

Explanatory Supplement for GLIMPSE Validation Observations

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The GLIMPSE observing strategy validation observations will utilize 10 hours of SIRTf time centered near the Galactic star formation region W51 ($L=49$, $b=-0.25$). This region is visible from approximately April 10 through June 10, 2002, matching the expected time period allocated for Legacy validation observations.

Figure 1 shows how 4 AORs will be used to cover a 40 arcmin x 60 arcmin region which includes W51 and surrounding areas of the Galactic Plane. Figure 2 shows the intended observation region on an IRAC 25 μm map of the W51 region. Figure 3 shows the intended observation region on an MSX 8 μm map of the W51 region. Each AOR mimics the actual GLIMPSE observing strategy which paves the Galactic Plane in long, thin strips of IRAC maps with half-frame overlap between exposures. In the actual survey, each object in the Plane is observed twice. During validation observations, each of the 4 AORs will be executed five times with subpixel offsets so that each object is observed a total of 10 times in a 8-hour period. After an interval of several (2–10?) days, we propose to execute one more pass of each AOR with the spacecraft at a slightly different roll angle. Our observation validation strategy is designed to test the robustness of the survey with regard to a range of signal-to-noise and instrumental issues.

- How does the photometric accuracy and confusion limit depend on **source density** and **saturated sources**? The region selected near W51 exhibits nearly the full range of source densities anticipated in the survey, peaking near W51 and falling to low values near Galactic latitude $=-1^\circ$ (see Figures 2 & 3). These observations will allow us to test empirically the impact of source density on source extraction and photometry. There will also be many saturated sources in the densest regions, allowing us to test our pipeline routines for handling saturation.
- How does the photometric accuracy, astrometry, and confusion limit depend on the *number of exposures* and the degree of *dithering*? We expect that all of the major science goals will be achieved with just two exposures per position, but if the validation observations should show otherwise, we are prepared to alter the observing strategy to include additional exposures per target at the expense of reduced areal coverage.
- What is the impact of *banding* on photometry and the confusion limit? Multiple exposures, *especially the final pass at a different spacecraft roll angle* will test how the impact of banding

can be mitigated by exposures at different roll angles. We expect that the impact of banding will not compromise the scientific goals of the survey performed with just two exposures per position. However, should the validation observations show that multiple passes at different roll angles are required, we are prepared to alter the observing strategy accordingly with only slightly-reduced areal coverage.

- The 5 consecutive passes in 8 hours allow us to test whether **asteroids** can be identified and tracked by their proper motions on time baselines of 1-8 hours. However, since most of the GLIMPSE survey is at high ecliptic latitudes, asteroid contamination should be minimal.
- The multiple passes for adjoining AORs will be performed with different amounts of frame-to-frame overlap from 8.5 pixels to 20.5 pixels. Half-pixel steps are used to improve the PSF sampling. This will allow us to optimize the amount of **frame-to-frame overlap** and **AOR-to-AOR overlap** needed to assure seamless mosaicing and photometry, while maximizing the efficiency of the survey.

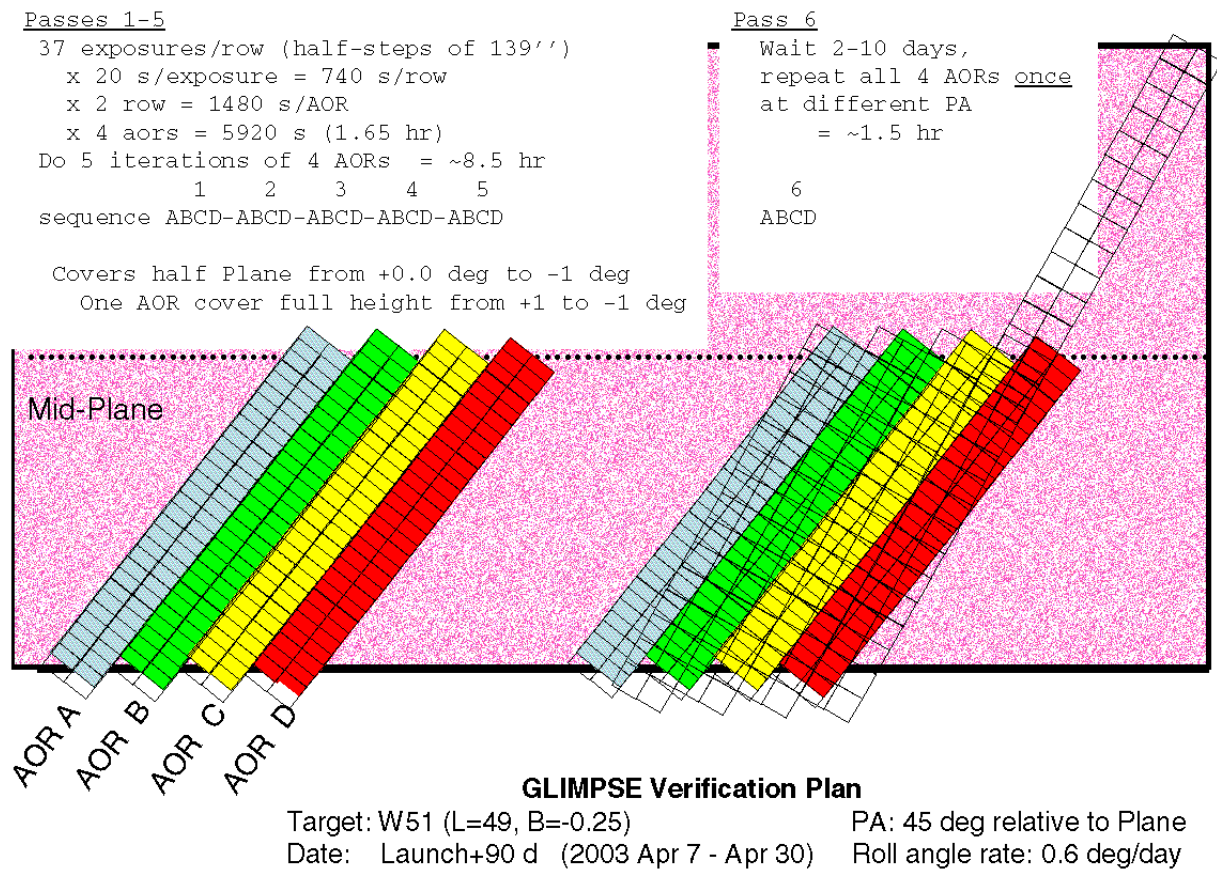


Fig. 1.— GLIMPSE validation observing plan.

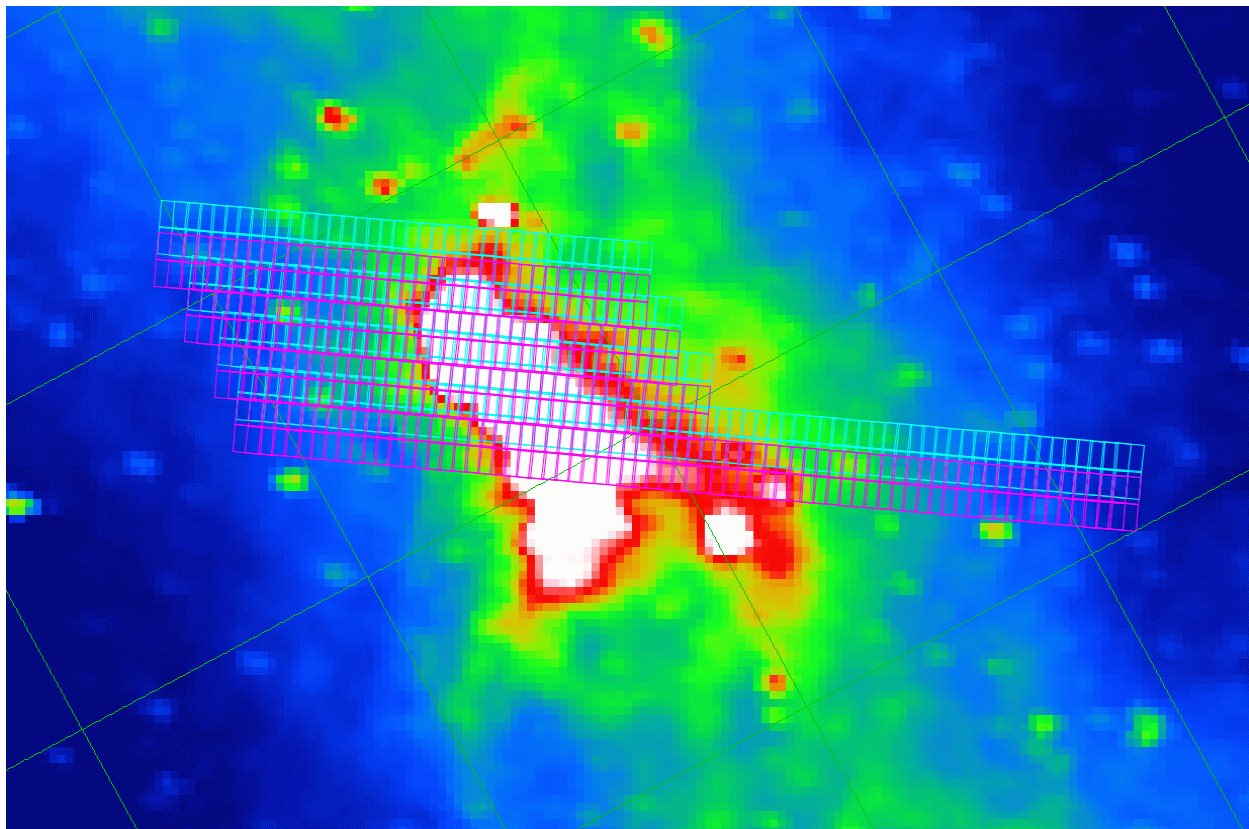


Fig. 2.— GLIMPSE data validation region near W51 superimposed on IRAS 25 μm image. Four AORs from Pass 1 are shown.

MSX 8 μ m image

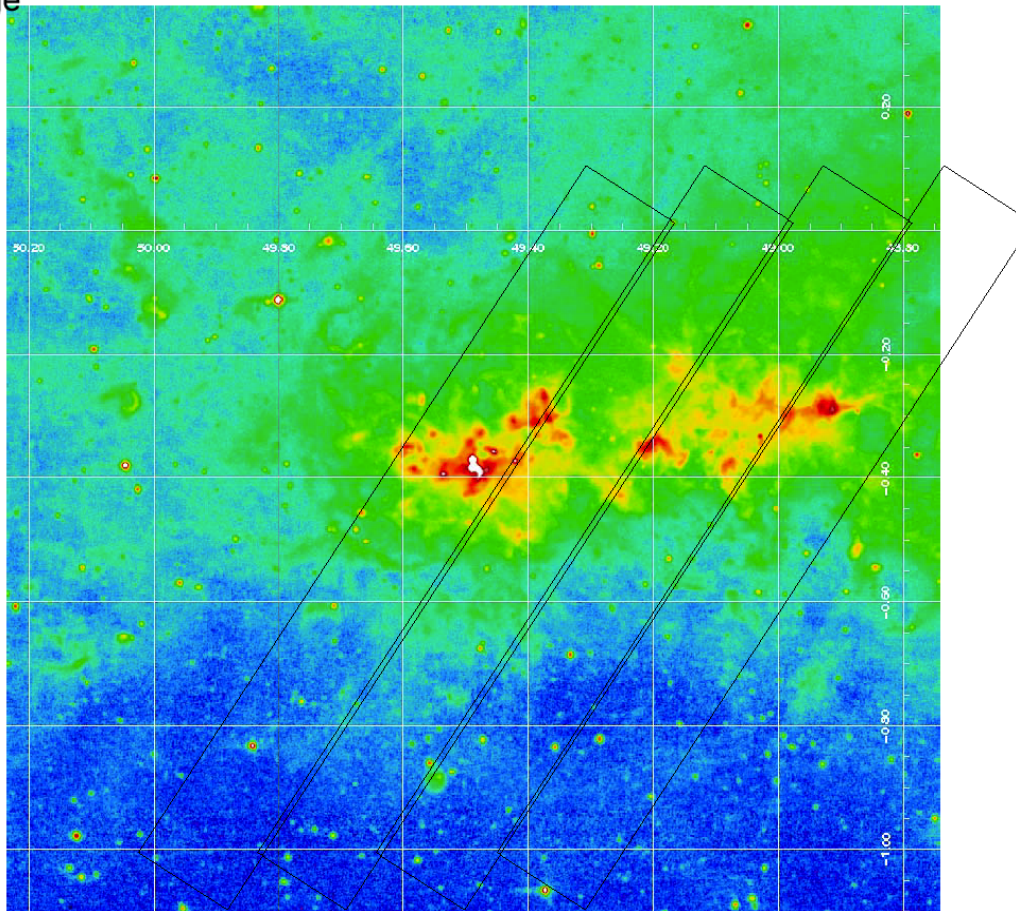


Fig. 3.— GLIMPSE data validation region near W51 superimposed on MSX 8 μ m image. Four AORs from Passes 2–5 are shown.