Indian Institute of Science Education and Research (IISER) Bhopal

The Earth and Environment (TEE)

Seminar Series

Organized by:
Department of Earth and Environmental Sciences

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Friday
22nd September, 2023
5.00pm

About the Speaker

Nibir Mandal is an Indian structural geologist and a professor of Geological Sciences at Jadavpur University. He completed his postgraduate degree in geology from Jadavpur University in 1984. He continued at the university for his doctoral studies as a CSIR research fellow and received his PhD degree in 1991. He then joined Allahabad University in 1992 as a lecturer. Later, he became a lecturer at Jadavpur University. He pursued post-doctoral studies as a visiting scientist at Hokkaido University and as a post-doctoral fellow at ETH Zurich.

Dr. Mandal was honored in 1992 with the Indian National Science Academy's Young Scientist Medal. He received the prestigious Shanti Swarup Bhatnagar award, one of the top Indian science honors, from the Council of Scientific and Industrial Research in 2005. In 2006, he was elected as a fellow by the Indian Academy of Sciences . Beside this he has served as an adjunct professor at the Department of Earth sciences of the Indian Institute of Technology Kanpur.

Prof. Nibir Mandal
Jadavpur University

Arc-Volcanism: an inside story

Abstract

Subduction zones generally involve dehydration melting in the mantle wedge to form partially molten layers above the subducting slabs, which play the most crucial role in the development of narrow volcanic fronts (island arcs). A part of this story will narrate scaled laboratory experiments used to demonstrate how a gravitational instability in the melt-rich layers can control the upwelling dynamics of melt-bearing materials in the form of three-dimensional regular waves as a function of the slab dip and the partially-molten layer thickness, and how they ultimately give rise to a set of plumes, leading to specific volcanic arc patterns. The experimental deliberations will be supported by findings from real scale computational fluid dynamics (CFD) simulations. The second part of this story will cover a linear stability analysis within a framework of lubrication approximation to theorize the two competing processes: gravitational instability and slab-parallel advection in the melt-rich layer atop the subducting slab. Finally, we will integrate the two directions: experiments and theory to explain varying spatial distributions of volcanoes observed in natural subduction zones, such as the presently active Mexican subduction system and the Java-Sumatra subduction system and the ancient subduction zones, e.g., the Andean subduction system.