

Physikalisches Kolloquium

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Topological and morphological analysis of random fields with applications to compressible turbulence

The theory of random functions and techniques of data analysis based on it mostly rely on the Gaussian statistical properties of the underlying random fields. This limitation is becoming less and less acceptable as the resolution, sensitivity and physical complexity of experimental and numerical data increase. Observations and simulations of compressible random flows, especially in astrophysical contexts, provide a good example of this difficulty. This work is motivated by the need to compare with observations the results of comprehensive simulations of turbulence in the interstellar medium. The quantitative methods used at present are largely limited to probability densities and Fourier spectra of random fields. Meanwhile, observations suggest widespread filamentary structures of the interstellar gas to which the available methods are insensitive. We discuss novel methods of data analysis that are applicable to intermittent, strongly non-Gaussian random fields and are based on recent developments in computational topology and morphology of random fields. Particular aspects that will be discussed include the recovery of a three-dimensional structure of a random field from its two-dimensional cross-section and the effects of magnetic field on interstellar turbulence.

Montag, 28.05.2018, 16:15 Uhr

Ort: Hörsaal 6