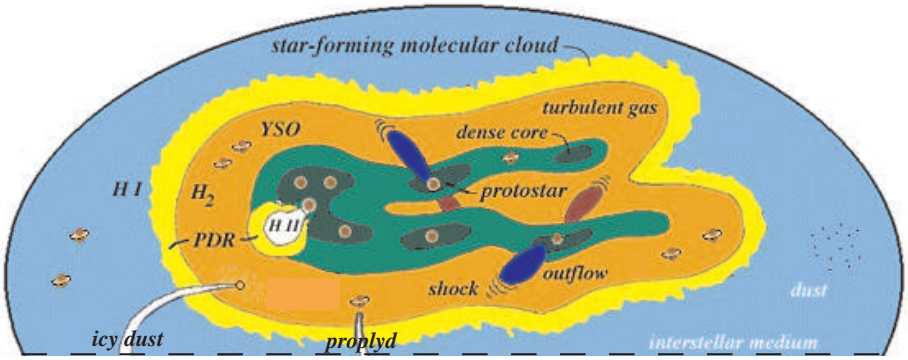

Fig. 2. Sketch of a star-forming molecular cloud and components. YSO: young stellar objects, PDR: photo-dissociation regions, HI: neutral hydrogen gas, H_2: molecular hydrogen gas, H II: ionized hydrogen regions, proplyds: disks with protoplanets (adapted from P. Myers, personal communication).

Regardless of the protostellar mass value, there is generally a dense core, jets and an accretion disk. Jets and disks were first discovered associated with low mass protostars, before Chini et al. (2004) detected for the first time an infrared disk around a massive protostar.

1.1. *Complications at high-mass star formation*

High-mass star formation can be summarized in four phases: compression of cold cores, collapse of hot cores, accretion onto a massive protostellar object and disruption to give birth to main sequence stars. A description of what can be observed in each phase is given by Zinnecker & Yorke (2007).

Massive stars produce intense UV flux, orders of magnitude higher than low-mass stars. This flux photoevaporates and photodissociates the matter found in its way, creating ionized hydrogen regions. The radiation pressure, together with its effects, are also larger in massive stars. There is disk dissipation, specially in the inner regions, close to the protostar. High-mass stars often form in non-single systems, where competitive accretion and N-body interactions are usually at work.

The issues just listed illustrate why high-mass star formation cannot be considered simply as a scaled-up version of low-mass star formation. From the observational point of view, the scarcity of massive stars, their large distances, multiplicity and time scales of the changes they undergo preclude to get a complete picture even with the best suited instruments.

2. MOTIVATION FOR RADIO STUDIES

Basically, radio continuum data provide information on the source geometry and radiation regime. Line observations, besides probing the abundant neutral hydrogen, reveal gas distribution and kinematics in general, temperature, mass, density, opacity, etc.

Studies of maser lines are particularly important. Observations of several species account for estimates on different physical variables. For instance, NH_3 and CS are emitted by dense molecular gas, generally surrounding the central source, and it might participate in driving gas flows. HCO^+ reports on the electron density in high-velocity gas. OH detections unveil the presence of low density gas in the outflow, it can be associated with high-mass star formation, where FIR radiation from heated dust is the pumping agent. Water masers are indicative of young stars of low and high masses, and pinpoint molecular gas with $T \sim 500$ K as in shocks (e.g., at dense clumps in winds). CH_3OH is related to high-mass star formation and hot molecular cores besides traces dense gas in or near compact HII regions. CH_3CN is also a disk tracer and presents low abundance in dense regions. SiO is an important print of molecular outflows; etc.

From the very beginning of the star-formation development, some physical processes leave signatures only at radio wavelengths, like the emission from cold dense cores. Radio waves can get through regions of dust almost without being absorbed. The spectral energy distribution built from millimeter to sub-mm data helps to determine the stage of a massive young stellar object. Figure 3 shows an example of how much information is provided by IR to radio observations towards a molecular cloud where stars are being formed (Pillai et al. 2006).

Magnetic fields play a fundamental role in massive-stars formation, not only in gravitational collapse but also during gas ejection. Measurements,