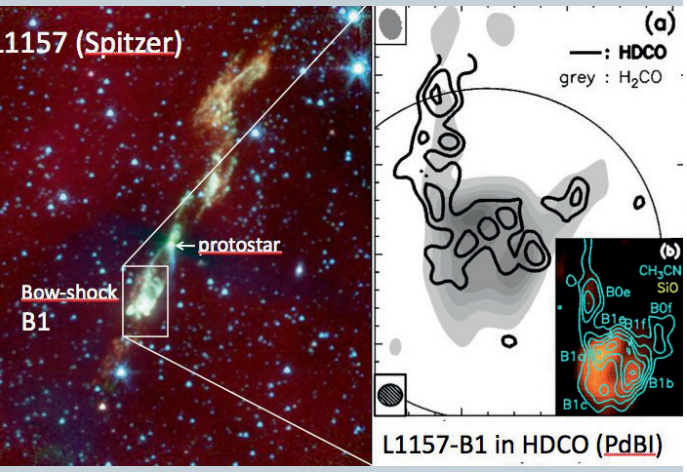
Colloquium

SFB 956

Conditions and Impact of Star Formation

15.12.2014
Monday 4:00 pm

Physikalische Institute Köln
Lecture Hall III
Zülpicher Straße 77 | 50937 Köln



L1157-B1 in HDCO (PdBI)

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Deuterium Fractionation in Different Star-formation Environments

The process of deuterium enrichment in molecules from the main reservoir HD is initiated in molecular clouds by exothermic gas-phase reactions, which boost the formation of deuterated species in cold (T<20K) gas, and inhibit it in warmer environments. For this reason, in the star-formation process, the fraction of deuterated molecules is thought to increase during the cold pre-stellar phase and then it is expected to drop after protostellar birth. Although this general framework remains true, growing observational evidence is showing that the story is not so simple. In fact, the deuterated species of several important molecules (NH_3, CH_3OH, H_2O) can be formed also on the icy mantles of dust grains during the early cold phase, and then realeased into the gas due to evaporation/erosion of these mantles at later stages. This contribution from surface chemistry can hence make significant differences in the dependence with time of the observed deuterated fraction for molecules formed uniquely in the gas phase and those formed also on dust grains. This effect is expected to be relevant especially in environments where the impact of nascent stars on dust grains is most important, namely massive star-forming cores and protostellar outflows.
I will present the main results obtained from observations of single-dish telescopes (IRAM-30m, Nobeyama-45m, GBT-100m), and interferometers (PdBI) with which we have surveyed several deuterated molecules (among which N_2D^+, NH_2D, CH_2DOH, DNC, HDCO) formed both in gas and on grain surfaces in both high-mass star forming cores and a prototypical chemically rich protostellar outflow, L1157-B1.