Defence Seminar

Seminar Title	: Fault Resonance Process and its Implication for Active Fault Systems
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Venue	: Seminar Room, Mining Engineering Department
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Abstract : Plate tectonics is the main driving force for lithospheric deformation and occurrence of seismicity. In addition to tectonic loading, various exogenous stress perturbations also influence the fault dynamics and modulate the seismicity. However, the exact response and feedback mechanism between seismicity modulation and exogenous stress perturbations remain elusive. Moreover, the contrast in seismicity modulation for different tectonic domains on Earth and other planetary environments remains debated. Also, there is an absence of a unified model for the seismicity modulation linked to different planetary bodies based on observational, theoretical, and mechanical frameworks. In the present work, a theoretical model has been developed incorporating rate-state-dependent friction to understand the fault dynamics and modulation of seismicity influenced by exogenous stress perturbations and also investigated the diversity in seismicity modulation in different planetary environments. From the fault resonance destabilization model, it has been observed that the fault slip is resonated by exogenous stress perturbation, depends upon the fault stiffness and critical period of excitation. It is found that a strong amplification of shear stress and velocity perturbation occurred with decreasing normal stress and an increasing relative plate motion. Moreover, the presence of anomalous fluid at deeper levels of the fault possibly places the fault segments in the conditional stable frictional regime, which is very sensitive to exogenous stress perturbation and modulates the seismicity. Further, it has been found that plate interior regions appear to be more sensitive to long period seismicity modulation and less sensitive to short period seismicity modulation. whereas, plate boundary regions are equally susceptible to both short period and long period seismicity modulation processes. It has also been observed that gravity-induced resonance destabilization model appears to be better in agreement with the diversity in seismicity modulation linked to different planetary environments. Finally, it has been suggested that the present resonance destabilization model can produce comprehensive results linked to seismicity modulation by exogenous processes in different planetary environments.