# Colloquium

## SFB 956

Conditions and Impact of Star Formation

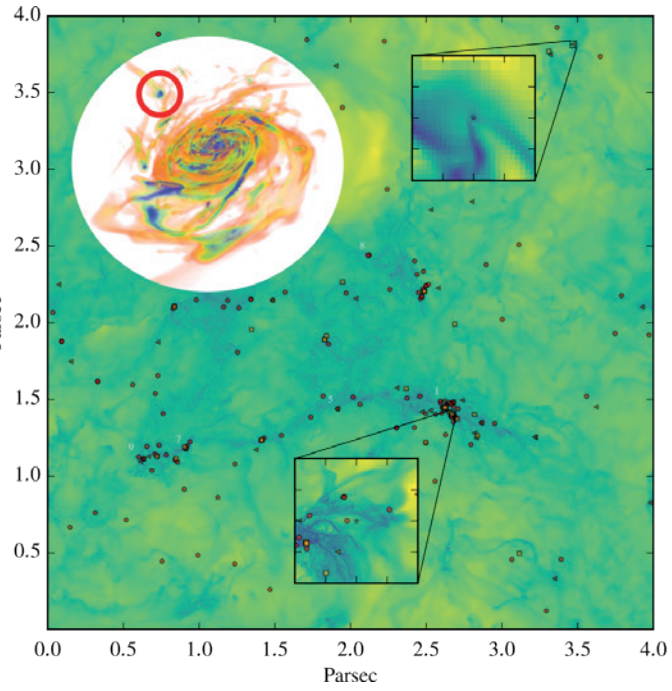
**07 October 2020**

Monday 3:00 pm

**Physikalische Institute Köln**

Lecture Hall III

Zülpicher Straße 77 | 50937 Köln




**Troels Haugbølle**

Niels Bohr Institute, University of Copenhagen, Denmark

# Explaining the Luminosity Spread in Young Clusters

An important shortcoming of the classical model of low-mass star formation is the so-called luminosity problem, whereby embedded protostars are observed to be under-luminous compared to what is expected from a steady mass accretion. An effect of this is observed in the Hertzsprung-Russell diagrams of star forming regions that show a large luminosity spread, which is incompatible with well-defined isochrones based on classic non-accreting protostellar evolution models. A possible solution is that accretion is not steady, but varies with time. It is debated if the time evolution of accretion rates in deeply embedded protostars is best characterised by a smooth decline from early to late stages, or by intermittent bursts of high accretion. Furthermore, while an age can be defined for a star forming region, the ages of individual stars in the region will vary. I will discuss how we can trace the accretion history of young stars, how non-steady accretion impacts the evolution of the protostellar structure, and how the observed luminosity spread can be explained through the combined effect of a protostellar age spread, a consequence of sustained star formation in star forming regions, and time-varying protostellar accretion for individual protostars.

Image: Star formation is a chaotic and dynamic process of interacting gas and stars.
The gravitational collapse makes it inherently multi-scale, and variability is seen on a large range of space and time-scales. This is illustrated here column by density images obtained from global models of a star forming region with a dynamic range of up to 500 million allowing us to capture dynamics on the star cluster, core, and circumstellar disk scales.