Colloquium

SFB 956

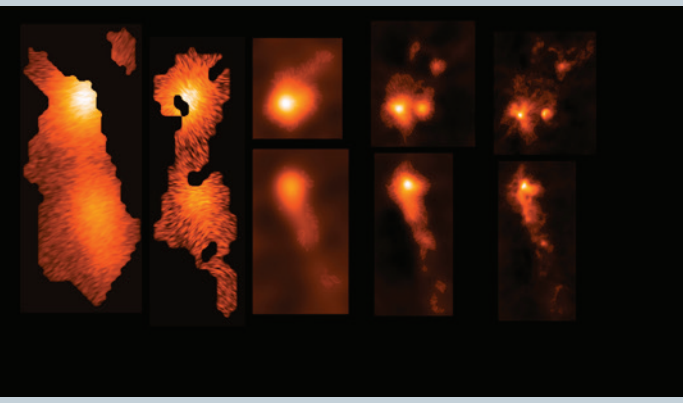
Conditions and Impact of Star Formation

21 June 2021

Monday 11:00 am

Physikalische Institute Köln

Video stream / Host: Peter Schilke



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Going Local – A Multi-scale Picture of the Magnetic Field in Star Formation

The role of the magnetic (B-) field in the star-formation process is highly debated. How important is the B-field? What is the role of the B-field in the presence of gravity and turbulence? While a growing number of instruments is now offering dust polarization observations as a tool to observe B-fields, the analysis and interpretation of these data can still be challenging. We present a synergetic multi-scale picture of the magnetic field, based on a series of dust polarization observations in high-mass star-forming regions. These observations image the B-field morphology with progressively higher resolutions from the pc-scale envelope, to globally collapsing cores, to the fragments within cores, and down to a network of core-connection fibers with the currently highest resolution around 500au. These data cover a range in resolution of about a factor 1,000 in area. Together with these scale-dependent B-field morphologies we analyze the gravitational vector field. In particular, our analysis is building on methods that are extracting local information of the B-field, to make optimized use of the detailed B-field structures that carry the imprints of the star-formation processes. As a result, we find recurring similarities in the B-field and in the gravitational vector fields. These self-similar structures point at a multi-scale collapse-within-collapse scenario. At the highest resolution, we find B-field orientations that are prevailingly parallel to the core-connecting extensions and fibers. With this we derive a stability criterion defining a minimum field strength that can stabilize fibers against a radial collapse. We find that the detected fibers are stable, hence possibly making them a fundamental component in the accretion onto central cores.