

Lamont-Doherty Earth Observatory

COLUMBIA UNIVERSITY | EARTH INSTITUTE



Lamont-Doherty Earth Observatory
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OPEN HOUSE

Feature exhibits from across our initiatives:

- Climate and Life
- Changing Ice, Changing Coastlines
- Extreme Weather and Climate
- Anticipating Earthquakes
- Real-Time Earth

www.openhouse.ldeo.columbia.edu

Saturday, October 8, 2016

10:00 a.m. to 4:00 p.m.

Located on a beautiful campus on the Hudson River, Lamont-Doherty Earth Observatory seeks fundamental knowledge about the origin, evolution and future of the natural world. Its scientists study the planet from its deepest interior to the outer reaches of its atmosphere, on every continent and in every ocean, providing a rational basis for the difficult choices facing humanity.

Bus from Morningside Heights to the Lamont Campus

Buses depart for the LDEO campus in Palisades, N.Y., from 120th Street (between Amsterdam and Broadway, in front of Teachers College) in 15 minute increments beginning at 9:15 a.m. and ending at 1:15 p.m.

Bus from the Lamont Campus to Morningside Heights

Buses return to 120th Street (between Amsterdam and Broadway, in front of Teachers College) from LDEO in 15 minute increments from 11:00 a.m. – 12:30 p.m. and 1:30 p.m. - 4:00 p.m. The last bus from LDEO to Manhattan departs at 4:00 p.m.

Shuttle Bus from HNA Palisades Conference Center, Route 9W

People arriving in cars or vans should park at the [HNA Palisades Conference Center on Route 9W](#) just north of the LDEO campus. Shuttle buses run continuously from 10:00 a.m. to 4:00 p.m., arriving and departing from the Geoscience Building at LDEO. ***Persons with special needs or questions should call LDEO Events at 845-365-8998.***

Complimentary parking is made available through the generosity of the HNA Palisades Conference Center.

Coach USA Schedule

Port Authority Terminal to Palisades, N.Y.: 9:15 a.m., 11:22 a.m., 12:22 p.m., and 2:22 p.m.

GW Bridge Station to Palisades, N.Y.: 9:40 a.m., 10:40 a.m., and 1:40 p.m.

Palisades, N.Y., to Port Authority Terminal: 10:58 a.m., 11:58 a.m., 1:58 p.m., 2:58 p.m., and 3:58 p.m.

Palisades, N.Y., to GW Bridge Station: 12:58 p.m. and 2:58 p.m.

FOR THEIR SAFETY, IT IS ESSENTIAL THAT CHILDREN BE SUPERVISED AT ALL TIMES.

EXHIBITS

1 WELCOME TENT/ GIFT SHOP TENT

Receive campus maps and information on exhibits. Purchase LDEO T-shirts, baseball caps, water bottles and more! Kids -- Pick up your Science Passport! Alumni Hospitality Table. Sign up for tours.

Walking Tours of the LDEO Campus

The 45-minute tours, limited to groups of 20 people each, depart from the front of the Welcome Tent at 10:30 a.m., 11:30 a.m., 12:30 p.m. and 1:30 p.m.

Geology Tour: The Last Ice Age around New York

The LDEO campus and Hudson River were covered by a large ice sheet 20,000 years ago. Learn about the last Ice Age in our area and the types of evidence Earth scientists look for. The 30-minute tours are limited to groups of 15. Tours meet by the Lincoln statue in front of Lamont Hall at 11:00 a.m. and at 2:00 p.m.

2 EARTH 2CLASS WORKSHOPS FOR TEACHERS AND STUDENTS

Geoscience Building – First floor conference room

“E2C” is a unique professional development program designed to improve the knowledge and teaching skills of teachers and students through interactive workshops with LDEO research scientists. E2C provides **monthly Saturday programs** that focus on cutting-edge LDEO discoveries, curriculum and educational technology integration, and networking. These are open to the general public. Our website, <http://www.earth2class.org>, provides registration information, along with a wide variety of resources for educators and students.

Earth2Class (E2C) Mini-Workshops

11:00 a.m. **Professional Development Opportunities for Teachers at LDEO**, Michael J. Passow

12:00 p.m. **Teaching with Your Local Environment: The Hackensack Past, Present, and Future**

1:00 p.m. **E2C and American Meteorological Society Professional Development Opportunities, featuring Sample Activities**, Samantha Adams, AMS Peer Trainer

2:00 p.m. **E2C and American Meteorological Society Professional Development Opportunities, featuring Sample Activities**, Raymond Szczebra, AMS Peer Trainer

3:00 p.m. **Professional Development Opportunities for Teachers at LDEO**, Michael J. Passow

Dendro Eco-Hike: Exploring Lamont’s Forest History through Tree-Ring Analysis

Lamont Tree Ring Laboratory scientists and E2C teachers lead short 20-minute hikes through the Lamont Forest showing what trees reveal about ecology, climate changes, human history, and the environment. The tours, limited to 15 people, begin in front of the Geoscience Building at 10:30 a.m., 11:00 a.m., 11:30 a.m., 1:00 p.m., 1:30 p.m. and 2:30 p.m.

3. CORE REPOSITORY

The Lamont-Doherty Core Repository stores thousands of cores, rocks and sediments taken from beneath the ocean floor. Deep-sea sediments contain fossils of marine animals, volcanic glass, cosmic spherules, and other unusual materials unique to a marine environment. Deep-sea samples also hold a permanent record of magnetic history, revealing to scientists the ever-changing magnetic orientation of the poles. See how we find evidence of climate change, cosmic impacts and earthquakes in these sediments. Visit <http://www.ldeo.columbia.edu/core-repository>

4 CENTER FOR INTERNATIONAL EARTH SCIENCE INFORMATION NETWORK (CIESIN)

CIESIN is a research and data center that studies human interactions with the environment. Our tent features the online Superfund mapper that maps a wide range of population and environmental data near Superfund sites across the country. Teachers and students will be interested in the CHANGE Viewer, which uses CIESIN and NASA data to explore how climate change may affect human health and other socioeconomic issues in various parts of the world. See poster versions of our popular “Map of the Month” series of posts from Columbia’s State of the Planet blog highlighting our global and national research interests. Kids can play a “CIESIN- blitz” mapping game where they collect information on all our displays.

HazPop Mapping Tool

The Hazards and Population Mapper (HazPop) is a free mobile application that enables users to easily display recent natural hazard data in relationship to population, major infrastructure, and satellite imagery. Users can visualize the location of active fires over the past 48 hours, earthquake alerts over the past seven days, and yesterday’s air pollution data measured from space, and can estimate the total population in proximity to the user’s current location or to a recent hazard event or other point of interest. HazPop is designed for use by disaster risk managers, humanitarian response organizations, public health professionals, journalists, and others needing a quick assessment of the population potentially exposed to a major hazard event or developing emergency. It is not intended to support in-depth risk assessment or estimation of actual disaster losses.

The Story of a Map: Gridding the Population of the World

The Gridded Population of the World (GPW) series, now in its fourth version (GPWv4), models the distribution of human population (counts and densities) on a continuous global surface. Since the release of the first version of this global population grid in 1995, the essential inputs have been population census tables and corresponding geographic boundaries. For GPWv4, population input data are collected at the most detailed spatial resolution available from the results of the 2010 round of censuses, which occurred between 2005 and 2014. The input data are extrapolated to produce population estimates for the years 2000, 2005, 2010, 2015, and 2020. A set of estimates adjusted to national level, historic and future, population predictions from the United Nation’s World Population Prospects report are also produced for the set same set of years. GPWv4 is gridded with an output resolution of 30 arc-seconds (approximately 1 km at the equator).

Integrating Water Quality Data Sources for Jamaica Bay

For a two-year project funded by the US Department of the Interior, CIESIN with Brooklyn College and partners of the Science and Resilience Institute at Jamaica Bay (SRI@JB) is developing an integrated data management system to assess spatial and temporal patterns of water quality in Jamaica Bay, and creating an [online interactive mapping tool](#).

Floods Over Time: AdaptMap

A study of the historic landscapes and potential future green shorelines of Jamaica Bay, New York, communicated via a story map/sea level rise viewer, AdaptMap. The tool provides information on flood impacts and cost-benefit analyses for green shoreline adaptations for the Bay. In addition, the historical landscapes of Jamaica Bay for 1609 and 1877 are mapped and floods modeled, to learn more about the resilience of past shorelines. A set of three future living shoreline adaptation scenarios have been developed collaboratively in a workshop with city planners, resource managers, and our science team.

Potential Flood Impacts to Buildings in the Hudson Valley/Long Island Regions

Building on previous projects supported by the New York State Energy Research and Development Authority (NYSERDA) Climate Change Adaptation Research and Strategies Program, conducted in collaboration with the Stevens Institute of Technology, this project aims to develop building footprint data and conduct a flood scenario impact analysis for all counties adjacent to the Hudson River (from the southern border of Westchester County to the Federal Dam at Troy), as well as counties outside New York City adjacent to Long Island Sound.

Fishermen, Mangroves, and Climate Change: Photos from the Field

CIESIN associate research scientist Sylwia Trzaska spent eight weeks in the field in Sierra Leone over June and July leading a vulnerability assessment of local fishing communities that rely on mangrove forests, as part of the USAID-funded West Africa Biodiversity and Climate Change (WA BiCC) project. The assessment, which utilized forest inventories, household surveys, and participatory rapid appraisals, took place in 24 fishing villages in the four main mangrove areas of Sierra Leone: the Scarcies River Estuary, the Sierra Leone River Estuary, the Yawri Bay and the Sherbro River Estuary. As the most affordable and widely available protein source, and fisheries are a critical link in the food security chain, especially for the rural poor. However, the sustainability of traditional fishing as a livelihood is under threat from the effects of climate change through sea level rise and increased storminess as well as from increased competition for the resource (fish, mangrove wood for fish processing) with the communities currently having limited adaptive capacity. The study results will inform interventions at the community- as well as national-level and the work of the Sierra Leone National Adaptation Programme of Action (NAPA), which aims to build coastal communities' resilience to climate change.

5 SEISMOLOGY, GEOLOGY & TECTONOPHYSICS (SG&T)

Our researchers study earthquakes, the structure of the Earth, and the large-scale motions and deformation of the tectonic plates. SG&T scientists also serve the nation and the world by applying their research and providing advice to national and international organizations in two critical areas: reducing society's vulnerability to natural hazards, and verifying international treaties governing nuclear weapons testing.

Ocean Bottom Seismology (OBS) Laboratory: Recording Earthquakes on the Seafloor - Lamont hosts the Ocean-bottom Seismometer Instrument Facility, which designs, builds and operates a fleet of 60 seismometers. These instruments are dropped on the seafloor at sites around the world where they record earthquakes for a year before being recovered. An instrument will be on display to demonstrate how we meet the challenges of pressure, corrosion, bio-fouling, and trawling to detect and record micrometer-scale seafloor movements

Deformation of the Earth after the Greatest Deep Earthquake Ever Recorded (2013) - We analyze the first ever GPS observations of static surface deformation from a deep earthquake: the 24 May 2013 Mw 8.3 Sea of Okhotsk event. Previous studies of deep earthquake sources relied on seismology, and

might have missed evidence for slow slip in the rupture. We observed co-seismic static offsets on a GPS network of 20 stations over the Sea of Okhotsk region. The seismic moment calculated from static offsets is only 7% larger than the seismological estimate from GCMT. Thus GPS observations confirm shear faulting as the source model, with no significant slow slip component. Our data indicate slip extending for tens of kilometers across most of the subducting Pacific slab thickness.

Real Time Monitoring of Earthquakes in the Eastern US (Seismology 201) - Lamont-Doherty is operating a 45-station seismographic network in the northeastern United States to monitor earthquakes and to mitigate earthquake hazards in the region - including greater New York City. The seismic network is supported by National Earthquake Hazards Reduction Program administered by US Geological Survey. See how the groundmotion in this region are gathered in real-time by the Internet, satellite and cell phone modems! The signals are processed to detect and locate seismic events.

Rock Mechanics - Watch Rock Mechanics – drilling, polishing, assessing weight, and depth of solid materials.

Seismic Sound Lab: Sights and Sounds of Earthquakes and Global Seismology (1st Fl. Conference Room) - Experience the sounds and animations of earthquakes and seismic waves as though you were deep inside the Earth. Our movies of earthquakes through time, and of seismic waves moving through and around the planet, illustrate why earthquakes occur, how the Earth responds to them, and what they teach us about the planet. In one exhibit, we will compare earthquakes in California, Haiti, Sumatra, Russia and Japan. In another exhibit, experience 4 days (in a few minutes) of earthquakes in Oklahoma induced by human activity. In a third exhibit, listen to the Earth on the day of your birth (your Birthquake!)

6 **BIOLOGY AND PALEO ENVIRONMENT (BPE)**

The Biology and Paleo Environment Division is a diverse group of oceanographers, geologists, geochemists, biologists and environmental scientists who pursue research in two connected efforts. First, biology - examining fossils to uncover clues about Earth's past environment. Second - understanding how the modern environment— through its oceans, atmosphere and land— affects present-day biology.

The Last Ice Age Retreat...What, When and How – What did New York look like at the end of the last ice age? When did ice actually leave the area, and what plants and animals came in from areas to the south? Examine sediment cores from the region, using microscopes, plant macrofossils, and posters. Glacial clay from the Hudson River will be distributed.

Plants are made of carbon – but where does it come from?

About 50% of the mass of a tree is made of carbon. This four station exhibit will explain where all of that carbon comes from (Station 1), demonstrate how plants actually get the carbon into them (Stations 2 and 3), and present a time-lapse animation made by NASA scientists that shows how the carbon rich forests of the world play a major role in regulating Earth's atmospheric carbon concentration over the course of each year (Station 4).

ECOGIG - Healthy ocean ecosystems provide the air we breathe, the food we eat, storm protection, and many other benefits. But the world's oceans are under stress from many threats, including industrial and agricultural pollution, plastic, ocean acidification, oil and gas exploration, and overfishing. At the Ocean Discovery Zone visitors will learn about our investigations into the effects of the 2010 Deepwater Horizon oil spill on the unique deep water ecosystem of the Gulf of Mexico. Drive a model remotely operated

vehicle (ROV), build a deep water coral, and learn about the importance of healthy ocean ecosystems.

The Artistic Oceanographer - Hands-on activities show the different kinds of marine phytoplankton and their strategies for surviving in the ocean. Design and choose your own phytoplankton and survival strategies while viewing live phytoplankton.

Iron Glaciers – The growth of ocean phytoplankton helps to reduce the level of carbon dioxide in the atmosphere. The phytoplankton take up carbon dioxide and sink from the surface. In many regions of the ocean, however, this uptake of atmospheric carbon dioxide is limited by very low levels of iron. Glaciers are good at grinding surface rock to dust that can blow far out to sea. Our recent work shows that this dust is exceptionally good at nourishing phytoplankton. The link between glaciers and ocean productivity provides a way to vary atmospheric carbon dioxide along with ice ages, similar to the variation that is shown by the historical record.

7 GEOCHEMISTRY

The Gary C. Comer Geochemistry Building is Lamont-Doherty's state-of-the-art laboratory building. Researchers in the Geochemistry Division seek to understand Earth's environments by studying its history—and the processes, past and present, that have governed these environments. Using advanced chemical and isotope analyses, Division scientists study samples of air, water, biological remains, rocks and meteorites in order to elucidate a broad range of scientific issues.

The Race for Safe Water - Learn more about the race for sufficient and safe water in Rockland County and Bangladesh— Visit our website: <http://superfund.ciesin.columbia.edu/Rocklandwater/home>

What's in Your Well Water? - What's in Your Drinking Water? – Lead can be leached from certain types of home pipes, while chemicals like arsenic are naturally occurring in well water. Learn about drinking water quality and pick up a test kit to find out what's in your family's water. For more info: <http://njarsenic.superfund.ciesin.columbia.edu/>

Thermal Ionization Mass Spectrometer (TIMS) Lab (Room 122) - How do we know how earth's chemical composition and ocean circulation changed in the past, how acidic was seawater hundreds of thousands of years ago and what was climate like at that time? Much of this information can be teased out of rocks and fossil remains of ocean creatures accumulated in seafloor sediments. In the thermal ionization mass spectrometry laboratory we heat samples to thousands of degrees, to analyze the isotopes of Strontium, Neodymium and Boron that help us with our quest.

The Secondary School Field Research Program (SSFRP) is a project-based instructional program focused on biodiversity and environmental research in wetlands of the New York metropolitan area. The program brings high school students, undergraduates, and high school science teachers to Lamont each summer to conduct research in Piermont Marsh and in Lamont-Doherty Laboratories. Students from this summer will present their projects and results. They are particularly interest in talking to youth who, like them, are interested in pursuing careers in science, math, and engineering.

GEOTRACES is an international program dedicated to identifying the processes that control the distributions of trace metals and other chemical constituents in the ocean, and discerning how sensitive these distributions are to environmental change. Our exhibit include an experiment on the bioavailability of different types of iron to plankton, a demonstration of the different classifications of elements in the oceans, and 3-d visualizations of different trace elements in the Atlantic Ocean.

The Center for Climate and Life at Lamont-Doherty Earth Observatory (LDEO) of Columbia University is offering summer internship opportunities for high school students interested in Earth Science research experience. 12 high school students worked with two scientists as part of the Center for Climate and Life's High School Research Program. The students came from the following schools: Lycée Français de New York (New York, NY), Morris Knolls High School (Rockaway, NJ), Fiorello H. LaGuardia High School of Music & Performing Arts (New York, NY), Ethical Culture Fieldston School (Bronx, NY), Riverdale Country School (Bronx, NY), and the Panther Academy of Earth and Space Science (Paterson, NJ). Students spent four weeks at Lamont working individually and in small groups on research projects designed and led by our scientists. By the end of their internship, students gained critical science skills and an understanding of what a career in science looks like. Students from this summer will present their projects and results.

Biking & Breathing - Who is the dirtiest kid at Open House: Measure your breathing rate at rest and while doing different exercises.

8 VOLCANOES!

Create your own eruptions! Save a city from imminent destruction!

Hands-on exhibit featuring volcanoes of different eruptive intensity, disaster planning with wax lava, volcanic rocks, and volcano research. Special Trash Can Plinian eruption every 30 minutes.

9 SEISMOGRAPH MUSEUM

Walk underneath the Lamont-Doherty cafeteria and see the collection of old and new earthquake monitoring instruments used at LDEO over the years. You can see your footsteps being detected and measured by sensitive seismometers. See over-60-years-old seismographs still working to monitor earthquakes!

MAKE YOUR OWN EARTHQUAKE - Experience your footsteps and body motions being detected by a sensitive seismometer on the ground! See a portable seismograph in use for small earthquake detection.

10 OCEAN AND CLIMATE PHYSICS (OCP)

The Ocean and Climate Physics (OCP) division works to understand Earth's climate system and its natural and human-induced changes. Societally-relevant phenomena such as El Niño, drought, hurricanes, and other aspects of the atmospheric and oceanic circulation are studied through field campaigns, data analysis, and modeling. Exhibits provide a "taste" of some of our current interests and research activities. Experience first-hand the salinity of the world's oceans through salt-water tasting; see how various features of the atmospheric and oceanic circulation can be simulated in a tank of water, and learn more about these circulation features in our new visualization lab; practice taking temperature measurements with an IR "gun", and learn how this relates to the satellites that measure Earth from space; understand the factors that produce air pollution; and see a demonstration of how to create a cloud in a bottle.

11 EARTH SCIENCE LECTURES and ACADEMIC RESOURCES

Monell Building Auditorium - See Lecture Schedule below

12 INTERNATIONAL RESEARCH INSTITUTE FOR CLIMATE & SOCIETY (IRI)

IRI scientists work to improve the lives of people in developing countries through the development and smart application of climate information and forecasts.

Farmer's Game: Come play a simple 20-minute table game in which you're a farmer in Ethiopia who has to decide whether to buy drought insurance and make other decisions about your livelihood. Ages 8 and up are welcome to participate. This game is similar to those we play with farmers around the world to teach the concepts of index insurance.

Climate Trivia Game - occurring once during the day, ages 12+

Probability Game: What's a tercile? Occurring 2x during the day, ages 10+

Soil Doc Kit – Demonstration of our new sub-Saharan Africa soil test kit.

13 MARINE GEOLOGY & GEOPHYSICS (MG&G)

Fifty years ago, with the purchase and refit of a 200' pleasure yacht renamed the Vema, Maurice Ewing inaugurated Lamont's exploration of the largely unknown terrain beneath the world's oceans. Today, members of the Marine Geology and Geophysics (MG&G) Division remain explorers at heart, motivated by curiosity to understand these remote and forbidding parts of our planet.

GeoMapApp & Earth Observer: Use these apps to explore our planet from the comfort of your computer or iPad. Examine the details of seafloor topography, add layers to show earthquakes and volcanoes, discover how polar sea ice changes with time. Also, learn how to import your own data – ideal for school projects – and how to save the maps for your school report! GeoMapApp is free!
<http://www.geomapapp.org/>
<http://www.earth-observer.org/>

Arctic Sea Ice & Eco-Systems: The Last Arctic Ice Refuge – Polar bears, ringed seals and other Arctic species rely on floating sea ice, part of an Arctic environment that is rapidly changing. Explore the Arctic of the future through this hands-on activity that demonstrates the impact of sea ice loss. Where will the ice stay the longest? Can we protect this ice area as a refuge for Arctic species?

Eco-Chains – How are plankton, krill, walrus, polar bears and other marine species connected to sea ice? How can industrialization, overfishing, or green energy choices affect these linkages? Play this unique card game based on connections between the natural world and human influences.

Life in Antarctica! Join scientist from Antarctica's Palmer Long Term Ecological Research Network to learn what lives in Antarctica. Learn how it is changing and why. Make a craft. Teacher materials available.

Why Studying Greenland Matters: What is a degree or two among friends? A one or two degree change in air temperature is not really noticeable to most people, but the same amount of temperature increase in the ocean can have significant impacts. Atlantic ocean water warmed by a degree or two is moving up to the glaciers through Greenland's deep fjords – causing weakening and accelerated melt.

Get your hands into the polar regions! Learn how glaciers flow using "glacier goo" and see how ice pushes down the land in Greenland by checking out physical models of the ice and ice surfaces.

Using Sound Waves to Image Geology Below the Ocean - In our experiment, we show that as we pop balloons underwater, they produced sound waves. These waves travel through water and are then picked up and recorded by the hydrophone (underwater microphone). The sound waves moved at a speed of 3355mph!! Sound is a wave that sets into motion microscopic particles in the medium. Various characteristics of that motion (e.g., how fast it spreads and which path it takes) depend on the composition and structure of the material. Therefore, by measuring the intensity and speed of a sound wave we can often tell something about the properties of the material it passed through. Scientists use sound to 'see through' materials that we cannot see through with our eyes, for example, deep water or even solid earth!

14 TREE-RING LABORATORY

Join tree-ring scientists to learn how they use ancient trees to learn about historical climate, geology, and ecology to better understand the changes happening today. For the past several decades, Tree-Ring Laboratory scientists have led expeditions to stunningly picturesque and remote places around the world in search of long-lived, sensitive trees. Visit the Tree-Ring Laboratory to meet the scientists, examine tree- ring samples and view a new of field photography.

15 BATHTUB SCIENCE

Feel how a bathtub full of cornstarch and water can be used to understand the dynamics of the solid Earth.

16. International Ocean Discovery Program / Office of Marine Operations - Meet the *JOIDES Resolution*.

Learn about engineering technology and the drilling process. What is a core? Learn about on-board outreach opportunities. These projects involve looking at historical rates of sea level change, mapping limits of US natural resources, and looking at rifting of the Atlantic Ocean basin and more. There is general information on the *R/V Marcus G. Langseth*, a newly-constructed model of the vessel, and immersion "Gumby" suits for kids of all ages to try on.

17 LDEO CHILD DEVELOPMENT CENTER

Hands-on activities for young children and information about on-site child care in the Bright Horizons day care center.

We gratefully acknowledge the generous support of our sponsors:

- Anonymous Donor
- Florentin Maurrasse '73 GSAS
- Frank and Joanne Gumper
- Gifts in Memory of Norm Olsen
- HNA Palisades Premier Conference Center
- The Market
- Orange and Rockland
- Payette Associates
- Robert & Catherine Murray Charitable Trust
- South Orangetown Ambulance Corps

LECTURES AT OPEN HOUSE

Featuring Lamont-Doherty Earth Observatory and Columbia University Professors, Researchers and Scientists

Monell Building Auditorium

- 10:45 am **Real-Time Earth: Realizing the Future of Earth Science**, Ryan Abernathy & Timothy Crone
- 11:45 am **Anticipating Earthquakes: Mapping and Monitoring the Source of Great Tsunami Earthquakes**, Donna Shillington
- 12:45 pm **Hurricanes and Typhoons: Past, Present and Future**, Suzana Camargo
- 1:45 pm **Exploring the Changing Ice**, Robin Bell
- 3:00 pm **Tree Rings, Drought, and Fire: How the Past Teaches us About the Future**, Park Williams

Gary C. Comer Geochemistry Building Seminar Room, 1st Floor

- 10:30 am **What is the Evidence for Sea-Level Rise**, Jim Davis
- 11:30 am **Earthquake Prediction in the Shadow of Chaos**, Bruce Shaw
- 1:00 – 4:00pm **The Lamont Film Festival: Science Shorts**

Geoscience Conference Room 1st Floor Earth2Class (E2C) Mini-Workshops

- 11:00 am **Professional Development Opportunities for Teachers at LDEO**, Michael J. Passow
- 12:00 pm **Teaching with Your Local Environment: The Hackensack Past, Present, and Future**
- 1:00 pm **E2C and American Meteorological Society Professional Development Opportunities, featuring Sample Activities**, Presented by Samantha Adams, AMS Peer Trainer
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Lamont-Doherty Earth Observatory is a core component of The Earth Institute, Columbia University