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A study of the cold cores population in the Serpens star-forming region

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Abstract. As part of the Herschel Gould Belt survey, the Serpens star-forming region was observed with the Herschel PACS and SPIRE instruments. Data analysis is ongoing and a first version of the source catalog is ready; here we show some preliminary results.

1. Introduction

The Serpens star-forming region was observed as part of the Herschel Gould Belt survey (HGBS, André et al. 2010) which aims at obtaining a complete census of prestellar cores and Class 0 protostars in the closest star-forming regions. The survey was carried out with the Herschel (Pilbratt et al. 2010) instruments PACS (Poglitsch et al. 2010) and SPIRE (Griffin et al. 2010). We observed what in literature is called Serpens Main, complemented with another zone South-East of Main. Their distance is a matter of controversy: recently Ortiz-León et al. (2017) have derived an average distance of 436 pc similar to the 415 pc previously known (Dzib et al. 2010) but distances as small as 230 pc are reported in literature. In this work we adopted 415 pc. Here we present the first results of data analysis of this region.

2. Sources extraction and photometry

PACS intensity maps at 70 μm and 160 μm were generated with *Unimap* (Piazzo et al. 2015); SPIRE intensity maps at 250 μm, 350 μm and 500 μm were instead generated with the *destriper* module in HIPE (Ott 2010). The zero-level of the diffuse dust emission in the maps was found through the procedure presented in Bernard et al. (2010); we then computed the H_2 column density map, shown in Figure 1 for both Serpens Main and East, by fitting a modified blackbody $I_\nu \propto N(\mathrm{H_2})\nu^2 \mathrm{B}_\nu(T_\mathrm{d})$ at the four wavelengths $\lambda \geq 160\,\mu$m.

All the five intensity maps plus two auxiliary maps (see for details Könyves et al. 2015, hereinafter Paper I) were used to identify compact sources and to measure their fluxes with *getsources* code (Men'shchikov et al. 2012). Not-reliable sources have been removed and the resulting list has been cross-checked with external databases (WISE, Simbad) to remove possible contaminants. A detailed description of the selection procedure can be found in

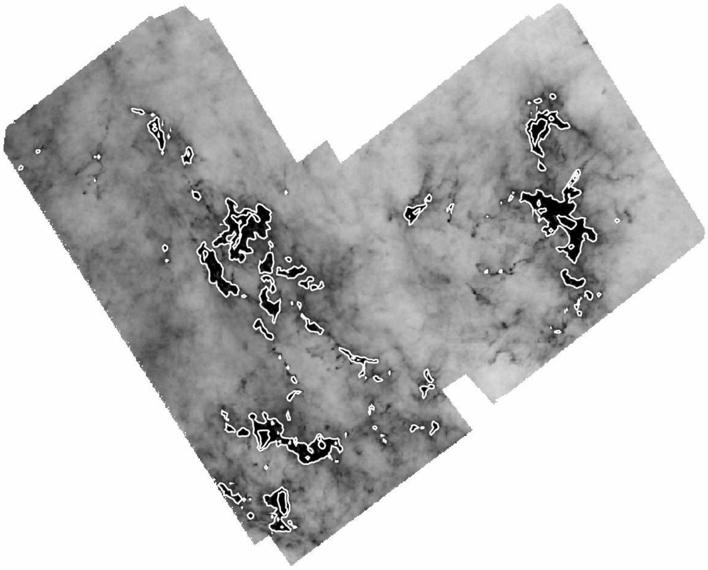

Fig. 1. Column density map of the Serpens region observed with Herschel; black areas are denser. The molecular hydrogen column density runs from 10^{21} cm^{-2} up to $1.3 \cdot 10^{23}$ cm^{-2}; contours levels are at $4.5 \cdot 10^{21}$ cm^{-2} and 10^{22} cm^{-2}.

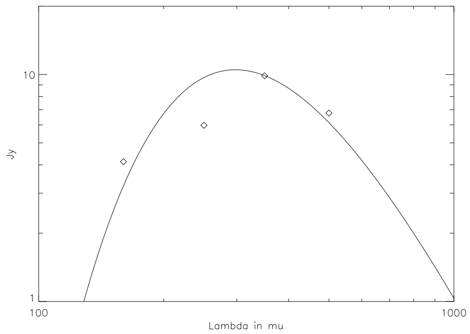

Fig. 2. The result of fitting a modified blackbody, with dust opacity index set to 2, to the SED of one of the 685 tentative cores found in Serpens: $T_d \sim 9.7$ K and $M \sim 16\ M_\odot$ at the adopted distance of 415 pc.

Paper I. A tentative list of 685 cold cores has been generated. In Figure 2 an example of SED fitting for a source is shown: the resulting mass is $\sim$16 M$_\odot$ with a temperature of $\sim$9.7 K. Note that adopting a distance of $\sim$230 pc, the mass would be $\lesssim$5 M$_\odot$.

3. Conclusions

The analysis of the detected sources is ongoing. Our goals are: to finalize the source catalog, to derive the physical properties of the cores in connection with the filamentary structure of the Serpens region; and to derive the CMF of the prestellar cores of the Serpens star-forming region.

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