

Institute Colloquium

“Climate Network Analysis Methods and
Results: El Nino, La Nina and
Tropical Cyclones”



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Auditorium,
North Campus

**Prof. Neelima M.
Gupte**

Department of Physics,
Indian Institute of Technology
Madras

Climate Network Analysis Methods and Results: El Nino, La Nina and Tropical Cyclones

Prof. Neelima M. Gupte {(Professor (Emeritus))}

Affiliation: - Department of Physics, Indian Institute of Technology, Madras.

Abstract: -

Climate networks, i.e. complex networks constructed out of the time series of weather-related data have become an important tool in the analysis of climatic behaviour. The combination of the techniques of percolation theory, and the topological characterisers of networks have led to the detailed analysis and prediction of extreme events such as the ENSO phenomena, and the Indian monsoon. In this talk, we apply these techniques to the study of climate phenomena such as the El Nino, and La Nina phenomena, as well as tropical cyclones in the Indian Ocean. The signatures of these phenomena can be seen in abrupt transitions in percolation measures like the order parameter and susceptibilities as well as in network related measures such as node degrees, and betweenness centralities. These quantities can also be used for characterization, prediction and provide estimates of the severity of extreme events and tipping points and locations. Our analysis is linked with geographic locations and can provide insights into teleconnections and climatic phenomena and circulations. These methods are sufficiently general that they can be used in other cases of extreme climatic events, as well as other areas.

Bio-Sketch:

Prof. Neelima Gupte obtained her B.Sc from Bombay University in 1976, M.Sc from IIT Bombay in 1978 and Ph.D from SUNY at Stony Brook in 1983. She has subsequently worked at the University of Hyderabad, and was on the faculty of Pune University from 1985 to 1993, and subsequently at IIT Madras. She has held the Girija Vaidyanathan Chair Professorship in the Department of Physics, IIT Madras, and is currently Professor Emeritus there. Her research interests lie in the field of nonlinear dynamics, and chaos. Her current research interests include explosive collective phenomena, the application of topological characterisers for revealing the hidden

geometry of time series networks, the analysis of chimera states, and studies of hierarchical and climate networks. She is a member of the Editorial Board of the the journal *Frontiers in Physics*, has been a member of the Editorial Board of the journal *Pramana* and the Program committee of the International Centre for Theoretical Sciences Bangalore, and a fellow of NASI. She has been the chair of the DST committee of the SERC schools on Nonlinear Dynamics, which is responsible for the organisation of the SERC schools on Nonlinear Dynamics, and several other DST and CSIR committees. She has also been one of the main organisers of the international conference series on Perspectives in Nonlinear Dynamics and a long-standing member of the advisory board of the Sigma-Phi conferences in Greece. In addition to her academic interests, she has participated in the activities of the Women in Physics group of the International Union of Pure and Applied Physics as well as that of the Indian Physics Association.
