National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: Land surface processes at urban scale resolution on thunderstorms prediction
Speaker	: Prof. Krishna Kishore Osuri
Supervisor	: 8125817908
Venue	: ER-303 Class Room
Date and Time	: 26 Sep 2024 (04:50 PM)
Abstract	: The study highlights the need of land surface process at an urban resolving scale to improve the thunderstorm representation and the rainfall characterization, particularly over the cities. The eastern states, Odisha, Chhattisgarh, Jharkhand, and West Bengal, show increasing trends in thunderstorm activity. The rainfall characterisation of urban thunderstorms is sensitive to Land Use Land cover (LULC) representation which has been understood from observational and modeling studies. For example, Bhubaneswar experiences ~20% more rainfall compared to Cuttack despite their geographical proximity and mainly due to LULC differences. The ARW modeling system is configured at different configurations to understand the sensitivity of physics and horizontal resolutions on thunderstorm rainfall. Results reveal that nested configuration at convective permitting resolution (2 km) improved the quantitative rainfall simulation with better skill score and less errors for different rainfall thresholds than a single domain cloud-resolving resolution configuration (3 km). Physics sensitivity analysis shows that the updated soil moisture during model integration appears to be vital for thunderstorm intensity and duration. Better choice of boundary layer and microphysical parameterization helps understanding distinct processes responsible for improved thunderstorm predictions. In addition to the above modeling efforts, a noteworthy outcome is the UCM (urban canopy model) significantly improves the thunderstorm and associated rainfall simulation in and around the city boundary, compared to when no urban physics scheme is used. Most importantly, the model operated with UCM at urban scale resolution (0.66km) with urban climate zones is able to show the splitting of thunderstorms when approaching a city. These outcomes and deliverables may be useful to customize the operational mesoscale model at India Meteorological Department for convective rainfall predictions.