



Deep Scientific Drilling at Koyna, India to Investigate Reservoir Triggered Earthquakes

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The Koyna region, located in the ~65 Ma old Deccan Traps of India, is globally the most prominent site of artificial water reservoir triggered earthquakes (RTS). Triggered earthquakes are occurring since impoundment of the Koyna Dam in 1962 including M 6.3 December 10, 1967; 22 M>5, and thousands of smaller earthquakes. Filling of the nearby Warna Reservoir gave an impetus to triggered earthquakes. The entire earthquake activity is limited to an area of about 20 km x 30 km, with most focal depths being within 6 km. There is no other earthquakes source within 50 km of the Koyna Dam. An ICDP Workshop held at Hyderabad and Koyna in March 2011 found Koyna to be the most suitable site to investigate RTS through deep drilling. A preparatory phase of investigations was recommended. Studies carried out since 2011 in the preparatory phase were recently reviewed in the second ICDP Workshop held at Koyna from May 16 to 18, 2014. Results of detailed airborne magnetic and gravity-gradient surveys, MT surveys, drilling of 6 boreholes going to depths of ~ 1500 m and logging, heat flow measurements, seismological investigations including the deployment of two borehole seismometers, and LiDAR surveys were reviewed. Significant results include absence of sediments below the basalt cover, the thickness of the basalt column and its relation with the surface elevation, and almost flat topography of the basement. The temperatures at the depth of 5 km would be around 130 to 150 degrees Celsius, in confirmation of earlier estimates. To achieve desired accuracies of ~ 50 meters in focal parameters, seismometers need to be placed below the basalt cover. This has led to the plan of putting eight borehole seismometers with good azimuthal coverage around the earthquake zone. Four of them are already in operation and four more are likely to be installed in the months to come. The future plan of work includes:

- Submitting a proposal to ICDP for two pilot boreholes by Jan 15, 2015.
- Drilling 2 pilot boreholes of 3 km depth during 2015.
- Concurrent planning of deep borehole(s), firming the specifications by the end of 2015 and drilling and setting of deep borehole observatory during 2016 and 2017.
- Plan for an international meeting and visit to Koyna in 2017.