

EDITORIAL

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Geothermal Energy: a glimpse at the state of the field and an introduction to the journal

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Editorial

We enthusiastically present to you this new journal dedicated solely to the growing field of geothermal energy and the many aspects and issues surrounding it. *Geothermal Energy* is a peer-reviewed, open-access journal published by SpringerOpen, providing a forum for geothermal research and investigating the opportunities and challenges of geothermal resources in both deep and shallow systems. A holistic view into geothermal energy in combination with the open-access concept makes this journal unique as new knowledge is provided efficiently and without barriers from and to the scientific community.

Since the Fukushima nuclear disaster in March 2011, the discussion around future energy resources and supply has permeated all levels of society. A new energy paradigm is evolving, in which renewable resources are increasingly gaining attention in science, technology, economics, safety, and public acceptance. Geothermal energy is a promising alternative energy source as it is suited for baseload energy supply, can replace fossil fuel power generation, can be combined with other renewable energy sources such as solar thermal energy, and can stimulate the regional economy. While disturbance of the land surface is small in the procurement of geothermal energy, questions remain as to the impact of subsurface activities on the greater region. To bring geothermal energy to a level in which it can be truly integrated into a nation's energy palette, more research is necessary in the fields of geotechnical engineering, natural sciences, and socioeconomics.

For the safe, long-term operation of deep geothermal systems, we require a better understanding on the functioning of the geological subsurface and its changing thermal, hydraulic, mechanical, and biogeochemical conditions. Access to geothermal reservoirs by drilling remains costly and associated with high exploration risks. Hydraulic stimulation is often necessary, turning deep subsurface reservoirs into efficient heat exchangers, i.e., enhanced or engineered geothermal systems (EGS). Even though several geothermal research projects have been conducted or are underway and power plants are in operation, the understanding we have about EGS is still based on the lessons learned from a few long-term sites.

Shallow geothermal systems have long been the focus of engineering development. In Germany alone, about half a million heat pumps have been installed. Current research on shallow systems focuses on optimization and environmental impacts. For example, geothermal heat pumps are normally installed without detailed knowledge of

the subsurface structure. Development of and access to this data would greatly improve the efficiency and productivity of shallow geothermal systems. Another example shows that for several years, temperature increases due to increasing urbanization processes in the shallow subsurface of cities have been observed. Therefore, long-term effects to microbial behavior need to be studied in more detail because ecosystem functions are very sensitive to temperature changes as a consequence of large-scale geothermal use of the subsurface.

Geothermal Energy focuses on fundamental and applied research needed to deploy technologies to develop and integrate geothermal energy as one key element in the future energy portfolio. Contributions to the journal include geological, geophysical, and geochemical studies; exploration of geothermal fields; reservoir characterization and modelling; development of productivity-enhancing methods; and approaches to achieve robust and economic plant operation. *Geothermal Energy* serves to examine the interaction of individual system components while taking the whole process into account, from the development of the reservoir to the economic provision of geothermal energy.

The editorial board of *Geothermal Energy* brings a broad base of expertise and a guarantee of high standards to the journal. Its members are located around the world - Africa, Asia, Australia, Europe, and North and South America - ensuring a balanced voice and world view. We would like to acknowledge the following members for their voluntary support: Hiroshi Asanuma, Tohoku University, Japan; Chris Bromley, GNS Science, New Zealand; Nicholas Davatzes, Temple University, USA; Christopher McDermott, University of Edinburgh, Scotland; Diego Morata, University of Chile, Chile; Zhonghe Pang, Chinese Academy of Sciences, China; Chan-Hee Park, Korean Institute of Geoscience and Mineral Resources, Korea; Bernard Sanjuan, Bureau de Recherches Géologiques et Minières, France; Joshua Taron, United States Geological Survey, USA; Meseret Zemedkun, United Nations Environment Programme, Kenya.

Manuscripts submitted to *Geothermal Energy* undergo a single-blind, peer review process streamlined to reduce time in the editors' hands and expedite a manuscript's path to publication. Open-access articles are free for viewing and downloading, meaning higher visibility for all accepted articles and greater exposure for authors.

Finally, we must acknowledge the Helmholtz Centre for Environmental Research, Karlsruhe Institute of Technology, and the Helmholtz Centre Potsdam German Research Centre for Geosciences. Their funding has made possible not only the launch of the journal but also the initial waiver of the article-processing charge, enabling all authors to submit their articles free of charge until December 31, 2015.

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Received: 28 March 2013 Accepted: 8 April 2013
Published: 28 May 2013

doi:10.1186/2195-9706-1-1

Cite this article as: Kolditz et al.: *Geothermal Energy*: a glimpse at the state of the field and an introduction to the journal. *Geothermal Energy* 2013 **1**:1.