High resolution mapping of the B1b core : the interaction of two young protostars with their environment

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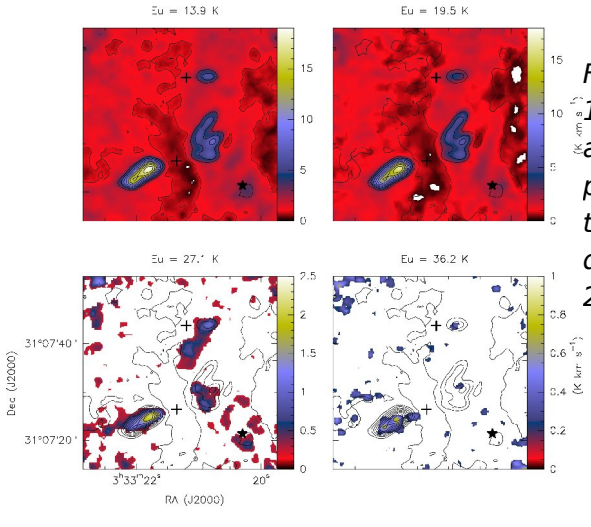
We present IRAM Plateau de Bure and 30m mapping observations of the Barnard 1b dense molecular core, combining detections of spectral lines of H_2CO and CH_3OH, as well as dust continuum emission at 2.2'' resolution (corresponding to ~500~AU). The two compact cores B1bN and B1bS are detected in the continuum at 2mm and 3mm, enabling an accurate analysis of their spectral energy distribution. We also detect molecular outflows associated with both cores. The outflow associated with B1bS presents bullets at velocities up to ~12 km/s from the core velocity, likely indicating variations in the accretion rate. The B1bN outflow is slower and more compact, with a dynamical age of less than 1000 years. A local peak of CH_3OH emission is detected near the position of the embedded protostar detected by Spitzer, possibly tracing the thermal evaporation of ice mantles. The 30m maps reveal the complex environment of the B1b core at large scale, with NH_2D tracing the cold cores and carbon chains a PDR on its east side.



Four methanol lines detected towards B1b at 145 GHz, with upper energy levels indicated above each map. The crosses show the positions of the B1bN and B1bS sources, and the star the position of the embedded source detected by Spitzer (S295, Jorgensen et al. 2006, ApJ 645, 1246).