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EDITORIAL

Editorial

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Modern earth science has two basic goals: seeking to unravel the historical archives locked in rocks formed over the entire history of the Earth and understanding the structure and dynamics of the active planet on which we live. We endeavour the former in order to better realise the latter. To achieve both goals scientific drilling is essential: it uncovers rock archives containing the records of tectonic, climatic and biological cycles, and impacts from extraterrestrial bodies, from the present day into deep time. Targeted scientific drilling allows us to sample, measure and monitor the Earth to help develop sustainable resources. Drillhole observatories give key insights into Earth's internal dynamic activities, such as fluctuations in heat and the magnetic fields or earthquakes and volcanoes.

It would be impossible to undertake modern earth science research without scientific drilling. The International Continental Scientific Drilling Program (ICDP) has played a primary role over the past two decades, uncovering geological secrets from beneath the continents. Firstly, it provides a strategy for successful science delivery by funding workshops, leading and supporting technological innovation, conducting outreach and teaching programmes and actively cooperating with programs such as IODP. It provides co-funding for coring as well as expertise and advice on all matters technical and logistical. It offers technological support for geophysical logging and data management.

ICDP recently published a new Science Plan 2014–2019 (www.icdp-online.org). The main themes in this document are active faults and earthquakes, heat and mass transfer, global cycles, the hidden biosphere, and cataclysmic events. These themes will underpin societal challenges in water quality and availability, climate and ecosystem evolution, energy and mineral resources, natural hazards, and—ultimately—living sustainably on Earth. The associated current special issue was conceived as providing a snap-shot of ongoing scientific endeavours related directly to continental drilling projects.

In all, 13 papers are presented here. At the largest scale, the importance of drilling for studying global geodynamic cycles and Earth evolution is considered, with reference to hotspot volcanism, the formation of continental crust, collisional orogenies, continental rifting, subduction zone processes and ore deposits. Plate boundaries come under scrutiny by studying shear behaviour in New Zealand and rupture mechanics in California. Also, the installation and operation of geophysical networks to monitor natural earthquake activity in Turkey and induced earthquakes in India are presented. By way of contrast, seismic observations and heat-flow measurements in stable metamorphic terranes of northeast Canada have revealed new insights into, for example, postglacial warming. Extending this theme, high-resolution records of palaeoclimatic change from Cenozoic lake sediments in Macedonia

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and Turkey are presented, as well as the potential for high-resolution palaeoclimatic change from Paleozoic lake and loess strata. Concerning resource evaluation, the petroleum-generating characteristics of cored Mesozoic lacustrine source rocks from Germany are revealed, with special focus on shale oil and shale gas. And last, but by no means least, in situ deep microbial communities are characterised using geomicrobiology and biogeochemistry, thereby helping us to slowly but surely understand the composition and extent of the deep biosphere in a variety of continental settings.

We hope you enjoy reading these varied and excellent contributions. Our sincere thanks go out to Monika and Wolf-Christian Dullo for their help, guidance and patience and to all reviewers for their hard work.