Preface

Star formation, the process that transforms diffuse gas into stars, is one of the most active research topics at present. We are concerned with understanding the role of star formation both as a function of time as well as across the range of stellar masses. The monotony of the initial Universe was broken by the formation of the first stars, only a few hundreds of millions of years after the Big Bang. These first stars reionized the surrounding gas and started cosmic complexity.

In spiral galaxies like ours, where interstellar gas is still relatively abundant, the formation of new stars is an on-going process that we can study and try to understand better. Large advances have taken place in the research of the formation of solar-type stars, those similar to our Sun, possibly because they are so abundant and relatively easy to observe. However, the formation of low-mass stars and brown dwarfs on one side of the stellar mass spectrum and of high-mass stars on the other, remains poorly understood.

It is on the formation of the most massive stars in the Galaxy that this work is centered. Different regions of massive star formation are studied in detail, using the powerful techniques offered by radio interferometry. Massive stars are formed and spend all of their youth inside dense regions of gas and dust and the classic methods of optical astronomy cannot be used. The different processes that are studied in the radio are described in a brief manner and the results presented in a clear, straightforward way.

Interestingly, the results of Galván-Madrid suggest that the formation of the most massive stars is consistent with a scaled-up version of the formation of solar-type stars. In both cases, there is gravitational infall of gas from a core into an accretion disk, where the gas slowly loses angular momentum to be able to finally reach the star. Nature's way to permit accretion involves the production of powerful outflows that remove excess angular momentum from the gas in the disk. As in solar-type stars, disks and outflows appear to be the key ingredients in the formation of massive stars. Another interesing result from this thesis is the evidence found for a larger influence of the environment outside the star-forming core than previously recognized.

The evidence, however, is far from conclusive. Massive stars are remote, heavily obscured and form in clusters; all of this complicates the observations. Fortunately, there is a new generation of interferometers that will allow a much more advanced understanding of massive star formation and the possible confirmation that they form like solar-type stars, but in a big way. Of course, the possibility that something else is lurking in that darkness is still open.

Centro de Radioastronomía y Astrofísica (CRyA) Luis F. Rodríguez
Universidad Nacional Autónoma de México (UNAM)