

# Colloquium

## SFB 956

### Conditions and Impact of Star Formation

01.12.2014

Monday 4:00 pm

**Max-Planck-Institut für Radioastronomie (MPIfR)**

Auditorium 0.02

Auf dem Hügel 69 | 53121 Bonn

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## Astrochemistry and Star Formation

Molecular lines are used to trace the structure of the interstellar medium and the physical conditions of the gas in different environments, from high-z galaxies to protoplanetary disks. To fully benefit from the diagnostic power of molecular lines, the formation and destruction paths of the molecules, including the interplay between gas-phase and grain surface chemistry, must be quantitatively understood. Well-defined sets of observations of simple template sources are key to benchmark the predictions of theoretical models.

I will first present the observation and analysis of an unbiased spectral line survey at 3, 2 and 1 mm with the IRAM-30m telescope in the Horsehead nebula, with an unprecedented combination of bandwidth, high spectral resolution and sensitivity. Two positions were observed: The warm photodissociation region (PDR) and a cold condensation shielded from the UV field. Approximately 30 species, with up to 7 atoms plus their isotopologues, are detected. These data are complemented by high-angular resolution IRAM-PdB interferometric maps of specific species.

The results include the detection of  $\text{CF}^+$ , a new diagnostic of the UV illuminated gas; the detection of a new species in the ISM,  $\text{C}_3\text{H}^+$ ; a deep study of the abundance, spatial distribution and excitation conditions of  $\text{H}_2\text{CO}$ ,  $\text{CH}_3\text{OH}$  and  $\text{CH}_3\text{CN}$ , which reveals that photo-desorption of ices is an efficient mechanism to release molecules into the gas phase; and the first detection of the complex organic molecules,  $\text{HCOOH}$ ,  $\text{CH}_2\text{CO}$ ,  $\text{CH}_3\text{CHO}$  and  $\text{CH}_3\text{CCH}$  in a PDR, which reveals the degree of chemical complexity reached in the UV illuminated neutral gas.

I will then open the talk by the preliminary presentation of a complete 3mm spectral-image cube of the western edge of the Orion B molecular cloud (see image). These observations will provide a complete picture of the distribution of molecular emission in this template star forming region, which we will use to calibrate popular molecular probes, developing their full potential as tools of Galactic and extra-galactic star formation explorations.

