National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: Feedback responses between endogenous and exogenous processes at Campi Flegrei caldera dynamics
Speaker	: Sambit Sahoo (519er2004)
Supervisor	: 8125817908
Venue	: ER-303 Dept. Class Room
Date and Time	: 05 Jan 2024 (4:30 PM)
Abstract	: The Campi Flegrei caldera is characterized by the phenomenon of bradyseism, as evidenced by stratigraphic records of alternate oceanic and continental sediments dating back over a thousand years. Since 2005, the caldera has been in a phase of unrest, which is increasing volcanic deformations and associated seismicity around the region, resulting in a growing concern over the dense population in the inhabitation. Recent studies have highlighted that the caldera dynamics are driven by a combination of endogenous processes and modulation phenomena induced by exogenous processes e.g. rainfall, atmospheric pressure and tidal loading, etc. Although the complex feedback mechanisms of both endogenous and exogenous processes are still under debate, the present study is focused on the increased potential of modulation due to exogenous processes with the increase or evolution in the degree of inflation of the magma chamber. Specifically, Campi Flegrei volcanic system shows sensitivity to seasonal hydrological cycles during slower rates of inflation and to short-period tidal modulations during higher rates of inflation. The observed seasonal modulations of seismic activity are explained in terms of water infiltration into the shallow aquifers, basins and vent depression system of the caldera. The rainfall-induced pore pressure build-up also favors the instability of the brittle cap rock, promoting seismicity. In addition, this study suggests that the tidal loadings provide horizontal NS extensions to the mostly NW-SE, NE-SW, and EW-oriented scattered fractures and further contribute towards fracture propagation. During this process, a cyclic opening and sealing of fractures by volatile outgassing and silicate settling may respectively produces the episodic behavior of the seismicity. The seismicity in relation to exogenous processes imposed by seasonal rainfall and tidal loadings shows that the degree of correlation depends on the different rates of inflation. The long-period seasonal modulations and short-period tidal modulations during the evolution of the degree of inflation are finally interpreted in the framework of the fault resonance destabilization model, under rate-and-state dependant frictional formalism.