Nature of Ambient Noise, Local Seismicity and Geometry of the Subducting Indian Plate in the Andaman and Nicobar Region: Scientific Results from the Passive OBS Experiment

Speaker: Dr. RamaKrushna Reddy
Time: 11 AM, July 10, 2021 (Saturday)
Webex link:
https://iitroorkee.webex.com/iitroorkee/j.php?MTID=mea1808b466b6b5e0abe1f6b09c63a55a
Meeting number: 159 012 8709
Password: NmmMDUHs826

An earthquake early warning system with a high degree of accuracy and precision measured in seconds can save many lives. The effectiveness of earthquake early warning systems can be predicted by using P-wave rather than S-wave energy to assess the magnitude associated with an earthquake. The S-wave travels at a slower velocity than the P-wave, which allows the exploitation of the S-P differential travel time for issuing an alert prior to damaging ground motion. We have presented a fully automated algorithm that has the potential to improve the reliability of magnitude determination from the first few seconds (2.7 s) of the incoming earthquake. We train and classify the scale-dependent threshold wavelet coefficients using a machine learning algorithm (SVM) to predict the magnitude of an incoming earthquake with an accuracy of ± 0.4 magnitude units.
Despite being in a high seismic risk zone, Andaman and Nicobar was poorly instrumented and understudied prior to the 2004 tsunamigenic earthquake. CSIR – NIO has strategically deployed twelve Ocean Bottom Seismometer (OBS) stations on important geomorphic features in the Andaman and Nicobar. OBSs were deployed to study the geometry of subducting Indo–Australian plate, the local seismicity pattern, and the geodynamic setting of the Andaman. Unlike continental stations OBSs are noisy due to its proximity to natural sources such as ocean waves, wind and ocean currents. The dominant noises record on OBS data are tilt noise, compliance noise, microseism, infragravity waves and self noise generated by the instrument. We studied the spatiotemporal and directional characteristics of microseism to understand its genesis and propagation. Amplitude spectra, polarization spectra and wave model strongly demonstrate that short period noise is generating in Andaman and long period noise is generated in the South Indian Ocean and propagating to Andaman. We also observe a strange signal in OBS data, harmonic in nature having a fundamental frequency and several overtones. We attribute the signal is generated by strumming of head buoy due to tidal currents.

About the Speaker
Dr. Ramakrushna Reddy received his M.Tech degree in computational seismology from IIT Kharagpur. He received his Ph.D. degree from IIT Madras in Earthquake Early Warning. In the context of Early Warning, he was specifically focused on machine learning techniques (SVM), wavelets, and filter bank theory to develop an algorithm. Later, he worked as a postdoctoral fellow in CSIR – NIO and IIT Kharagpur. He is a recipient of SERB – NPDF fellowship. During NIO, he was actively involved in five scientific expeditions in the Bay of Bengal, Andaman, and the Arabian Sea for acquiring geophysical data. Over the past few years, he has been working on OBS data processing, interpretation, and understanding the seismicity generated by volcanic and tectonic activity.

A study of silicate weathering, crustal recycling, and mantle geodynamics using radiogenic (Nd, Sr) and stable (Ca, S) isotopes

Speaker: Dr. Anupam Banerjee
Time: 12:15 PM, July 10, 2021 (Saturday)
Webex link:
https://iitroorkee.webex.com/iitroorkee/j.php?MTID=mea1808b466b6b5e0abe1f6b09c63a55a
Meeting number: 159 012 8709
Password: NmmMDUHs826

Silicate weathering releases cations which are eventually transported to the oceans, where calcium carbonate precipitates and this process results in the net consumption of atmospheric CO_2. The marine carbonates are eventually subducted as part of the oceanic lithosphere resulting in mantle heterogeneity, which is subsequently sampled by mantle-derived magmas.

In this presentation, I will first present geochemical and Nd, Sr, and stable Ca isotope data for spheroidally weathered mafic rocks and demonstrate that selective weathering of rock-forming minerals could perturb the weathering indices in case of incongruent weathering. Additionally, such compositional variation due to selective weathering of minerals can be used to determine the age of paleo-weathering events and has a broader implication for understanding variations in river water chemistry. In the second part of the talk, I will present radiogenic Sr, Nd and stable Ca and S isotopic compositions of carbonatites from different locations worldwide and demonstrate that crustal recycling signatures are more prevalent in carbonatites younger than 300 Ma, which has implications for the change in mantle geodynamics from the Archean to present.

About the Speaker
Anupam is currently a Research Associate at the Indian Institute of Science Bangalore. Prior to this, Anupam was a postdoctoral researcher at Niigata University in Japan where he carried out research on the applications of Sulfur isotopes on magmatic rocks. Anupam completed his PhD in 2018 from the Indian Institute of Science, Bangalore. He obtained his bachelor's degree in Geology from Presidency College under the affiliation of University of Calcutta, followed by a master's degree in Geology from the Indian Institute of Technology, Kharagpur. His main research interest lies in high-temperature isotope geochemistry although he started his PhD which involved understanding low-temperature processes. Anupam has the first-hand experience in setting up a clean lab and calibration of ICPMS and TIMS at the IISc. He has published in internationally acclaimed journals and has seven published articles at present. Although Anupam has worked on multiple stable and radiogenic isotope systems, his main expertise is the applications of stable calcium isotopes on magmatic rocks.

Predicting hillslope response during earthquake and extreme rainfall;
Case studies from the SE Carpathians (Romania) and NW Himalaya (India)

Speaker: Dr. V. Kumar
Time: 4 PM, July 10, 2021 (Saturday)
WebEx link:
https://iitroorkee.webex.com/iitroorkee/j.php?MTID=mcc626b091c01fb256e59b9237f5538ed
Meeting number: 159 686 7118
Password: QVnv8BFjF36

Landslide, though a normal process of hillslope erosion, poses the socio-economic risk to human life and infrastructure in the mountain region. Despite the rising global landslide mortality risk, effective evaluation of the disastrous influences of landslides has been infrequent. Such evaluation approaches could be regional or local. However, effectiveness in such approaches can't be rationalized until both the main landslide triggering factors; rainfall and earthquake are evaluated together. Despite the numerous case studies of rainfall induced slope failures in the earthquake affected terrain, studies predicting the potential effects of both factors have been relatively rare. The necessity of such studies becomes more critical in view of an annual average of >4,000 landslide related deaths worldwide in the last decade.

Owing to the capability to represent the progressive deformation under various conditions, numerical simulation can be considered as a primary approach for an effective evaluation of slope instability and associated risk. Though the continuum simulation-based approaches have been common for the local scale, estimation of large strain, particularly during the seismic analysis requires the discontinuum simulation. Along with stability evaluation, prediction of potential runout during the slope failure constitutes a principal risk evaluation approach.

In view of these understandings, my research plan aims to predict the potential response of the hillslopes under seismic and extreme rainfall conditions using field investigation, satellite imagery analysis, geotechnical/geophysical investigation, slope stability modeling, and runout modeling. This proposed talk involves case studies from the SE Carpathians (Romania) and NW Himalaya (India). The objectives of these studies are as follows; (1) Determining the spatial extent and magnitude of major landslide hillslopes under the extreme rainfall and seismic events, (2) Predicting the potential outreach, velocity, and height of the debris flows during the extreme rainfall events, (3) Predicting the potential landslide damming and landslide lake outburst flood (LLOF) sites.

About the Speaker

Dr. Vipin Kumar is currently works as a post-doctoral fellow at University of Liege, Belgium. Prior to this he was working as a Lecturer at HNB Garhwal University, Srinagar. Dr. Kumar completed his PhD in Geology in 2019, from Wadia Institute of Himalayas Geology (HNB Garhwal University). He specializes in Engineering Geology, Georisk and Environmental Sciences.