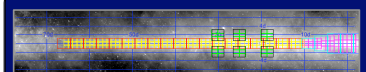
Star Formation Research and the NASA/IPAC Infrared Science Archive

Anastasia Alexov and the IRSA Team

http://irsa.ipac.caltech.edu

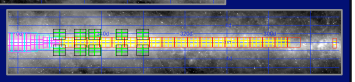
IRSA currently curates and serves data from 24 projects and missions, including 120 source catalogs, 48 image data collections, and seven spectral data sets. This paper highlights the data and services of importance to star formation researchers. IRSA hosts science products from the IRAS, 2MASS, and MSX surveys, the Spitzer Legacy team surveys GLIMPSE, MIPSGAL and SAGE, the pointed observations of the Spitzer Legacy programs C2D and FEPS, and the SWAS mission. IRSA is also interoperable with the Spitzer archive. IRSA has recently enhanced its data access services to support input of source lists, and scripts to support bulk download of data. It will soon complete the definition of "program-friendly interfaces" (including those that comply with VO-standards) that will automate access to all its data through queries embedded in programs and scripts. IRSA offers unique tools that support extraction of optimized science content of its data sets. The IRAS Scan Processing and Integration Tool ("Scanpi"), which computes weighted average fluxes of 1-dimensional (in-scan) IRAS raw survey data, has been modernized to give the user insight into the processing steps. The Montage image mosaic engine, available for download, computes science-grade mosaics that preserve the calibration and astrometric fidelity of the input images. It has been used by Spitzer Legacy teams in generating their science products, and it powers an on-request mosaic service accessible from a simple web form. IRSA will deliver new data sets applicable to star formation in the next four years. In mid-2011, it will assume responsibility for the long-term Spitzer archive, and will serve data from all the Spitzer Legacy Enhanced Products. It will host the archive for WISE, and will provide access to science products from the Herschel and Planck missions.

Spitzer Legacy Enhanced Products



GLIMPSE I, II, 3D

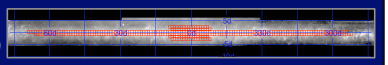
(PI's: Churchwell Benjamin)



Galactic Legacy Infrared Midplane Survey Extraordinaire I , II, 3D

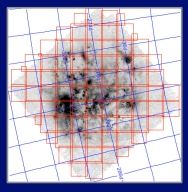
Data Available (3D data to be released soon):
- •IRAC image mosaics
- •Source Catalogs/Archives

MIPSGAL (PI: Carey)



A 24 and 70 Micron Survey of the Inner Galactic Disk with MIPS

Data Available:
- •MIPS image mosaics



SAGE (PI: Meixner)

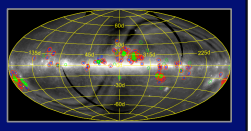
Surveying the Agents of a Galaxy's Evolution

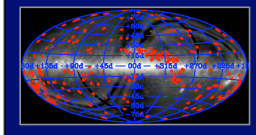
Data Available:
- •MIPS images
- •IRAC time stamp images
- •Source catalogs

C2D (PI: Evans)

From Molecular Cores to Planet-Forming Disks

Data Available:
- •IRAC & MIPS images
- •IRS Spectra
- •Source Catalogs





FEPS (PI: Meyer)

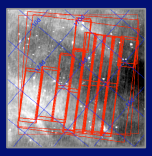
The Formation and Evolution of Planetary Systems

Data Available:
- •IRAC & MIPS images
- •IRS Spectra & Models
- •Source List

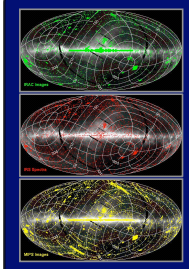
Taurus (PI: Padgett)

Finishing the Map of the Taurus Molecular Clouds

Data to be released soon:
- •IRAC & MIPS images
- •Source catalog



Mission Datasets Relevant to Star Formation



Spitzer post-BCD

Spitzer post-processed Basic Calibrated Data (post-BCD) data products housed at the Spitzer Science Center (SSC)

Wavelengths: 3.6-160um

Products include:
- •IRAC images
- •IRS images and spectra
- •MIPS images and spectra

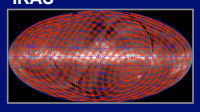
2MASS

Two Micron All-Sky Survey

Wavelengths: J, H, Ks

Products include:
- •Point Source Catalog (PSC)
- •Extended Source Catalog (XSC)
- •Large Galaxy Atlas (LGA)
- •All-Sky images
- •Extended Mission datasets

IRAS



The Infrared Astronomical Satellite

Wavelengths: 12, 25, 60 and 100 um

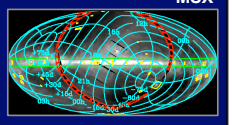
Products include:
- •Sky Survey Images
- •Source catalogs

MSX

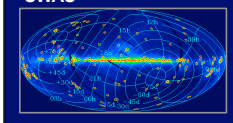
The Midcourse Space Experiment

Wavelengths: 8-21 um

Products include:
- •Survey images and source lists
- •Deep scans of star formation regions and galaxies
- •Image scans of IRAS gaps



SWAS



The Submillimeter Wave Astronomy Satellite

Wavelengths: 1.4-2.8GHz

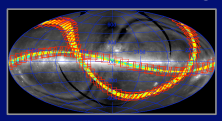
Products include:
- •Spectra of O2 (487 GHz), CI (492 GHz), CO (551 GHz), H20 (549,557 GHz) lines in FITS and CLASS format

IRTS

The Infrared Telescope in Space

Wavelengths: 1-1000 um

Products include:
- •Source catalogs
- •Far-infrared spectral maps



Unique Science Tools

Montage

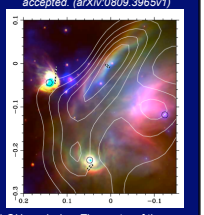
Montage composes FITS images into mosaics

http://montage.ipac.caltech.edu

- •Preserves spatial and calibration fidelity
- •Supports all WCS projections
- •Independent modules for mosaicking steps
- •Tools for managing and manipulating large image files
- •Available for download

- •Used by Spitzer Legacy Teams:
  - •GLIMPSE I, II, 3D
  - •SWIRE
  - •MIPSGAL
  - •SAGE
- •Users can create on-demand, science-grade mosaics online using:
  - •2MASS (J, H, Ks)
  - •DSS (B, R, I, …)
  - •SDSS (u, g, r, i, z)

S. Casassus et al. (2008). MNRAS, accepted. (arXiv:0809.3965v1)



Three-color mosaic of Rho Oph W computed with Montage (Casassus et al. 2008); red: MIPS 24 um; green: IRAC4 at 8 um, dominated by the 7.7 um PAH band; blue: 2MASS Ks-band image. The x and y axes show the offsets in RA and DEC from Rho Oph W, in degrees. The contours follow the 31 GHz emission. The centre of the black circles indicate the positions of the early-type stars S 1, SR 3, and HD147889.

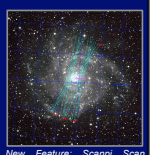
Scanpi

The IRAS Scan Processing and Integration Tool

http://scanpiops.ipac.caltech.edu:9000

Overview:
- • An interactive tool for viewing, plotting and averaging the calibrated survey scans from IRAS.
- • Measures the fluxes of extended, confused or faint sources, for diagnosing source extent, and for estimating local upper limits.
- • Sensitivity gain of 75% over IRAS Faint Source Catalog or a factor of 2-5 over the IRAS Point Source Catalog (PSC).
- • Allows user interaction to subset, plot and coadd IRAS scan data at any sky position.

Scanpi was modernized and improved (2007):
- • More transparent processing steps
- • Adjustable fitting and display parameters
- • All products available from each processing step
- • Scan tracks overplotted on sky maps (see image on right)
- • Added UTC date to all files
- • Plotting has been colorized as visual aid
- • Source lists can also be uploaded



New Feature: Scanpi Scan Tracks plotted over object IC342 on DSS image backdrop

Future Datasets to be Archived at IRSA…

IRSA will be interoperable with the Herschel Observatory Archive