3500 years of Observing

Stonehenge, 1500 BC

Ptolemy in Alexandria, 100 AD

Observatory Tower, Lincolnshire, UK, c. 1300

Galileo, 1600

The “Scientific Revolution”

Reber’s Radio Telescope, 1937

Reber’s Radio Telescope, 1937

NASA/Explorer 7 (Space-based Observing) 1959

“The Internet”

Long-distance remote-control/“robotic” telescopes 1990s

“Virtual Observatory”

.gSky

.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)
“Seamless Astronomy”  [a cute example]

astrometry.net + flickr + WWT
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 12/2010 IVOA recommendation
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.
Spring 2012 Update
Submitted by patudom on May, 9

WWT Ambassadors have had a busy and productive spring! We demo'd WWT at the USA Science and Engineering Festival and two local science festival events in Cambridge to engaged and enthusiastic crowds of close to 2000 people. The most common refrain we heard was, “Really? I can download this at home for free?” Ambassadors continue to be impressed by the astute questions and observations made by children who are given the opportunity to explore our universe for the first time. “Why is Pluto’s orbit so out of whack from all the other planets?” “Why does Jupiter have so many more moons than other planets?” “How long would it take for us to travel far enough outside the Milky Way to take a picture of it?”

wwtambassadors.org

Alyssa Goodman & Patricia Udomprasert
Harvard-Smithsonian Center for Astrophysics

Curtis Wong & Jonathan Fay
Microsoft Research
Gains in Student Interest and Understanding
(“Traditional Way” vs “WWT Way”)

“Cooler than ‘Call of Duty’”
What I did (or want to do) on my Summer Vacation...

A “Seamless Astronomy” Story about the Galaxy
Once upon a time in an enchanted castle by a lake, a sea monster...
THE “NESSIE” NEBULA: CLUSTER FORMATION IN A FILAMENTARY INFRARED DARK CLOUD

JAMES M. JACKSON$^1$, SUSANNA C. FINN$^1$, EDWARD T. CHAMBERS$^2$, JILL M. RATHBORNE$^3$, AND ROBERT SIMON$^4$

1 Institute for Astrophysical Research, Boston University, Boston, MA 02215, USA; jackson@bu.edu, sfinn@bu.edu
2 Department of Physics and Astronomy, Northwestern University, Evanston, IL 60208, USA; e-chambers@northwestern.edu
3 Australia Telescope National Facility and Universidad de Chile, Santiago, Chile; rathborn@das.uchile.cl
4 I. Physikalisches Institut, Universität zu Köln, 50937 Köln, Germany; simonr@ph1.uni-koeln.de

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 ($1.5 \times 0.01$ or $80 \text{ pc} \times 0.5 \text{ pc}$ at a kinematic distance of $3.1 \text{ kpc}$). 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
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/
**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)
Igor (GUI + scripting)

filtering out only “long” Peretto & Fuller clouds, and showing their orientation (color~length)
Huh? Let’s look...
Aladin view
Aladin + TOPCAT + SAMP
Aladin view
Huh? Let’s look...
Pre-publication Composite for Analysis

full box length ~7 degrees ~ 350 pc at 3 kpc
Pre-publication Composite for Analysis
Preliminary Interpretation...

A Galactic “Skin”

WRONG!
Scene 5  Wising up...(thanks to Jens Kauffmann)

Hi Alyssa & Alyssa,

I made a quick test and the sun is rising over the object. The true angle will lead to your analysis being reversed!

You should have a position above the object, typically Schuller or Bontemps.

You and Alyssa need to test the sun's position. Cheers,

Jens

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

Hi Alyssa & Alyssa,

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Jens

From: Alyssa Goodman

Hi Andi,

Jens is right - I am not happy with the result. I will check.

A

Thanks to Jens.

Alyssa A.

http://www.wm.astro.usm.uni-muenchen.de:617.230 (typed on the line)

From: Andreas Burkert <burkert@usm.uni-muenchen.de>
Subject: Re: Jens is right!
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 μm emission towards an IRDC is 1:1. When Thushara and I looked at other galaxies, the 8 μm 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

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cheers

Jens

See More from Alyssa Goodman

See More from Kauffmann, Jens (3266-Affiliate) <Jens.Kauffmann@jpl.nasa.gov>
GALACTIC STRUCTURE BASED ON THE ATLASGAL 870 μm SURVEY

H. Beuther¹, J. Tackenberg¹, H. Linz¹, Th. Henning¹, F. Schuller², F. Wyrowski³, P. Schilke², K. Menten³, T. P. Robitaille⁴, C. M. Walmsley⁵,6, L. Bronfman⁷, F. Motte⁸, Q. Nguyen-Luong⁸, and S. Bontemps⁹

¹ Max-Planck-Institute for Astronomy, Königstuhl 17, D-69117 Heidelberg, Germany; beuther@mpia.de
² 1st Physikalisches Institut, University of Cologne, Zülpicher Straße 77, D-50937 Köln, Germany
³ Harvard-Smithsonian Center for Astrophysics, 60 Garden Street, Cambridge, MA 02138, USA
⁴ Max-Planck-Institute for Radioastronomy, Auf dem Hügel 71, D-53121 Bonn, Germany
⁵ Osservatori Astrofisico di Arcetri, Largo E. Fermi 5, I-50125 Firenze, Italy
⁶ Dublin Institute for Advanced Studies (DIAS), 31 Fitzwilliam Place, Dublin 2, Ireland
⁷ Departamento de Astronomía, Universidad de Chile, Casilla 36-D, Santiago, Chile
⁸ Laboratoire AIM, CEA/IRFU - CNRS/INSU - Université Paris Diderot, CEa-Saclay, F-91191 Gif-sur-Yvette Cedex, France
⁹ 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 μm continuum survey conducted with the APEX telescope is the first one covering the whole inner Galactic plane (60° > l > −60° and b < ±1:5) 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 ~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 6

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!
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...

THIS IS NOT GOOD ENOUGH, BUT HINTS AT WHAT IS TO COME!
EPILOGUE

ADS All Sky Survey

[prototype: using CDS tools]
[see presentations/unconferences by Beaumont, Borkin, Robitaille]
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.

SLOAN Digital Sky Survey 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 $z = 0.1$; there are redshifts for luminous red galaxies as far as $z = 0.7$, and for quasars as far as $z = 5$; and the imaging survey has been involved in the detection of quasars beyond a redshift $z = 6$.

Astronomy News

- June 26, 2012: Astronomers use supercomputer to explore role of dark matter in galaxy formation
- June 25, 2012: Moon to pass by Mars tonight
- June 24, 2012: Astronomers find planets so close they 'see' each other in night sky
- June 14, 2012: Huge Asteroid to fly by Earth
- June 13, 2012: Astronomers may have discovered the oldest galaxy in the Universe
- June 5, 2012: Last Transit of Venus for the 21st century

A Roadmap to the Milky Way

(artist's concept)

NASA / JPL-Caltech / R. Hurt (SSC-Caltech)

ssc2008-10a
Results from Tom Rice's Thesis:
Preliminary Hierarchical Catalog of Milky Way Plane Molecular Clouds
SEAMLESS ASTRONOMY
Alyssa A. Goodman, Harvard-Smithsonian Center for Astrophysics