High Resolution Radio Observations of Southern Star Forming Regions

R. P. Verma[1], S. K. Ghosh[1], V. K. Kulkarni[2], D. K. Ojha[1], A. Tej[1] and S. Vig[1]

1.Tata Institute of Fundamental Research, Mumbai, 400005, India, 2. National Centre for Radio Astrophysics, Pune, 411007, India

At Tata Institute of Fundamental Research (TIFR) we have a programme of far infrared mapping of Galactic star forming regions to understand the emission from cold dust in these regions. Now a new programme has been started to map these regions in radio continuum to understand the emission from gas. Many regions have been mapped at 1280, 610 and 325 MHz using Giant Metrewave Radio Telescope (GMRT), India. Here some of the radio maps of southern sources are presented and compared with observations at other wavelengths.

GMRT

GMRT is located in western part of India at latitude of 19.1 deg. (N) and longitude of 74.05 deg. (E). It is an aperture synthesis array consisting of 30 fully steerable parabolic dishes of 45 m diameter. Twelve of these dishes are located in a central cluster of 1.1 km and 18 along the three arms of 'Y'. Baselines range from 100 m to 25 km. Thus it gives a high angular resolution and is also sensitive to extended emission. Observations are made in the frequency range of 150 to 1500 MHz. Details of GMRT are given in Swarup et al. (Curr. Sci., 60, 95, 1991).

Observations

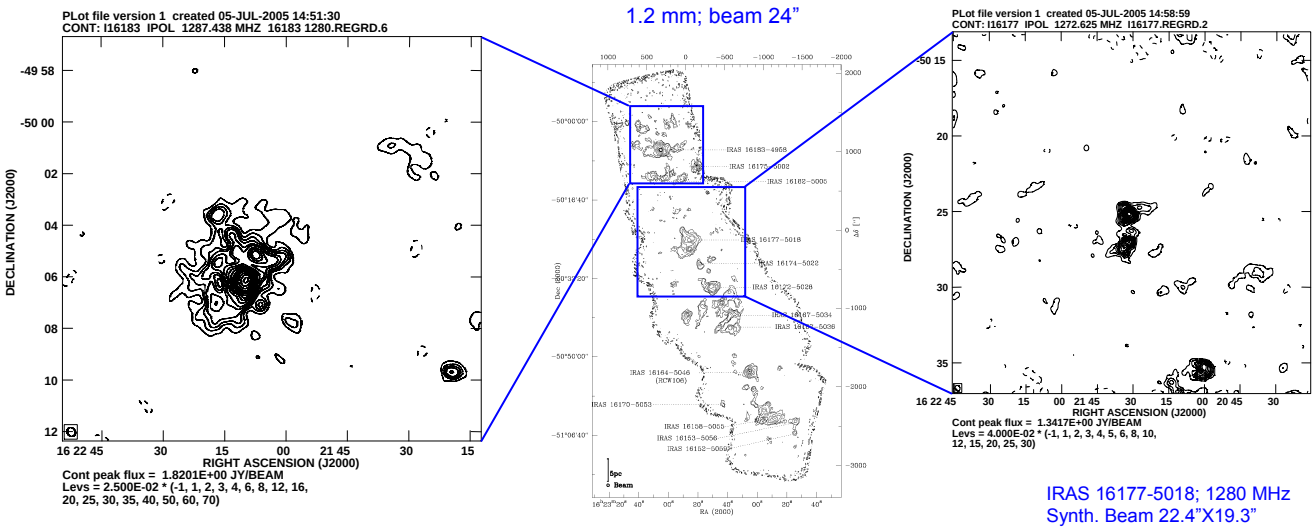
Southern star forming regions around 10 IRAS sources have been observed so far. All of these have been observed at 1280 and 610 MHz. Some of the sources have also been observed at 325 MHz. Most of these regions have earlier been mapped at far infrared wavelengths. The sources are -

1. IRAS 08576-4334
2. IRAS 09002-4732
3. IRAS 16177-5018
4. IRAS 16183-4858
5. IRAS 16571-4029
6. IRAS 17059-4132
7. IRAS 17160-3707
8. IRAS 17233-3606
9. IRAS 17258-3637
10. IRAS 18174-1612

Data have been processed using classic AIPS and the maps have been self - calibrated.

RCW 106 Region (IRAS 16177-5018 & 16183-4858)

RCW 106 star forming region has been studied in several infrared and sub mm wavelengths (Karnik et al. MNRAS, 326, 293, 2001 Mookerjea et al A&A 426, 119, 2004). The areas around IRAS 16177-5018 & 16183-4858 have been mapped at 1280 and 610 MHz. The maps at 1280 MHz are shown here. For a comparison, 1.2 mm map of a larger region from Mookerjea et al (2004) is also shown. There is general similarity between the radio and sub mm maps. Most of the Type A sub mm clumps (with infrared associations) have been seen in radio. But pure sub mm clumps (Type B, with no association) which are cold condensations are not seen in radio.



IRAS 16183-4858; 1280 MHz
Synth. Beam 21.7"X18.2"

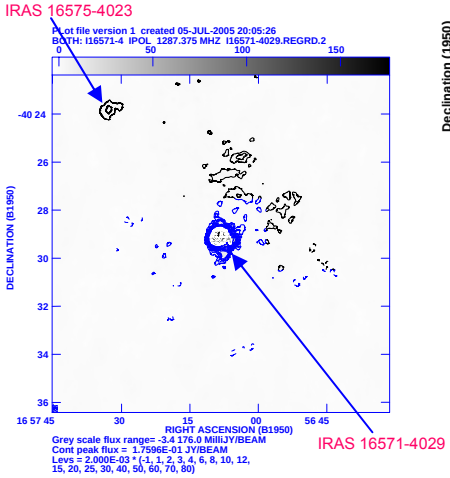
From Mookerjea et al (A&A 426, 119, 2004)

IRAS 16177-5018; 1280 MHz
Synth. Beam 22.4"X19.3"

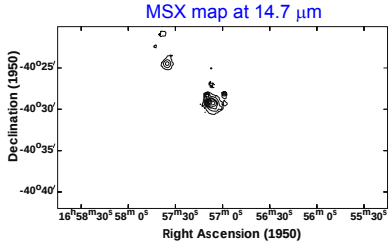
Region around IRAS 16571-4029 and 16575-4023

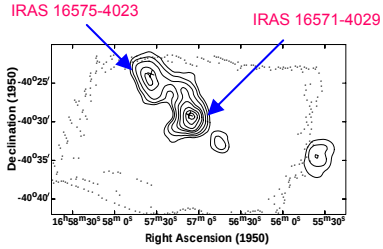
Star forming region around IRAS 16571-4029 and 16575-4023 has been observed at three frequencies (1280, 610 and 325 MHz). The map at 1280 MHz is shown below. Besides the main source there is quite a bit of extended emission. For comparison, the maps of the same region at 230 μm obtained from TIFR balloon-borne telescope and at 14.7 μm from MSX are also shown. It is seen that whereas IRAS 16571-4029 is quite strong in radio IRAS 16575-4023 is relatively much weaker. Spectral energy distributions (SEDs) for the two IRAS sources have been constructed using infrared flux densities from other available observations. It is found that IRAS 16571-4029 is heated by O9 star and IRAS 16571-4029 by B0.5 star. SEDs have been modelled with spherically symmetric radiation transfer models (Mookerjea and Ghosh, JAA, 20, 1, 1999). For IRAS 16571-4029 the fitted and observed SED is shown.

1280 MHz; Synth. Beam 9.5"X5.9"



MSX map at 14.7 μm





230 μm; resolution 1.2'

Fitted and observed SED of IRAS 16571-4029