GLIMPSE, GLIMPSEII and GLIMPSE-3D Data Products & Delivery Schedule

Version 1.0
December 1, 2006

1 Overview

The Galactic Legacy Infrared Midplane Survey Extraordinaire (GLIMPSE) is an infrared survey of the inner Galactic plane using the Infrared Array Camera (IRAC) (Fazio et al. 2004) on board the *Spitzer* Space Telescope (SST) (Werner et al. 2004). IRAC has four detectors, centered at approximately 3.6, 4.5, 5.8 and 8.0 μm. GLIMPSE covered a latitude range of $\pm1^\circ$, and a longitude range of $|l| = 10^\circ - 65^\circ$ (Benjamin et al. 2003). GLIMPSEII imaged longitudes $\pm10^\circ$ of the central region of the Galaxy. The latitude coverage is $\pm1^\circ$from $|l| = 10^\circ to\ 5^\circ$, $\pm1.5^\circ$ from $|l| = 5^\circ to\ 2^\circ$, and $\pm2^\circ$ from $|l| = 2^\circ to\ 0^\circ$(excluding the Galactic center region l=$\pm1^\circ$, b=$\pm0.75^\circ$ observed by Dr. Susan Stolovy's GTO program (PID=3677)). The GLIMPSE-3D program studies the vertical stellar and interstellar structure of the Inner Galaxy by observing latitude strips farther away from the Galactic plane. Figure 1 shows the GLIMPSE-3D coverage as well as GLIMPSEII and part of the GLIMPSE coverage. All of GLIMPSEII and much of GLIMPSE-3D have 2 epoch coverage (3 visits on the sky; the first two taken at one epoch and the other months later) useful for variability studies.

The GLIMPSE, GLIMPSEII and GLIMPSE-3D enhanced data products consist of highly reliable Point Source Catalogs (GLMC), more complete Point Source Archives (GLMA) and mosaic images covering the survey areas. We use the DAOPHOT package (Stetson 1987) for point source photometry on individual IRAC frames, modified to work with highly variable backgrounds. The IRAC images are mosaicked, using the Montage package (montage.ipac.caltech.edu), into rectangular tiles that cover the surveyed region. The units are MJy/sr and the coordinates are Galactic. A document describing the steps used to produce the photometry for the source lists, a Quality Assurance Document (discussing the astrometric and photometric accuracy along with other issues affecting data quality) and a Data Products Document with more details about the Wisconsin IRAC pipeline and source list criteria can be found at www.astro.wisc.edu/glimpse/docs.html.

The enhanced data products are:

1. The GLIMPSE Catalog (GLMC, or the "Catalog"): Point sources whose selection criteria are determined by the requirement that the reliability be $\geq$99.5%. The photometric uncertainty is typically < 0.2 mag. For each IRAC band the Catalog provides fluxes (with uncertainties), positions (with uncertainties), the areal density of local point sources, the local sky brightness, and a flag that provides information on source quality and any anomalies present in the data. The sources were bandmerged with the Two Micron All Sky Survey (2MASS) Point Source Catalog, providing imaging at similar resolution to GLIMPSE, in the J (1.25 μm), H (1.65 μm), and K_s (2.17 μm) bands. The Catalog format is ASCII, using the IPAC Tables convention (irsa.ipac.caltech.edu/applications/DDGEN/Doc/ipac_tbl.html). The GLIMPSE Catalog contains about 30 million sources and the GLIMPSEII Catalog contains about 16 million sources.

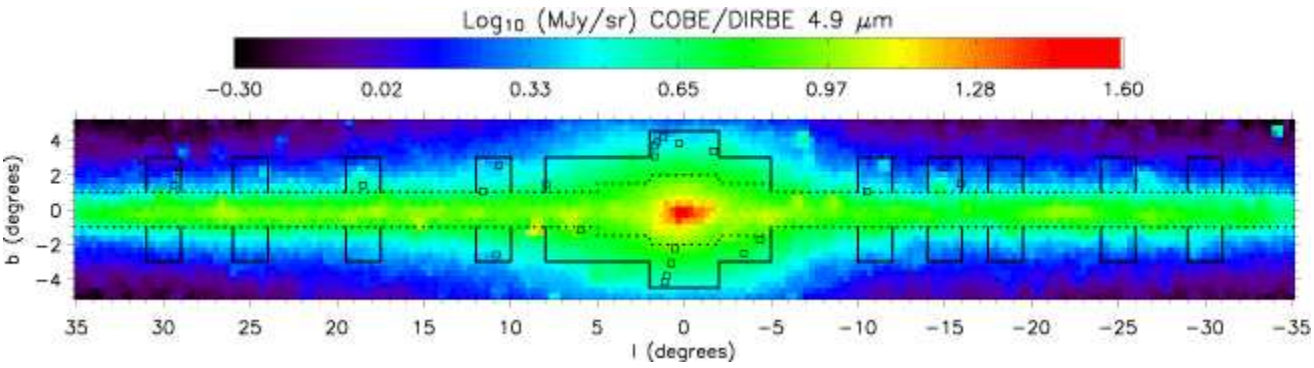

Figure 1: COBE/DIRBE 4.9 μm map of infrared intensity in the Galactic plane. Dotted lines show the area already observed by GLIMPSE and GLIMPSEII. The vertical extensions for GLIMPSE-3D are shown with solid lines, and the location of fields observed in Cycle 1 and 2 are shown by squares.

2. The GLIMPSE Archive (GLMA or the "Archive"): Point sources with a signal to noise > 5 in at least one band and less stringent selection critera than the Catalog. The photometric uncertainty is typically < 0.3 mag. The information provided is in the same format as the Catalog. The GLIMPSE Archive contains about 47 million sources and the GLIMPSEII Archive contains about 21 million sources.

3. The GLIMPSE Image Atlas: Mosaicked Images for each band, each covering typically $1.1^\circ \times 0.8^\circ$. These are 32-bit IEEE floating point single extension FITS formatted images covering the entire survey areas. These images, in units of surface brightness MJy/sr, have a pixel size of $0.6''$. Mosaics of each band are made for larger (e.g. $3.1^\circ \times 2.4^\circ$) areas, with a pixel size of $1.2''$. Also included are quicklook 3-color jpeg images of the same size as the FITS images.

2 GLIMPSE

2.1 v1.0 Data Products

Source lists and images for the entire GLIMPSE survey region derived from data from SSC pipeline processing version S10.5 and earlier were delivered to the SSC. v1.0 source lists were delivered in April 2005. Image delivery was completed in August 2006.
www.astro.wisc.edu/glimpse/glimpsedata.html gives the links to the location of the v1.0 GLIMPSE data products at the SSC.

2.2 v2.0 Data Products

v2.0 data products consist of point source Catalogs and Archives and mosaics for the entire survey region. v2.0 data products incorporate improvements in the SSC processing and the Wisconsin IRAC pipeline as well as folding in new data taken to fill gaps in coverage. We are also providing 2MASS fluxes with the IRAC data, when available. We don't provide 2MASS sources that lack any IRAC counterpart. We currently do not attempt to match instrumental background variations between the images during the mosaic stage.

v2.0 processing uses SSC pipeline processing version S13.2 or later which has improved pointing refinement to 2MASS positions and a new flux calibration as discussed in Reach et al. 2005.

The Wisconsin IRAC pipeline enhancements for the v2.0 processing include: muxbleed correction; better banding correction for band 3; more information included in the source quality flag; "lumping" of sources within 2″ in the in-band and cross-band merging (to lessen flux sharing between close sources); photometric correction applied (a function of position of the source in the frame); and a close source flag implemented (set if have sources in the Archive within 3″ of the source).

2.3 v3.0 Data Products

In the mosaic images, we may try to match instrumental background variations between the images if we are satisfied we are not also removing real sky variations. We will likely re-process the images with this background matching. We have been working on this but there is not enough time to re-process before the end of 2006. This change would primarily affect the images from bands 3 and 4.

2.4 Data Delivery Schedule

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December 2006-early 2007
  v2.0 source lists - point source Archives and Catalogs (IRAC+2MASS)
  v2.0 mosaics and 3-color jpgs
       1.1x0.8 deg 0.6" pixel images (1332 fits files)
       3.1x2.4 deg 1.2" pixel images (164 fits files)
  updated documentation, including a gallery of instrument artifacts
  remaining in the mosaics. (The documentation will likely be delivered
  in early 2007.)

2007? (after the project ends, so not guaranteed but desirable)
  v3.0 mosaics, with background matching.
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3 GLIMPSEII

3.1 v1.0 Data Products

v1.0 data products consist of point source Catalogs and Archives and mosaics for the entire GLIMPSEII survey region using the SSC pipeline processing version S12.4 data taken in September 2005. This dataset is the two-visit survey of the entire GLIMPSEII area. This is similar to the GLIMPSE survey data. (The third pass data was taken in April 2006). The older SSC S12.4 processing does not include the new flux calibration and position refinement improvements. v1.0 data products incorporate some of the Wisconsin IRAC pipeline improvements, namely muxbleed correction and implements the close source flag. We are providing 2MASS fluxes with the IRAC data, when available. No background matching has been done on the IRAC images.

3.2 v2.0 Data Products

v2.0 data products will use data processed with SSC pipeline version S13.2 and later and will include both epochs of the GLIMPSEII survey. Source lists for each epoch will be provided along with source lists for the combined epochs. v2.0 products will also include GTO time data for the 1 degree around Galactic Center (PI: Stolovy), as processed by the Wisconsin IRAC pipeline, and will include any overlaps with the GLIMPSE data. We plan to take some very short exposure sub-array mode data to recover photometry from saturated sources.

3.3 Data Delivery Schedule

Documentation will be provided with each data delivery.

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December 2006
  derived from data taken in September 2005
  v1.0 source lists - point source Archives and Catalogs, IRAC+2MASS
       (about 16 million Catalog sources, 21 million Archive sources)
  v1.0 mosaics and 3-color jpgs
      1.1x0.8 deg 0.6" pixel mosaics - for 8 degrees of longitude
           (l=6 through 9 deg; l=350 through 353 deg)- 32 fits files
      3.1x2.4 deg 1.2" pixel mosaics  (centered at l=9 and 351 deg)-8 fits files

Spring 2007
  v1.0 mosaics and 3-color jpgs
   the remaining images for the rest of the GLIMPSEII survey from data taken Sept 2005
    1.1x1.2 deg 0.6" pixel mosaics for l=5,4,3,354,355,356 deg
    1.1x1.6 deg 0.6" pixel mosaics for l=2,1,0,359,358,357 deg
    3.1x2.4 deg 1.2" pixel mosaics centered at l=6,9,351,354 deg
    3.1x3.45 deg 1.2" pixel mosaics of l=0,3,357

Fall 2007
  v2.0 source lists - both epochs (all 3 passes) + Galactic center
  v2.0 mosaics - some of them

Spring 2008
  v2.0 mosaics - the remaining mosaics for the rest of the GLIMPSEII survey, including
    the Galactic center
  v2.0 source lists of each epoch separately, to be used for variable stars and
    asteroid hunting.
  v2.0 source lists of the subarray mode data
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4 GLIMPSE-3D

Data products consist of point source Catalogs and Archives and mosaic images (0.6″ pixels and 1.2″ pixels). Data products will use data processed with SSC pipeline version S14.4 and later. For

areas that have two epoch coverage, separate source lists will be made for each epoch as well as source lists including all of the data. Documentation will be provided with each data delivery.

4.1 Data Delivery Schedule

Initial data taking (2 visits) was in September 2006, of 10 areas, at longitudes centered on 330°(both latitude strips), 335°(negative latitudes), 345°(positive), 350°(both), 356.5°(both) and 6.5°(both) (see Figure 1). Remaining blocks to be observed are as shown in Figure 1. Delivery will depend upon future observations scheduling.

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Spring 2007
  from the September 2006 observations
  v1.0 source lists for the 3 areas that have the single epoch only data
      l=329-330 deg, b=+1 to 3 deg, b=-1 to -3 deg
      l=334-335 deg, b=-1 to -3 deg
  v1.0 mosaics of these 3 areas

Fall 2007
  v1.0 source lists and mosaics for the rest of the data taken in Sept 2006
    (7 areas)

Spring 2008
  source lists and mosaics for more areas, include information on variability
  separate source lists for each epoch and combined source lists

Fall 2008
  source lists and mosaics
  separate source lists for each epoch and combined source lists

Spring 2009
  source lists and mosaics
  separate source lists for each epoch and combined source lists
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REFERENCES

Benjamin, R.A., et al, 2003, PASP, 115, 953.
Fazio, G. et al., 2004, ApJS, 154, 10.
Reach, W. et al, 2005, PASP, 117, 978.
Stetson, P. 1987, PASP, 99, 191.
Werner, M. et al. 2004, ApJS, 154, 1.