

World's top magma minds embark on journey into molten Earth

Some of the world's leading volcanologists and geothermal engineers have signed up to a \$100m magma drilling project in a bid to help protect millions of people, towns and cities across the world from volcano disasters; and to make a strategic step in scaling up the use of geothermal energy.

More than 30 magma and geothermal scientists from as far away as Alaska and New Zealand came together at a three-day meeting in Paris this month (13-15th March 2017) to work up plans for the Krafla Magma Testbed project, which would see a 2.1km-deep-hole drilled directly into a magma chamber below a volcano in Iceland.

Discovered serendipitously in 2009 as part of a deep drilling project by Iceland's energy company Landsvirkjun, the magma chamber beneath the Krafla volcano provides scientists with the first-ever opportunity to study, in-situ and at depth, the source of volcanic eruptions and geothermal energy.

Volcanology Professor John Eichelberger at the University of Alaska Fairbanks explained: "Finding the magma chamber presents us with the first-ever opportunity to investigate magma properties in situ and to deliver a rich and tested dataset that can provide civil defence authorities with greater surety of what is happening below dangerous volcanoes.

"Krafla is the only place in the world where we can pinpoint the exact location of a magma chamber: making it the best and only place on Earth to do this. It is also among the most researched volcanoes in the world, and therefore one we know most about.

"What we know about magma comes from interpreting activity measured at the surface, the geology of fossil magma chambers, and laboratory experiments. The Krafla drilling project will provide direct samples and observations, helping the world to read signs of volcanic unrest better. It will improve civil protection for the 800 million people who live within 100km of an active volcano: be they the millions of Indonesian citizens living under the veil of the archipelago's active volcanoes or the millions of tourists visiting America's Yellowstone National Park."

So far, 38 research institutes and companies from 11 countries have signed up to the Krafla Magma Testbed (KMT) project. These include Britain, Canada, Denmark, France, Germany, Iceland, Italy, New Zealand, Russia, South Korea and the United States. The project is gaining wider international recognition, with Mexico, Switzerland, and Japan taking an interest following the Paris meeting.

The collaboration is seeking to raise \$30m for the first drilling phase to make the research facilities available to the scientific community by 2020. The facilities would be open to the international science community for a 30-year-programme of research, including repeated probing and sampling of the magma body.

Paolo Papale, Director of Research from Italy's Istituto Nazionale di Geofisica e Vulcanologia, said: "The Krafla Magma Testbed will be the place to develop our fundamental science of the Earth system; new ways of understanding and monitoring volcanos; our ability to extract and exploit geothermal energy sources; and new technology and materials that function in the most extreme conditions we can access on Earth."

Sigurdur Markusson, from Iceland's national energy company Landsvirkjun, said: "Utilizing geothermal energy from the near magma environment is a very exciting next step for the geothermal industry. Understanding where the magma is, how to locate it and the properties of the fluid, is very, very relevant to developing the concept of near-magma geothermal energy in volcanic areas all over the world."

Charles Mandeville, Volcano Hazard Program Coordinator of the United States Geological Survey, said: "KMT gives us the single biggest opportunity to deliver ground truth: providing fundamental data on magma that will close the knowledge gaps in our current monitoring programmes.

“KMT will make the hundreds of millions of dollars we invest globally in volcano disaster protection more effective. It will help national civil protection and hazard monitoring agencies to be more efficient, reducing the uncertainty in forecasting. It will also help organisations like the World Bank who need to understand the risks associated with new projects.”

John Ludden, Executive Director of the British Geological Survey said: “KMT will deliver an incredible knowledge of real conditions of magma rocks by getting into the system. It will enable geoscientists to explore the big questions. Can we harness the energy of magma? Can we find better ways of monitoring magma? How do we use new technology involving gravity to track magmas in volcanoes?”

“KMT will allow us to test and develop models about how the planet works and observe the real properties of the system. We’ll acquire an enormously-improved understanding of magma dynamics. Sensors close to the magma chamber will enable us to measure directly what happens there: How the system behaves; how it evolves with time; how temperature changes; and what happens when you perturb pressure and temperature.”

Professor John Eichelberger added: “If there is something hidden, or an amazing environment within our reach, human beings will find a way to get there. We’re driven to by our nature. It’s just something that human beings do. Of all the hidden places we’ve not yet explored, few are as close to us and as important to us as magma. It will help humankind to solve the energy problem, manage hazards and understand how the rocky planets have formed their crust. This will not be like landing on the Moon, where one country gets to wave a flag. This is a truly international science endeavour where everyone has a role to play.”

Jean Vandemeulebrouck volcanologist from France’s Institut des Sciences de la Terre said: “After 150 years, technological and scientific advancements are enabling our community to embark on Jules Verne’s Journey to the Centre of the Earth. The potential benefits for humanity and for the well-being of our planet are immeasurable.”

The KMT project team, from its Icelandic office, is working up its science, technical drilling and business plans to approach research funding agencies and foundations to raise the initial \$30m required to deliver the research infrastructure. The remaining \$70m would fund a 30-year programme of strategic scientific research at the magma chamber.

In June, the International Continental Scientific Drilling Programme will determine a \$5.5m proposal to kickstart the project.

Issued by Cristina Chapman, KMT Communications Team. Tel +44 (0)115 936 3066 Mobile +44(0)7970 229792 Email crisc@bgs.ac.uk

