National Institute of Technology Rourkela

Registration Seminar

Seminar Title	: Investigating Monsoon Depression Dynamics and Rainfall prediction Using Indian Ocean Land Atmosphere Coupled Modeling system
Speaker	: Imamah Ali (Rollno : 523er1001)
Supervisor	: Krishna Kishore Osuri
Venue	: ER-303, Dept of ER
Date and Time	: 16 May 2025 (4:00 PM)
Abstract	: Monsoon depressions (MDs) are dominant synoptic-scale, rain-producing systems within the Indian monsoon, with approximately 70&ndash75% forming over the Head Bay of Bengal and around 25&ndash30% developing over land, typically in proximity to the monsoon trough. Moving in west-northwestward direction, these systems produce substantial rainfall contributing ~40-50% to the seasonal rainfall. This study aims to comprehensively evaluate the structure, dynamics, and genesis of monsoon depressions using high-resolution Indian Ocean&ndashLand&ndashAtmosphere (IOLA) coupled model. Following the introduction chapter, the first working chapter deals with the performance of the model in simulating MDs tracks and other dynamical and thermodynamical processes, which will be compared with observations or other available studies. The second chapter will identify and diagnose rainfall biases in model forecasts using non-traditional, object-based approaches (Contiguous Rain Area, CRA) to isolate systemic deficiencies of the model. Third, the physics of moist convection within the MD environment will be examined to understand how convective parameterizations contribute to structural discrepancies and rainfall variability, along with cloud microphysical schemes. Finally, the predictability of MD genesis will also be assessed by using the above customized model. By addressing these four interconnected objectives, the research will contribute to a robust process-based understanding of monsoon depression behavior in high-resolution simulations. The insights gained will be instrumental in guiding the development and tuning of the IOLA model framework for improved prediction of MDs and associated rainfall. Additionally, this work can serve as a critical component in the early warning system for MDs, supporting disaster risk reduction efforts in India.