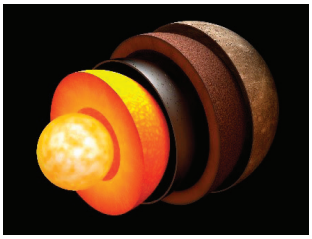
THEMATIC TOPICS IN 2019

Volume 15, Number 1 (February)

PLANET MERCURY

Guest Editors: **Bernard Charlier** (University of Liège, Belgium) and **Olivier Namur** (KU Leuven, Belgium)



Mercury is unique amongst terrestrial planets because of its very high metal/silicate ratio. The NASA *MESSENGER* mission ended in 2015 and significantly advanced our understanding of the deep structure of the planet as well as our comprehension of Mercury's volcanic history and crust formation. The European Space Agency (ESA) is now ready for the launch of the *BepiColombo* mission that will take place at the end of 2018. The "Planet Mercury" issue will summarize the latest developments in light of *MESSENGER* data and perspectives for the *BepiColombo* mission on internal structures and surface processes, based on insights from geophysics, geochemistry, igneous and experimental petrology and volcanology.

- **Origin and Differentiation of Planet Mercury** Bernard Charlier (University of Liège, Belgium) and Olivier Namur (KU Leuven, Belgium)
- **Exploration of Mercury: From *MESSENGER* to *BepiColombo*** Sean Solomon (Columbia University, USA) and Johannes Benkhoff (ESA/ESTEC, The Netherlands)
- **Mercury: Inside the Iron Planet** Steven A. Hauck II (Case Western Reserve University, USA) and Catherine Johnson (University of British Columbia, Canada)
- **Volcanism on Mercury** Rebecca J. Thomas (University of Colorado, USA) and David A. Rothery (The Open University, UK)
- **The Surface Composition of Mercury** Larry R. Nittler (Carnegie Institution of Washington, USA) and Shoshana Z. Weider (Carnegie Institution of Washington, USA)
- **Mercury: Differentiation under Reducing Conditions** Camille Cartier (Université de Lorraine, France) and Bernard J. Wood (University of Oxford, UK)

Volume 15, Number 2 (April)

REACTIVE TRANSPORT MODELING

Guest Editors: **Kate Maher** (Stanford University, USA) and **K. Ulrich Mayer** (University of British Columbia, Canada)

Reactive transport modeling, or computer simulations of the transfer of mass and energy through the subsurface, has become a central tool for understanding how Earth's unique chemical environments are formed, how they function today, and how they might behave in the future. This process-based approach has enabled us to gain a new understanding of a diverse array of Earth processes, from biogeochemical cycles in marine sediments and the factors that control soil formation, to the evolution of contaminated groundwater systems and the engineered containment of nuclear waste. The diverse contributions in this issue will highlight the unique role that reactive transport models have played in advancing our understanding of Earth's shallow crustal environments and our human interactions with them.

- **Tracking Diverse Minerals, Hungry Organisms and Dangerous Contaminants Using Reactive Transport Models** Kate Maher (Stanford University, USA) and K. Ulrich Mayer (University of British Columbia, Canada)
- **Reactive Transport Modeling of Microbial Dynamics in Soils and Sediments** Christof Meile (University of Georgia, USA) and Timothy Scheibe (Pacific Northwest National Laboratory, USA)
- **Reactive Transport of Stable Isotopes** Jennifer L. Druhan (University of Illinois, Urbana Champaign, USA) and Matthew J. Winnick (University of Massachusetts, Amherst, USA)

- **Modeling Continental Weathering Processes Across Spatial and Temporal Scales** Yves Goddéris and Jacques Schott (CNRS, France), Susan Brantley (Pennsylvania State University, USA)
- **Using Reactive Transport Models for Understanding, Quantifying and Predicting Groundwater Quality Changes** Henning Prommer (University of Western Australia; CSIRO; National Centre for Groundwater Research and Training, Australia) Jing Sun (University of Western Australia and CSIRO, Australia) and Benjamin D. Kocar (Massachusetts Institute of Technology, USA)
- **Modeling the Fate of Carbon Dioxide in the Subsurface** Anna Harrison (University College London, UK), Benjamin M. Tutolo (University of Calgary, Canada), Donald J. DePaolo (University of California, Berkeley; the Lawrence Berkeley National Laboratory, USA)
- **Reactive Transport Models for Long-Term Safety Assessment of Nuclear Waste Disposal** Laurent De Windt (MINES ParisTech, France) and Nicolas Spycher (Lawrence Berkeley National Laboratory, USA)

Volume 15, Number 3 (June)

THE SOUTH AEGEAN VOLCANIC ARC

Guest Editors: **Timothy H. Druitt** (University of Clermont Auvergne, France) and **Georges Vougioukalakis** (Institute of Geology and Mineral Exploration, Greece)

The South Aegean Volcanic Arc lies at the intersection between Europe, Asia, and Africa, in the cradle of European civilization. Studies over the last decade have transformed our understanding of the arc: subduction architecture and back-arc geodynamics, genesis of the arc magmas, eruption chronology of the arc recorded in marine tephra archives, and hazards posed by eruptions and tsunamis. Santorini is one of the most explosive arc volcanoes in the world, and its 'Minoan' eruption of the Late Bronze Age is an iconic event in volcanology and archaeology. Caldera unrest at Santorini in 2011–2012 reminds us of the possibility of eruption at this major tourist center. The Kolumbo submarine crater, best known for its deadly eruption of 1650, today hosts a high-temperature hydrothermal system and bacterial colonies. In the eastern sector of the arc lies the large submarine caldera formed by the Kos Plateau Tuff eruption. The eruptive mechanisms and petrology of this eruption have now been unraveled, as have the eruptive and magmatic histories of Nisyros and Yali volcanoes on the caldera rim.

- **Deep Structure and Active Tectonics of the South Aegean Volcanic Arc** Costas B. Papazachos (Aristotle University of Thessaloniki, Greece)
- **The South Aegean Volcanic Arc** Georges Vougioukalakis (Institute of Geology and Mineral Exploration, Greece) and Christopher Satow (Oxford Brookes University, UK)
- **Geochemical Variations and Petrogenetic Processes of the South Aegean Volcanic Arc** Lorella Francalanci (University of Florence, Italy) and Georg F. Zellmer (Massey University, New Zealand)
- **The Christiana–Santorini–Kolumbo Rift** Paraskevi Nomikou (National and Kapodistrian University of Athens, Greece), Christian Hübscher (University of Hamburg, Germany) and Steven Carey (University of Rhode Island, USA)
- **Santorini Caldera and its Plumbing System** Timothy H. Druitt (University of Clermont Auvergne, France), David M. Pyle (University of Oxford, UK) and Tamsin A. Mather (University of Oxford, UK).
- **The Late Bronze-Age Eruption of Santorini and its Impact on the Ancient Mediterranean World** Timothy H. Druitt (University of Clermont Auvergne, France) and Floyd W. McCoy (University of Hawaii, USA)
- **The Kos–Nisyros Volcanic Complex** Olivier Bachmann (ETH Zürich, Switzerland), Sharon Allen (University of Tasmania, Australia) and Caroline Bouvet de Maisonneuve (Nanyang Technological University, Singapore)

THEMATIC TOPICS IN 2019

Volume 15, Number 4 (August)

WEATHERING

Guest editors: **Patrick J. Frings** (GFZ German Research Centre for Geosciences, Germany) and **Heather Buss** (University of Bristol, UK)

This issue will highlight the integral role of weathering processes across a range of geoscience fields. Chemical weathering – the loss of mass by mineral dissolution and export – is key to understanding how Earth's skin functions. Weathering is the starting point for the biogeochemical cycles of most elements. It determines river and groundwater chemistry and provides nutrients to ecosystems. Weathering alters rock structure and susceptibility to erosion; soil and landscape evolution cannot be understood without considering the role of chemical weathering. Weathering of silicate rocks is a long-term sink for atmospheric CO_2, and has been crucial in maintaining our planet's habitability over billions of years … and may constitute a geoengineering strategy. The issue will be the state-of-the-art on these topics and will explore the linkages between them.

- **The Central Role of Weathering in the Geosciences** Heather Buss (University of Bristol, UK) and Patrick Frings (GFZ German Research Centre for Geosciences, Germany)
- **The Goldilocks Planet? How Silicate Weathering Maintains Earth 'Just Right'** James Kasting (Pennsylvania State University, USA)
- **How Plants Enhance Weathering and How Weathering is Important to Plants** Stephen Porder (Brown University, USA)
- **Sculpting Earth's Surface: The Interaction of Mechanical and Chemical Weathering** Suzanne Anderson (University of Colorado, Boulder, USA)
- **Enhanced Weathering and Carbon Sequestration Potential** M. Grace Andrews (Southampton University, UK) and Lyla L. Taylor (University of Sheffield, UK)
- **Paleoweathering: Inferring Climate–Weathering Coupling from the Sedimentary Record** Patrick Frings (GFZ German Research Centre for Geosciences, Germany)

Volume 15, Number 5 (October)

CATASTROPHIC EVENTS IN EARTH'S HISTORY AND THEIR IMPACT ON THE CARBON CYCLE

Guest Editors: **Marie Edmonds** (University of Cambridge, UK), **Adrian Jones** (University College London, UK), and **Celina Suarez** (University of Arkansas, USA)

Carbon is one of the most important elements on Earth. It is the basis of all life on the planet, is stored and mobilized throughout the Earth from core to crust, and is the basis of the energy sources that are so important to human civilization. This issue will explore the origins of carbon on Earth; the long-term carbon cycle; catastrophic and large-scale perturbations to Earth's carbon cycle such as large igneous provinces and bolide impacts; carbon's role in mass extinctions; and icehouse–greenhouse climate transitions in deep time. Deciphering the complex, and often faint, signals of distant carbon catastrophes requires a multidisciplinary effort and the most innovative analytical technology. This thematic collection comes at an important time in which carbon fluxes on Earth are changing rapidly. Society must understand the way in which the deep carbon-cycle on Earth works to secure a sustainable future.

- **The Role of Deep Carbon in Deep Time** Marie Edmonds, (University of Cambridge, UK), Adrian Jones (University College London, UK) and Celina Suarez (University of Arkansas, USA)
- **The Origins of Earth's Carbon** Sami Mikhail (University of St Andrews, UK) and Evelyn Furi (Centre de Recherches Pétrographiques et Géochimiques, France)
- **Large and Giant Bolide Impacts and their Environmental Consequences** Balz S. Kamber (Trinity College Dublin, Ireland; Queensland University of Technology, Australia) and Joseph A. Petrus (University of Melbourne, Australia)
- **Deep Carbon and the Life Cycle of Large Igneous Provinces** Ben Black (City University of New York, USA) and Sally Gibson (University of Cambridge, UK)
- **Carbon Cycle Perturbations and Mass Extinctions** Paul Wignall (University of Leeds, UK), Martin Schobben (Utrecht University, The Netherlands) and Bas van de Schootbrugge (Utrecht University, The Netherlands)
- **Earth Outgassing and Climatic Transitions: The Slow-Burn Towards Biotic "Catastrophes"** Ryan N. McKenzie (University of Hong Kong) and Hehe Jiang (William Marsh Rice University, USA)

Volume 15, Number 6 (December)

KIMBERLITES: FROM DEEP EARTH TO DIAMOND MINES

Guest editors: **Andrea Giuliani** (University of Melbourne, Macquarie University, Australia) and **D. Graham Pearson** (University of Alberta, Canada)

Kimberlites are the most deeply derived of all volcanic rocks, as well as the host rock for most of the world's diamond mines. Kimberlites, therefore, provide unique snap-shots of magma genesis and mantle evolution in the deep Earth well into the diamond stability field (>150 km and, potentially, >700 km). Despite over 100 years of study, the origin of this complex rock-type remains the subject of intense debate. This thematic issue will summarize current knowledge and controversies on kimberlite formation, including key aspects of the petrology, geochemistry and volcanology of these unique rocks. It will show how kimberlites can be successfully dated, and explore links between the temporal and spatial distribution of kimberlites and known geological events. Diamond exploration and resource evaluation methods will be reviewed to demonstrate the inextricable link between an accurate understanding of the characteristics of kimberlites, their entrained mantle cargo, and diamonds.

- **Kimberlites: From Deep Earth to Diamond Mines. An Introduction** Andrea Giuliani (University of Melbourne, Macquarie University, Australia) and D. Graham Pearson (University of Alberta, Canada)
- **What is Kimberlite? Petrology and Mineralogy** Roger H. Mitchell (Lakehead University, Canada), Andrea Giuliani (University of Melbourne, Macquarie University, Australia) and Hugh O'Brien (Geological Survey of Finland)
- **Source Regions of Kimberlites: A Geochemical Perspective** D. Graham Pearson (University of Alberta, Canada), Jon D. Woodhead (University of Melbourne, Australia) and Phillip E. Janney (University of Cape Town, South Africa)
- **Kimberlites Through Time** Larry M. Heaman (University of Alberta, Canada), David Phillips (University of Melbourne, Australia) and Graham D. Pearson (University of Alberta, Canada)
- **Kimberlites as Volcanic Rocks: Transport, Ascent and Emplacement** J. Kelly Russell (University of British Columbia, Canada), R. Stephen J. Sparks (University of Bristol, UK) and Janine Kavanagh (University of Liverpool, UK)
- **Kimberlites: From Source to Surface. Insights from Experiments** Stephen F. Foley (Macquarie University, Australia), Bruce A. Kjarsgaard (Geological Survey of Canada) and Gregory M. Yaxley (Australian National University)
- **Diamond Exploration and Resource Evaluation of Kimberlites** Bruce A. Kjarsgaard (Geological Survey of Canada), Nicole Januszczak (De Beers Exploration Canada Inc.) and Johann Stiefenhofer (Anglo-American Operations Ltd., South Africa)