



Data Processing, Validation, and Products of the SWIRE Survey

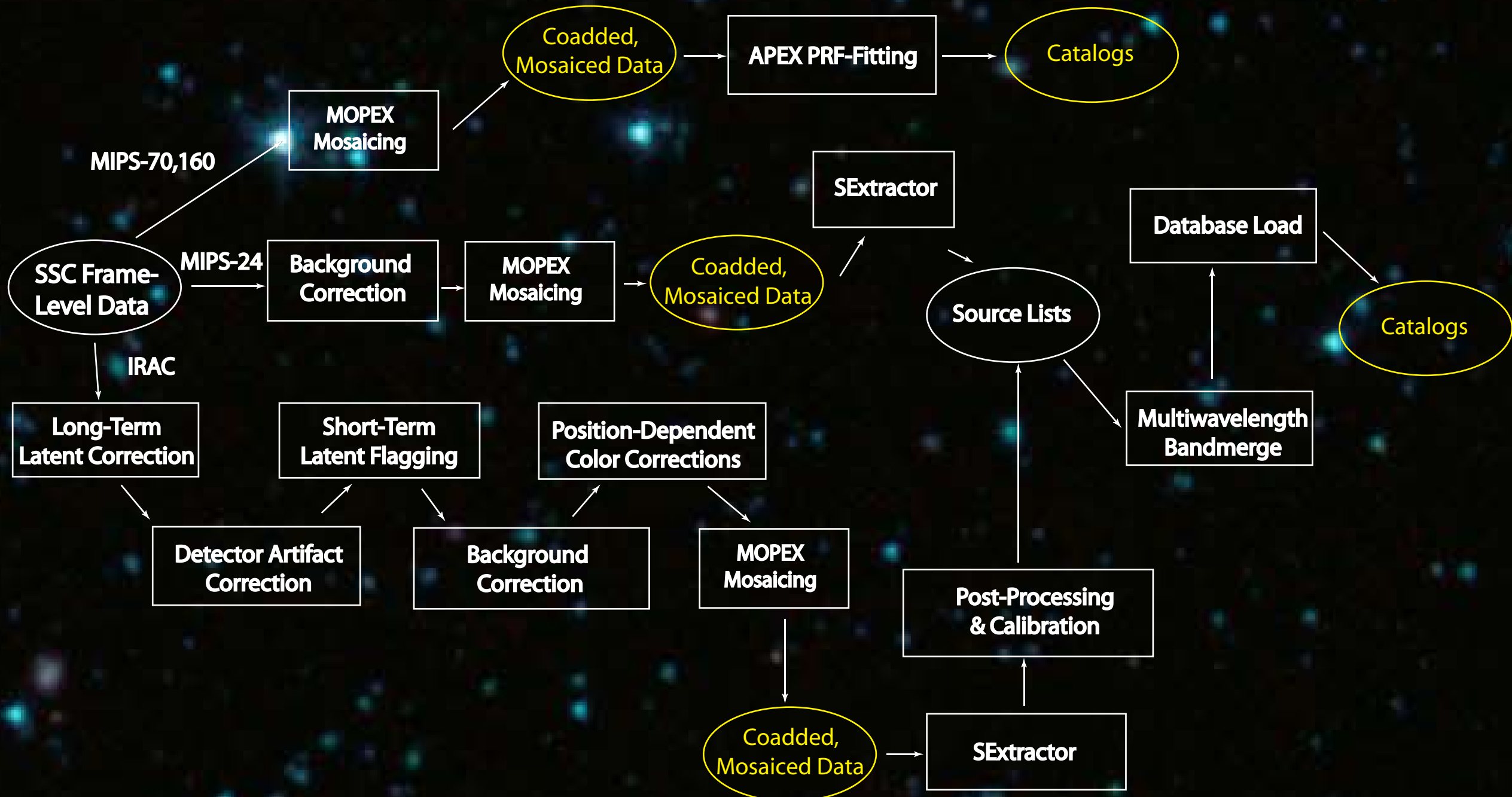
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Introduction to SWIRE

- The SWIRE Survey:
- stands for Spitzer Wide-area Infrared Extragalactic Survey.
 - is the largest Spitzer Legacy Program.
 - is an areal survey of fifty square degrees, split among ELAIS-N1, ELAIS-N2, ELAIS-S1, the Lockman Hole, the Chandra Deep-Field South, and the XMM-LSS field.
 - is specifically located in the lowest-background regions of the IR sky. Most optical survey regions have very high infrared backgrounds.
 - covers the wavelengths: 3.6, 4.5, 5.8, and $8\mu\text{m}$ with the Infrared Array Camera, and 24, 70, $160\mu\text{m}$ with MIPS.
 - also includes UgrIZ imaging over most of the survey area.
 - is publicly available.
 - makes available advanced data products including images and catalogs.
 - can detect an L^* galaxy to $z=2$.
 - is the Sloan Digital Sky Survey at higher redshift, encompassing the same volume at $z=1$ as the SDSS.

Data Processing

Data is processed with a combination of community software, custom IDL procedures, and shell scripts. Image and source tracking is accomplished via an Informix database. Integration of database resources directly with IRSA provides integration with IRSA tools.



Data Validation

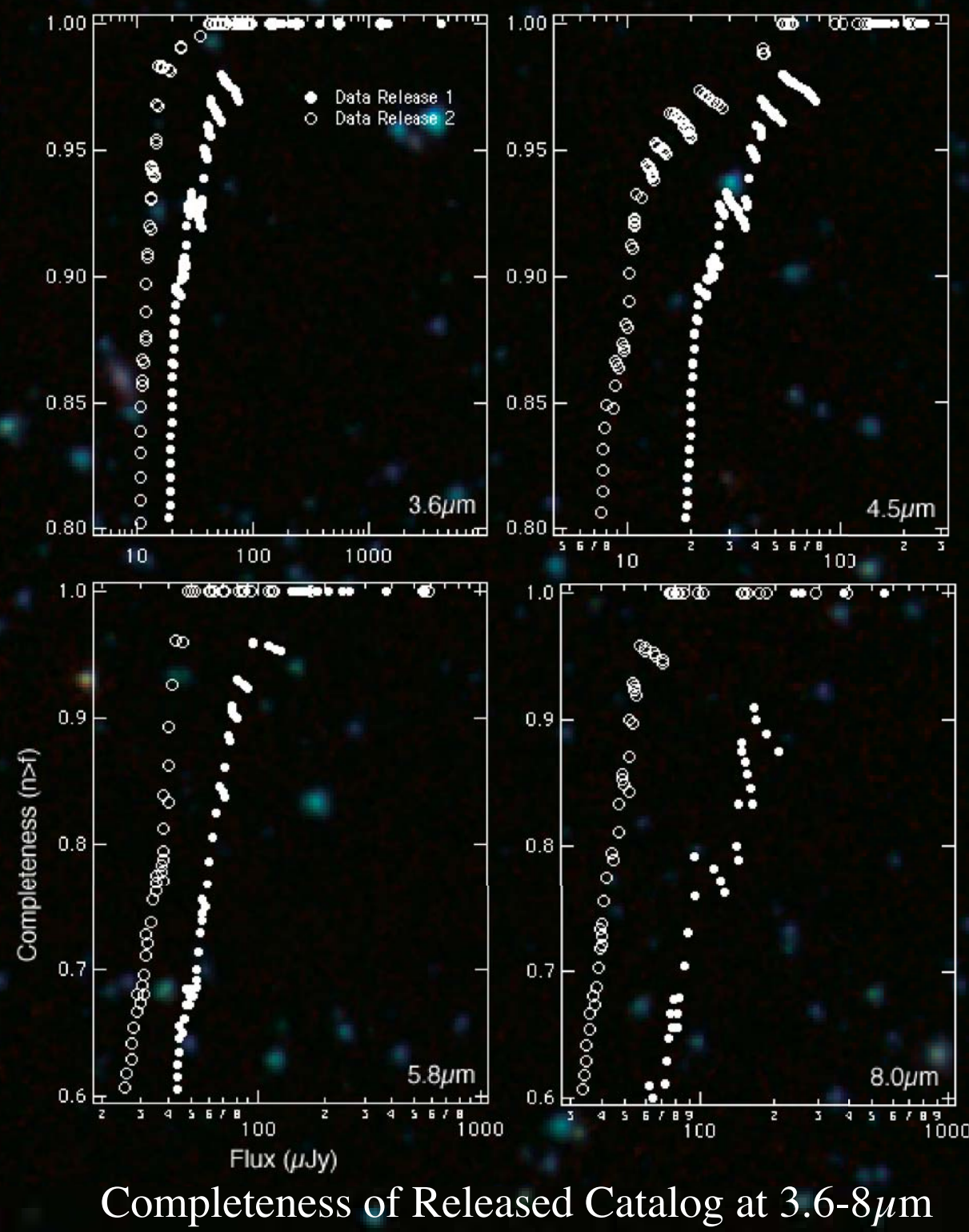
SWIRE data products are highly validated.

The optical-IRAC-MIPS24 catalog requires a detection at 3.6 and $4.5\mu\text{m}$ above a specific SNR level which translates to $10\mu\text{Jy}$ (for the bulk of the survey). Early testing showed that this multiband requirement played a key role in ensuring that reliability met the survey design requirements. Due to IRAC's sensitivity, this excludes very few long-wavelength sources.

Completeness and reliability were determined through use of a "validation field" in ELAIS-N1. A small region was observed separately and to much greater depth than the rest of the SWIRE survey. Targets were matched within this deeper dataset to directly determine completeness. Monte Carlo simulations involving embedding artificial sources within the actual data and attempting to extract them were also used. Completeness curves for the IRAC data are shown at right, the effective survey limits are in the table above.

Reliability was also determined by manually examining several square degrees randomly distributed throughout the survey, and verifying the validity of all sources in the extracted catalog. The Optical-IRAC-MIPS24 catalog is of greater than 99.9% reliability overall.

SWIRE Sensitivity Limits*		
IRAC		
Channel	Image Sensitivity	DR2 Catalog 95% Completeness
3.6 μm	3.7 μJy	14 μJy
4.5 μm	5.4 μJy	15 μJy
5.8 μm	48 μJy	42 μJy
8.0 μm	37.8 μJy	56 μJy
MIPS		
Channel	Image Sensitivity	DR2 Catalog Limits
24 μm	230 μJy	280 μJy (90% completeness)
70 μm	18 mJy	15.5 mJy (flux limits)
160 μm	150 mJy	90 mJy (flux limits)
* estimated 5		



Data Products

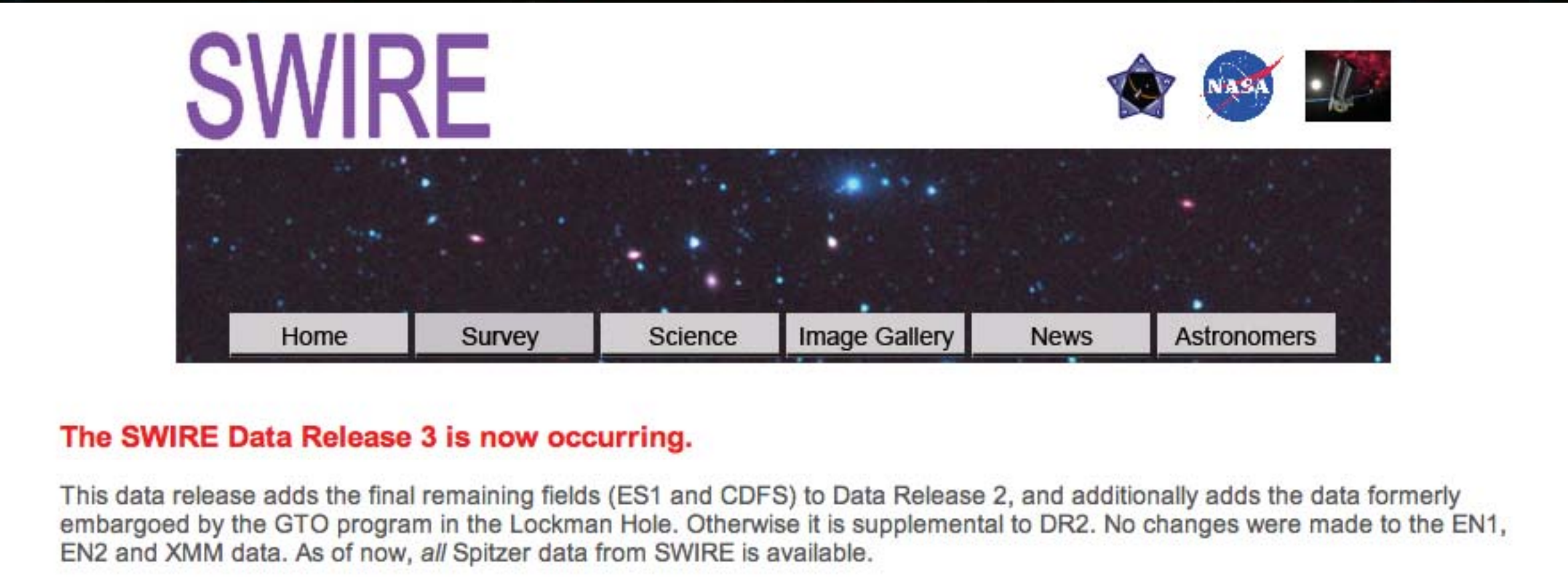
- There are several types of image products:
- Coadded mosaiced images, one per each of the four IRAC bands (3.6, 4.5, 5.8, and 8 microns). The data are supplied for convenience in the form of ``tiles" of roughly one degree in size. There are also associated coverage, mask, and uncertainty images.
 - Three coadded, mosaiced images, one for each of the MIPS bands (24, 70, and 160 microns). These are supplied as one image for the entire field.
 - Optical images in five optical bands (UgrIZ) where available. These data are tiled like the IRAC data.
 - Pseudo-truecolor images made from the IRAC 3.6, 4.5, and 8 micron data. The image in the background of this poster is one of these.

- There are four primary SWIRE catalogs at this time.
- A bandmerged catalog consisting of optical, IRAC, and MIPS-24 fluxes, associated with each other. This catalog has extremely high C&R (described at left and in the data release paper). This catalog requires detections at 3.6 and 4.5 microns above specific SNR thresholds.
 - Three separate catalogs for 24, 70 and 160 microns. These catalogs are single-band only and are cut based only on the MIPS waveband in question.

Data Retrieval

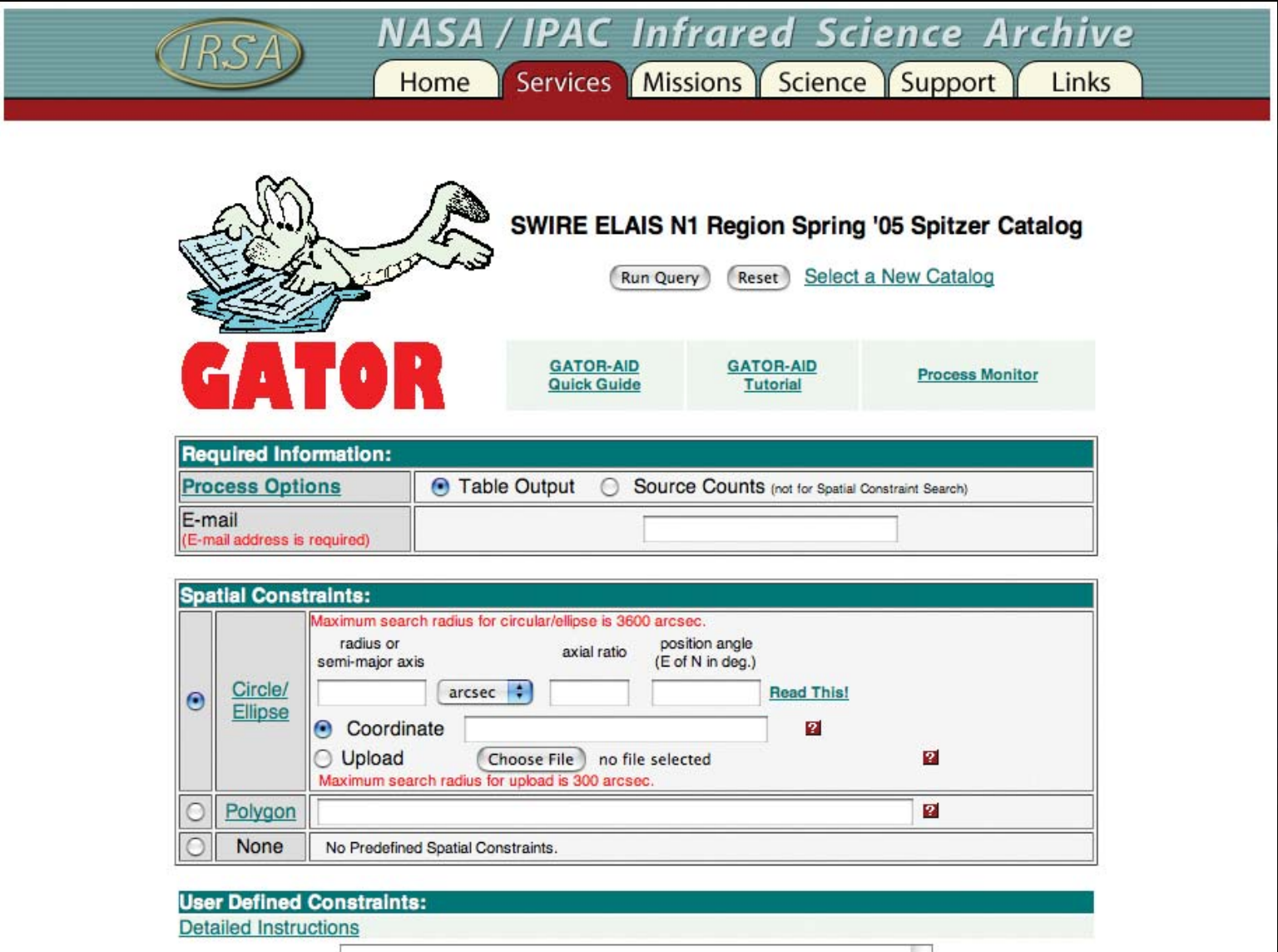
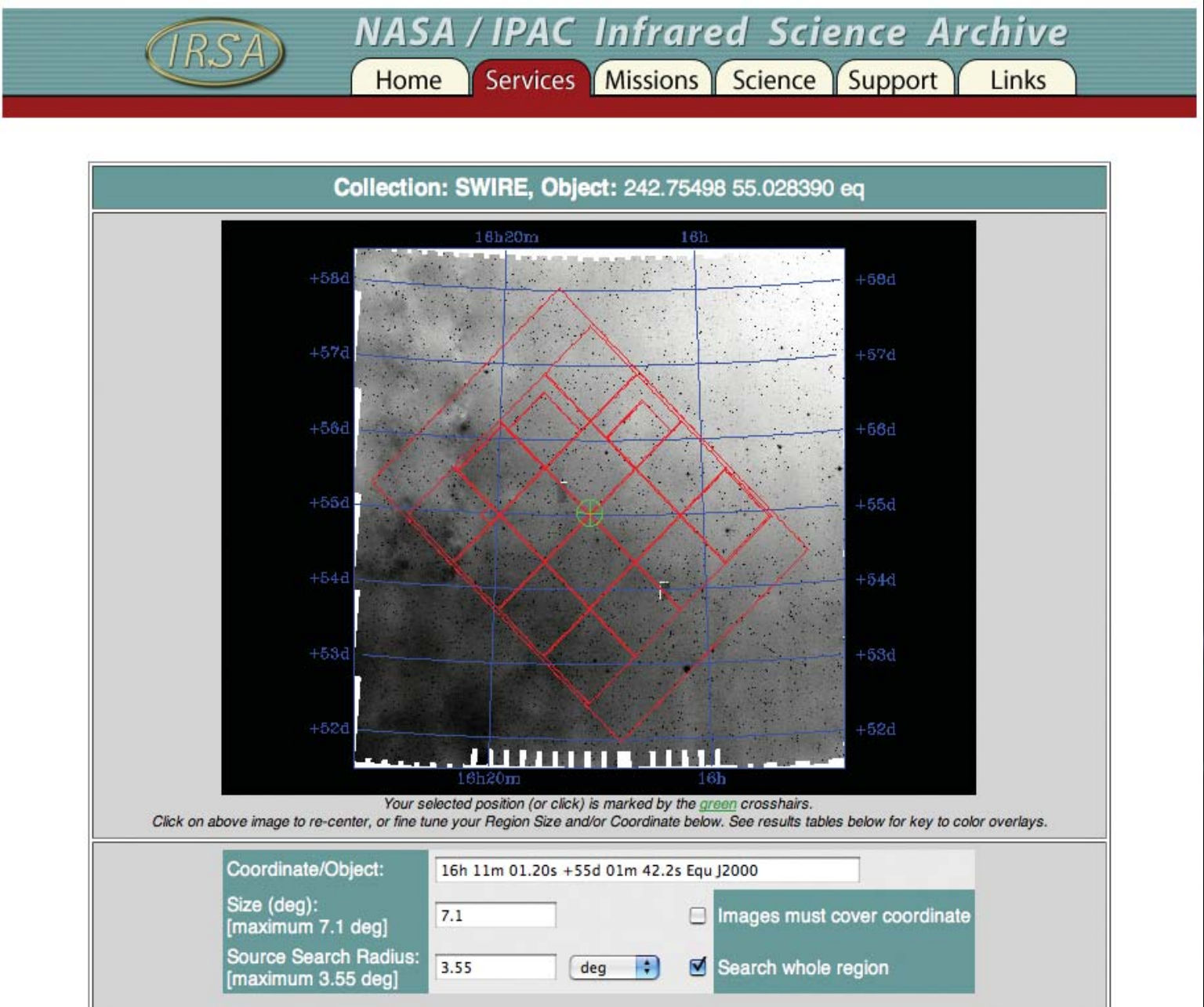
The data can be retrieved in any of several ways. The most direct option is to go to the SWIRE web page at the URL below. From here you can find pointers to copies of the fully processed FITS images and ascii versions of the catalogs, in most cases distributed from the Spitzer Science Center server. This method is preferable because it will ensure that you get the latest version of the SWIRE data. There have been several generations of released data, and it is best to get the latest.

http://swire.ipac.caltech.edu/swire/astronomers/data_access.html



IRSA (<http://irsa.ipac.caltech.edu>) provides sophisticated SWIRE data retrieval options. The IRSA Gator search engine allows sophisticated queries of the catalog data, selecting, for example, objects with specific flux limits, colors, or within specified regions. Users can also select subsets of the available types of data, rather than the full several hundred columns of the full catalog. This may be a more attractive than manipulating the raw ascii catalogs available from the Spitzer Science Center, which may be several hundred MB in size. IRSA can also provide such services as automated matching of the catalogs to uploaded source lists.

The IRSA Atlas image service allows users to easily identify and retrieve image products. Again, this may be a more attractive for many users since it will allow them to quickly identify which image tiles contain their regions of interest.



The Background on this poster is a pseudo-color composite, where the blue, green, and red components of the image are mapped from the 3.6, 4.5, and $8\mu\text{m}$ IRAC channels. The image is 0.36 degrees across, and is roughly 0.25% of the total survey area.