



Resolving the Earth's Mantle Composition

Columbia University in the City of New York

December 3–5, 2026

International House
500 Riverside Dr, New York, NY 10027

Workshop Overview

The MINERALS Project at Columbia University will host *Resolving the Earth's Mantle Composition*, a three-day international workshop bringing together mineral physicists, seismologists, geodynamicists, and geochemists to confront one of the most consequential open questions in the Earth sciences: what the planet's mantle is actually made of.

The workshop takes place on December 3–5, 2026, at Columbia University in New York and is convened by Dr. Renata M. Wentzcovitch, Principal Investigator of the MINERALS Project and a professor at Columbia's Department of Applied Physics and Applied Mathematics and at Lamont-Doherty Earth Observatory.

The mantle accounts for the overwhelming majority of Earth's volume, yet no sample of it has ever been recovered from depth. Everything known about its composition is inferred — from seismic waves that pass through it, from laboratory experiments that recreate its crushing pressures and temperatures, and, increasingly, from quantum-mechanical simulations that predict how minerals behave under conditions no experiment can yet reach. Each of these approaches produces a partial answer, and the answers do not always agree.

Determining the composition of Earth's mantle remains one of the most fundamental and enduring challenges in the Earth sciences, with implications for planetary formation, thermal evolution, and geodynamic behavior. Despite decades of progress, key questions persist, including the bulk composition of the lower mantle, its spatial variability, and its relationship to the bulk silicate Earth. Competing constraints from geochemistry, geophysics, and mineral physics continue to yield divergent interpretations, reflecting both intrinsic complexity and observational limitations.

Recent advances are beginning to transform this problem. High-resolution seismic imaging, including full-waveform tomography, combined with improved mineral physics models, now enables joint interpretations of multiple observables. At the same time, new constraints from geoneutrino measurements, high-pressure experiments, and first-principles simulations provide independent insights into Earth's composition and energy budget. Together, these developments offer new pathways to break long-standing degeneracies between temperature, composition, and phase transitions.

This workshop will bring together contributions that integrate observations, experiments, and theory to constrain mantle composition, explore its heterogeneity, and extend these insights to terrestrial planets and exoplanets.

Organizers: Dr. Renata Wentzcovitch and Dr. William McDonough

Support: Gordon & Betty Moore Foundation Award GBMF12801 (doi.org/10.37807/GBMF12801)

Confirmed Speakers

1. **Maxim Ballmer** (University College London, UK)
2. **Laura Cobden** (University of Utrecht, NL)
3. **Arwen Deuss** (University of Utrecht, NL)
4. **Ed Garnero** (University of Arizona, US)
5. **Damanveer Grewal** (Yale University, US)
6. **Christine Hernlund** (Earth Life Sciences Institute, Institute of Science Tokyo, JP)
7. **Kei Hirose** (virtual) (University of Tokyo, JP)
8. **Shun-Ichiro Karato** (Yale University, US)
9. **Tomo Katsura** (Bavarian Geoinstitute (BGI) at University of Bayreuth, DE)
10. **Jun Korenaga** (Yale University, US)
11. **Jung-Fu Lin** (University of Texas at Austin, US)
12. **Maureen Long** (Yale University, US)
13. **Chenxing Luo** (Columbia University, US)
14. **William McDonough** (Qingdao National Laboratory for Marine Science and Technology, PRC)
15. **Raj Moulik** (Columbia University, US)
16. **Motohiko Murakami** (virtual) (Swiss Federal Institute of Technology Zurich, CH)
17. **Robert Myhill** (University of Bristol, UK)
18. **Kaveh Pahlevan** (Carl Sagan Center for Research, SETI Institute, US)
19. **Paolo Sossi** (virtual) (Swiss Federal Institute of Technology Zurich, CH)
20. **Paul Tackley** (Swiss Federal Institute of Technology Zurich, CH)
21. **Renata Wentzcovitch** (Columbia University)

Note for Speakers

Each speaking slot is 45 minutes in total. We ask speakers to plan for approximately 37 minutes of presentation, leaving about 8 minutes for questions and transition to the next speaker. Session chairs will provide a discreet time signal at the 30-minute mark to help sessions stay on schedule. Please arrive at your session room at least 10 minutes before your slot begins.

We look forward to a rich and engaging program. Thank you for being part of it.

Conference at a Glance

Date	Format	Hours	Program
Thursday, Dec 3	Full Day	8:00 AM – 6:00 PM	9 Talks
Friday, Dec 4	Full Day	8:00 AM – 6:00 PM	9 Talks
Friday, Dec 5	Half Day	9:00 AM – 12:30 PM	3 Talks + Wrap-Up

Breakfast is available on all three days. Each speaker slot is 45 minutes, structured as approximately 37 minutes of presentation followed by 8 minutes for questions and transition.

Day 1 — Thursday

December 3 | Full Conference Day

Time	Session	Presentation Title
7:00 – 8:00 AM	Breakfast	
8:00 – 8:15 AM	Welcome & Opening Remarks	
8:15 – 9:00 AM	Talk 1 — Speaker TBD	
9:00 – 9:45 AM	Talk 2 — Speaker TBD	
9:45 – 10:30 AM	Talk 3 — Speaker TBD	
10:30 – 11:00 AM	Coffee Break	
11:00 – 11:45 AM	Talk 4 — Speaker TBD	
11:45 AM – 12:30 PM	Talk 5 — Speaker TBD	
12:30 – 2:00 PM	Lunch	
2:00 – 2:45 PM	Talk 6 — Speaker TBD	
2:45 – 3:30 PM	Talk 7 — Speaker TBD	
3:30 – 4:00 PM	Coffee Break	
4:00 – 4:45 PM	Talk 8 — Speaker TBD	
4:45 – 5:30 PM	Talk 9 — Speaker TBD	
5:30 – 6:00 PM	Informal Discussion / Networking	

Day 2 — Friday

December 4 | Full Conference Day

Time	Session	Presentation Title
7:00 – 8:00 AM	Breakfast	
8:00 – 8:45 AM	Talk 10 — Speaker TBD	
8:45 – 9:30 AM	Talk 11 — Speaker TBD	
9:30 – 10:15 AM	Talk 12 — Speaker TBD	
10:15 – 10:45 AM	Coffee Break	
10:45 – 11:30 AM	Talk 13 — Speaker TBD	
11:30 AM – 12:15 PM	Talk 14 — Speaker TBD	
12:15 – 1:45 PM	Lunch	
1:45 – 2:30 PM	Talk 15 — Speaker TBD	
2:30 – 3:15 PM	Talk 16 — Speaker TBD	
3:15 – 3:45 PM	Coffee Break	
3:45 – 4:30 PM	Talk 17 — Speaker TBD	
4:30 – 5:15 PM	Talk 18 — Speaker TBD	
5:15 – 6:00 PM	Informal Discussion / Networking	

Day 3 — Saturday

December 5 | Full Conference Day

Time	Session	Presentation Title
8:00 – 9:00 AM	Breakfast	
9:00 – 9:45 AM	Talk 19 — Speaker TBD	
9:45 – 10:30 AM	Talk 20 — Speaker TBD	
10:30 – 11:15 AM	Talk 21 — Speaker TBD	
11:15 – 11:30 AM	Coffee Break	
11:30 AM – 12:30 PM	Wrap-Up Discussion	
12:30 PM	Departure	<i>Lunchboxes available for departing attendees</i>