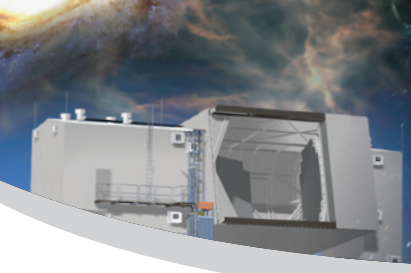


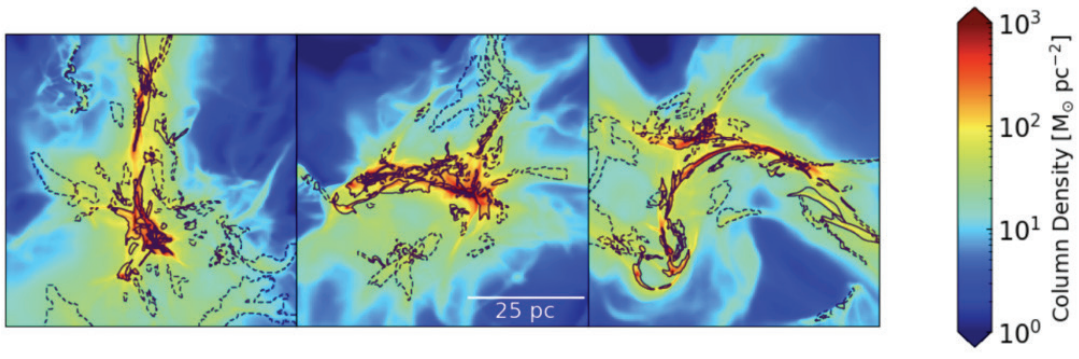
CRC1601

COLLOQUIUM

CRC 1601 HABITATS OF MASSIVE STARS ACROSS COSMIC TIME

July 8, 2025

University of Cologne
Physics Institutes
Lecture Hall III, 2:00 pm



Stefanie Walch-Gassner
SFB 1601 / I. Physics Institute

The energetics of molecular clouds: reassessing the role of gravity

The intricate dynamics of molecular clouds, pivotal to the formation of stars, have been a subject of our ongoing investigation. In the SILCC-Zoom simulation suite, we investigate the formation and evolution of molecular clouds within their galactic, multi-phase ISM environment. The adaptive mesh refinement (AMR) magneto-hydrodynamics simulations include a chemical network and radiative transfer.

The clouds are divided into coherent and hierarchical substructures using dendrograms. A detailed virial analysis of the identified substructures unravels their energetics. We can show that substructures that mostly consist of atomic, rather than molecular gas, are always unbound. Only denser, molecular structures become “bound”, but often they seem to be stabilized by ram pressure or thermal pressure rather than truly bound by self-gravity. Only a few structures are clearly gravitationally bound. Our results put the role of gravity to the test and have important implications for the low star formation rate and efficiency in molecular clouds.