



Lawrence Berkeley  
National Laboratory

**Contacts:**

Julie Chao, [JHChao@lbl.gov](mailto:JHChao@lbl.gov), c-415-318-9940  
Dan Krotz, [DAKrotz@lbl.gov](mailto:DAKrotz@lbl.gov), c-510-220-8529

***Berkeley Lab Researchers at AGU***

**Climate Change and Prediction, Induced Seismicity,  
and Arctic and Amazon Ecosystems Among Many Talks**

Berkeley Lab scientists will touch on multiple research areas at this year's AGU meeting. Topics including climate modeling challenges, projects on Arctic permafrost, increased lightning strikes, and subsurface fractures are but some of the science being discussed. And, Berkeley Lab's Earth Sciences Division will also be hosting Meet A Scientist sessions throughout the week in booth #2309.

**Monday, Dec. 15**

4:00 PM - 6:00 PM

*MOSCONE WEST 3006*

**Coastal Fog, Climate Change, and the Environment**

The cover article of this week's edition of *Eos* explores a pressing question: how will global climate change influence fog and how might fog be affected by rising surface temperatures and other effects? The article is co-authored by **Travis O'Brien** of Berkeley Lab, who is also co-convening a scientific session on the same topic. O'Brien will be available at the Monday session to discuss why fog projections and assessment of marine fog's vulnerability to climate change are critical for coastal adaptation planning. Stratocumulus and fog define the climatology of the eastern Pacific coast, and numerous other regions, impacting the hydrology, chemistry, and thermodynamic balance of ecosystems and urban environments.

6:15 PM - 7:15 PM

*MOSCONE WEST 2005*

**Town Hall on DOE Crosscutting Subsurface Initiative: Adaptive Control of Subsurface Fractures and Flow**

The subsurface provides most of the world's energy and offers great potential for CO<sub>2</sub>, nuclear waste, and energy storage. Despite decades of research, and recent successes in new extraction methods, significant challenges remain for efficient and sustainable development of the subsurface. The US DOE and National Laboratories are advancing an innovative crosscutting Subsurface Initiative, focused on revolutionizing sustainable subsurface energy production and storage through transformational improvements in the ability to access, characterize, predict and adaptively manipulate fracture and flow processes over scales from nanometers to kilometers. This town hall describes the Initiative and solicits community feedback, with **Susan Hubbard** of Berkeley Laboratory.

**Tuesday, Dec. 16**

12:30 PM - 01:30 PM

*MOSCONE WEST 2004*

**Town Hall on The AmeriFlux Network: Looking to 2015**

The AmeriFlux network links ecosystem-flux and process-scale studies across the Americas. The DOE AmeriFlux Management Project serves the community of flux sites and data users. Its primary objectives are to maximize the quality of AmeriFlux data and its use by a broad community, including facilitating innovative

measurements and synthesis. Join the town hall to hear news about the network (such as new synthesis activities) and AMP activities (new data products, QA/QC services), and more. Come and exchange ideas, learn about opportunities (or announce them), and create new ones. With primary convener, **Margaret Torn**, Berkeley Lab.

4:30 PM- 4:45 PM

MOSCONE WEST 3001

### **Opportunities for Increasing Confidence in Projections of Future Changes in Extreme Temperature and Precipitation in the Next US National Climate Assessment**

Projections of future changes in extreme temperature and precipitation from global climate models are prominently featured in the 3<sup>rd</sup> US National Climate Assessment. The appropriate level of confidence in the details of these particular projections will be discussed. Limitation in this confidence comes from several sources, including but not restricted to, the relative coarseness of the underlying computational grids that models are built upon. Recent advances in high computing technologies are enabling several groups to perform multi-decadal integrations of global high-resolution atmospheric models that significantly better represent severe storms including hurricanes. Factors influencing projection confidence resulting from statistical uncertainties will also be discussed and suggestions for quantifying them presented. With **Michael Wehner**, Berkeley Laboratory

6:15 PM - 07:15 PM

MOSCONE WEST 2002

### **Town Hall on DOE's Next Generation Ecosystem Experiment -- Tropics**

This year, the Department of Energy's Office of Biological & Environmental Research initiated a decade long study of tropical forest ecosystems in Earth-system models in the context of a changing climate. The project, called the Next Generation Ecosystem Experiment – Tropics, is led by Berkeley Lab. The project will use modeling uncertainties to inform field research, with the goal of determining whether tropical forests will continue to act as large net carbon sinks throughout the 21<sup>st</sup> century, among other questions. Berkeley Lab's **Jeff Chambers** will give a presentation at the town hall, and will be joined by other Berkeley Lab scientists during the Q&A portion of the event.

## **Wednesday, Dec. 17**

11:35 AM - 11:50 AM

### **A Harder Rain is Going to Fall: Challenges for Actionable Projections of Extremes**

MOSCONE WEST 3001

Hydrometeorological extremes are projected to increase in both severity and frequency as the Earth's surface continues to warm in response to anthropogenic emissions of greenhouse gases. These extremes will directly affect the availability and reliability of water and other critical resources. The most comprehensive suite of multi-model projections has been assembled under the Coupled Model Intercomparison Project version 5 (CMIP5) and assessed in the Fifth Assessment (AR5) of the Intergovernmental Panel on Climate Change (IPCC). In order for these projections to be actionable, the projections should exhibit consistency and fidelity down to the local length and timescales required for operational resource planning, for example the scales relevant for water allocations from a major watershed. Researchers in this presentation will summarize the length and timescales relevant for resource planning and then use downscaled versions of the IPCC simulations over the contiguous United States to address three questions. First, over what range of scales is there quantitative agreement between the simulated historical extremes and in situ measurements? Second, does this range of scales in the historical and future simulations overlap with the scales relevant for

resource management and adaptation? Third, does downscaling enhance the degree of multi-model consistency at scales smaller than the typical global model resolution? Requirements for further model development to make the next generation of models more useful for planning purposes will be highlighted. With **William Collins** - Berkeley Lab.

2:40 PM- 2:55 PM

MOSCONE WEST 3020

### **Projected Increase in Lightning Strikes in the United States Due to Global Warming**

Lightning plays an important role in atmospheric chemistry and in the initiation of wildfires, but the impact of global warming on lightning rates is poorly constrained. The lightning flash rate is proposed here to be proportional to the convective available potential energy (CAPE) times the precipitation rate. Using observations, the product of CAPE and precipitation is found to explain the majority of variance in the time series of total cloud-to-ground lightning flashes over the contiguous United States (CONUS) on timescales ranging from diurnal to seasonal. The observations reveal that storms convert the CAPE of water mass to discharged lightning energy with an efficiency of about 1%. This proxy can be applied to global climate models, which provide predictions for the increase in lightning due to global warming. Results from 11 GCMs will be shown. With Berkeley Lab's **David Romps**.

4:00 PM- 4:20 PM

MOSCONE WEST 3004

### **Latest Developments in Best Practices and Mitigation Efforts for Induced Seismicity Due to Fluid Injections and/or Withdrawal**

As more attention from both the public and private sector is being focused on induced seismicity, there is a need for a set of best practices. A critical element of any best practices is a mitigation procedure. It is clear that there is no universally accepted set of best practices that satisfies the public, the private sector, regulators or policy makers. Berkeley Lab's **Ernest Majer's** presentation will suggest fundamental elements of best practices based upon existing and developing best practices, and experiences to date in the energy industry. Examples of best practices, pros and cons to various approaches and examples from field application will be given. Emphasis will be placed on mitigation procedures such as improved spotlight methods.

**Thursday, Dec. 18**

12:05 PM - 12:20 PM

MOSCONE WEST 3008

### **Far-Infrared Surface Emissivity Impacts on Climate and the Potential for a Positive Feedback**

There are few observational constraints on surface emissivity at wavelengths longer than 15  $\mu\text{m}$ , a spectral region commonly referred to as the far-infrared. The representation of surface emissivity in climate models is highly simplified, and systematically higher than emissivity of real surfaces. Berkeley Lab scientists, led by **Daniel Feldman**, performed sensitivity studies using the Community Earth System Model and found that Arctic surface temperatures warm by 2  $^{\circ}\text{K}$  and frozen surface extent decreases by 5-10% when the model is subjected to realistic values of far-infrared surface emissivity. This finding may help explain the cold-pole bias, and also suggests the potential for a positive feedback whereby the loss of snow or ice leads to the exposure of surfaces that reduce surface infrared cooling, thus warming the surface further.

Thursday, Dec. 18 cont.

5:30 PM- 5:45 PM

MOSCONE WEST 3018

### **Can We Attribute Changes in Risk to Anthropogenic Emissions?**

Losses and damages associated with extreme weather events have been receiving attention lately within the context of anthropogenic climate change. Investigations of the role of anthropogenic emissions have so far taken two forms. "Event attribution" studies have examined the role of anthropogenic emissions in the occurrence of the extreme weather event, usually in terms of the chance of the event, while a different line of research has been primarily concerned with how losses related to extreme weather events have varied over time. According to these latter studies, the increase in asset values and in exposure are the main drivers of the strong increase of economic losses over the past several decades. Here researchers propose a better integration of these existing lines of research in detection and attribution of extreme weather events and disasters by applying a risk framework, where risk is considered a function of the probability of occurrence of an extreme weather event and the associated consequences of that event. They examine the feasibility of considering the role of anthropogenic emissions against other factors in contributing to long-term trends in risk. With Berkeley Lab's **Dáithí Stone**.

#### **Berkeley Lab's Earth Sciences Division Presents *Meet the Scientists: Booth #2309***

Tuesday through Friday, Berkeley Lab scientists will be available at the Earth Sciences Division booth for conversations about their research. Berkeley Lab's Earth Sciences Division (ESD) is developing 21st century approaches and scientific understanding relevant to both energy and the environment, including geothermal, nuclear waste, and geosciences, as well as fundamental research in climate studies, hydrogeology, and microbial ecology. A hallmark of ESD research is considering process interactions occurring within and across many Earth system compartments and scales.

For a complete list of scientists, stop by booth #2309 or see: <http://esd.lbl.gov/newsandevents/esdagu.html>