

DCO EARLY CAREER SCIENTIST WORKSHOP

Hotel Biancaneve, Nicolosi
Mount Etna, Italy
28 August – 2 September 2017

SPONSORS



**ALFRED P. SLOAN
FOUNDATION**



**Istituto Nazionale di
Geofisica e Vulcanologia**



**ThermoFisher
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AGENDA

MEETING HASHTAG: #DCOECS17

Sunday, 27 August 2017

All day **Arrival at Hotel Biancaneve, Nicolosi**
All day; transportation from Catania Fontanarossa Airport (CTA) will be provided where possible. Check-in, registration, and badge pick up.

Monday, 28 August

Until 16:00 **Arrival at Hotel Biancaneve, Nicolosi**
All day; transportation from Catania Fontanarossa Airport (CTA) will be provided where possible. Check-in, registration, and badge pick up.

16:30 **Welcome and Icebreaker**
Members of the organizing committee.

16:30 – 16:45 *Welcome to the Third DCO Early Career Scientist Workshop*
Vincenzo Stagno, Workshop PI, Sapienza University of Rome, Italy

- 16:45 – 17:00** *An introduction to the Deep Life Community*
Melitza Crespo-Medina, Co-Organizer, CECIA – Inter American University of Puerto Rico
- 17:00 – 17:15** *An introduction to the Deep Energy Community*
Riikka Kietäväinen, Co-Organizer, Geological Survey of Finland
- 17:15 – 17:30** *An introduction to the Extreme Physics and Chemistry Community*
Valerio Cerantola, Co-Organizer, ESRF Grenoble, France
- 17:30 – 17:45** *An introduction to the Reservoirs and Fluxes Community*
Peter Barry, Co-Organizer, University of Oxford, UK
- 17:45 – 18:00** *An introduction to Modeling and Visualization*
Tobias Keller, Co-Organizer, Stanford University, USA
- 18:00 – 18:30** *An overview of workshop logistics*
Giancarlo Tamburello, Co-Organizer, INGV Bologna, Italy
- 18:30 – 21:00** *Icebreaker activity (with light refreshments and dinner)*
Katie Pratt, Co-Organizer, University of Rhode Island, USA
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Tuesday, 29 August

- 07:30 – 08:15** **Breakfast**
Provided in Hotel Biancaneve
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- 08:30** **Morning Session I: Water, Water, Everywhere**
Participant lightning talks: 5 minutes each with 5 minutes for questions and discussion

Moderator: **Riikka Kietäväinen**, Geological Survey of Finland
- 08:30 – 08:40** *Welcome and logistical announcements*
Organizing committee
- 08:40 – 08:50** *Exploring the influence of the liquid-liquid phase transition of water on geochemical processes*
Sebastien Facq, University of Cambridge, UK
- 08:50 – 09:00** *Evidence for mantle hydration by metasomatism beneath Siberian craton*
Maria Kolesnichenko, V. S. Sobolev Institute of Geology and Mineralogy, Russia
- 09:00 – 09:10** *Chemical and physical aspects of fluid extraction within the Earth's crust*
Mattia Pistone, University of Lausanne, Switzerland
- 09:10 – 09:20** *Carbon dioxide migration pathways in the volcanic-hydrothermal system of Taal volcano (Philippines)*
Katharine Maussen, Université Libre de Bruxelles, Belgium
- 09:20 – 09:30** *Mineral carbonation in interfacial water films: Influence of nanoconfinement and organic ligands*
Quin Miller, University of Wyoming, USA
- 09:30 – 09:40** *Serpentinization: Reactive transport processes and hydrothermal fluxes*
Benjamin Tutolo, University of Calgary, Canada
- 09:40 – 09:50** *Pre-eruptive volatile contents of silicate melt in active volcanic systems: a melt inclusion perspective*
Rosario Esposito, University of California Los Angeles, USA
- 09:50 – 10:00** *Initial characterization of surface photosynthetic communities at the lagoa da furnas, Azores Islands*
Armando Azua, Centro de Astrobiología, CSIC, Spain
- 10:00 – 10:10** *Fluid pathways in the mantle wedge: Influence of mineral grain size and mantle compaction*
Nestor Cerpa, University of Oxford, UK
- 10:10 – 10:30** *Discussion*

10:30 – 11:00	Coffee Break and Poster Setup All participants set up posters for duration of the workshop
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11:00	Morning Session II: What goes around comes around Participant lightning talks: 5 minutes each with 5 minutes for questions and discussion Moderator: Peter Barry , University of Oxford, UK
11:00 – 11:10	<i>Carbon storage within the Earth: is the amphibole an important reservoir at lower crust depths?</i> Enrico Cannao , University of Milan, Italy
11:10 – 11:20	<i>Processes controlling crystal exchange between different magmas</i> Cansu Culha , Stanford University, USA
11:20 – 11:30	<i>What is the CO₂ budget of basaltic lavas?</i> Ery Hughes , University of Bristol, UK
11:30 – 11:40	<i>Spatially resolved SO₂ flux from Mt. Etna and correlation between geochemical and geophysical data</i> Roberto D'Aleo , Università degli Studi di Palermo, Italy
11:40 – 11:50	<i>Magnesite stability in the reduced mantle conditions</i> Naira Martirosyan , V. S. Sobolev Institute of Geology and Mineralogy
11:50 – 12:00	<i>Impact of crustal differentiation on geological carbon cycle</i> Omar Bartoli , Padova University, Italy
12:00 – 12:10	<i>Microbial controls on biogeochemical carbon cycling in marine sediments</i> Nagissa Mahmoudi , Harvard University, USA
12:10 – 12:20	<i>Digging deeper: Is the subsurface really alive?</i> Brandi Reese , Texas A&M University, USA
12:20 – 12:30	<i>Fermenters shall inherit the Earth: Estimates of deep biosphere activity in 2,000 mbsf coal beds utilizing passive tracer and minimal carbon and nitrogen amended SIP-NanoSIMS incubations</i> Elizabeth Trembath-Reichert , MBL/WHOI, USA
12:30 – 12:40	<i>Relationships between microbial activity and volatile flux along convergent margins of differing carbon sources</i> Heather Miller , Michigan State University, USA
12:40 – 12:50	<i>Microbial dumpster diving: Deep-sea heterotrophs that specialize on the degradation of dead biomass</i> Emil Ruff , University of Calgary, Canada
12:50 – 13:00	<i>Geomicrobiology of extreme environments</i> Cody Sheik , University of Minnesota Duluth, USA

13:00 – 14:30

Lunch

Hotel Biancaneve

14:30

Afternoon Session I

Introduction to Field Trip activities and scientific investigations of Mount Etna

Moderator: **Giancarlo Tamburello**, INGV Bologna, Italy

14:30 – 15:00

Geochemical tracers as tools for volcanological research and monitoring
Andrea Rizzo, INGV Palermo, Italy

15:00 – 15:30

Plume and soil gas geochemistry: application for volcano monitoring
Marco Liuzzo and Gaetano Giudice, INGV Palermo, Italy

15:30 – 16:00

An Introduction to Filming in the Field and DCO Public Engagement
Katie Pratt, University of Rhode Island, USA

16:00 – 16:30

Etna: a volcano in an identity crisis?
Boris Behnke, INGV Catania, Italy

16:30 – 17:00

Geophysical observations: the surficial signatures of volcanic activity
Gilda Currenti, INGV Catania, Italy

17:00 – 17:30

Anatomy of an unstable volcano: multiple processes affecting flank instability at Mt. Etna (Italy)
Marco Neri, INGV Catania, Italy

17:30 – 18:00

Delta Ray demonstration
Doug Hamilton, Thermo Scientific
Laser technology demonstration (CO₂ and d¹³C analyses of samples)
Fausto Grassa, INGV Palermo, Italy

18:00

Coffee Break, Refreshments, and Poster Session

20:00

Dinner

Hotel Biancaneve

Wednesday, 30 August – Field Day I

06:00 – 06:30

Breakfast

Provided in Hotel Biancaneve

06:30

Bus departs to Mount Etna Volcano

Excursion to the Etna summit craters led by **Boris Behncke** (INGV Catania, Italy).

Gas sampling activity led by INGV researchers.

17:30

Arrival back in Nicolosi

Debriefing and open discussion on designing interdisciplinary research projects in collaboration with INGV researchers.

20:00

Dinner

Hotel Biancaneve

Thursday, 31 August

- 07:00 – 08:15** **Breakfast**
Provided in Hotel Biancaneve
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- 08:30** **Morning Session III: Under pressure**
Participant lightning talks: 5 minutes each with 5 minutes for questions and discussion

Moderator: **Valerio Cerantola**, ESRF Grenoble, France
- 08:30 – 08:40** *Welcome and logistical announcements*
Organizing committee
- 08:40 – 08:50** *Stability of carbonates at lower mantle conditions – a possible candidate for carbon storage in the Earth's deep interior*
Nicole Biedermann, European XFEL GmbH, Germany
- 08:50 – 09:00** *Looking for carbonates in the deep Earth: An experimental approach at extreme conditions*
Stella Chariton, Bayerisches Geoinstitut, Germany
- 09:00 – 09:10** *Formation Fe³⁺-rich majoritic garnets and diamond from redox reaction between recycled carbonate and mantle rock*
Renbiao Tao, Carnegie Institution for Science, USA
- 09:10 – 09:20** *Effect of pressure on the speciation of carbon in silicate melts and crystals at high pressure up to 8 GPa: Insights from multi-nuclear solid-state NMR*
Eun Jeong Kim, Seoul National University, Rep. of Korea
- 09:20 – 09:30** *The effect of carbon on the formation of volatile-bearing melts at the base of the Earth's upper mantle*
Davide Novella, University of Cambridge, UK
- 09:30 – 09:40** *Experimental viscosity measurements of carbonatitic magmas at pressures and temperatures of the Earth's upper mantle*
Veronica Stoppioni, Sapienza University of Rome, Italy
- 09:40 – 09:50** *The transition from carbonititic to carbonate-silicate magmas in carbonated eclogites*
Marco Caruso, Sapienza University of Rome, Italy
- 09:50 – 10:00** *HP-HT transformations of polycyclic aromatic hydrocarbons: phase transitions, oligomerization, decomposition, compressibility and thermal expansion*
Artem Chanyshv, V. S. Sobolev Institute of Geology and Mineralogy, Russia
- 10:00 – 10:10** *Genomic evidence of adaptation to deep life*
Lotta Purkamo, University of St Andrews, UK
- 10:10 – 10:20** *Eukaryotic signatures in hot subseafloor sediments off Muroto peninsula*
Lorenzo Lagostina, ETH Zurich, Switzerland

10:20 – 10:30	<i>Discussion</i>
10:30 – 11:00	Coffee Break
11:00	<p>Morning Session IV: Powering deep life Participant lightning talks: 5 minutes each with 5 minutes for questions and discussion</p> <p>Moderator: Melitza Crespo-Medina, CECIA – Inter American University of Puerto Rico</p>
11:00 – 11:10	<p><i>Methane cycling in terrestrial serpentizing spring ecosystems</i> Kristin Woycheese, Massachusetts Institute of Technology, USA</p>
11:10 – 11:20	<p><i>Methane origin at the Ciomadul volcano: methane concentration above 1% in a volcanic area</i> Artur Ionescu, Babes-Bolyai University, Romania</p>
11:20 – 11:30	<p><i>Sulphur and methane clumped isotopes of arc volcanic gases to trace volatile cycling in subduction zones</i> Patrick Beaudry, Massachusetts Institute of Technology, USA</p>
11:30 – 11:40	<p><i>Using genome sequencing to understand the metabolic capabilities of deep life</i> Lily Momper Massachusetts Institute of Technology, USA</p>
11:40 – 11:50	<p><i>Using RNA-Seq to understand the metabolically active microorganisms in the deep biosphere</i> Maggie Lau, Princeton University, USA</p>
11:50 – 12:00	<p><i>How diverse is microbial sulfate reduction? New insights from the terrestrial and marine subsurface microbiomes</i> Karthik Anantharaman, University of California Berkeley, USA</p>
12:00 – 12:10	<p><i>Growing the “fast” slowly: Proteomic and isotopic phenotypes of sulfate reducers under differential bioenergetic regimes</i> William Leavitt, Dartmouth College, USA</p>
12:10 – 12:20	<p><i>Metabolic ecology of chemosynthetic nitrate reducing bacteria from deep-sea vents</i> Ileana Pérez-Rodriguez, University of Pennsylvania, USA</p>
12:20 – 12:30	<p><i>Direct dating of microbial methane oxidation in deep crustal fracture systems</i> Mikael Tillberg, Linnaeus University, Sweden</p>
12:30 – 12:40	<p><i>Challenges to the growth of methanogenic communities in coal seams</i> Maija Raudsepp, University of Queensland, Australia</p>
12:40 – 13:00	<i>Discussion</i>
13:00 – 14:30	<p>Lunch Hotel Biancaneve</p>

14:30	Afternoon Session III: Ancient Earth: C-bearing processes over deep time Participant talks: 5 minutes each with 5 minutes for questions and discussion Moderator: Tobias Keller , Stanford University, USA
14:30 – 14:40	<i>Logistical announcements</i> Organizing committee
14:40 – 14:50	<i>Volcano acoustics</i> Leighton Watson , Stanford University, USA
14:50 – 15:00	<i>Magmatic outgassing in the Earth's early atmosphere</i> Jasmeet Dhaliwal , Penn State University, USA
15:00 – 15:10	<i>Using noble gas systematics to constrain fluxes of volatiles between terrestrial reservoirs</i> Rosie Jones , University of Oxford, UK
15:10 – 15:20	<i>Linking large igneous province volcanism to the initiation of a major negative feedback mechanism in the global carbon cycle</i> Micha Ruhl , University of Oxford, UK
15:20 – 15:30	<i>Subduction dynamics, mantle and crustal process at arc volcanoes, investigated by relative CO₂/ST abundances and ³He/⁴He isotope signatures</i> João Lages , Università degli Studi di Palermo, Italy
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15:30 – 16:00	Coffee Break
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16:00 – 16:10	<i>The role of C-O-H-S fluids in the partial melting of eclogite in the cratonic mantle</i> Sara Burness , University of the Witwatersrand, South Africa
16:10 – 16:20	<i>Fluid-rich diamonds through time – a new approach to unraveling Earth history</i> Yaakov Weiss , LDEO Columbia University, USA
16:20 – 16:30	<i>Cerium stable isotopes as a redox tracer in early Earth environments</i> Nina Bellot , Université Libre de Bruxelles, Belgium
16:30 – 16:40	<i>Parameterizing devolatilization of subducted lithologies and modeling deep carbon transport during subduction process</i> Meng Tian , University of Oxford, UK
16:40 – 16:50	<i>The role of plate tectonics and mantle convection in the deep-time and deep-Earth carbon cycle</i> Sabin Zahirovic , University of Sydney, Australia
16:50 – 17:00	<i>Continental controls on a growing marine subsurface biosphere through recent geologic history</i> Marshall Bowles , LUMCON, USA
17:00 – 17:30	<i>Discussion</i>

17:30 **Coffee Break, Refreshments, and Poster Session**

20:00 **Dinner**
Hotel Biancaneve

Friday, 1 September – Field Day II

06:30 – 07:00 **Breakfast**
Provided in Hotel Biancaneve.

07:00 **Bus departs to Paterno (Salinelle)**
Data and sample collection in the field led by **Salvatore Giammanco**, INGV Catania.
Group photo.

17:30 **Arrival back in Nicolosi**
Debriefing and open discussion on designing interdisciplinary research projects in collaboration with INGV researchers.

19:30 **Dinner**
Hotel Biancaneve, followed by social outing to [Cantine Nicosia](#).

Saturday, 2 September

- 07:30 – 08:15** **Breakfast**
Provided in Hotel Biancaneve
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- 08:30** **Morning Session V**
- 08:30 – 08:40** *Logistical announcements*
Organizing committee
- 08:40 – 12:30** *DCO Task Force 2020: Early Career Scientists and the Future of Deep Carbon Science*
Claude Jaupart, IPGP, France, **Beth Orcutt**, Bigelow Laboratory, USA, and **Antonio Costa**, INGV Bologna
This session will involve group discussions and breakout sessions to inform the future of multi-disciplinary deep carbon science following the culmination of the DCO program at the end of 2019.
- 08:40 – 09:00** *Brief introduction of TF2020*
Who we are, TF2020 goals, summary of recent activities.
- 09:00 – 09:30** **Breakout session I**
Post-it note brainstorming session on big (and cross-disciplinary!) ideas. Individually and in small groups, suggest areas of interdisciplinary study that build off deep carbon science to address as yet unanswered questions.
- 09:30 – 10:00** Review above ideas, and discussion on what is needed to make those big ideas happen. Identify collaborators from within ECS and DCO at large. Identify funding sources and begin defining roles within the group.
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- 10:00 – 10:15** **Coffee Break**
Sticker-vote on breakout session I ideas.
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- 10:15 – 10:45** **Breakout session II**
Post-it note brainstorming session on DCO ECS needs beyond 2019.
Guiding questions:
What areas of career development are lacking?
Are there ways DCO could help with this?
Would creating/leading deep carbon science groups locally (ie at a specific University) led by ECS be helpful?
How do you want to stay in touch past 2019? (Newsletter? Facebook groups?)
Anything else?
- 10:45 – 11:15** Review above ideas, and discussion on what is needed to make them happen. Identify leaders from within and beyond the group in the room. Identify resources needed (this could include help from existing DCO support teams).
- 11:15 – 12:30** Final discussion to wrap up these big ideas and ECS needs, ask for any additional feedback, outline TF2020 next steps.

12:30 – 13:00 *Reimbursement procedures*
Vincenzo Stagno, Sapienza University of Rome, Italy

13:00 – 14:30 **Lunch**
At Hotel Biancaneve

14:30 **Workshop adjourns**

15:00 – 00:00 **Check out of Hotel Biancaneve**
Transportation to Catania airport provided.
For those staying an extra night, dinner in Nicolosi TBD.

Sunday, 3 September

07:30 – 09:00 **Breakfast**
Provided in Hotel Biancaneve

All day **Check out of Hotel Biancaneve**
Transportation to Catania airport provided.
Participants departing after today will need to find their own transportation back to the airport.



DEEP CARBON OBSERVATORY

MEETING PARTICIPANTS

Organizing Committee

Vincenzo Stagno, Sapienza University of Rome, Italy
Giancarlo Tamburello, INGV Bologna, Italy
Peter Barry, University of Oxford, UK
Valerio Cerantola, ESRF, France
Melitza Crespo-Medina, Inter-American University of Puerto Rico
Tobias Keller, Stanford University, USA
Riikka Kietäväinen, Geological Survey of Finland
Katie Pratt, University of Rhode Island, USA

Twitter Handle

@pbarry10
@M_CrespoMedina
@riikkakie
@katie_phd/@deepcarb

Local Contributors

Boris Behncke, INGV Catania, Italy
Marcello Bitetto, Università degli Studi di Palermo, Italy
Sergio Calabrese, Università degli Studi di Palermo, Italy
Gilda Currenti, INGV Catania, Italy
Salvatore Giammanco, INGV Catania, Italy
Gaetano Giudice, INGV Palermo, Italy
Fausto Grassa, INGV Palermo, Italy
Marco Liuzzo, INGV Palermo, Italy
Marco Neri, INGV Catania, Italy
Andrea Rizzo, INGV Palermo, Italy
Giuseppe Salerno, INGV Catania, Italy

Sponsor Representatives

Leonardo Coppo, West Systems
Doug Hamilton, Thermo Fisher Scientific

Task Force 2020 Representatives

Claude Jaupart, IGP, France
Beth Orcutt, Bigelow Laboratory for Ocean Sciences, USA
Antonio Costa, INGV Bologna, Italy

Participants

Karthik Anantharaman, University of California Berkeley, USA
Armando Azua, Centro de Astrobiología, CSIC, Spain
Omar Bartoli, Padova University, Italy
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Stella Chariton, Bayerisches Geoinstitut, Germany
Cansu Culha, Stanford University, USA
Roberto D'Aleo, Università degli Studi di Palermo, Italy
Jasmeet Dhaliwal, Penn State University, USA
Rosario Esposito, University of California Los Angeles, USA
Sebastian Facq, University of Cambridge, UK
Ery Hughes, University of Bristol, UK

@KarthikGeomicro
@ArmandoAzua_B

@PhDisaster

Artur Ionescu, Babes-Bolyai University, Romania
Rosie Jones, University of Oxford, UK
Eun Jeong Kim, Seoul National University, Republic of Korea
Maria Kolesnichenko, V. S. Sobolev Institute of Geology and Mineralogy, Russia
Joao Lages, Università degli Studi di Palermo, Italy
Lorenzo Lagostina, ETH Zurich, Switzerland
Maggie Lau, Princeton University, USA
William Leavitt, Dartmouth College, USA
Nagissa Mahmoudi, Harvard University, USA @NagissaM
Naira Martirosyan, V. S. Sobolev Institute of Geology and Mineralogy, Russia
Katharine Maussen, Université Libre de Bruxelles, Belgium
Heather Miller, Michigan State University, USA @ArcVolcanoMicro
Quin Miller, University of Wyoming, USA @QuinMiller
Lily Momper, Massachusetts Institute of Technology, USA
Davide Novella, University of Cambridge, UK
Ileana Pérez-Rodríguez, University of Pennsylvania, USA
Mattia Pistone, University of Lausanne, Switzerland @MattiaQuarzino
Lotta Purkamo, University of St. Andrews, UK @MicroecoLotta
Maija Raudsepp, University of Queensland, Australia
Brandi Reese, Texas A&M University, USA @Extreme_GeoBio
Emil Ruff, University of Calgary, Canada @EmilRuff
Micha Ruhl, University of Oxford, UK
Cody Sheik, University of Minnesota Duluth, USA @microbesheik
Veronica Stopponi, Sapienza University of Rome, Italy
Renbiao Tao, Carnegie Institution for Science, USA
Meng Tian, University of Oxford, UK
Mikael Tillberg, Linnaeus University, Sweden
Elizabeth Trembath-Reichert, MBL/WHOI, USA
Benjamin Tutolo, University of Calgary, Canada
Leighton Watson, Stanford University, USA
Yaakov Weiss, LDEO Columbia University, USA
Kristin Woycheese, Massachusetts Institute of Technology, USA
Sabin Zahirovic, University of Sydney, Australia @tectonicSZ