Testing Models of Massive Star Formation in Cep OB4

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Summary

Cep OB4 is a nearby (~800 pc) OB association that provides an excellent laboratory for studying massive star formation. The OB association has created an H II region that is expanding into the surrounding molecular cloud, and several sites of current star-forming activity have been identified. IRAC observations combined with near-IR photometry are powerful tools for studying these regions because they can locate clusters of young stellar objects (YSOs) and determine their physical properties. Previously, only a small portion of this region had been mapped by Spitzer. Our new large-area survey (~4º×3º) will provide a complete census of the star formation activity in this region. The survey will allow us to characterize the YSOs and clusters that are currently forming, and evaluate whether various models of massive star formation can explain the observations

Figure 1: IRAC mapping pattern used for the new Warm Mission observations of the region. The previous cryo misson map is also shown in the lower center, outlined with the white box.
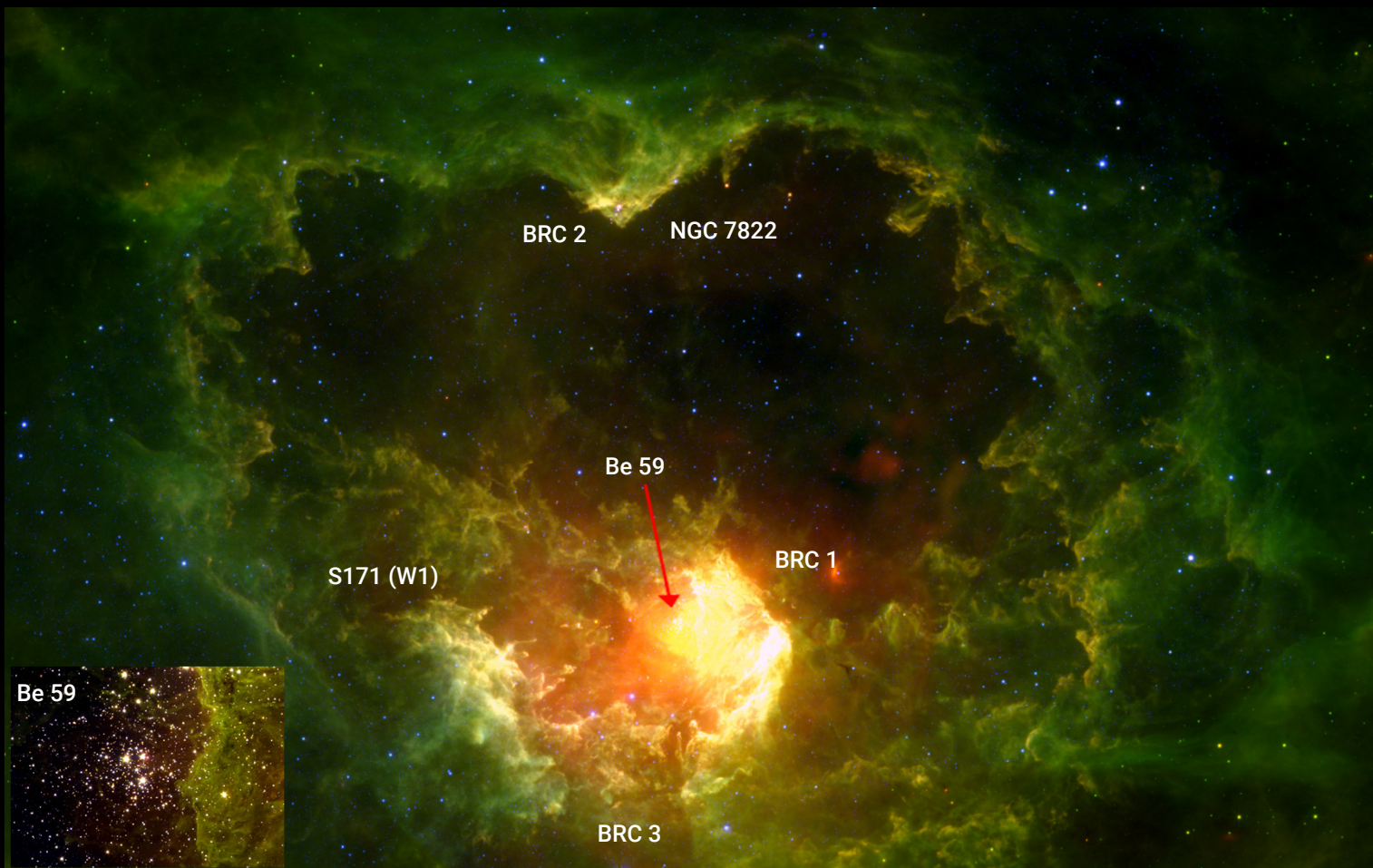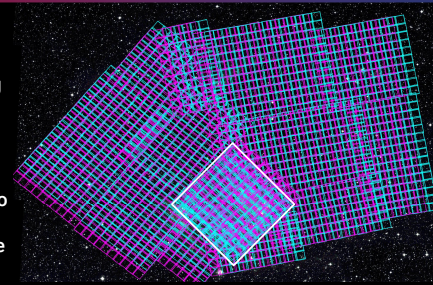

Figure 2: The Cep OB4 region as imaged by IRAC (4.5 µm: blue) and *WISE* (12 µm: green, 22 µm: red). The region shown is approximately 4º wide, or 56 pc at a distance of 800 pc. Several previously identified clusters and features are marked. The new IRAC data covers the ring structure and the area interior to it (see Figure 1). Inset (lower left): A 15′×10′ region around the Be 59 cluster, blue: *H*-band (1.6 µm), green: 3.6 µm, red: 4.5 µm.

The Cep OB4 Project

Our Warm Mission program mapped the Cep OB4 ring at 3.6 and 4.5 µm, completing the IRAC observations of the region (see Figure 1 & 2). We will identify the YSOs through their IR emission (see Figure 3), determine their characteristics using spectral energy distribution (SED)−fitting techniques, and study their clustering properties. We will estimate relative ages of the clusters from their Class I/Class II ratios and put together a comprehensive picture of the star formation activity in this region.

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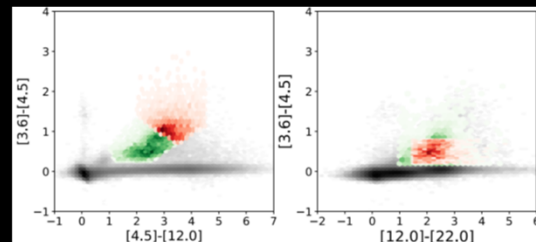~jhora/2020SC_CepOB4.pdf

Figure 3: An example of YSO selection in the SFOG field (Winston et al. 2020, in prep.) based on IRAC 3.6 and 4.5 µm and WISE 12 and 22 µm colors (red: excess, green: protostars) overlaid on sources in the SFOG field (gray points). Left: IRAC+WISE [3.6 - 4.5] v [4.5 - 12]. Right: IRAC+WISE [3.6 - 4.5] v [12 - 22].