

Understanding continental crust emplacement: A continental scientific drilling perspective

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Scientific drilling is a critical tool for Earth science to understand crustal evolution and processes. In the recent past, the International Continental Scientific Drilling Program, ICDP, supported several drilling operations in hard rock addressing the formation and emplacement of continental crust from Archean volcanism (Peering into the Cradle of Life, Barberton, South Africa), Paleoproterozoic volcanism (FAR-DEEP, Baltic Shield, Russia), rift volcanism (Krafla, Iceland), hot spot volcanism (Hawaii, USA, Snake River Plain, Idaho, USA) and Himalyan-style thrust sheet emplacement (COSC, Sweden). The results of these studies have significantly improved our understanding in past and present formation of continental crust.

ICDP supports scientific drilling operations that facilitate outstanding science at globally important sites. ICDP brings together scientists and stakeholders from 24 nations to work together at the highest scientific and technical level. Since its founding in 1996, more than 40 drilling projects and 75 planning workshops have been supported by ICDP worldwide. The outcomes of scientific drilling operations supported by ICDP cover the full range of the Earth sciences from climate change, natural hazards and earth resources to the origins and evolution of life on Earth, effectively addressing the needs of our growing population for energy, sustenance, and quality of life.

Forthcoming ICDP drilling into the Samail ophiolite complex in Oman will provide key data on melt extraction processes from the mantle, igneous accretion of oceanic crust, and hydrothermal modification of that crust. Drilling will also investigate present day alteration processes of mantle peridotites and their relationship to the deep biosphere.

The Surtsey volcano drilling in fall 2016 aims to investigating processes of rift zone volcanism, hydrothermal alteration and biological colonization of basaltic tephra. It will refine our understanding of seawater- interactions with magma and rock that influence diagenetic and microbial alteration of tephra to produce lithified tuff and shed new light on how rift zone volcanic islands form, lithify, and are ultimately destroyed.

ICDP is also funding drilling for Reservoir Triggered Seismicity near the Koyna dam located close to the west coast of India. The basement rocks of the Koyna-Warna region consists of Precambrian basement overlain by a more than 1 km thick Deccan Trap cover that erupted about 65 Ma ago. Two pilot boreholes will provide critical information on the in-situ stress regime, pore fluid pressure, fluid/gas properties and hydrological parameters of basement rocks, and the geothermal regime. These 3 km deep wells will lay the ground for two deep main boreholes for penetrating into the source of induced seismicity at more than 5 km depth.

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