Colloquium

SFB 956

Conditions and Impact of Star Formation

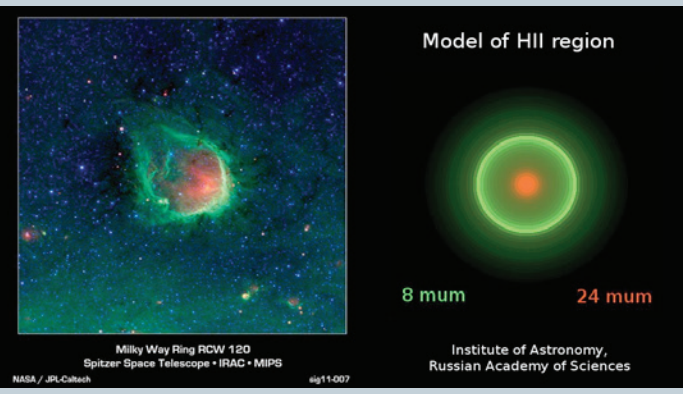
29 November 2017 | supplementary colloquium

Wednesday 11:00 am

I. Physikalisches Institut Köln

KOSMA Raum

Zülpicher Straße 77 | 50937 Köln



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Dust Dynamics and Evolution in Expanding HII Regions

Massive stars signpost places of their birth in molecular clouds by expanding volumes of hot ionized gas. The region between hot ionized and cold molecular gas is known as photodissociation region (PDR). The physical and chemical properties of this region are defined by radiation spectrum from a massive star. The local radiation intensity inside PDR is able to dissociate molecules but not sufficient to ionize hydrogen. The HII and PDRs have very specific observational manifestation on Spitzer's images. Namely, the ring-like structures which are seen at 8 micron surrounds the inner regions which are bright at 24 micron. This is most probably related to the properties of dust particles which are not same inside and outside of HII regions. We started a theoretical study of expanding HII regions to clarify the reasons of this specific observational appearance and to understand how HII and PDRs look during their development around massive stars. We consider the dust drift under influence of radiation pressure during the pressure driven expansion of an HII region. The dust particles are represented by polycyclic aromatic hydrocarbons (PAHs) and ensemble of silicate and graphite grains of larger sizes. The radiation pressure on dust, Coulomb drag, dust drift, and the lug of gas by dust are all important process which are considered simultaneously to describe the dynamics of HII regions. We evaluated a grain charge evolution within the HII region for each dust type.

Big grains are effectively swept out of the HII region. PAHs and smaller graphite grains are mostly coupled to the gas. Intermediate size grains have double-peaked distribution. Accurate treatment of dust dynamics let us explain some observational features of HII and PDRs and also suggest other processes needed to build complete sequence of dust evolution near massive stars.

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