Sloan Digital Sky Survey

The Sloan Digital Sky Survey (SDSS) is a joint project of The University of Chicago, Fermilab, the Institute for Advanced Study, the Japan Participation Group, The Johns Hopkins University, the Max-Planck-Institute for Astronomy (MPIA), the Max-Planck-Institute for Astrophysics (MPA), New Mexico State University, Princeton University, Univ of Pittsburgh, the United States Naval Observatory, and the University of Washington.

Funding for the project has been provided by the Alfred P. Sloan Foundation, the Participating Institutions, the National Aeronautics and Space Administration, the National Science Foundation, the U.S. Department of Energy, the Japanese Monbukagakusho, and the Max Planck Society.

Experimental Astrophysics Group

- **Staff Scientists**
  - **Stephen Kent**
  - **Chris Stoughton**
  - **Jim Annis**
  - **Rich Kron**
  - **Huan Lin**
  - **(John Peoples)**
  - **Douglas Tucker**
  - **Brian Yanny**
- **Postdocs**
  - **Hubert Lampeitl (Hamburg)**
  - **Sebastian Jester (Heidelberg)**
  - **Brian Lee ==> Postdoc (Berkeley)**
  - **Dan vanden Berk ==> Res. Prof. (Pittsburgh)**
- **Computing Professionals**
  - **Jen Adelman**
  - **Nikolai Kuropatkine**
  - **Dan Yocum**
  - **John Inkmann**
  - **John Hendry**
  - **Vijay Sekhri (NVO/iVDGL)**
- **Students**
  - **Brian Wilhite (UC)**
- **Visitors/Guests**
  - **Christobal Lara (Spain)**
  - **Rob Sparks ==> HS (Racine)**
  - **Susan Kayser**
  - **Sahar Allam ==> Postdoc (NMSU)**

Sloan Digital Sky Survey (E885)

Goal:

Conduct fundamental research in cosmology, particularly formation & evolution of galaxies and large scale structure

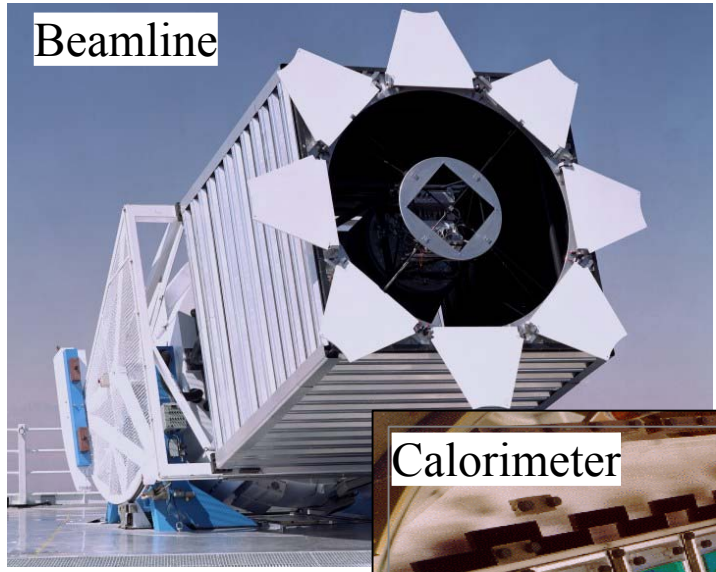
Approach:

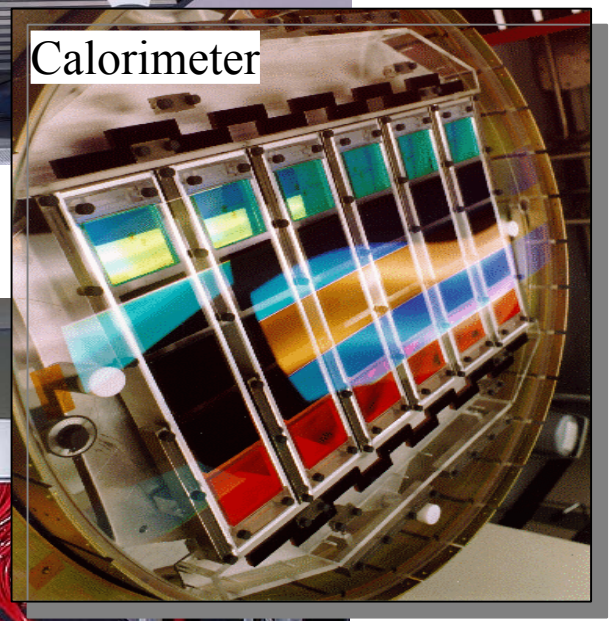
Digital map of ¼ of sky in 5 bands

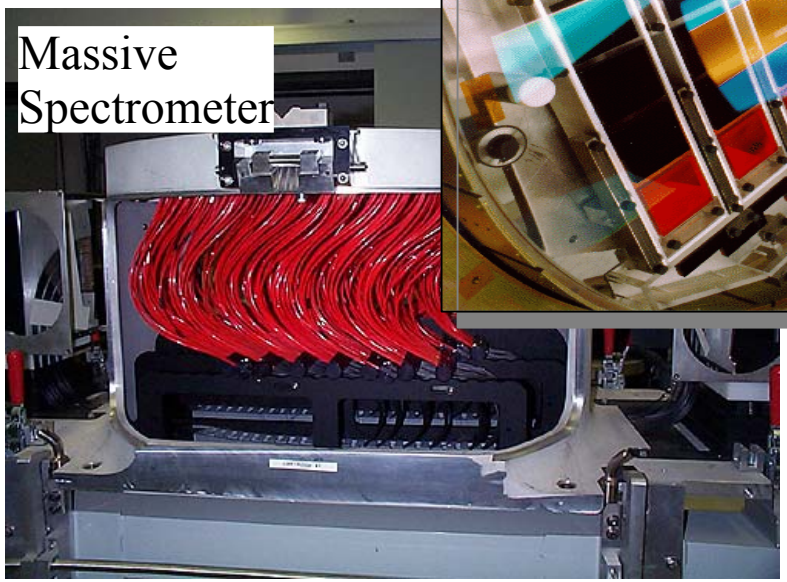
Spectra of 1 million galaxies, 100,000 quasars

Resources:

- 2.5 m telescope in New Mexico
- Large CCD camera
- 640 fiber spectrograph
- 11 partner institutions







FNAL in SDSS

Role:

- Data acquisition
- Data processing
- Survey Planning
- Data distribution
- Support telescope and instrument systems

Science:

- Galaxy angular correlation functions (Dodelson)
- Weak lensing (Annis)
- Galaxy clusters (Annis, Kent, Tucker)
- Milky Way halo structure (Yanny, Kent)
- Galaxy evolution (Lin)
- QSO luminosity functions (Stoughton)
- Near Earth Asteroids (Kent)

Of 103 refereed papers, 17 have current or former FNAL scientist or student supervised by FNAL as lead author

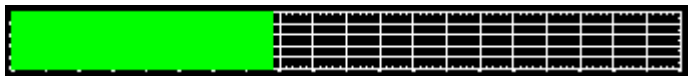
Participants

- **EAG**
- TAG
- PPD
  - Bill Boroski
  - French Leger
  - Carlos Gonzalez
  - Steve Bastian
- Comp. Comm. Fab. (CD)
  - Don Holmgren
  - Eric Neilsen
  - Ron Rechenmacher
  - Valery Sergeev

SDSS Current Status (Mar 2003)

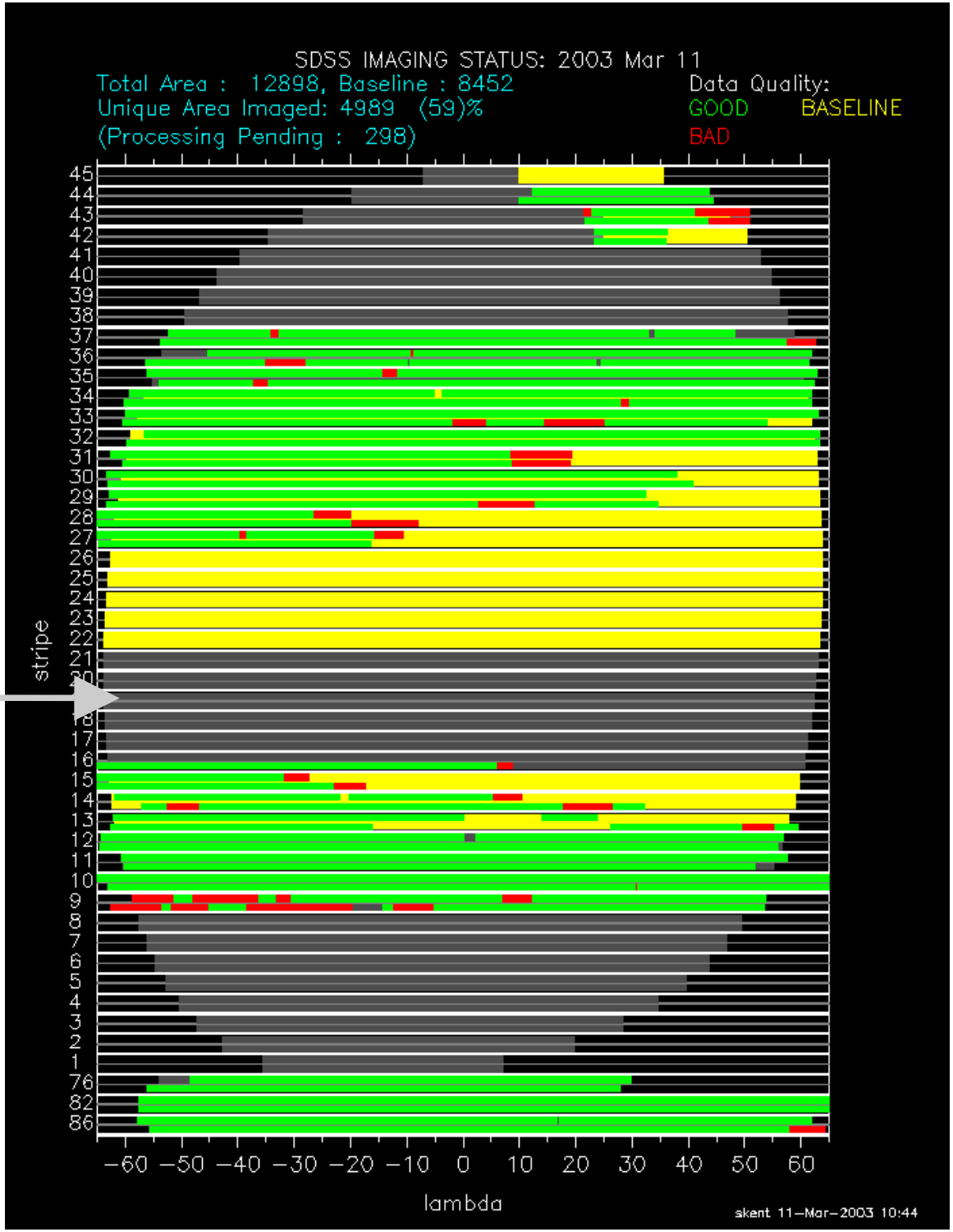
Imaging: 59% as of March 11, 2003

Spectroscopy: 41% as of March 11, 2003



Current operations funded thru June, 2005

A proposal is being developed to continue operations for another 2 or more years (fill the gap).

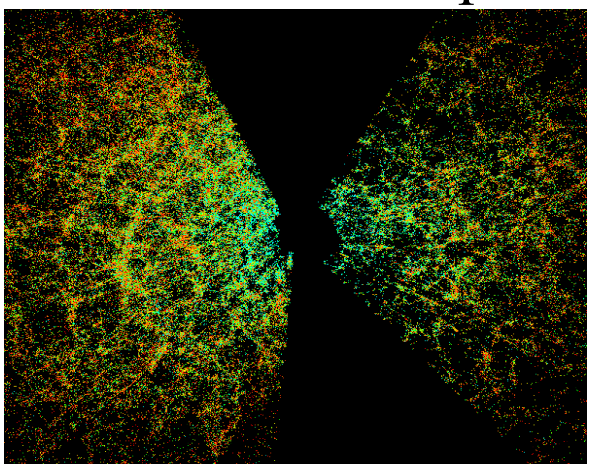


Research Highlights

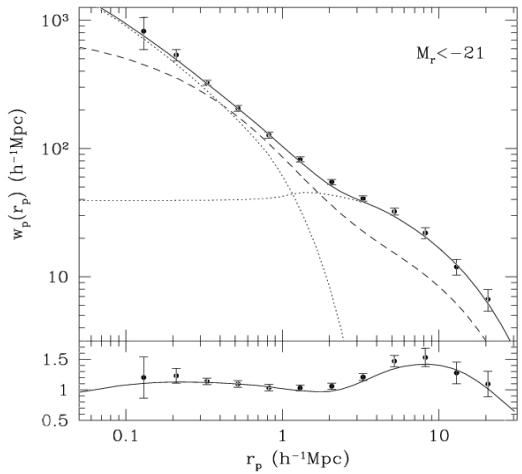
- 31 papers submitted by collaboration in past year.
- 20 papers submitted by noncollaboration based on publicly released data (EDR)

Yet another speed record for QSOs (z=6.4)

Large Scale Structure update:



Pie diagram (Blanton)

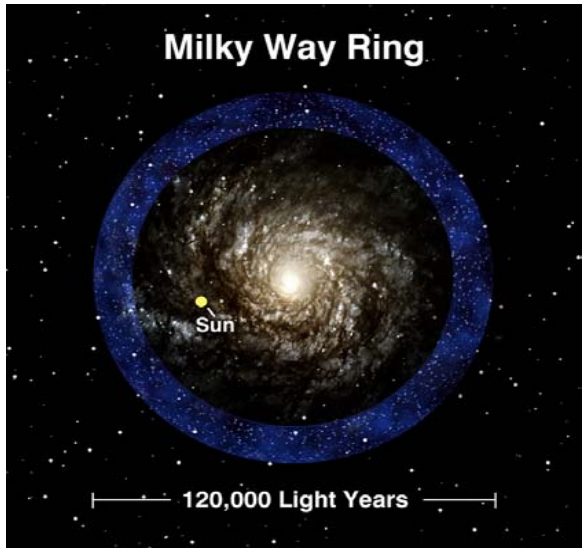


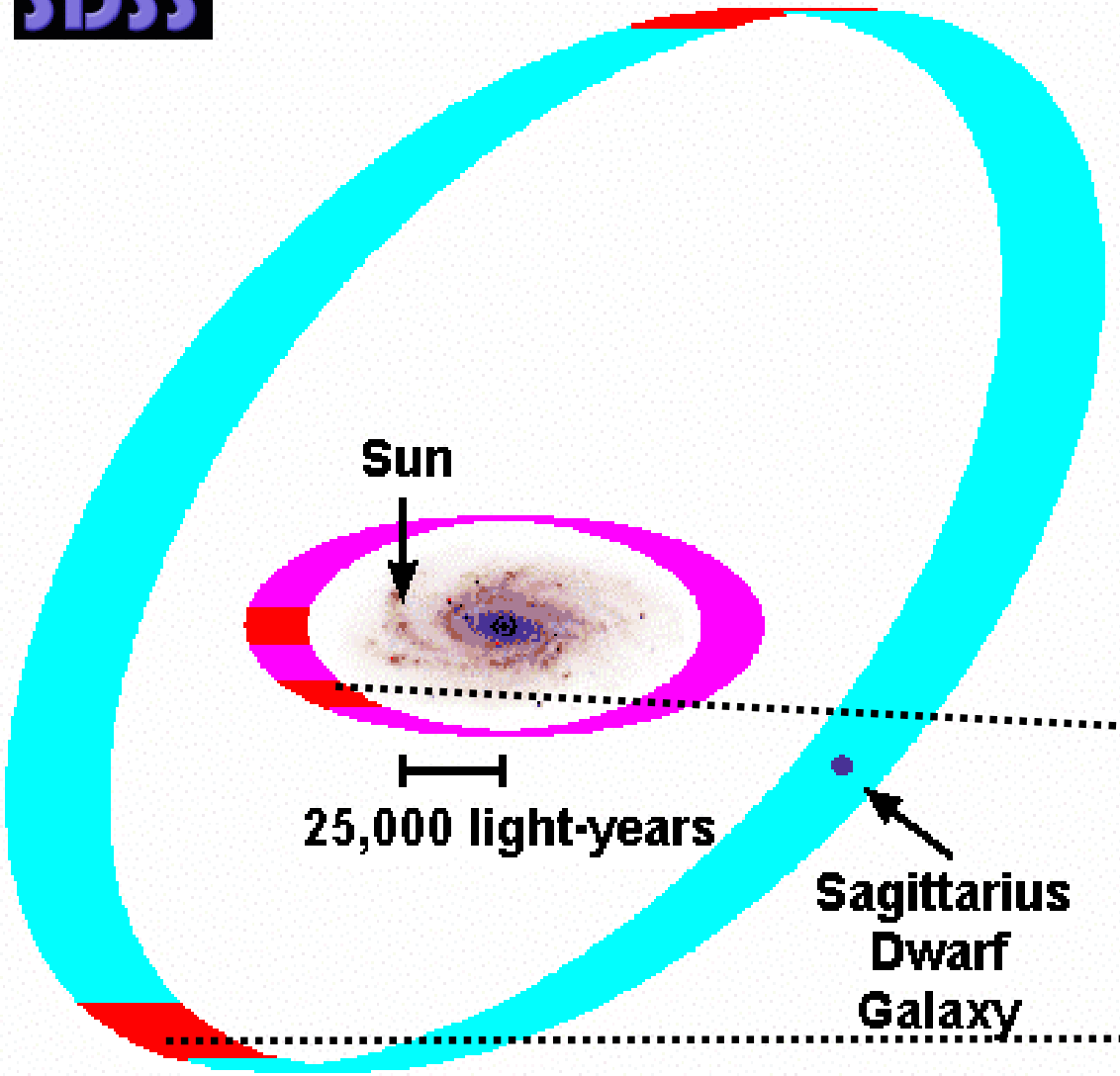
2-point correlation function (Zehavi)

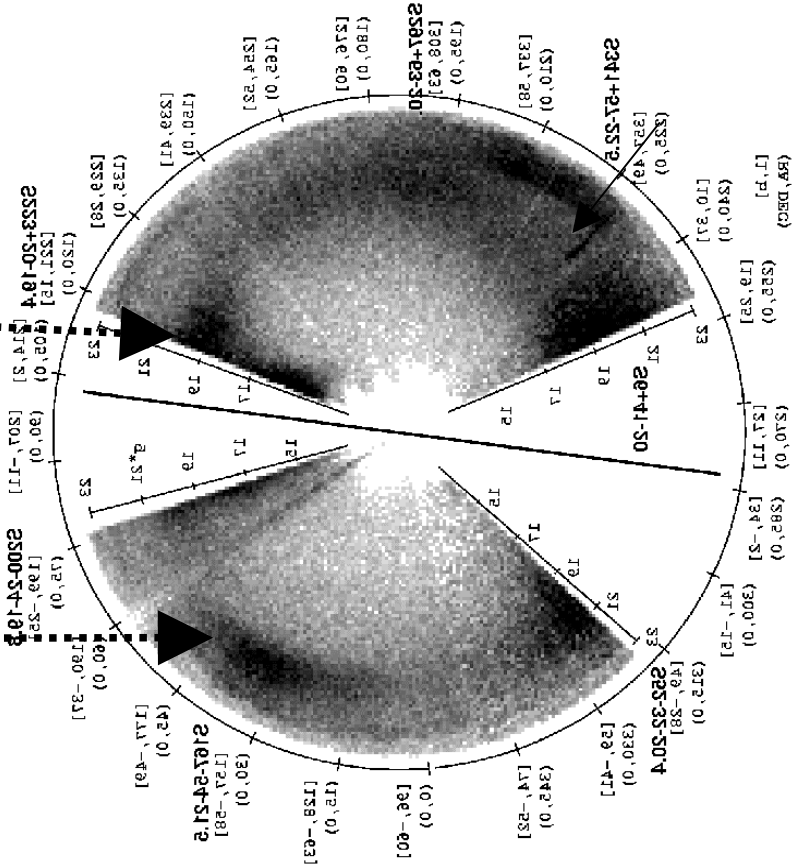
Ring around the Milky Way (see next slide)

Rings around the Galaxy

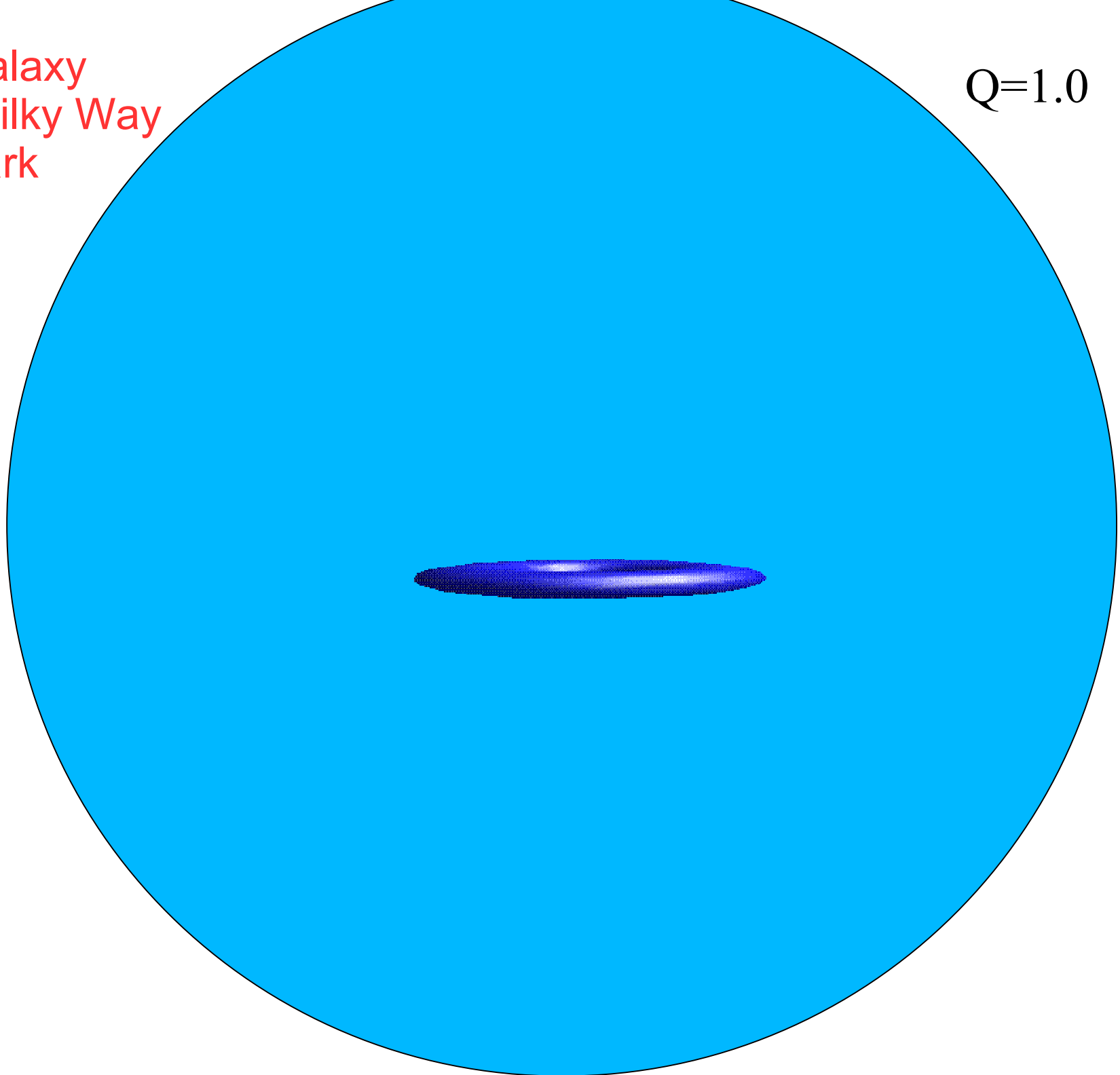
(Yanny & Newberg)

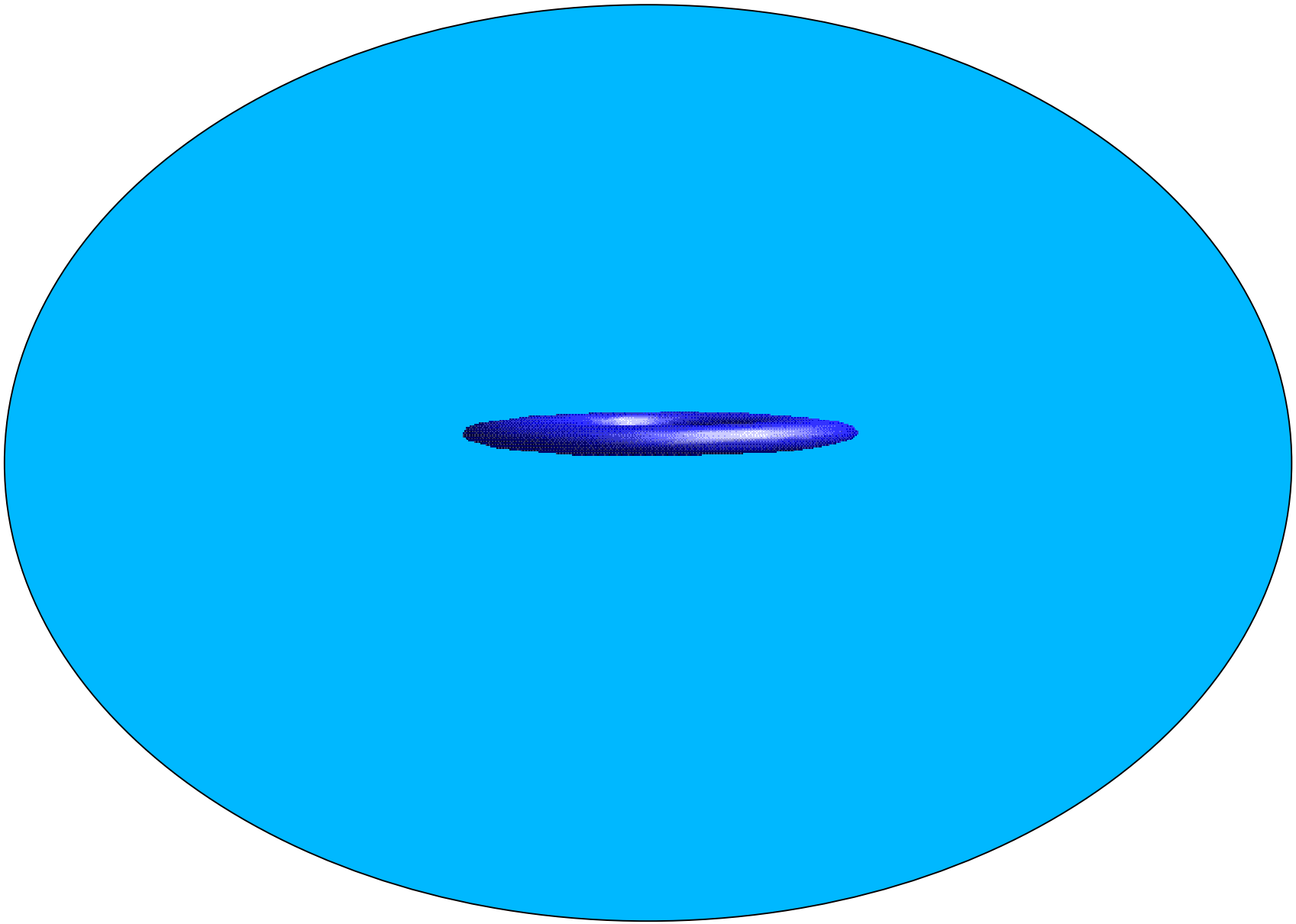






A Disk Galaxy
like the Milky Way
and its dark
matter
halo.

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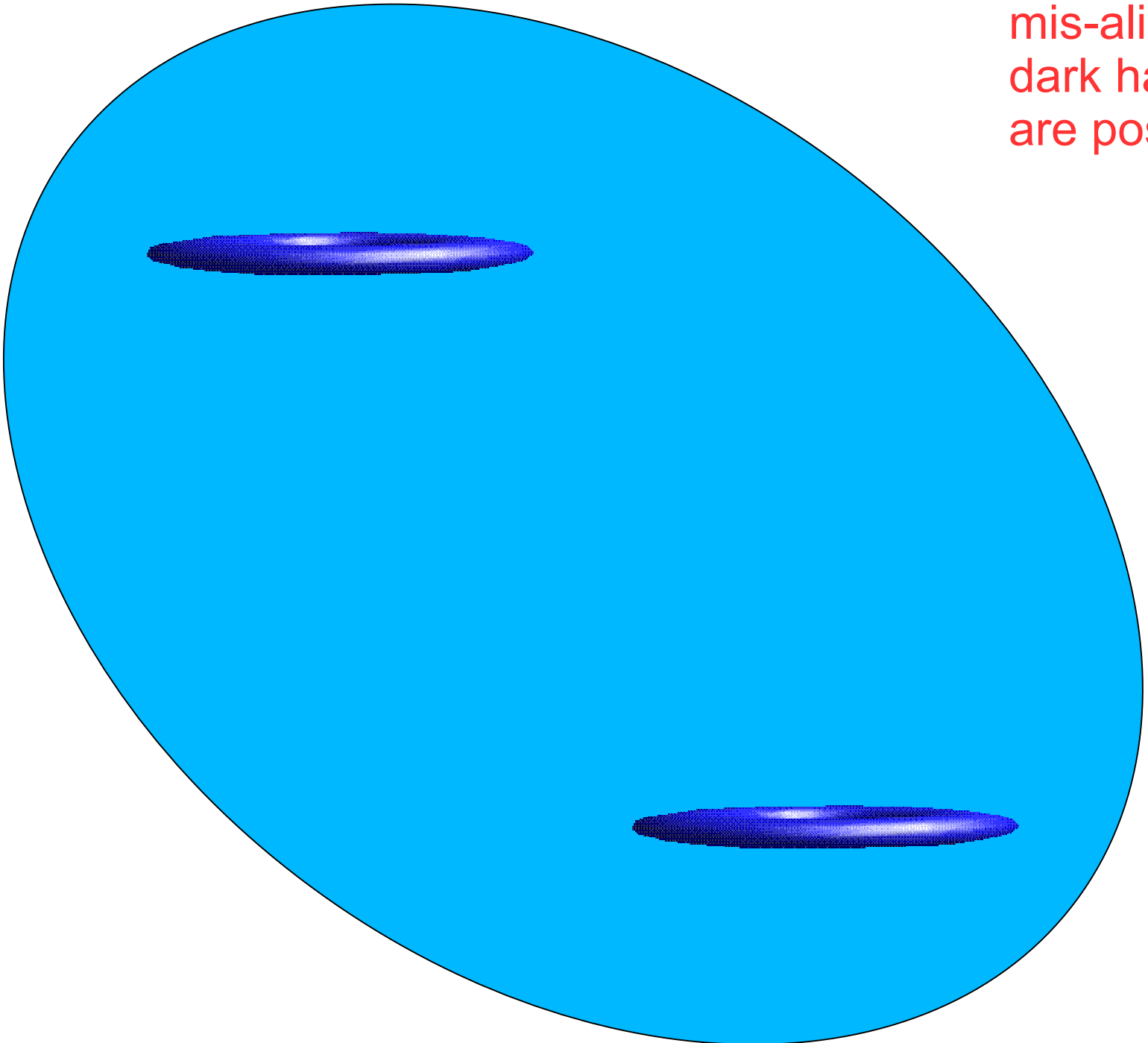
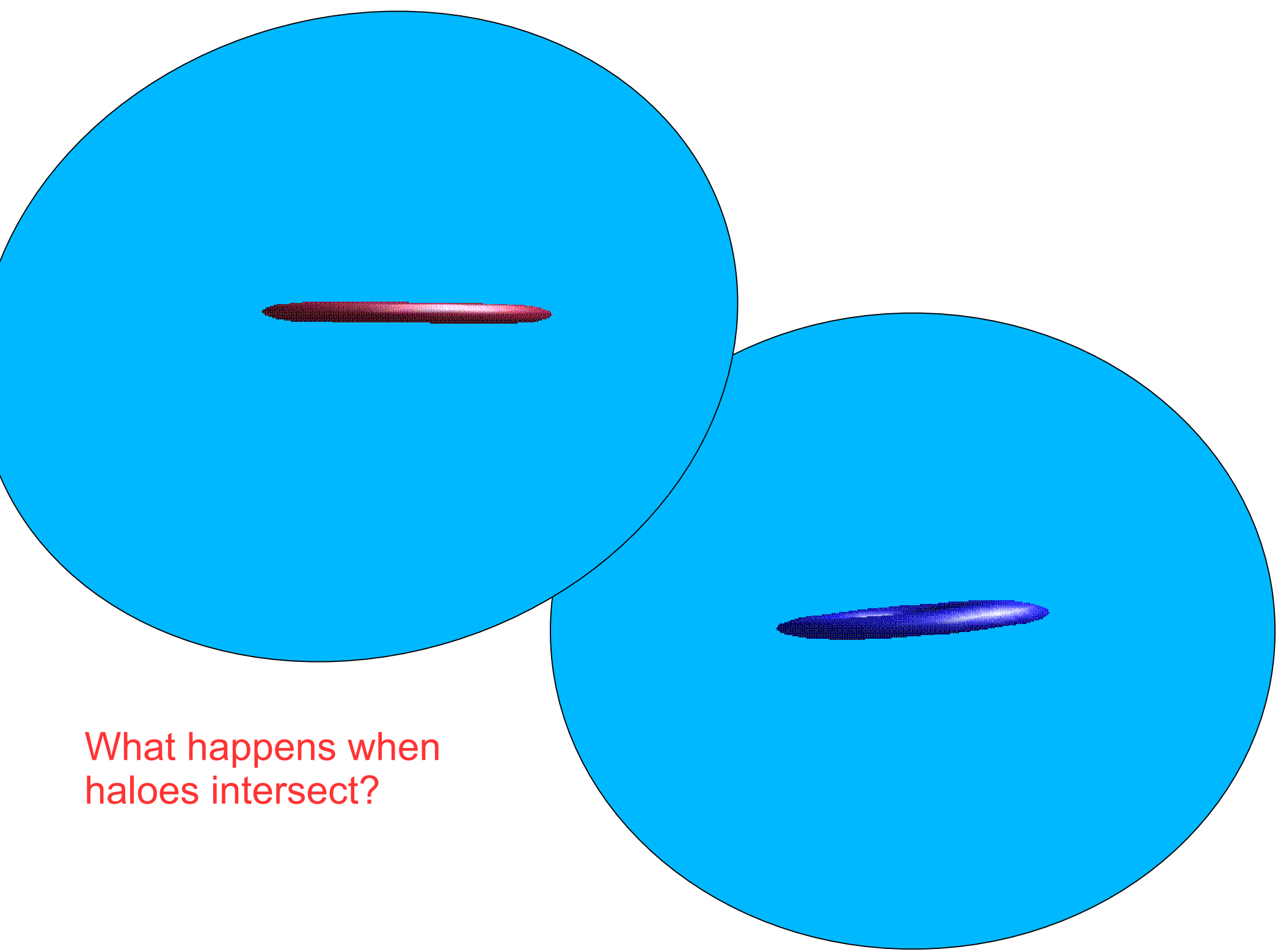


Offcenter
or
mis-aligned
dark haloes
are possible



What happens when haloes intersect?

Idit Zehavi, Josh Frieman et al. find in SDSS projected correlation function a scale at about 1.5 Mpc which may indicate break between single and multiply occupied dark halos.

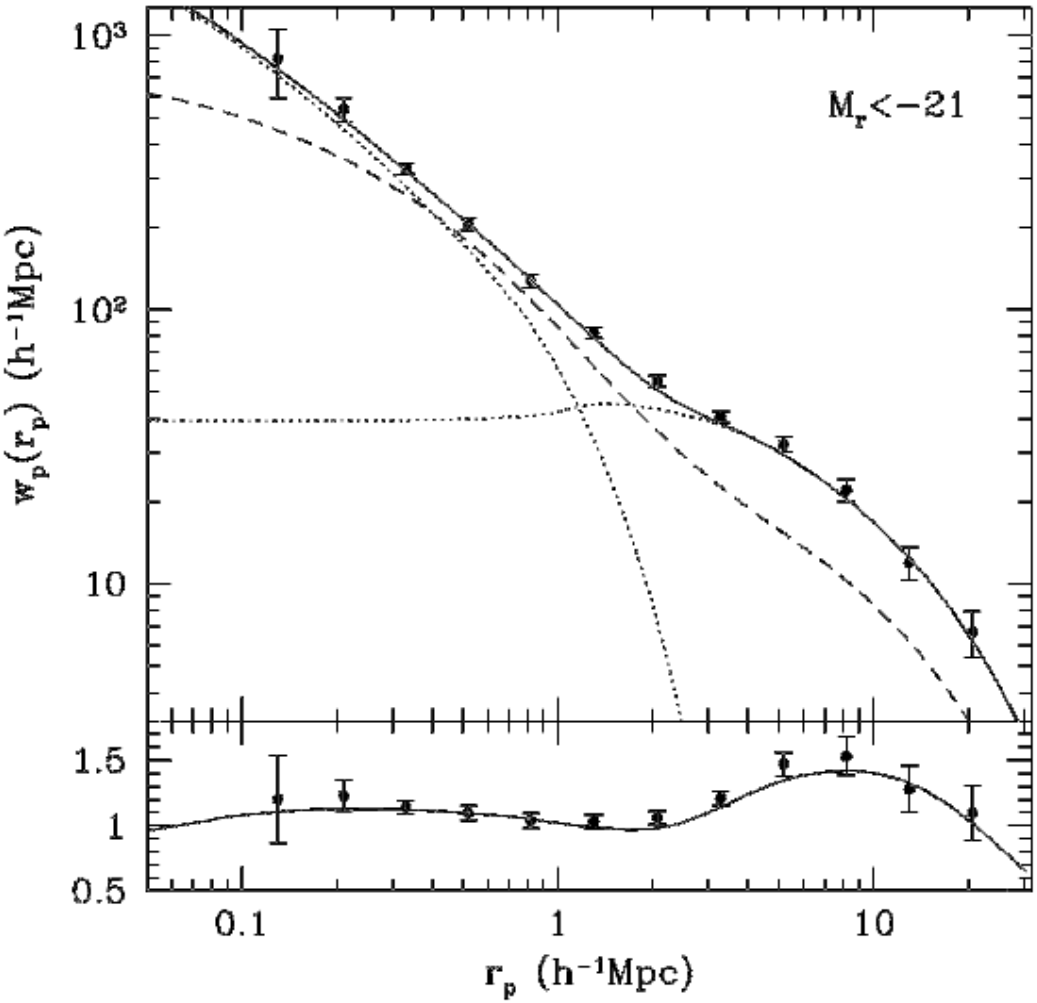
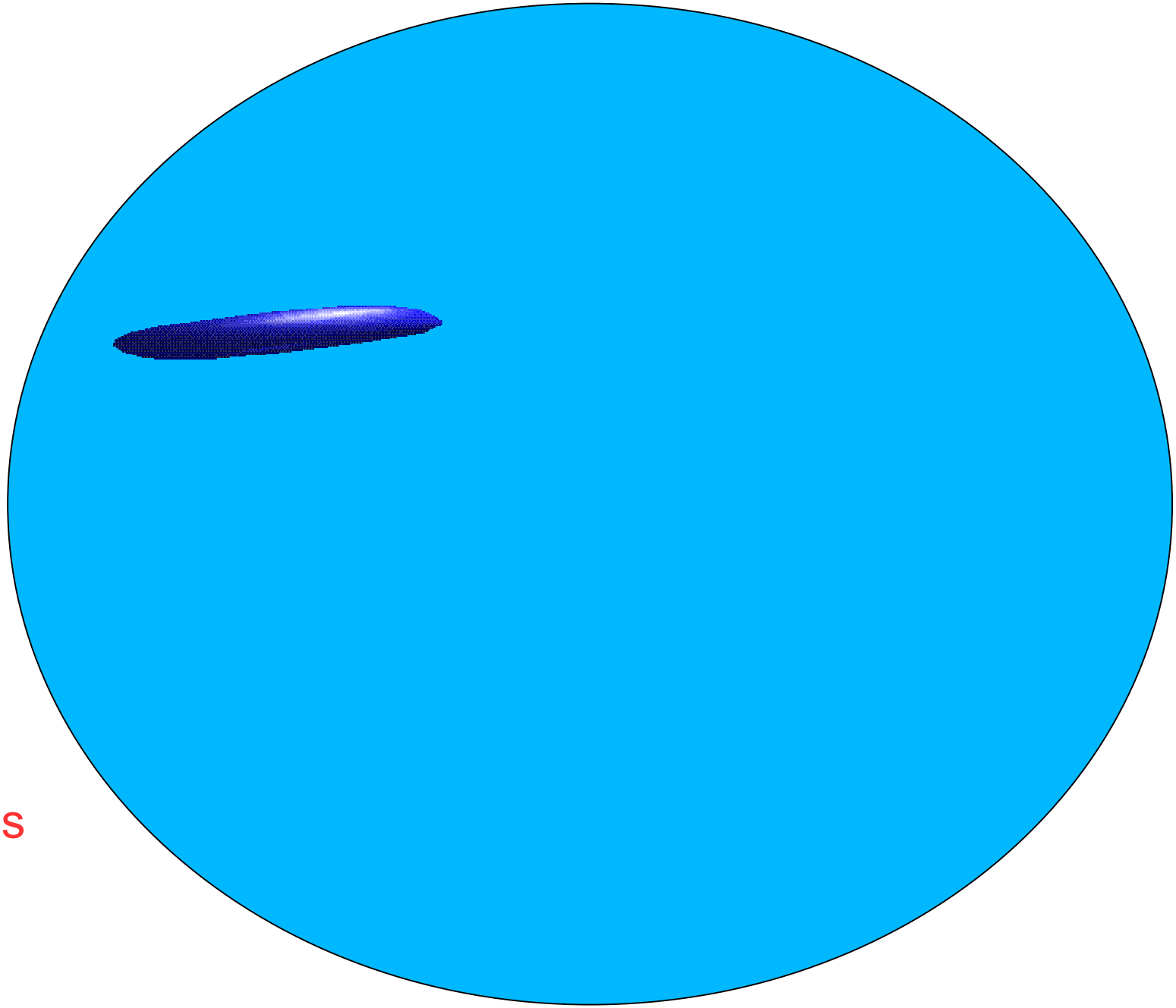


Fig. 3.— Projected correlation function for the $M_{0.1_r} < -21$ sample together with the predicted correlation function for the best-fit HOD model, with parameters $\alpha = 0.89$, $M_1 = 4.74 \times 10^{13} h^{-1} M_\odot$, and $M_{\rm min} = 6.10 \times 10^{12} h^{-1} M_\odot$. The reduced χ^2 for this 2-parameter fit is $\chi^2/{\rm d.o.f.} = 0.93$, while the reduced χ^2 for the power-law fit shown by the solid line in Figure 1 is $\chi^2/{\rm d.o.f.} = 6.12$. The lower panel shows the data and model prediction divided by this best-fit power law. In the upper panel, dotted curves show the 1-halo and 2-halo contributions to $w_p(r_p)$ and the dashed curve shows the projected correlation function for the matter computed from the nonlinear power spectrum of Smith et al. (2002b).

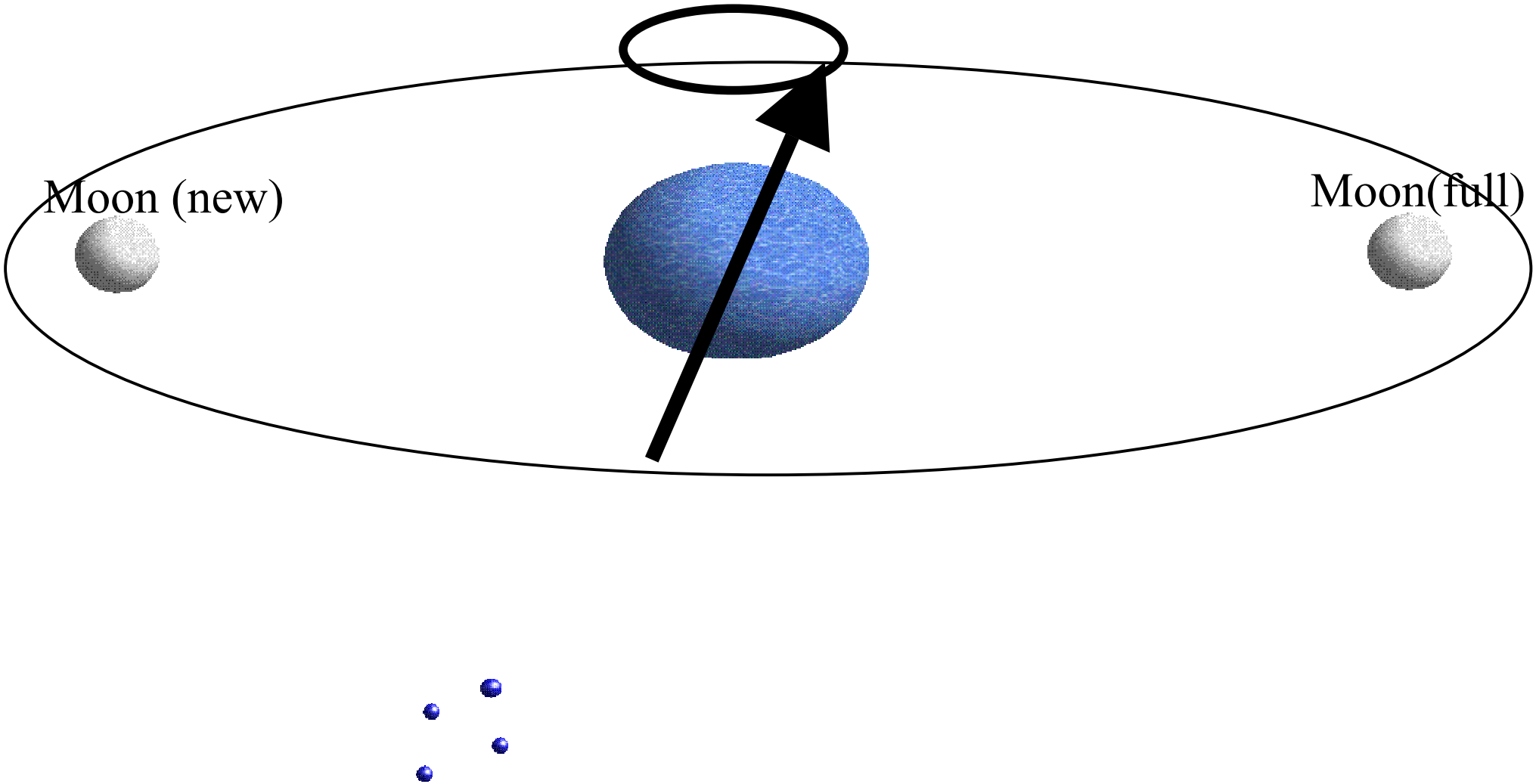


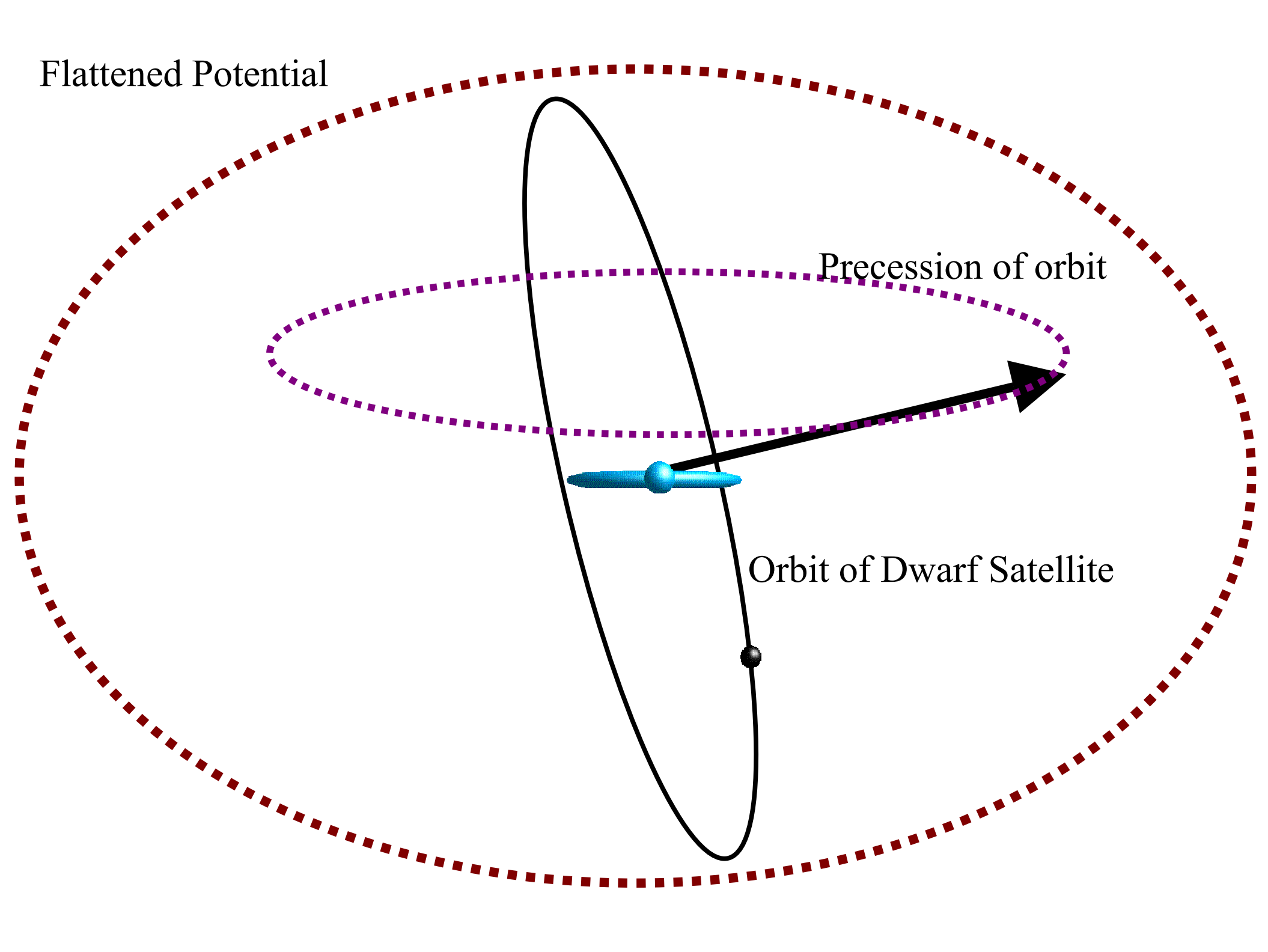
Are galaxies centered in haloes?

Vega

Polaris

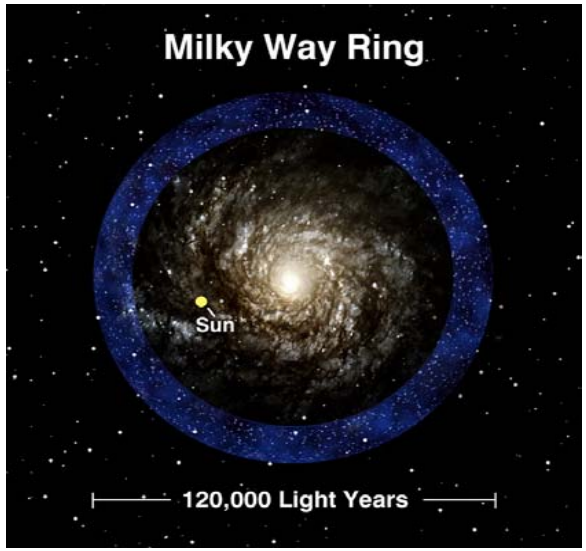
Earth-moon dynamic system is a 'flattened potential'
The result is precession of the Earth's Axis (North Star changes) with period = 26,000 years

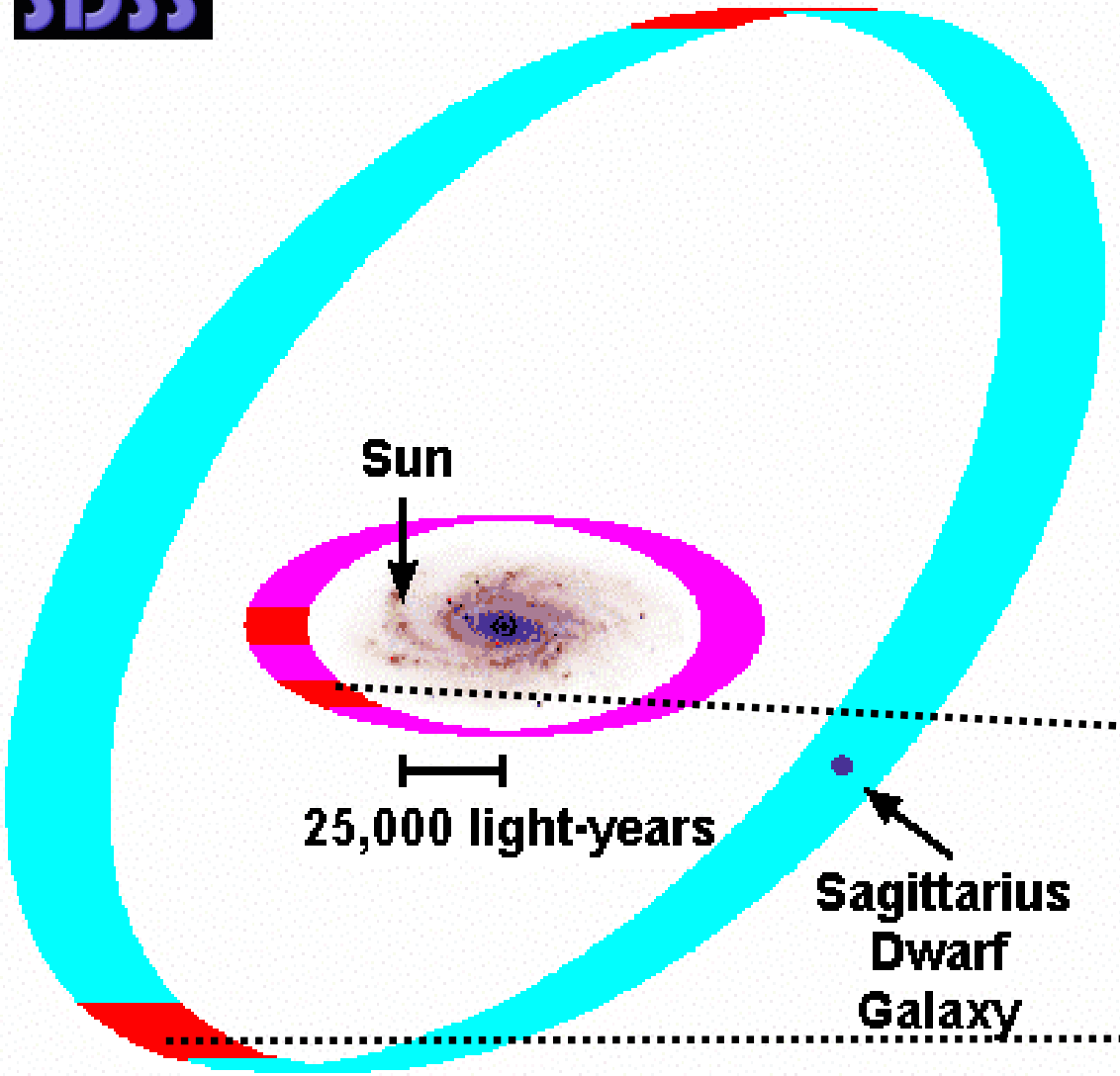


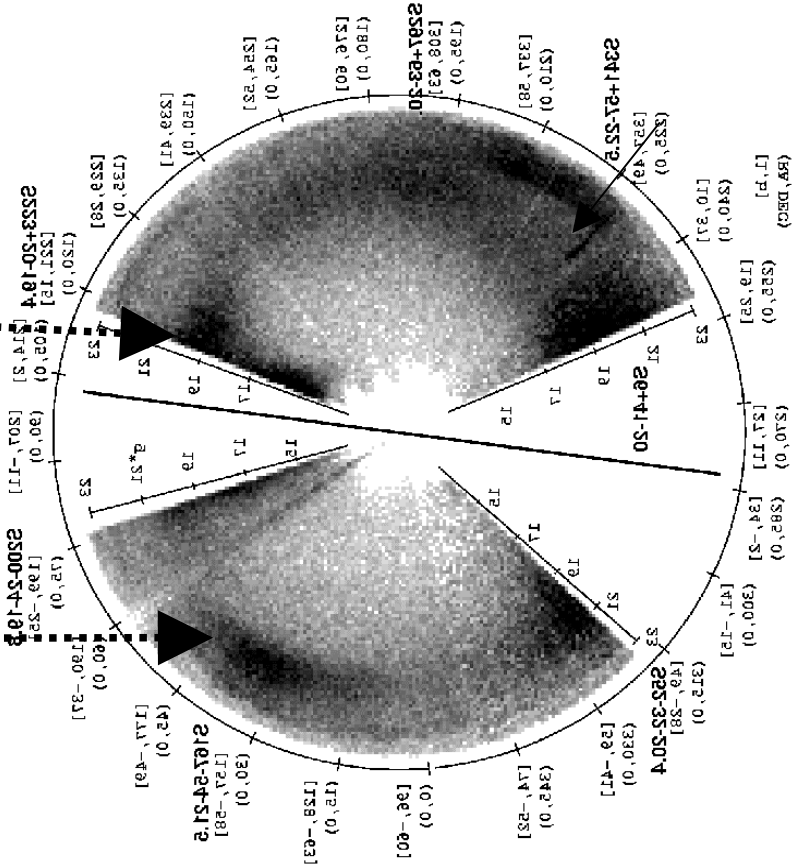

Flattened Potential
Precession of orbit
Orbit of Dwarf Satellite

Rings around the Galaxy

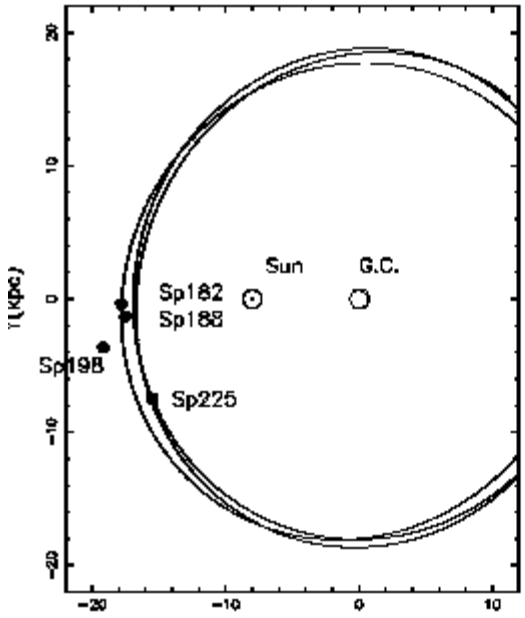
(Yanny & Newberg)

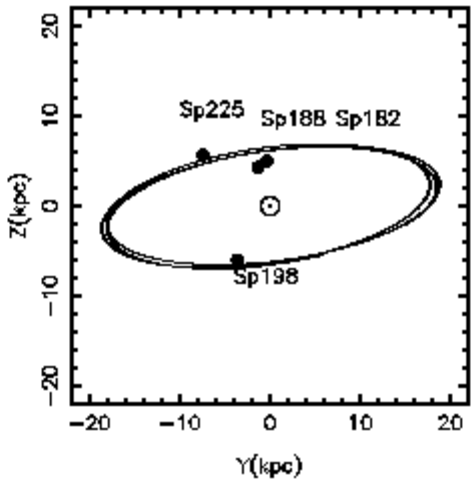


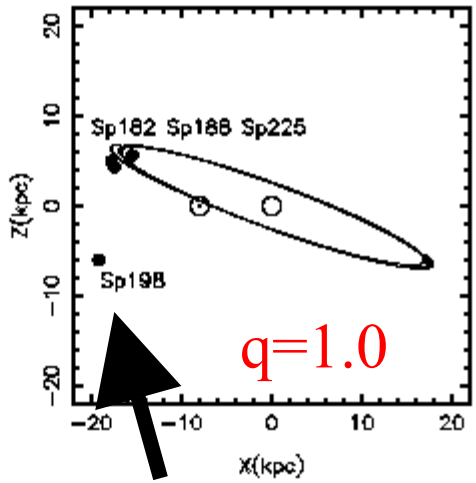




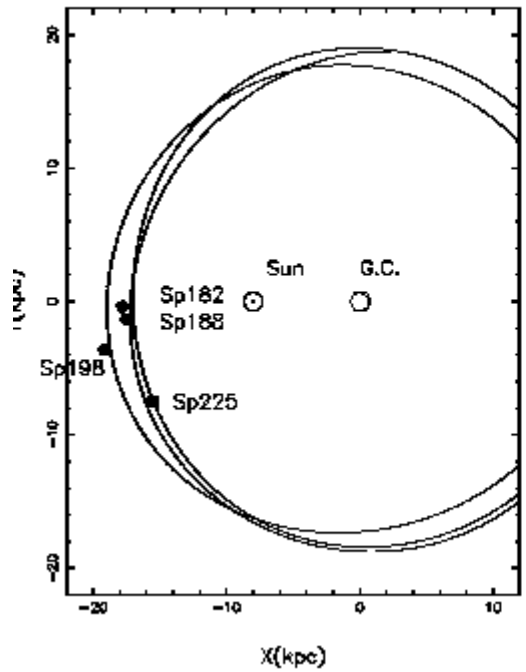
No precession in Spherical potential



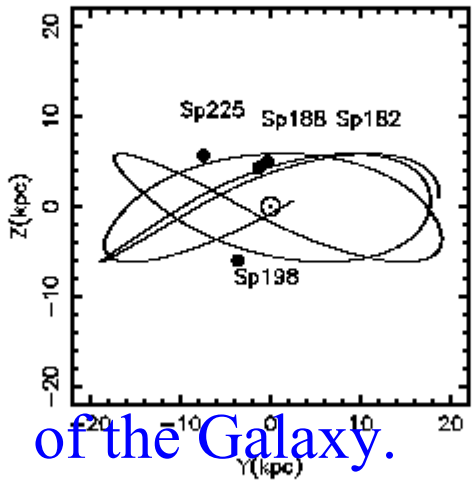


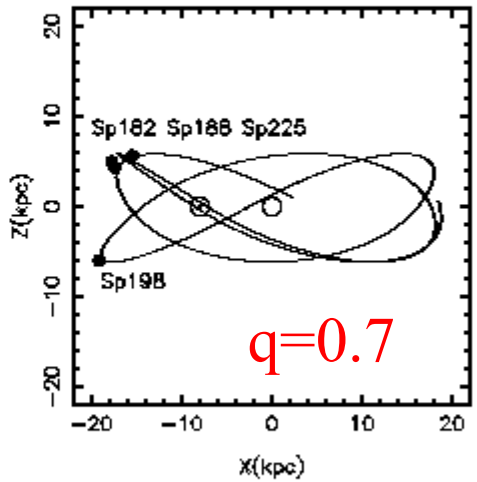


unreachable in same orbit



In flattened potential, can hit points above and below the plane on side of the Galaxy.





Data Release 1 to public imminent

All data through June 30, 2001

SDSS Data Release 1

Sloan Digital Sky Survey

- Where to Start
- News and Updates
- Data Products
- Data Access
- Sky Coverage
- Instruments
- Data Flow
- Algorithms
- Glossary
- Help and Feedback
- Search

The Sloan Digital Sky Survey (see www.sdss.org for general information) will map in detail one-quarter of the entire sky and perform a redshift survey of galaxies, quasars and stars. The data are released to the astronomical community in increments of 1-2 years. After last year's Early Data Release (EDR), the DR1 is the first major data release. It contains

- Imaging of a footprint of 2067 square degrees, and a photometric catalogue of 53 million unique objects
- Spectra of 186240 objects from 1556 square degrees of sky, comprising 134015 galaxies, 17705 quasars, 17623 stars, 9684 sky spectra, 4491 stars dominated by molecular bands (M or later), 1738 spectra with unknown classification, and 984 quasars at redshift $z > 2.3$.

We will provide news and updates of immediate relevance through this web page. If you are new to the SDSS, read "Where to start" first. Learn what SDSS provides on the Data products page, and how to obtain the data on the Data access page.

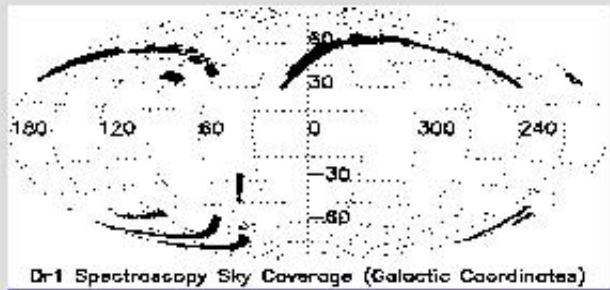
Please refer to the credits page for our sources of funding, participating institutions, and how to acknowledge the use of SDSS data in your publications.

This is version v0_30_30 .
Last modified: Fri Mar 7 15:06:12 CST 2003

If you are using Netscape 4.x and see oversized fonts, please look at the workaround on the Credits page.

Dr1 Best Imaging Sky Coverage (Galactic Coordinates)

Aitoff projection in Galactic coordinates of SDSS DR1 "Best" Imaging Sky Coverage



Dr1 Spectroscopy Sky Coverage (Galactic Coordinates)

Aitoff projection in Galactic coordinates of SDSS DR1 Spectral Sky Coverage

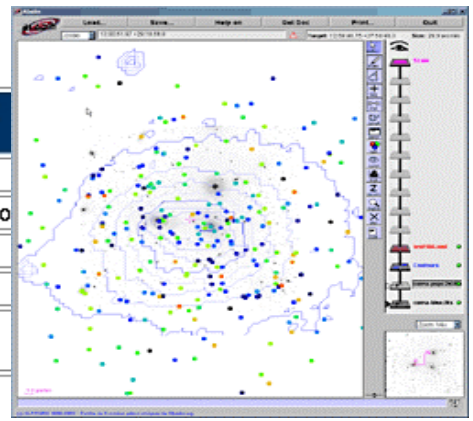
Send your questions to sdss-webmaster@sdss.org

Computational Projects

- Griphyn and iVDGL
- National Virtual Observatory (NVO)
  - Apply grid toolkits to problems in astrophysics
  - Provide testbed, develop grid-enabled applications using SDSS data for challenge problems
  - Create standards for astronomical data collections that will make data easier to use and facilitate joining multiple data collection

Galaxy Morphology Science Prototype: A Case Study in Grid Computing

Data Resources	Computing Resources
Chandra X-ray image (SAO/CXC)	USC/ISI
ROSAT image (GSFC/HEASARC)	UW-Madiso
DSS image (STScI/MAST)	Fermilab
Galaxy cluster catalogs (NED)	
CNOC1 cluster images and catalogs (CADC)	



Johns Hopkins University Press press release showing potential of NVO to correlate between heterogeneous catalogs and make discoveries that need data fr.om both

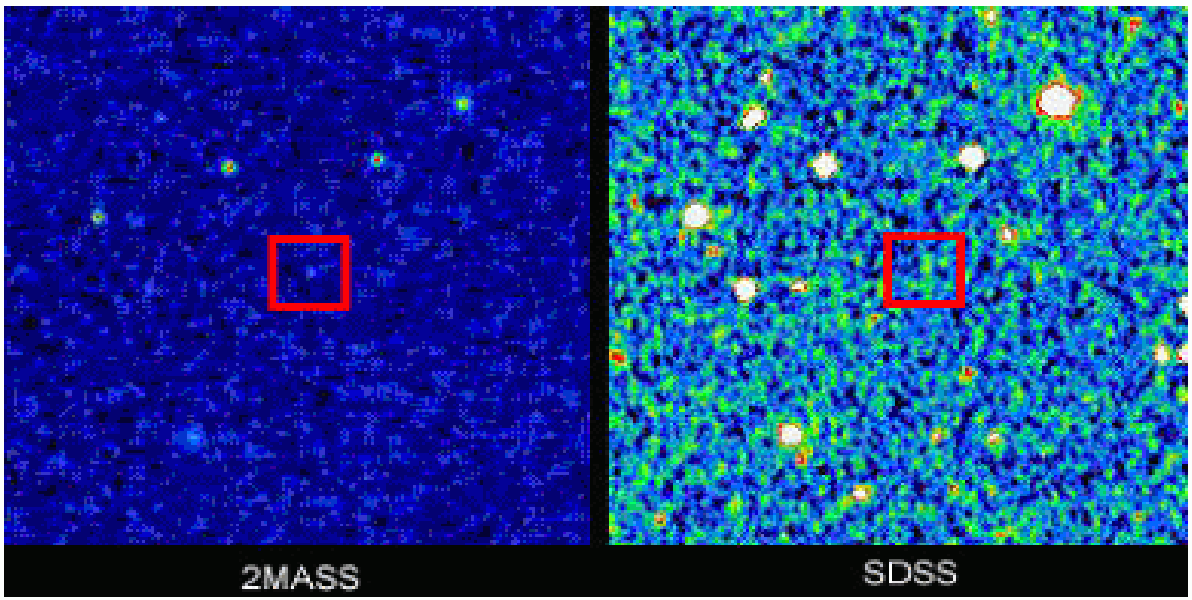
Virtual Observatory Prototype Produces Surprise Discovery

Early demo project identifies new brown dwarf

A new approach to finding undiscovered objects buried in immense astronomical databases has produced an early and unexpected payoff: a new instance of a hard–to–find type of star known as a brown dwarf.

Scientists working to create the National Virtual Observatory (NVO), an online portal for astronomical research unifying dozens of large astronomical databases, confirmed discovery of the new brown dwarf recently. The star emerged from a computerized search of information on millions of astronomical objects in two separate astronomical databases. Thanks to an NVO prototype, that search, formerly an endeavor requiring weeks or months of human attention, took approximately two minutes.

NATIONAL VIRTUAL OBSERVATORY



The 2MASS (left) and SDSS (right) images of the newly found L–type brown dwarf, 2MASSI J0104075–005328.

Summary:

1. SDSS is fully operational; will continue to run at least through June 2005 with FNAL as data processing and data distribution center.
2. Data Release One, served from FNAL, goes public within weeks (3TB total images and catalogs). NVO connection in future.
3. SDSS science tackling distribution of Dark Matter in the universe.
4. Other astrophysics from SDSS in progress: nu mass estimate, dark energy from clustering, weak-lensing large scale structure dark matter probes, history of universe from most distant quasars.