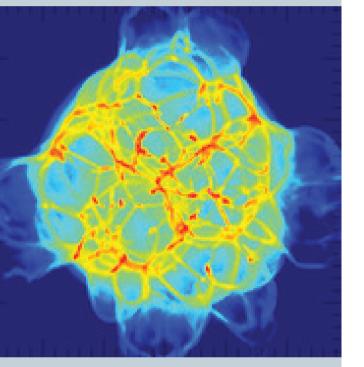# Colloquium

SFB 956
Conditions and Impact of Star Formation

10 May 2021

Monday 3:30 pm

Physikalische Institute Köln / MPIfR, Bonn

Video stream / Host: Sac Medina

Richard Wünsch

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Simulating Star Formation with the Radiation Transport Code TreeRay

I will present a novel fast radiation transport algorithm TreeRay, suitable to work together with hydrodynamic codes. It is based on reverse ray tracing combined with tree-based accelerated integration. TreeRay is implemented in the adaptive mesh refinement code FLASH, however, the method itself is independent of the host code and can be implemented in any grid based or particle based hydrodynamics code.
A key advantage of TreeRay is that its computational cost is independent of the number of sources, making it suitable for simulations with many point sources (e.g. massive star clusters) as well as simulations where diffuse emission is important. A very efficient communication and tree-walk strategy enables TreeRay to achieve almost ideal parallel scalings. TreeRay can easily be extended with modules to treat radiative transfer at different wavelengths and to implement related physical processes.
I will focus on the module calculating ionising radiation using the On-the-Spot approximation and describe various tests demonstrating that complicated simulations of star clusters with feedback from multiple massive stars become feasible with TreeRay. Finally, I will show several applications where TreeRay has been used, including project SILCC (SImulating Life Cycle of Clouds) - complex simulations of the interstellar medium in a part of the galactic disk, designed to capture the full matter cycle between gas and stars.