Mid-Infrared observations of GRS 1915+105 and SS433

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Abstract. We have observed in the mid-infrared (4-18 μm) the counterpart of the compact object GRS 1915+105, and the western jet of SS433. The images were carried out with the ISOCAM infrared camera on board of the Infrared Space Observatory (ISO). The mid-infrared photometry of GRS 1915+105 shows the presence of an additional contribution besides the synchrotron emission. The 15 μm images of the large-scale western lobe of the SS433/W50 nebula are compared to the radio and X-ray ones. They show infrared synchrotron emission on the western edge of SS433/W50 lobe.

1. GRS 1915+105

We have imaged the close environment of GRS 1915+105 with ISOCAM at two epochs, on 1996 April 28 and on 1997 October 24. The binary system appears in mid-infrared wavelengths as a faint point source, globally brighter in our 1997 observations than in the 1996 ones. No elongated structure was observed with 1.5″ pixel field of view, the best ISOCAM resolution. We obtained the photometry with several large-band filters between 4 and 18 μm, and have compared it to simultaneous observations at near-infrared, radio and X-ray wavelengths.

On 1996 April 28 GRS 1915+105 was in a High/Soft state, with nearly constant RXTE/ASM flux (~ 90 counts/s), no significant BATSE flux, and ~ 3 mJy at 15 GHz (Ryle Telescope) few days before and after. On 1997 October 24, 5 days before a major radio and X-ray flare, the compact source was in a plateau state with ~ 50 mJy at 2.25 & 8 GHz (GBI) giving a radio spectral index ~ -0.08, with low constant RXTE/ASM flux (~ 20 counts/s) and BASTE photon flux ~ 0.06.

The IR data have been de-reddened according to the law from Lutz et al. (1996). We used very simple models combining a hot black body emission or a hot synchrotron one to fit the near infrared data, with a cold black body emission (for a dust envelope heated by the binary) and a synchrotron emission extrapolated from radio wavelengths. We conclude that synchrotron emission alone is not sufficient to explain the mid-infrared flux of GRS 1915+105, and that an additional contribution, which could be dust emission around the binary, is needed.

2. SS433 / W50

SS433 is a high mass X-ray binary surrounded by the supernova remnant W50, a bright radio nebula with a $\sim 1^\circ \times 2^\circ$ unusual ellipsoidal morphology. SS433 produces relativistic jets at subarcsec scales and large scale lobes ($\sim 90\,$pc at a distance of $5\,$kpc). We have imaged the large scale west radio lobe with the ISOCAM 14-16 μm filter and a $6''$ pixel field of view resolution in September-October 1997.

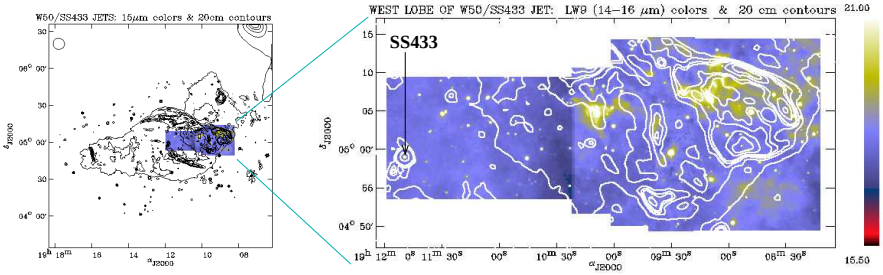

Figure 1. **Left:** SS433/W50 image at 20 cm from Dubner et al. (1998). **Right:** superimposing radio 20 cm contours with ISOCAM 15 μm image shows that the IR emission matches the radio one along the western edge of the radio nebula. **This IR emission is likely to be due to synchrotron radiation.**

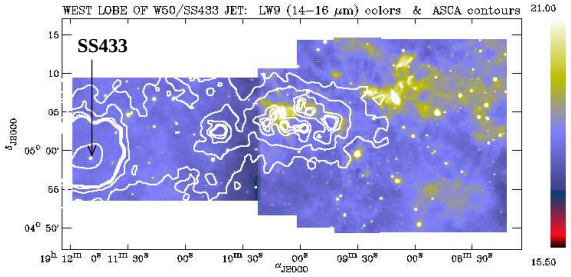

Figure 2. Superimposition of the west lobe X-ray ASCA emission in contours with the 15 μm image in colors. It shows that the IR emission lies along the same axis as the X-ray western lobe. Thus both emissions are the result of the interaction of the mass outflow with the interstellar medium. Most of the IR emission occurs at the western edge of W50 whereas the X-ray lobe fills the space between SS433 and this edge, which is an indication that the jet is present between these two components without being seen (Mirabel & Rodríguez 1999).

References

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