Wednesday Talk Series

Date: Wednesday, January 07, 2026

Time: 04:00 PM-5:00 PM

Venue: Mithal Hall, Department of Earth Sciences, IIT Roorkee

Quantitative Approach to Finite Strain Analysis in Deformed Rocks

Foundation, Evolution, and Objectivity

Speaker: Nikhil Mishra

Abstract: A key tool in structural geology for limiting penetrative deformation from the spatial distribution of the.passive strain markers is quantitative finite strain analysis. The Fry method, which takes advantage of the geometry of vacancy fields produced by thorough inter-marker vector analysis, is still a popular technique for two-dimensional strain estimation. The resulting central low-density region defines an ellipse whose axial ratio and orientation match the finite strain ellipse for a marker population that was initially isotropic, homogeneously strained, and anti-clustered. A number of geometric presumptions, such as initial isotropy, spatial homogeneity, uniform strain, and the absence of primary fabric, are crucial to the dependability of this method and can all be variedly broken in natural rocks. Constraints on minimum marker populations as a function of anti-clustering intensity and normalization techniques intended to reduce size-dependent noise are two methodological advancements that address these limitations. More recent developments substitute objective, algorithm-based optimization for subjective manual ellipse fitting. Specifically, by maximizing an exponential density-contrast function across the void boundary, the Continuous Function Method finds the ideal strain ellipse and produces statistically reliable strain parameters. To ensure methodological admissibility and interpretive reliability, pre-analysis validation using dispersion and directional isotropy tests is suggested.

Brief introduction: Nikhil Mishra is an MHRD research scholar in the Department of Earth Sciences at IIT Roorkee, working under the supervision of Prof. Sandeep Bhatt. He completed his bachelor's degree in Geology from the University of Delhi in 2021, followed by his master's degree in 2023 from Hemvati Nandan Bahuguna Garhwal University. His doctoral research focuses on statistical and algorithmic approaches to finite strain analysis in deformed rocks