Submillimeter observations of young Brown Dwarfs: understanding their formation

1 Abstract

How brown dwarfs (BDs) and even isolated planetary mass objects (IPMOs) form, is one of the main open questions in the field of star formation and remains a subject of debate until now. A scaled down version of star formation processes is one of the promising scenario. The circum-(sub)stellar disk serves as a crucial medium to understand their formation. Numerous observations of BDs in recent years have detected disks with properties similar to those found in T Tauri stars, suggesting that brown dwarfs may form in a similar way to hydrogen-burning stars. Despite this progress, thorough disk comparisons are required to obtain a clear view of the formation mechanism of BDs.

My group in Valparaiso has been awarded APEX and ALMA time to search for the earliest stages of evolution of substellar objects (the so called pre and proto-BDs) in the Barnard 35 dark cloud. This dark cloud is part of the Lambda Orionis Star forming region (LOSFR, that has been subject of study by me since my PhD thesis) and has an estimated age of $\sim$3 Myrs (Bayo et al. PhD, among others).

An excellent by product of this search for proto-BDs will be the exquisite submm data that we will obtain (the APEX data has already been delivered) for the already confirmed BD members that hold optically thick disks (still young, but at a later stage in evolution than their proto-BDs progenitors).

Within my group and with my collaborators, we have optical and near-infrared spectroscopy of these disk-bearing substellar objects as well as multi-wavelength photometry (including X-rays and now submm data). This wealth of data needs to be properly modeled in order to compare the disks around substellar objects with those around stellar ones to look for similarities and / or differences (disk sizes, evolution time scales, etc.) that will shed light over the mechanism of formation of isolated substellar objects.