the impact of the sun's position above the plane on the latitude distribution of dust emission. I am not sure whether that is a Schuller or Beuther paper (sorry, no internet here).

cheers

Jens



# Scene 5 *Wising up...(thanks to Jens Kauffmann)*

**From:** Kauffmann, Jens (3266-Affiliate) <Jens.Kauffmann@jpl.nasa.gov> Hide  
**Subject:** IRDC Distribution Inbox - CfAGoogle 1  
**Date:** July 6, 2012 7:44:54 AM GMT+02:00  
**To:** Aly


Hi Alyssa & A

I made a quick  
and the sun is  
they would ap  
true angle will  
your analysis

You should ha  
position above  
Schuller or Be

cheers

Jens

**From:** Alyssa Goodman Hide  
**Subject:** Jens is right! Sent Mail   
**Date:** July 6, 2012 9:27:10 PM GMT+02:00  
**To:** Andreas Burkert <burkert@usm.uni-muenchen.de>  
**Cc:** Jens Kauffmann , Joao Alves

Hi Andi,

Jens is right, I think. The IRDCs are in the midplane! More later from my laptop...

Thanks to Jens! And Joao for discussion!

A

Alyssa A. Goodman  
<http://www.cfa.harvard.edu>  
m: 617.230.7080  
(typed on tiny touch keyboard)



# Scene 5 *Wising up...(thanks to Jens Kauffmann)*

**From:** Kauffmann, Jens (3266-Affiliate) <Jens.Kauffmann@jpl.nasa.gov> Hide  
**Subject:** IRDC Distribution Inbox - CfAGoogle 1  
**Date:** July 6, 2012 7:44:54 AM GMT+02:00  
**To:** Aly

Hi Alyssa & A

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and the sun is  
they would ap  
true angle will  
your analysis

You should ha  
position above  
Schuller or Be

cheers

Jens

**From:** Alyssa Goodman Hide  
**Subject:** Jens is right! Sent Mail  
**Date:**  
**To:**  
**Cc:**

Hi Andi,

Jens is right

Thanks to

A

Alyssa A.  
<http://www>  
m: 617.230  
(typed on t

**From:** Andreas Burkert <burkert@usm.uni-muenchen.de> Hide  
**Subject:** Re: Jens is right! Inbox - CfAGoogle 1  
**Date:** July 6, 2012 11:12:40 PM GMT+02:00  
**To:** Alyssa Goodman  
**Cc:** Jens Kauffmann , Joao Alves

I have been thinking about it too. As odd as it appears given the fact that the filaments appear to lie at the edge of the gas distribution, I agree that this has to be the correct answer.

Thanks Jens!!!

Cheers, Andi

[See More from Alyssa Goodman](#)

---

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[burkert@usm.uni-muenchen.de](mailto:burkert@usm.uni-muenchen.de)  
<http://www.usm.lmu.de>

---



# Scene 5 *Wising up...(thanks to Jens Kauffmann)*

**From:** Kauffmann, Jens (3266-Affiliate) <Jens.Kauffmann@jpl.nasa.gov> Hide  
**Subject:** IRDC Distribution Inbox - CfAGoogle 1  
**Date:** July 6, 2012 7:44:54 AM GMT+02:00  
**To:** Aly

Hi Alyssa & A

I made a quick  
and the sun is  
they would ap  
true angle will  
your analysis

You should ha  
position above  
Schuller or Be

cheers

Jens

**From:** Alyssa Goodman Hide  
**Subject:** Jens is right! Sent Mail  
**Date:**  
**To:**  
**Cc:**

Hi Andi,

Jens is right

Thanks to

A

Alyssa A.  
<http://www>  
m: 617.230  
(typed on t

**From:** Andreas Burkert <burkert@usm.uni-muenchen.de> Hide  
**Subject:** Re: Jens is right!  
**Date:** July  
**To:** Alys  
**Cc:** Jens

I have been thi  
at the edge  
of the gas distr

Thanks Jens!!!

Cheers, Andi

[See More from Al](#)

-----  
Prof. Dr. Andre  
Theoretical and  
University Obs  
Scheinerstr. 1  
81679 Munich  
Phone: +49 89  
Fax: +49 89  
[burkert@usm.u](mailto:burkert@usm.u)  
<http://www.usm>  
-----

**From:** Kauffmann, Jens (3266-Affiliate) <Jens.Kauffmann@jpl.nasa.gov> Hide  
**Subject:** Re: Jens is right! Inbox - CfAGoogle 2  
**Date:** July 7, 2012 10:21:28 AM GMT+02:00  
**To:** Alyssa Goodman  
**Cc:** Andreas Burkert <burkert@usm.uni-muenchen.de> , Joao Alves

Hi Alyssa,

happy that I could ... well ... "help". What are your plans how? It is still interesting that all these clouds form one elongated structure. Means they are probably all at the same distance, probably a spiral arm.

A spiral arm position is reasonable and consistent with a few other measures of IRDCs. I believe it was Peretto & Fuller who concluded that the foreground/background ratio for the 8 mu emission towards an IRDC is 1:1. When Thushara and I looked at other galaxies, the 8 mu emission nicely follows spiral arms. If you drop clouds right into the arms, you will directly get a 1:1 ratio.

I wonder whether Jonathan F. does already have distances to all these objects. They are likely to be part of MALT90, and he might have observed them in extinction.

cheers

Jens

[See More from Alyssa Goodman](#)



# Scene 5 The “Literature” ...special thanks to Henrik Beuther

THE ASTROPHYSICAL JOURNAL, 747:43 (8pp), 2012 March 1

doi:10.1088/0004-637X/747/1/43

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## GALACTIC STRUCTURE BASED ON THE ATLASGAL 870 $\mu\text{m}$ SURVEY

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T. P. ROBITAILLE<sup>4</sup>, C. M. WALMSLEY<sup>5,6</sup>, L. BRONFMAN<sup>7</sup>, F. MOTTE<sup>8</sup>, Q. NGUYEN-LUONG<sup>8</sup>, AND S. BONTEMPS<sup>9</sup>

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<sup>3</sup> Max-Planck-Institute for Radioastronomy, Auf dem Hügel 71, D-53121 Bonn, Germany

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<sup>7</sup> Departamento de Astronomia, Universidad de Chile, Casilla 36-D, Santiago, Chile

<sup>8</sup> Laboratoire AIM, CEA/IRFU - CNRS/INSU - Universit Paris Diderot, CEA-Saclay, F-91191 Gif-sur-Yvette Cedex, France

<sup>9</sup> OASU, Université de Bordeaux, 2 rue del'Observatoire, B.P. 89, F-33271 Floirac, France

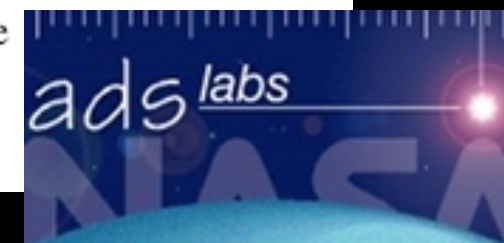
Received 2011 August 11; accepted 2011 December 16; published 2012 February 13

### ABSTRACT

The ATLASGAL 870  $\mu\text{m}$  continuum survey conducted with the APEX telescope is the first one covering the whole inner Galactic plane ( $60^\circ > l > -60^\circ$  and  $b < \pm 1.5^\circ$ ) in submillimeter (submm) continuum emission tracing the cold dust of dense and young star-forming regions. Here, we present the overall distribution of sources within our Galactic disk. The submm continuum emission is confined to a narrow range around the Galactic plane, but shifted on average by  $\sim 0.07$  deg below the plane. Source number counts show strong enhancements toward the Galactic center, the spiral arms, and toward prominent star-forming regions. Comparing the distribution of ATLASGAL dust continuum emission to that of young intermediate- to high-mass young stellar objects (YSOs) derived from *Spitzer* data, we find similarities as well as differences. In particular, the distribution of submm dust continuum emission is significantly more confined to the plane than the YSO distribution (FWHM of 0.7 and 1.1 deg, corresponding to mean physical scale heights of approximately 46 and 80 pc, respectively). While this difference may partly be caused by the large extinction from the dense submm cores, gradual dispersal of stellar distributions after their birth could also contribute to this effect. Compared to other tracers of Galactic structure, the ATLASGAL data are strongly confined to a narrow latitude strip around the Galactic plane.

*Key words:* dust, extinction – Galaxy: structure – ISM: clouds – stars: formation – stars: pre-main sequence

*Online-only material:* color figures





# Scene & Epilogue

*The near & slightly farther future...*

## Science

IRDCs = edge-on column density  
features in the plane

## Dissemination

*ApJ Letter* by Burkert, Goodman, and...

## Politics / Credit

+Kauffmann as author (but what  
about others who helped...  
Robitaille, Bressert, Alves...)

ADS All-Sky Survey?

universe3d.org?

ORCID?

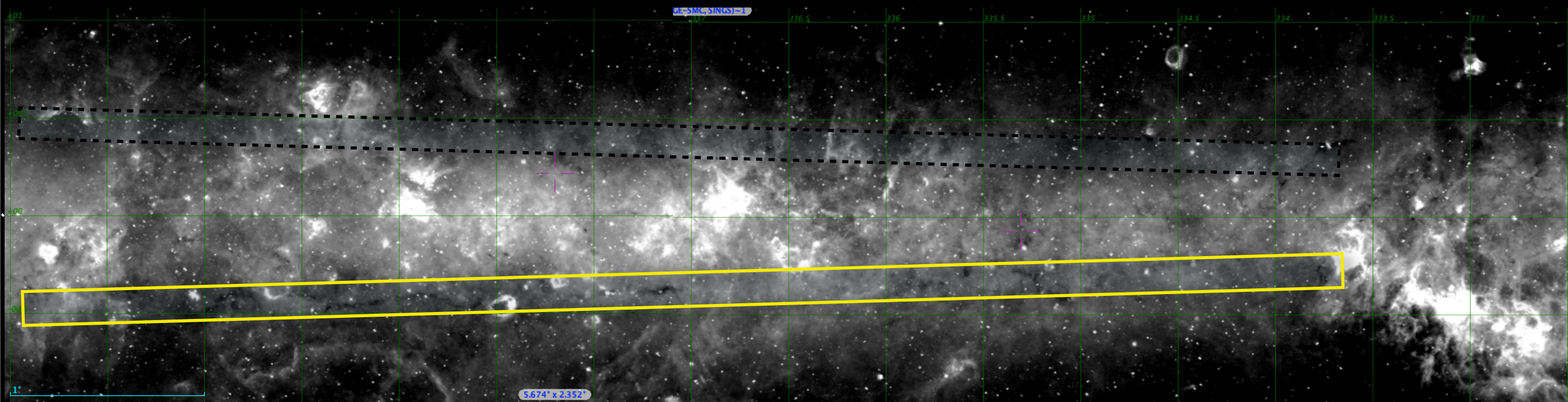
Web SAMP and Glue?

“Authorea”? (ask Alberto)



# Scene 6

*Much better Interpretation...*  
That **is** the galactic plane!





# Literature

# “Seamless Astronomy” (Tools)

# Data

arXiv.org

nature

A BIG YEAR FOR ASTRONOMY

THE ASTRONOMICAL JOURNAL

ads labs

astronomy.net

WIKIPEDIA  
The Free Encyclopedia

AstroBetter

Blogs, Wikis, etc.

ADS

Microsoft

WorldWide Telescope

TOPCAT

ds9

European Union

VIZIER

SIMBAD

ASTRO GRID

MAO OBSERVATORY

IVOA

EUROVOA

Astronomical Infrastructure for Data Access

Registries”

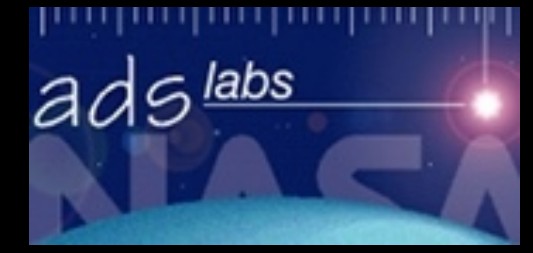
DataScope

**Disclaimer:** This slide shows key excerpts from within the astronomy community & excludes more general s/w that is used, such as Papers, Zotero, Mendeley, EndNote, graphing & statistics packages, data handling software, search engines, etc.



# [Scene 6]

## ADS, ADS Labs, ADS All-Sky Survey...



Search Twitter | Related Tweets | Trending: ... | Tweet

### ADS Labs

Galaxy     X-Ray Source  
 Other object     Nebula  
 Star     UV Source  
 Radio Source     HII Region  
 Infrared Source

Right Ascension: Start: 0.000000 Stop: 360.000000  
Declination: Start: -90.000000 Stop: 90.000000

Show Labels    Apply to facets  
 Object Selection

The main visualization is a sky map showing a large number of objects. A prominent feature is a curved band of objects, likely representing the Milky Way, highlighted in purple. Other labeled objects include LDN 1157, LDN 1204A, LDN 106.60+05.16, NAME W 3 CORE, NAME California molecular cloud, NAME CYG COMPLEX, BLAST J194311+234405, NAME VELA XYZ, and NAME DR KEBULA. The map includes navigation controls on the left and a "POWERED BY Google" logo in the bottom left corner.

POWERED BY Google

0 2000 2005 2010

Ellingsen, S. The Astrophysical Journal Letters, pp. 241-261. Feb 2006


Matches in Abstract / Matches in fulltext

Terms of Use







Location  Clear Frame ICRS 

★ Allsky opt ★ Allsky IR ★ DSS ★ Simbad ★ NED ★ PPMX ★ 2MASS

simbad-biblio\_equatorial\_512.hpx

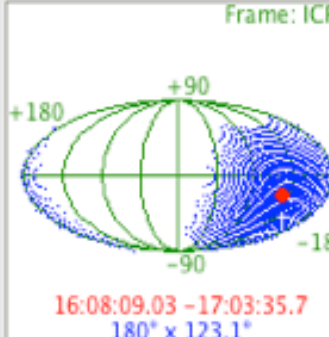
# ADS All Sky Survey

draw  
tag  
filter  
cross  
rgb  
assoc  
crop  
cont  
mglss  
pixel  
prop  
del

IRAS-IRIS color  
 DSS colored  
 simbad-biblio

om 1/16x

Frame: ICRS



180° x 123.1°

grid north multiview match

Search


(c) 2010 UDS/CNRS - by CDS - Distributed under GNU GPL v3

0 sel / 0 src 189Mb

pilogue

[prototype: using CDS tools]

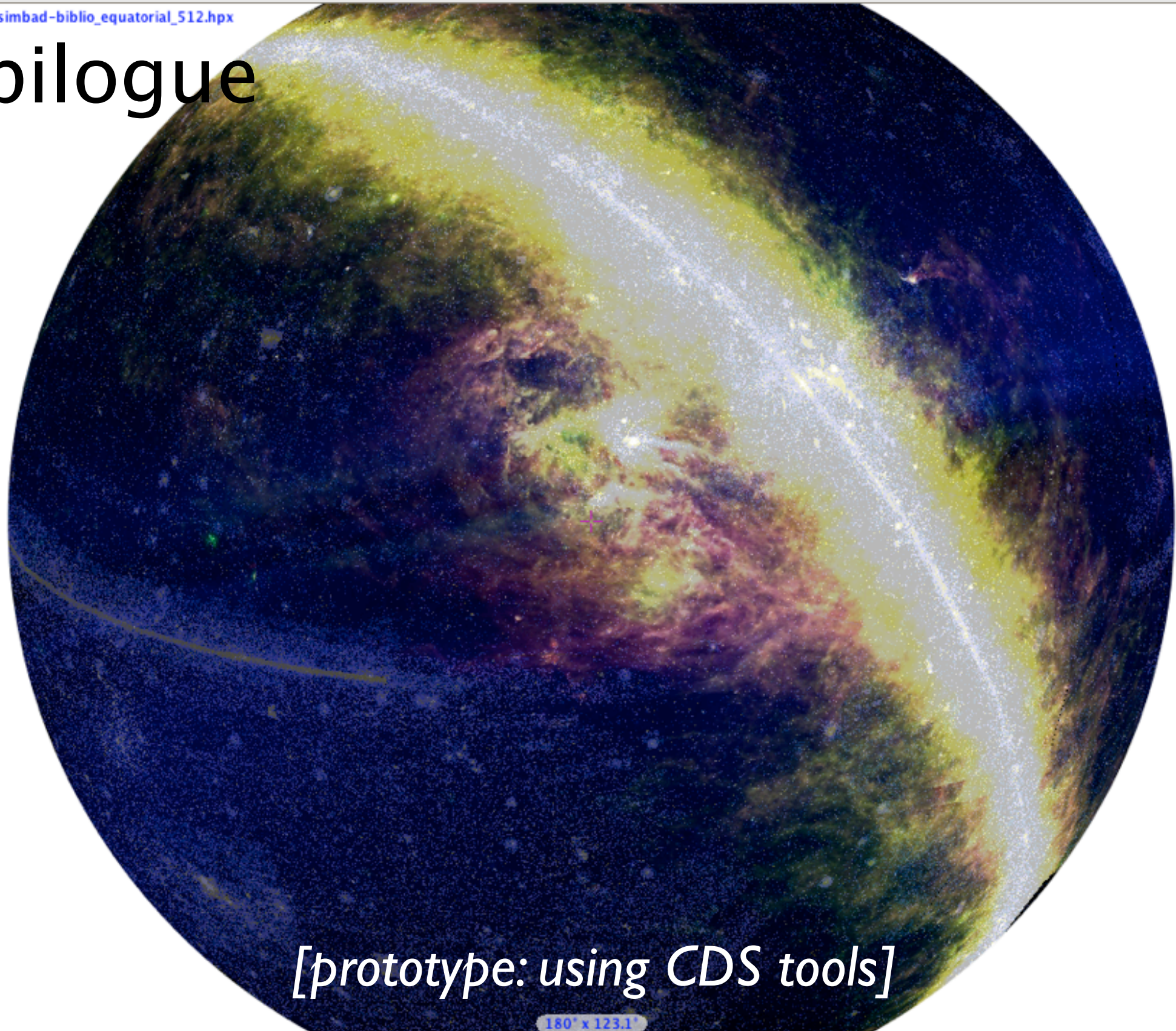


Location  Clear Frame ICRS 

Allsky opt 
  Allsky IR 
  DSS 
  Simbad 
  NED 
  PPMX 
  2MASS


simbad-biblio\_equatorial\_512.hpx


# pilogue





[prototype: using CDS tools]


180° x 123.1°


select 


pan 


zoom 


dist 


phot 


draw 


tag 


filter 


cross 


rgb 


assoc 


crop 

cont 

mglss 

pixel 

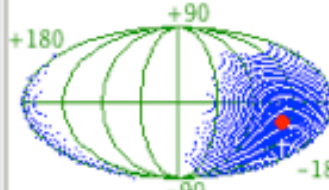
prop 

del 

IRIS-IRIS color  
 DSS colored  
 simbad-biblio






om 1/16x

Frame: ICR




16:08:09.03 - 17:03:35.7  
180° x 123.1°

grid north multiview match

Search      

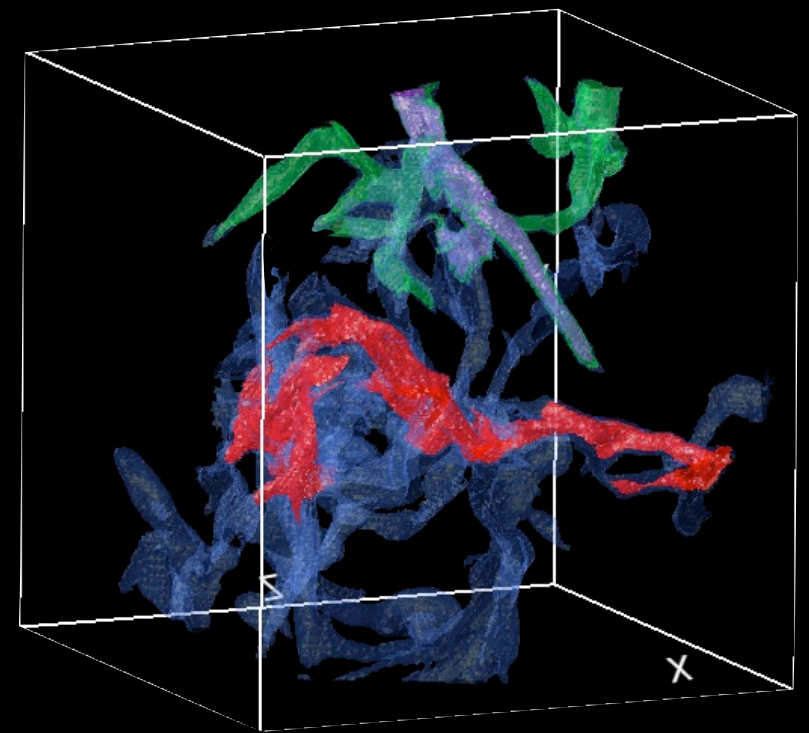
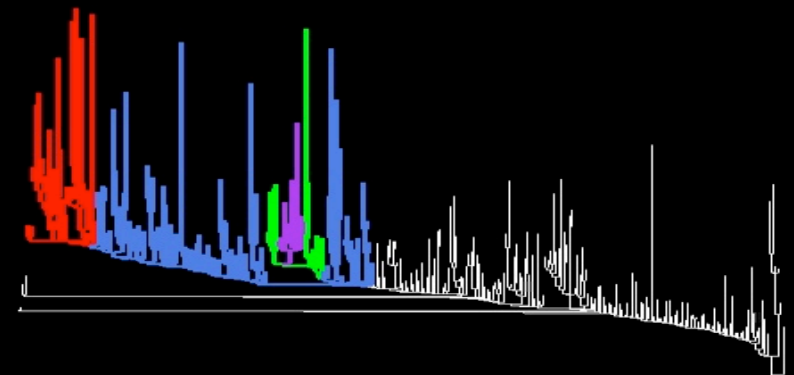
© 2010 UDS/CNRS - by CDS - Distributed under GNU GPL v3

0 sel / 0 src 189Mb 



pilogue

Glue

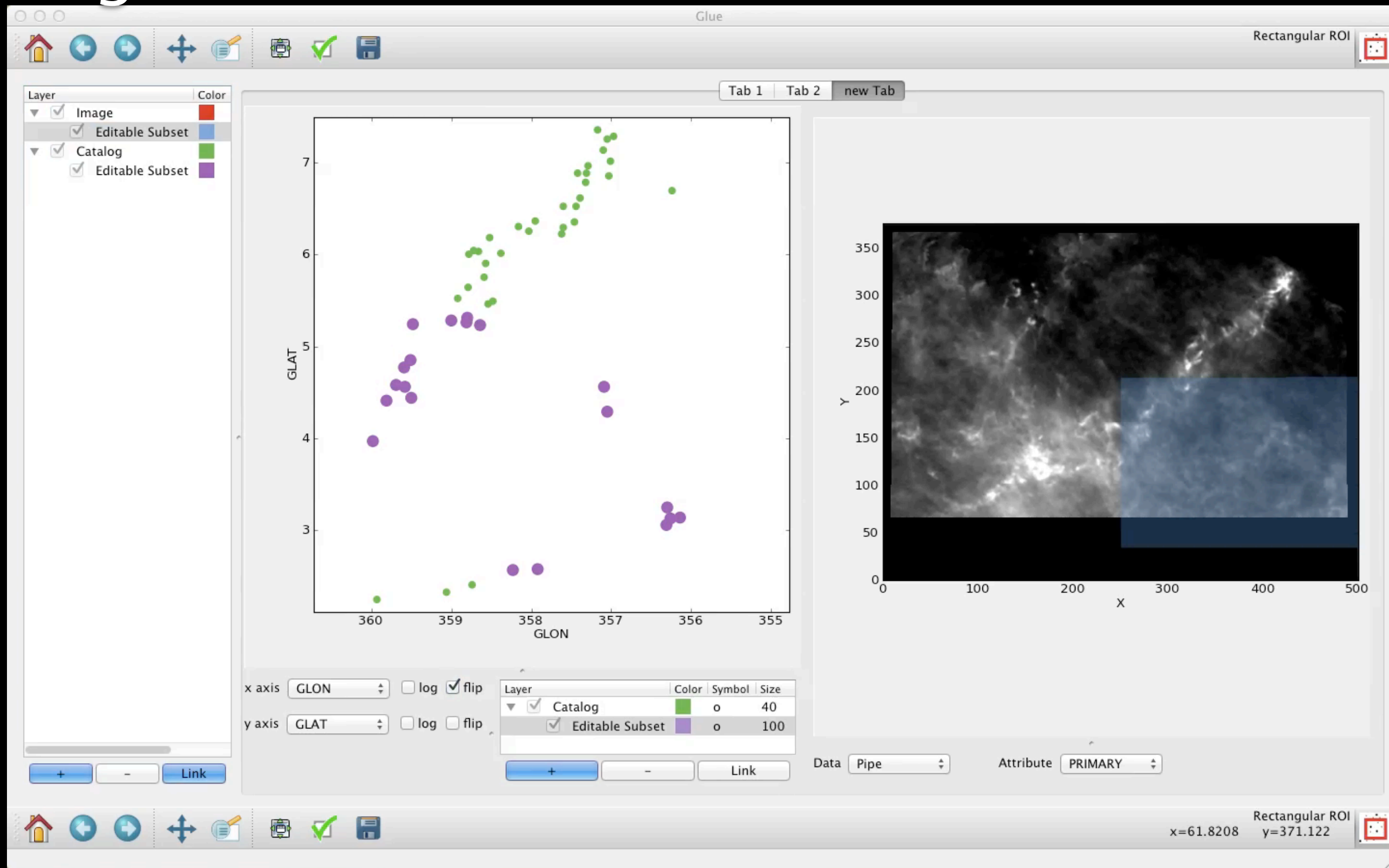


*[see presentations/unconferences by Beaumont, Borkin, Robitaille]*



# prologue

# Glue



[see presentations/unconferences by Beaumont, Borkin, Robitaille]



Page Discussion

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- Upload file
- Special pages
- Printable version
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## What is Universe3D.org?

The intention of Universe3D.org is to host links to web content that enable the enhancement of our three-dimensional view of the Universe.

Recently added Dataset
<p><b>SLOAN Digital Sky Survey</b> <a href="#">↗</a> The Sloan Digital Sky Survey or SDSS is a major multi-filter imaging and spectroscopic redshift survey using a dedicated 2.5-m wide-angle optical telescope at Apache Point Observatory in New Mexico, United States. The main galaxy sample has a median redshift of <math>z = 0.1</math>; there are redshifts for luminous red galaxies as far as <math>z = 0.7</math>, and for quasars as far as <math>z = 5</math>; and the imaging survey has been involved in the detection of quasars beyond a redshift <math>z = 6</math>.</p>

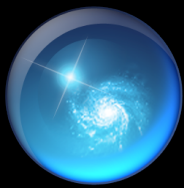
Astronomy News
<ul style="list-style-type: none"> <li>• <i>June 26, 2012:</i> Astronomers use supercomputer to explore role of dark matter in galaxy formation</li> <li>• <i>June 25, 2012:</i> Moon to pass by Mars tonight</li> <li>• <i>June 24, 2012:</i> Astronomers find planets so close they 'see' each other in night sky</li> <li>• <i>June 14, 2012:</i> Huge Asteroid to fly by Earth</li> <li>• <i>June 13, 2012:</i> Astronomers may have discovered the oldest galaxy in the Universe</li> <li>• <i>June 5, 2012:</i> Last Transit of Venus for the 21st century</li> </ul>

Announcements
<ul style="list-style-type: none"> <li>• <i>July 05, 2012:</i> Website moved to the URL universe3d.org!</li> <li>• <i>June 11, 2012:</i> Website moved to MediaWiki!</li> <li>• <i>December 5, 2011:</i> Site established!</li> </ul> <p>To make good on Alyssa Goodman's promise at the "Milky Way 2011" meeting held in Rome this past September, the site "universe3d.org" has been established. By 2012, it will be populated with links to existing data</p>

The Milky Way

<p><b>A Roadmap to the Milky Way</b> (artist's concept)</p> <p>NASA / JPL-Caltech / R. Hurt (SSC-Caltech) <span style="float: right;">ssc2008-10a</span></p>



# Epilogue



Microsoft WorldWide Telescope

Explore Guided Tours Search Community Telescope View Settings Milky Way Molecular Clouds f... Sign In

Constellation Lines + Overlays

- Figures
- Boundaries
- Focused Only

Equatorial Grid

Ecliptic/Orbits

Reticle/Crosshairs

Field of View Indicator  Setup

3d Solar System

- Show Stars
- Milky Way
- Cosmos
- Orbits

Planets

Asteroids

Lighting

Minor Orbits

Observing Location

Name: Algiers, Algeria

Lat: 45.28.37

Lng: 09.10.59

View from this location Setup

Observing Time

1636/10/05 03:41:47

X 10000000  UTC

Now

UNIVERSE3D.org

Results from Tom Rice's Thesis:  
Preliminary Hierarchical Catalog of Milky Way Plane Molecular Clouds

Look At: SolarSystem

Imagery: 3D Solar System View

Tracking

Context Search Filter: All 1 of 2

Planet Size: 143688 ly

Actual Large

Sun

Lat: -90.48.01

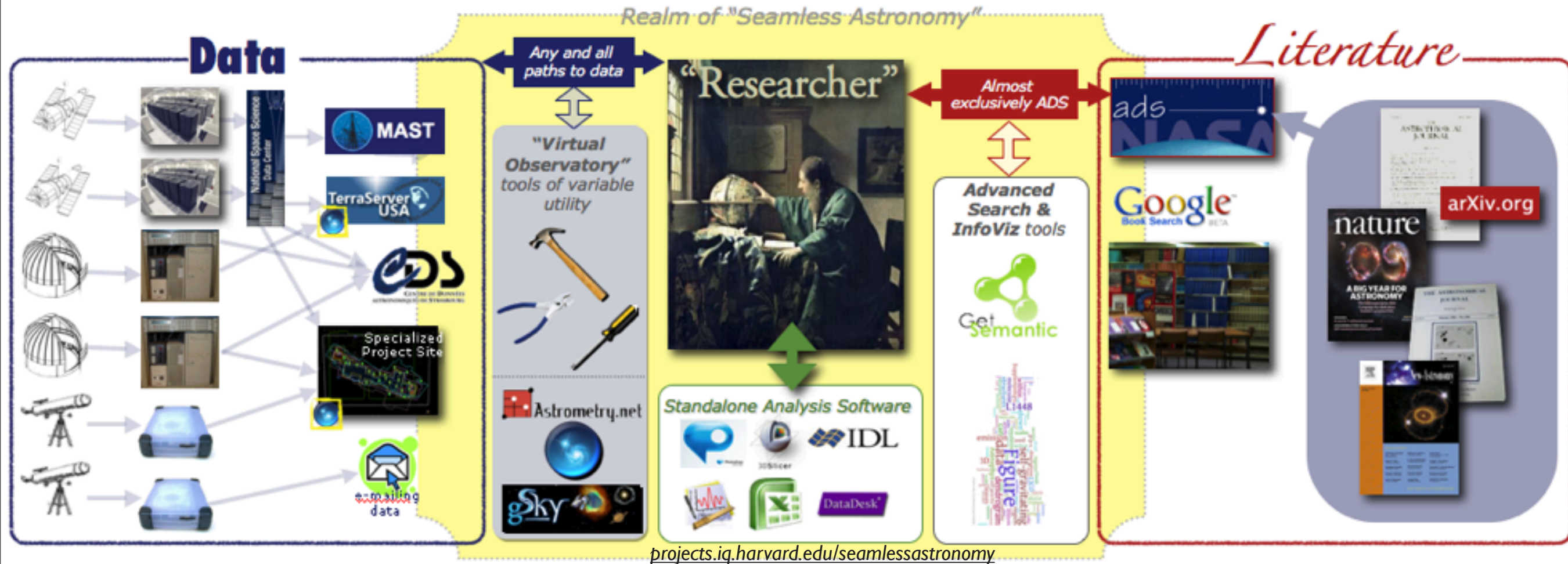
Lng: -39.51.19

Sun Mercury Venus Earth Mars Jupiter Saturn Uranus Neptune Pluto Moon Io Europa



# SEAMLESS ASTRONOMY+

Alyssa A. Goodman, Harvard-Smithsonian Center for Astrophysics



with

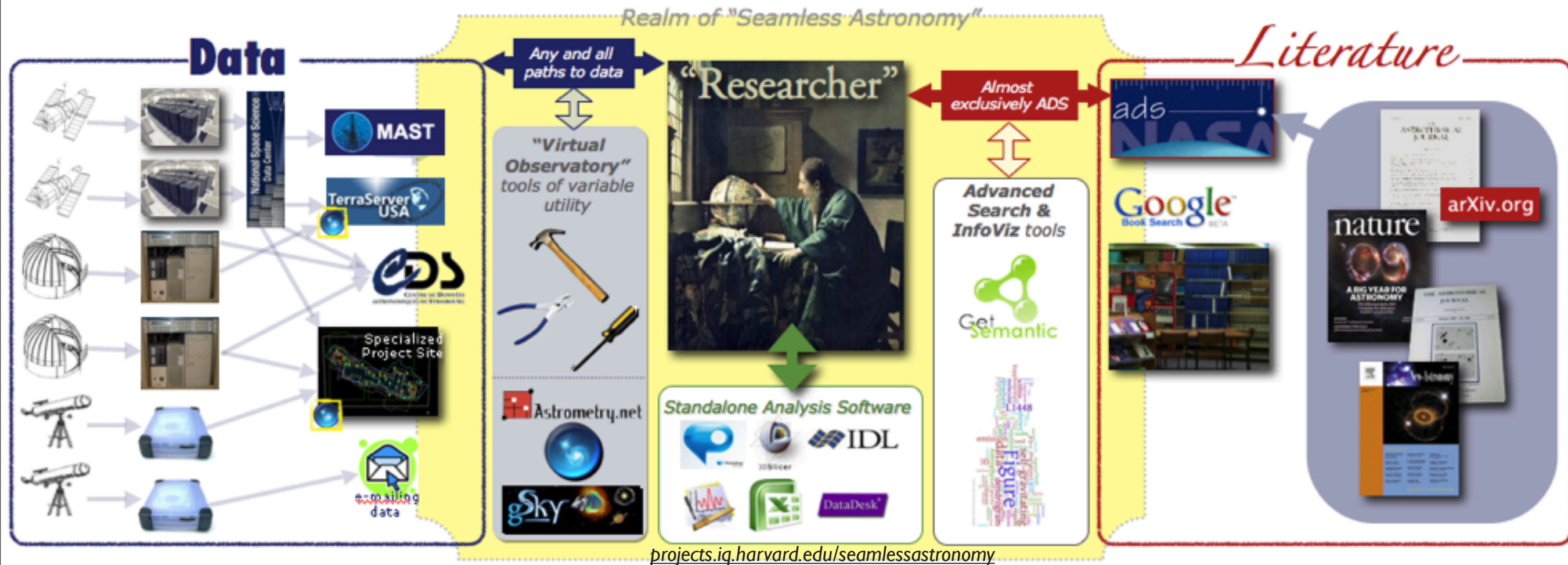
Alberto Accomazzi, Douglas Burke, Raffaele D’Abrusco, Rahul Davé, Christopher Erdmann, Pepi Fabbiano, Edwin Henneken, Jay Luker, Gus **Muench**, Michael Kurtz, Max Lu, Victoria Mittelbach, Alberto **Pepe**, Arnold Rots, Patricia Udomprasert (Harvard-Smithsonian CfA); Christopher **Beaumont** (CfA & U. Hawaii); Michelle **Borkin** (Harvard SEAS); Mercé Crosas (Harvard Institute for Quantitative Social Science); Christine Borgman (UCLA); Thomas **Robitaille** (MPIA); Jonathan Fay & Curtis Wong (Microsoft Research); Alberto Conti (Space Telescope Science Institute)





# SEAMLESS ASTRONOMY+

Alyssa A. Goodman, Harvard-Smithsonian Center for Astrophysics



with

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