Multi-wavelength Study of G328.237-0.547 Methanol Masers

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Introduction & Literature Review

By Paul

Introduction

- OH and water masers are observed in a wide range of astrophysical environments unlike methanol masers which are closely associated with star forming regions.
- 6.7GHz methanol maser(Class II maser-associated with mm and IR sources) have been considered one of the best tracers of high mass star forming regions.

  N/B: Class 1 masers are observed at 44 and 95 GHz
- Their (6.7GHz methanol maser) have high emission and hence can be observed using both single dish and interferometers

Literature Review of G328 maser

- According to Norris et al. (1993), G328.237 has a bipolar flow. This suggested morphology is due to the large velocity difference (10km/s) between the two observed “clumps” i.e. one to the east and the other to the west of HII region.
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Distance from the literature.

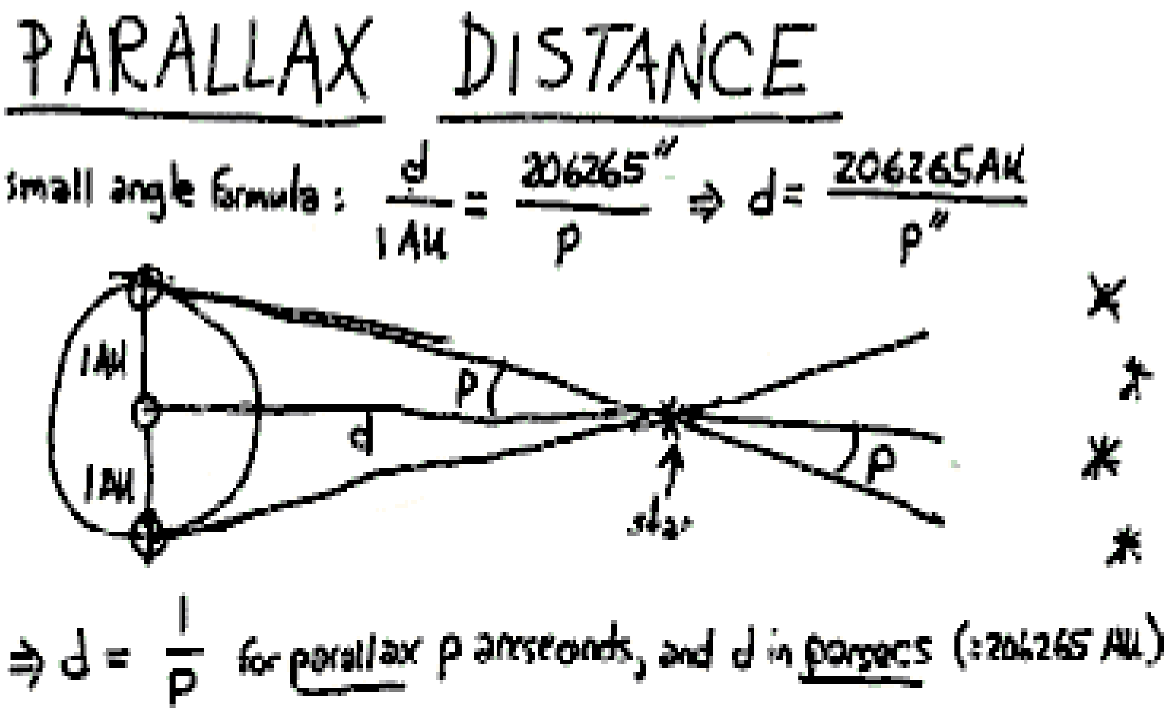
It is possible to estimate a particular source kinematic distance

for sources located within the solar circle(ie 8.5kpc of galactic centre)there are two fold degeneracy as the source velocity corresponds to two distances equally spaced on either side of tangent position.

A number of methanol masers have distance ambiguities. Although the ambiguities can be solved.

Green and mMacCure(2011) examined H1 spectra for 734 methanol masers located at the galactic longitude between 20 and 60 degrees.he used galactic rotation model to determine the kinematic distances to the source of methanol masers.

Determining distance using parallax



tan $p = 1/d$ *AU*

or

$d \approx 1/p$ *AU*

where *p is in rad. For small angles (p<<1):*

For annual parallax observation, similar masers are at the distance of 764 ± 27pc from the source. (Hirota et al 2008)

Luminosity

Luminosity depends on the distance and extinction (as well as relativistic effects).The measured flux f is in units of [W/m2], the flow of energy per unit area. It is given by 195Jy for our source.

The **radiated power L** (Luminosity, [W]), ignoring extinction, is given by inverse square law:

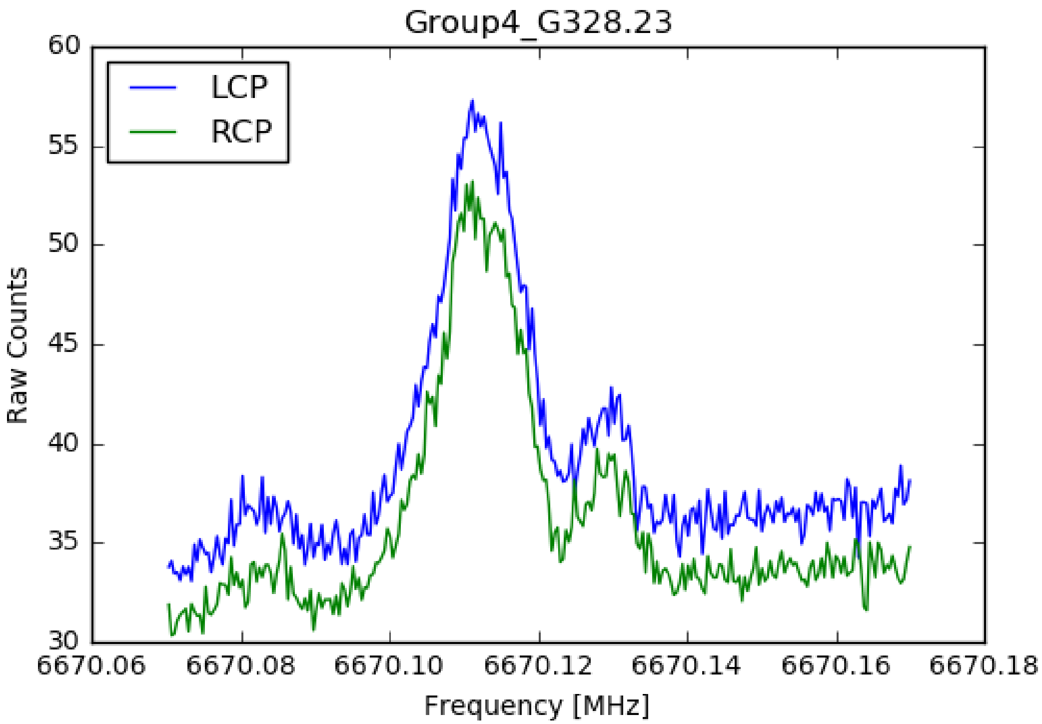
$$f = L / 4\pi d^2$$

$$L = d^2 * 4\pi f$$

Luminosity (Cont’d)

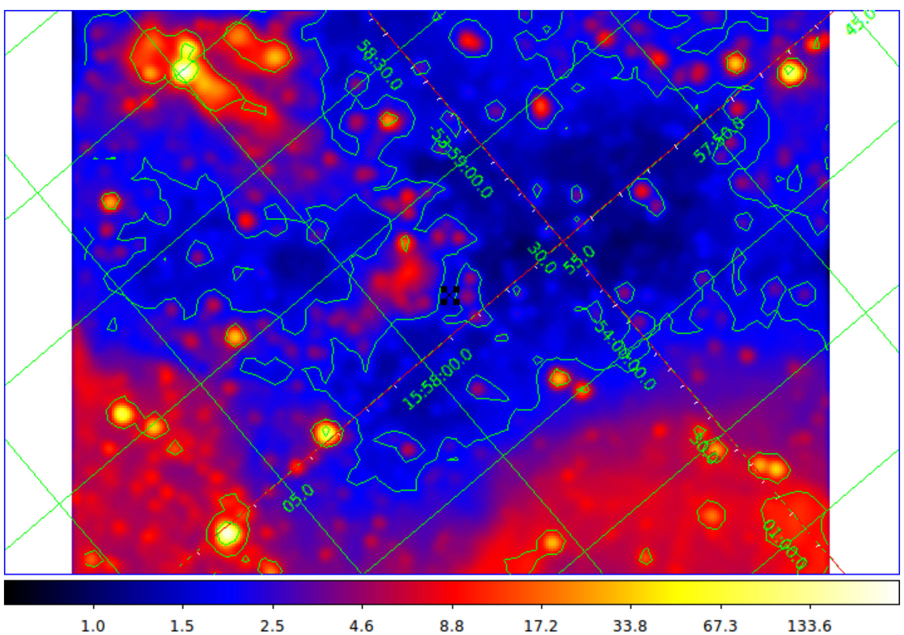
The luminosity of our source was found to be 1.8*10^29 which is approximately 450 times luminosity of the sun hence can be classified as intermediate massive star.

Spectra diagram of G328.237-0.547 observed at GRAO

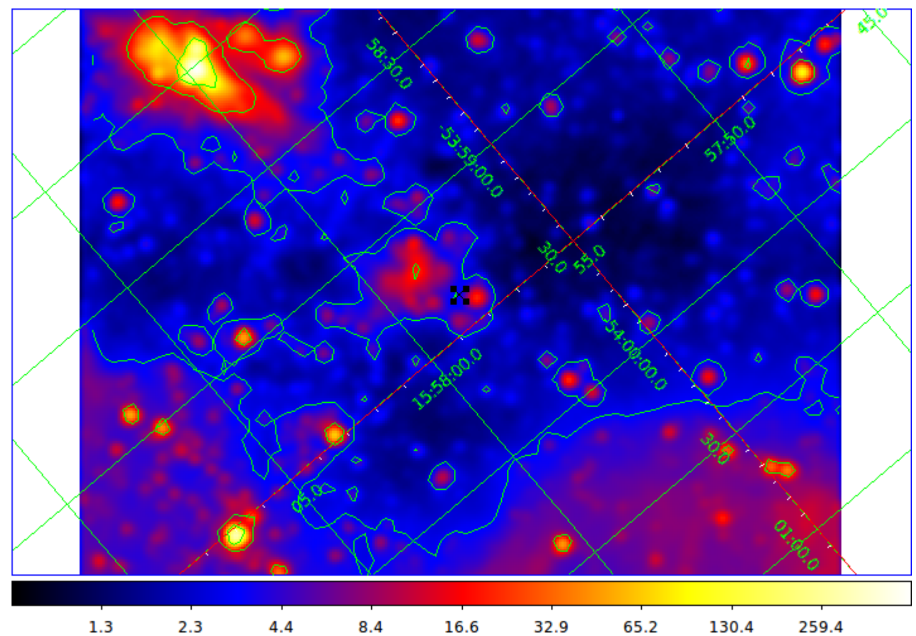


GLIMPSE SURVEY

3.6 microns

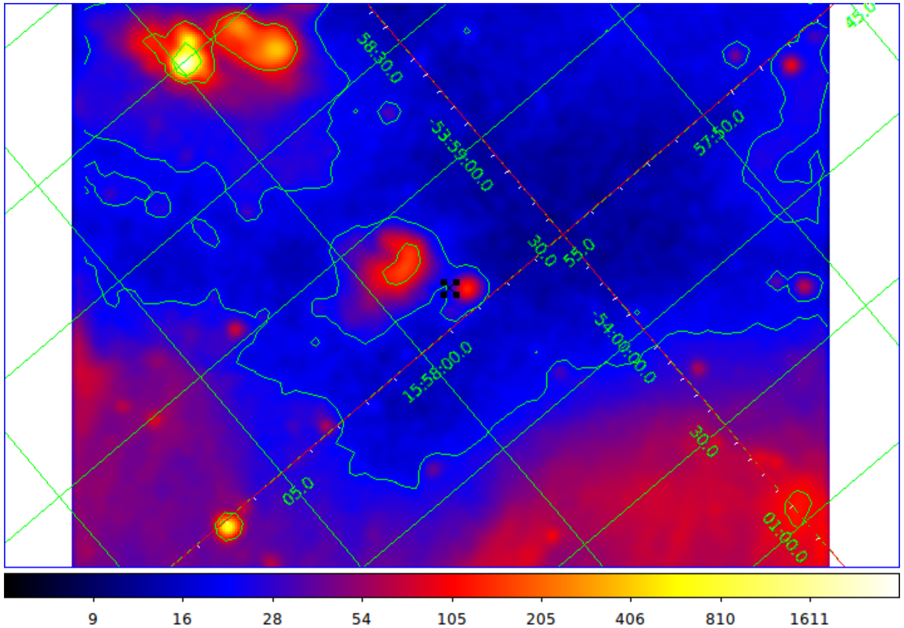


4.5 microns

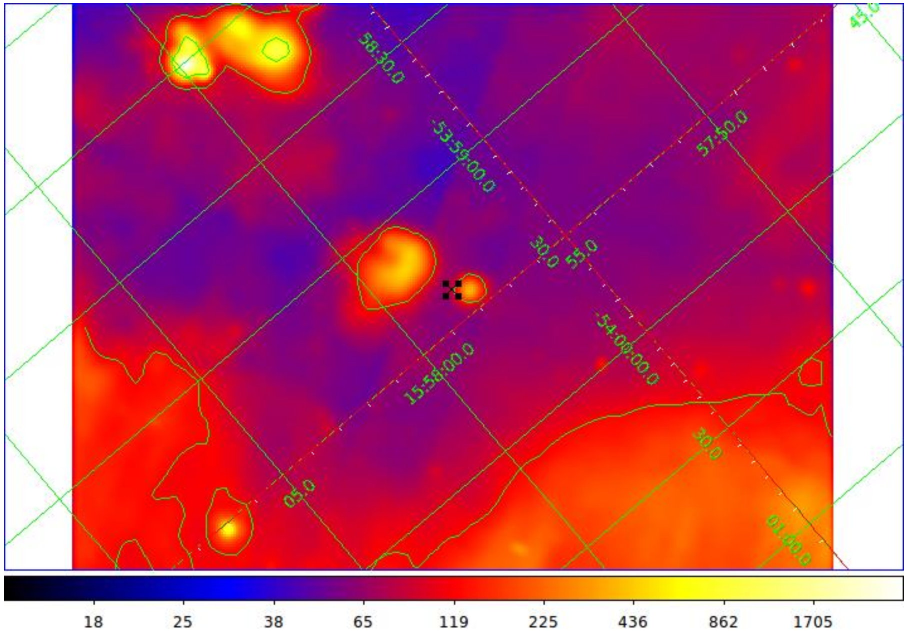


GLIMPSE (CONT'D)

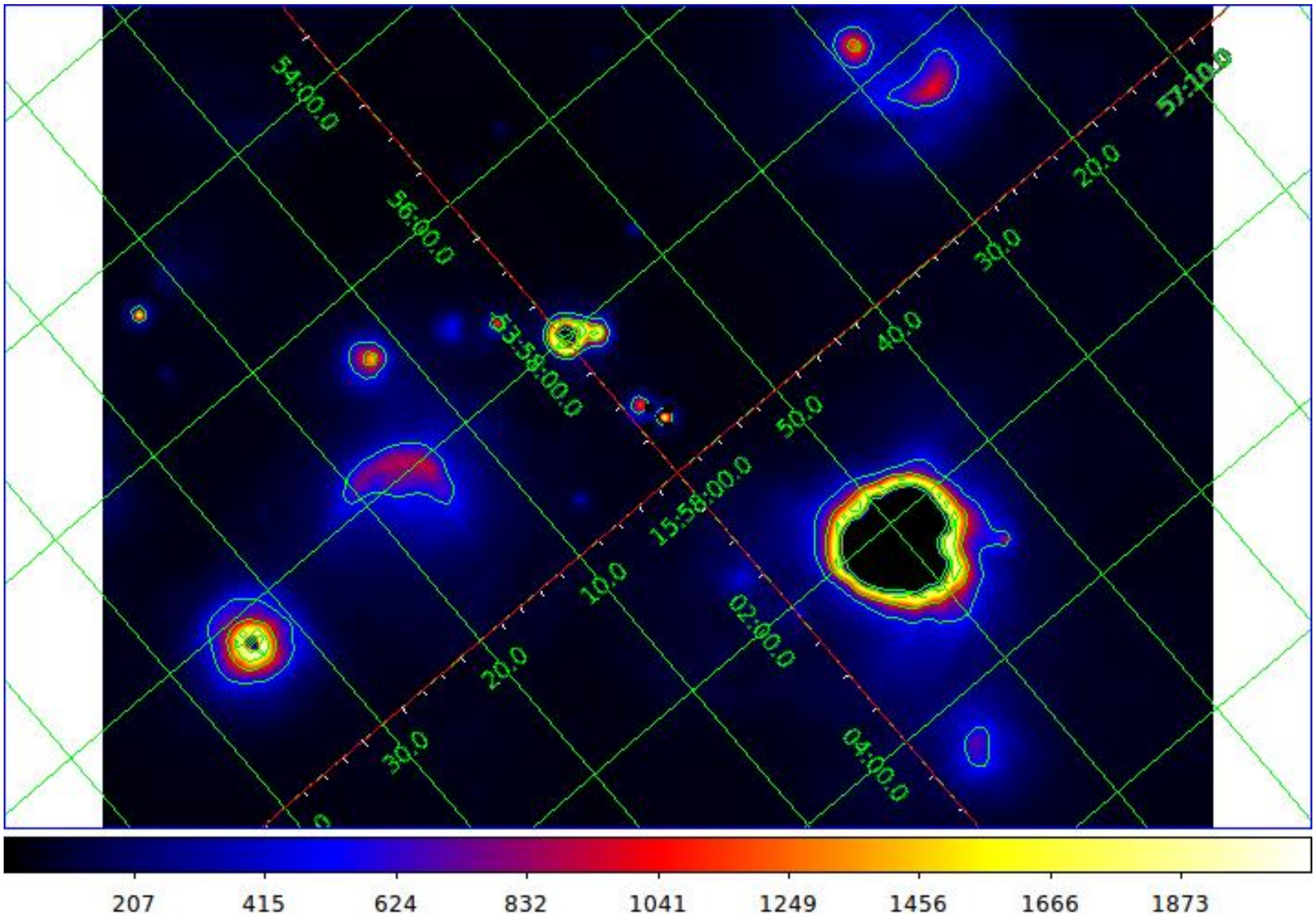
5.8 microns



8.0 microns

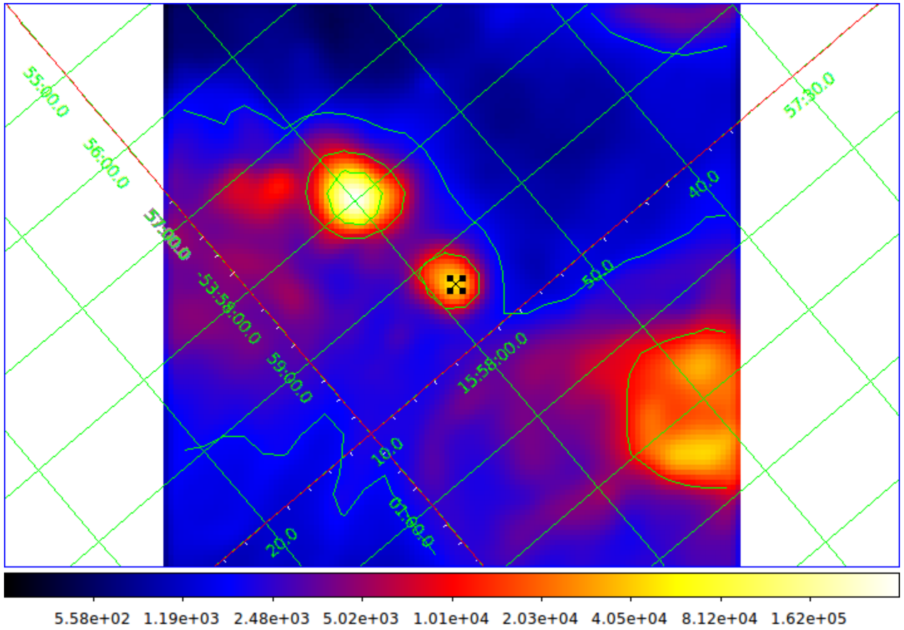


MIPSGAL at 24 microns

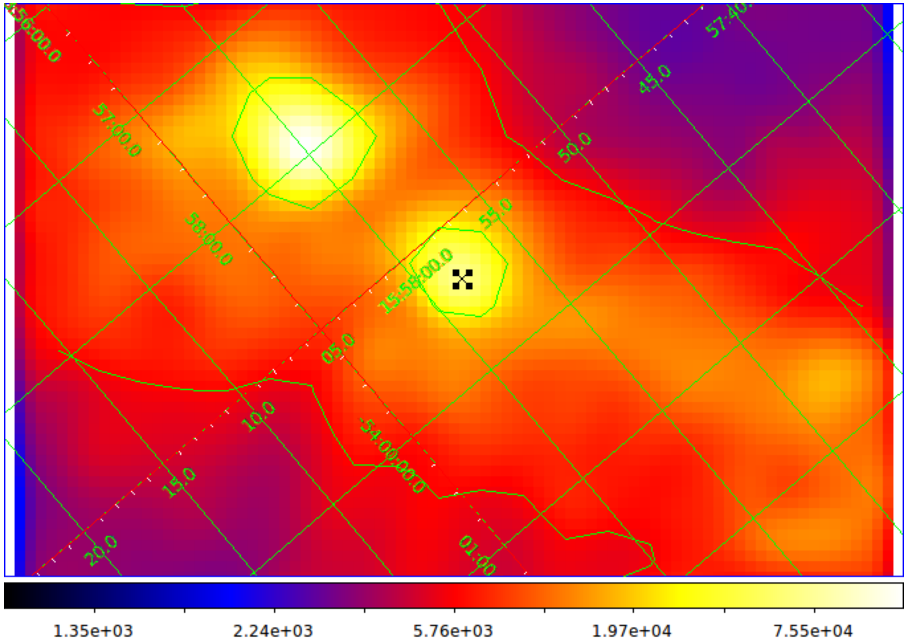


Hi-GAL at different wavelengths.

70 microns

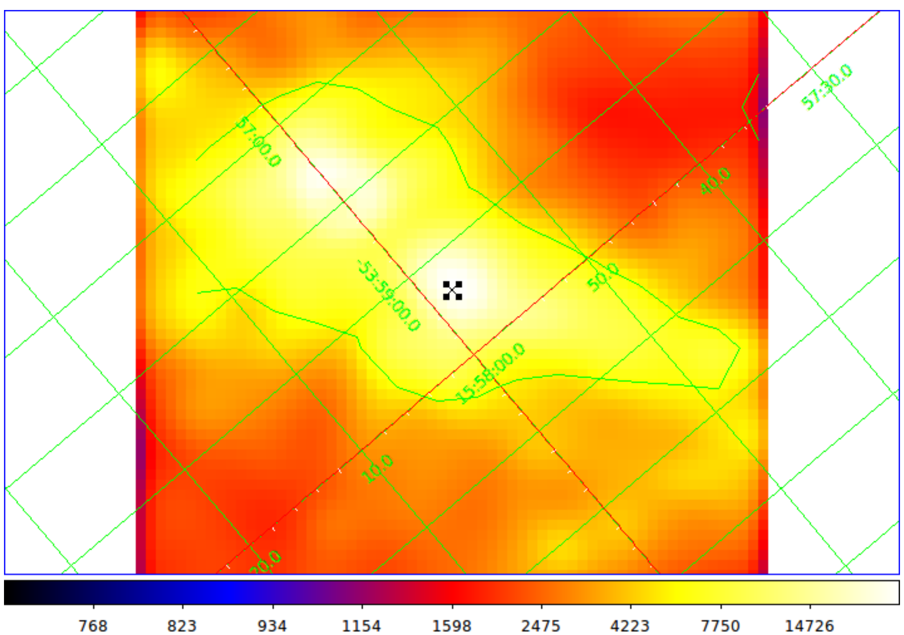


160 microns

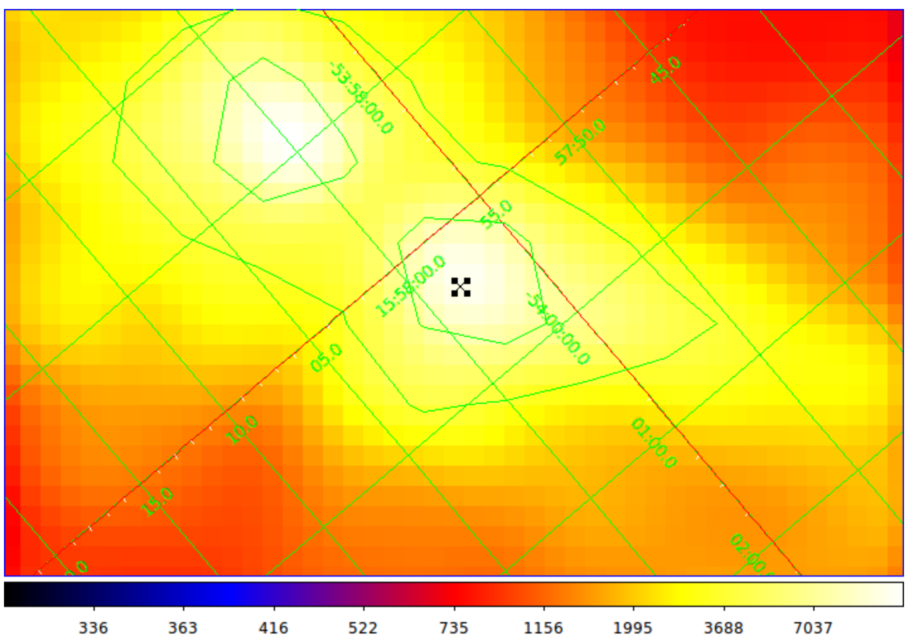


Hi-GAL at different wavelengths (cont’d).

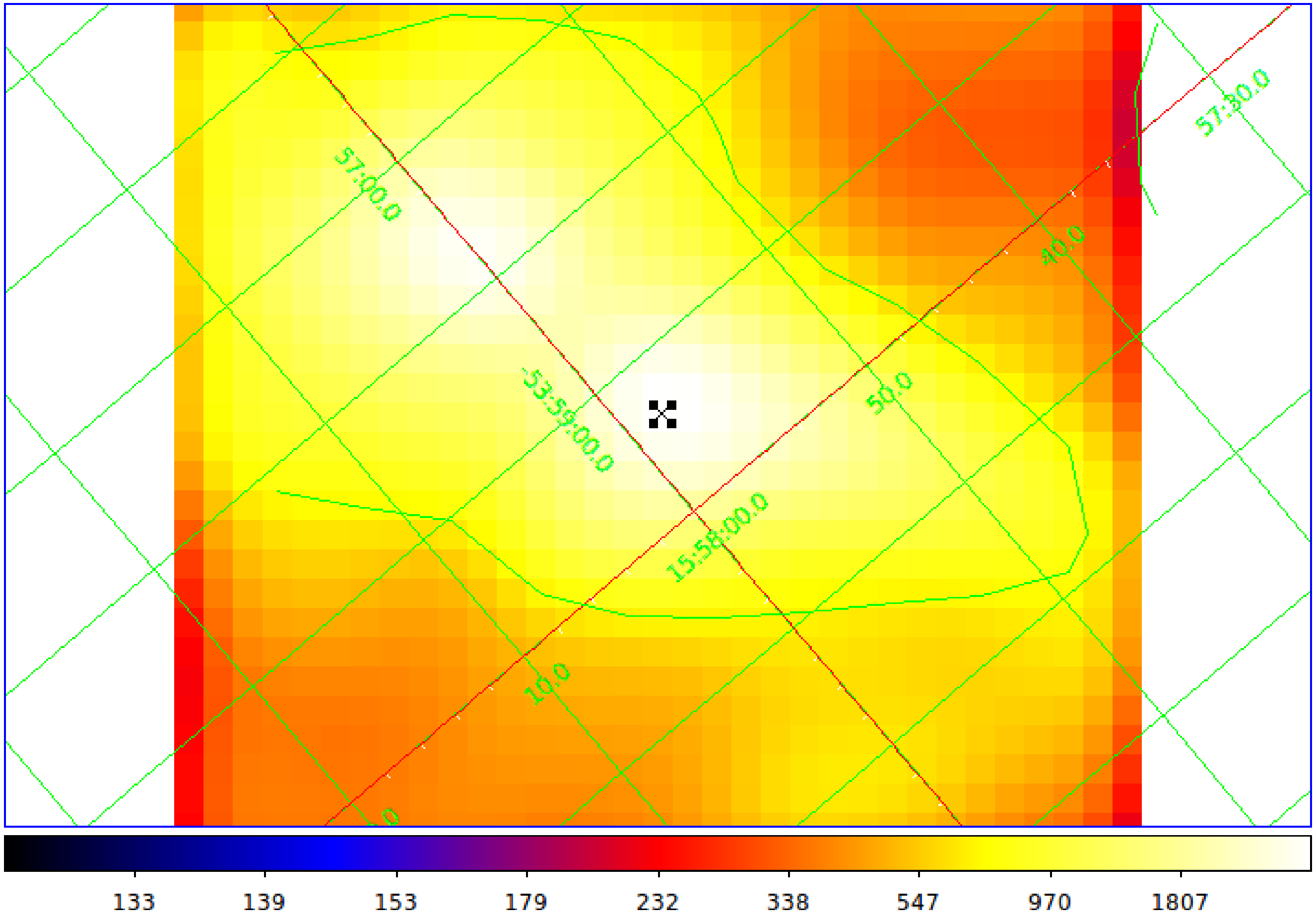
250 microns



350 microns



Hi-GAL at different wavelengths (cont'd)



ATLASGAL SURVEY at 870 microns.

870 microns

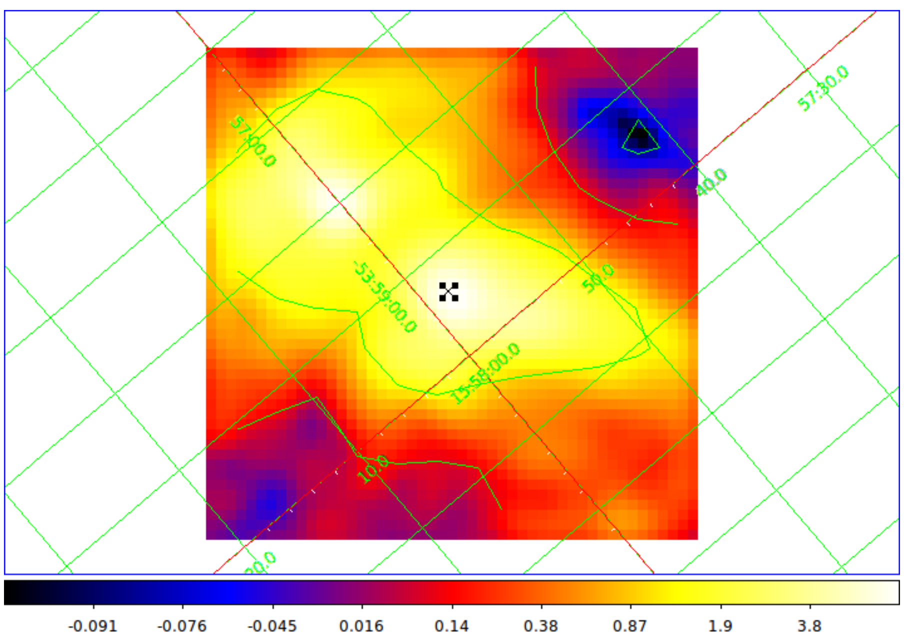
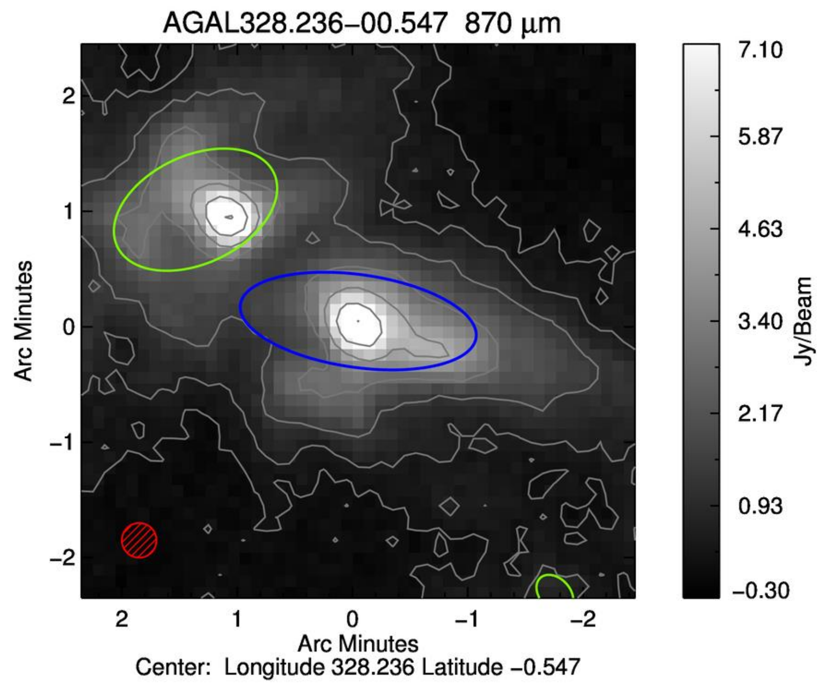


Image from Atlasgal Database



Spectral Energy Distribution (SED)