GIANT INFRARED BUBBLE IN CEPHEUS

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(Received 12 January, 1987)

Abstract. A ring-shaped infrared emission region is recognizable on the IRAS Sky Flux images of a Cepheus region which happens to include the association Cepheus OB 2. The ring is easily visible both at 60 and 100 microns. The approximate galactic coordinates of its centre are \( l = 102^\circ 8 \) and \( b = +6^\circ 7 \), with an outer diameter of 7 deg. IC 1396 and several other H II regions, such as S 129, S 133, S 134, and S 140 are apparently parts of the ring. If it is assumed that these H II regions are physically connected to the ring its distance must be about 900 pc and its diameter 120 pc. The existence of several arc-shaped He filaments along the ring, the proper motion of the nearby runaway star \( \lambda \) Cephei, and the possible presence of the \([\text{Fe x}] 26375 \) interstellar line in the spectra of two stars of Cep OB 2 combine to suggest that the infrared ring might well be a result of a supernova explosion which occurred in this region about 2–3 million years ago.

1. Introduction

Ring-like features in the interstellar medium have received much attention in the last decade. The diameters of these shells vary from some parsecs to a kiloparsec. Several of them emit at different wavelength regions, and are associated with young stars or stellar groups. One type of this association is that the shells surround a young star or stellar group. These are interpreted as bubbles blown into the interstellar medium by stellar winds of the early-type stars, or as supernova shells, or as composite effects of stellar winds and supernova explosions within a stellar association (Bruhweiler et al., 1980). Another type of connection between some interstellar rings and young stars is that the young objects (stellar associations, H II regions) are parts of a ring. In these cases the star formation occurred in the shell, and was probably triggered by the event which produced the shell.

Because the matter comprised in a shell may contain a certain amount of dust heated up in the environment of an O-type star or supernova, we would expect that infrared shells can be detected in the sky. In the present paper we describe an infrared ring which can be seen on the IRAS Sky Flux maps PL 025 and PL 026 of a Cepheus region between \( l = 98^\circ–106^\circ \) and \( b = +2^\circ–+10^\circ \). We have reproduced the ring by electronically merging these two adjacent fields and by combining this with the data in the literature we are able to draw some tentative conclusions about the origin and evolution of the ring.

2. The Infrared Ring and Its Associated H II Regions

The approximate centre of the infrared emission region is at \( l = 102^\circ 8 \) and \( b = +6^\circ 7 \). The ring is shown by both the 60 and 100\( \mu \) maps. It has a filamentary appearance, with fuzzy outer and inner borders. The overall surface brightness decreases towards the
higher galactic latitudes. This is probably due to the decreasing density and/or temperature of the radiating medium nearer the higher latitudes.

Comparison of the infrared maps with Dubout-Crillon's (1976) Hα photograph of the same region reveals that several bright patches of the ring are apparently identical with H II regions. The brightest part of the ring is S 140. This and S 129, S 131 (IC 1396), S 133, S 134 as well as some fainter or smaller H II regions not listed in Sharpless' (1959) catalogue seem to be connected with each other by a region of weaker infrared radiation. Some of these H II regions have known sources of excitation and thus known distances.

A bright part of the ring, IC 1396, is excited by the young open cluster Tr 37 for which Simonson (1968) derived a distance of 830 pc. It contains some bright-rimmed dark clouds which are remarkably bright in the infrared.

S 129 is an arc-shaped H II region around l = 98° 5 and b = +7° 97. It is excited by HD 202214 which, according to Hoffleit's (1982) Bright Star Catalogue is a B0II type star. If −4° 8 is adopted for its absolute magnitude the distance of the star and S 129 is about 950 pc.