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Institutional Report

Borehole Geophysics Research Laboratory

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Introduction

Borehole Geophysics Research Laboratory (BGRL) was established by the Ministry of Earth Sciences (MoES), Government of India to address challenging seismological problems of societal relevance through scientific drilling investigations. The research laboratory was conceptualised as part of the Ministry's flagship programme Scientific Deep Drilling in the Koyna Intraplate Seismic Zone, Maharashtra.

Recognising the growing importance of scientific drilling and the lack of such facilities and expertise in the country, MoES has undertaken to develop indigenous capacity and expertise in all aspects of scientific drilling, deep borehole geophysics, associated geological investigations and modelling dedicated to earthquake research.

BGRL started functioning on October 7, 2014 from its temporary office in Karad with the help of a young team of dedicated scientific, technical and administrative staff. The project activities are being implemented utilising the administrative and financial support infrastructure of NCAOR, Goa. The permanent infrastructure including office buildings, main laboratories and a state-of-the-art core repository

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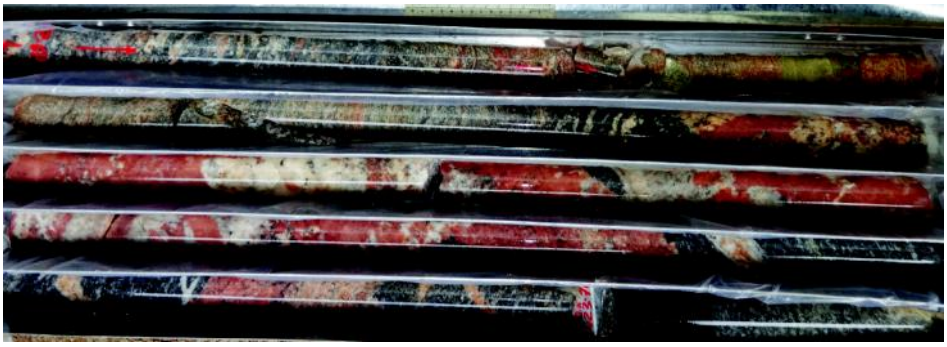
Core with slickenlines on a fault plane from Koyna area

Core showing a near-vertical fault from Koyna area



Granite-gneiss basement rock underlying Deccan Traps at Koyna

is under development at its campus in Hazarmachi, Karad.

Scientific deep drilling investigations have been undertaken in the Koyna seismic zone, western India to study reservoir triggered earthquakes that have been occurring persistently since the impoundment of the Shivaji Sagar Lake in 1962. A strong correlation between continued earthquake activity and the annual loading and unloading cycles of the Koyna and Warna reservoirs is established. However, a model to comprehend the genesis of reservoir triggered earthquakes is elusive, likely due to lack of observations from near-field. Through the project, scientists are striving to reach the depths of earthquakes by scientific deep drilling and establish a fault zone observatory, sample fault zone materials for multi-disciplinary laboratory studies, and model earthquake mechanism(s) using direct observations in the near-field before, during and after their occurrence.

To start with, four major divisions have been planned:

Scientific drilling: Well design, planning and coordination of drilling operations and on-site measurements, collection of cores and cuttings, data archival in a Drilling Information System.

Borehole geophysics and related laboratories: Downhole geophysical measurements, in-situ stress and hydrology, borehole seismics, geothermics, petrology, rock physics.

Core repository: Curation of cores and cuttings, core imaging and analysis, facilities for sampling and distribution of samples for scientific studies.

Information and Outreach: Information centre, Geocentre for school children and general public, training courses on Borehole Geophysics.

During the first year, a number of activities have been initiated apart from setting up of the office and work facilities. BGRL has firmed up the well designs and plans for scientific drilling of 3-5 km deep boreholes in the Koyna seismogenic zone and downhole measurements during and after drilling, configured a Drilling Information System, established petrology and geothermal laboratories, and carried out geological and geophysical studies on core samples. A major effort has been initiated towards capacity building including both establishment of advanced laboratories and training of manpower in areas relevant to scientific drilling investigations. The association between MoES and International Continental Scientific Drilling Program (ICDP) allows BGRL to engage with international experts on deep borehole investigations.

After successful completion of the scientific deep drilling in Koyna region, MoES will utilize the expertise and facilities developed at BGRL to undertake scientific drilling investigations in other parts of the country. The goal of BGRL is to emerge as an institution of international repute housing highly advanced geophysical, geological and geotechnical facilities related to earthquake research.

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