

Global Climate Change and Society Conference

Events Program

August 8 - 9, 2002

Thursday Afternoon Sessions (12:00-2:30pm)

- 12:00-12:50 pm **Ground based sampling of pyrogenic emissions from Big Elk Fire, Estes Park**
Jennifer Small, Lindsay Sabik, Doug Vilsack (Mentor: Dr. Al Cooper, NCAR)
- 12:50-1:10 pm **Prediction and Yucca Mountain**
Jeremy Van Cleve (Mentor: Dr. Roger Pielke Jr., GCCS)
- 1:10-1:25 pm **Coffee Break**
- 1:25-2:00 pm **A Quantification of Groundwater Seepage During Drought and Its Importance for Water Quality Modeling in the St. Vrain Watershed**
Hannah Chapin and Tommy Gerber (Mentor: Dr. James Saunders, The Limnology Center)
- 2:00-2:20 pm **Carbon Sequestration Methods: the State of the Art**
Dan Leistra (Mentor: Dr. Roger Pielke Jr., GCCS)

Friday Morning Sessions (9:30am-12pm)

- 9:30-9:50 am **Integrating Scientific Information with Societal Needs: Citizen Involvement at Rocky Flats**
Natalie Gulsrud (Mentors: Dr. Robert Frodeman and Dr. Carl Mitcham, GCCS/Colorado School of Mines)
- 9:50-10:10 am **Urban Garden Indicators for Community Health**
Sheri Karooni (Mentor: Dr. Jill Litt, CU Health Sciences Center)
- 10:10-10:30 am **Global climate Change Mitigation Policy in Japan and the US: The Role of the State and Economic Structure**
Noah Long (Mentor: Dr. Bob Harriss, ESIG, NCAR)
- 10:30-10:50 am **Coffee Break**
- 10:50-11:10 am **Cosmic Catastrophes: Credible or Comical?**
Brendan M. Mulligan (Mentor: Dr. Clark Chapman, South West Research Instit.)
- 11:10-11:30 am **Understanding Energy in the American West**
Eric Skovsted (Mentor: Dr. Patricia Limerick, Center of the American West)
- 11:30-11:50 am **Philosophical Critiques of Scientific Modeling**
Carol Braun (Mentors: Dr. Robert Frodeman and Dr. Mark Bullock, GCCS)

Thursday Morning Presentations

August 8, 2002

12:00 –2:30 pm

12:00-12:50 pm

Ground based sampling of pyrogenic emissions from Big Elk Fire, Estes Park, CO

Jennifer Small, Lindsay Sabik, Doug Vilsack

In order to fully understand the impact of pyrogenic emissions it is necessary to have a good understanding of the microphysics of clouds. Cloud formation and the aerosol emissions from wildfires are intimately connected. By understanding these interactions it is possible to investigate the role aerosols play in precipitation processes and the radiation budget. Of extreme importance are the aerosol particle size distributions produced as a result of wildfires and biomass burning. Using the Scanning Mobility Particle Sizer (SMPS) it was possible to sample pyrogenic emissions from the Big Elk Fire, Estes Park, CO. Instrument calibration and testing was completed by using a constant output atomizer (COA), NaCl solution and multiple filters. The SMPS system is transportable and was brought to a specific site to sample air downwind of the Big Elk Fire. By sampling air downwind of the fire it was possible to obtain both clean air and smoky air samples. High variability in wind speed and direction allowed for sampling of air containing various levels of CN. Smoke samples had consistently higher concentrations of particles, especially in the smallest size range detectible by the SMPS (approximately 12-25nm). These findings are consistent with other aerial based studies. Aerosol science is particularly interested in the size distributions of particles produced from such events due to their impact on cloud microphysics. By providing another dataset concerning particle size distribution and concentrations this study hopes to further support current trends in aerosol science regarding precipitation inhibition and alteration of the radiation budget.

12:50-1:10 pm

Prediction and Yucca Mountain

Jeremy Van Cleve

As the United States moves into the 21st century, it continues the struggle to safely dispose of the hazardous byproducts of the nuclear age, namely spent nuclear fuel (SNF) from commercial, defense, and research nuclear reactors and high level waste (HLW) from the

construction of nuclear weapons. The current solution to the problem, a deep geologic repository located at Yucca Mountain in Nevada, is headed into the licensing and possibly construction phase of a policy program set out in the Nuclear Waste Policy Act of 1982. Even after the US Department of Energy (DOE) submits a license for construction, the Nuclear Regulatory Commission has up to four years to decide on whether the repository is built or not. Until then, DOE has an opportunity to finalize its repository design and bolster its argument that Yucca Mountain will meet Environmental Protection Agency (EPA) guidelines for the next 10,000 years. Based on analysis of the DOE's previous efforts to site, design, and defend Yucca Mountain, it seems there are two available future methodologies that the DOE can pursue. The first is a continuation of the present course of action, which aggressively uses computer models and predictions to justify the viability of Yucca Mountain and pursues a linear sequence of steps towards final approval of the project. The second methodology, "adaptive staging," focuses on a staged design process, which recognizes the limits and possible failures of predictive science. It also complements the use of predictive modeling with other approaches for evaluating repository performance, including expert judgment, the use of natural analogues, and comparative risk analysis between other viable alternatives.

1:10-1:25 pm..... Coffee Break

1:25- 2:00 pm

A Quantification of Groundwater Seepage During Drought and Its Importance for Water Quality Modeling in the St. Vrain Watershed

Hannah Chapin and Tommy Gerber

The current drought affecting Colorado is one of the worst on record, and surface water flow is significantly decreased in comparison to historical records. Water quality models rely on estimated flow values that may not reflect the current conditions. This project attempted to quantify groundwater seepage in Boulder, Coal, and St. Vrain Creeks, using the drought conditions as a way of isolating the influence of this water source on total stream flow. Quantifying groundwater inputs is necessary to accurately model in-stream water quality because groundwater is a source of dilution. Water quality models guide the issuing of permits regulating wastewater discharges. This type of model, defined as the Total Maximum Daily Load (TMDL), is being applied to control ammonia in the St. Vrain watershed. Ammonia is discharged in wastewater effluent, and the levels of this pollutant in the watershed have

repeatedly exceeded water quality standards, as supported by grab-sample data collected during this study. We measured levels of groundwater seepage lower than those calculated based on the 10-year record of flow residuals in Boulder and St. Vrain creeks. Running the TMDL with our revised seepage values changes the concentration of ammonia in these streams. The effect was most significant in the St. Vrain where the new model predicts ammonia levels that exceed water quality standards. Compliance with these standards would require significant and costly changes in wastewater treatment. These results illustrate the importance of field-testing the hydrologic assumptions used in the TMDL and similar models.

2:00-2:20 pm

Carbon Sequestration Methods: the State of the Art

Dan Leistra

For many people, the debate on what to do about global warming has centered around two seemingly opposed strategies: mitigation and adaptation. While both approaches have some merit, the seeming dichotomy that has been established between these two lines of argument has shut out another approach to climate change known as carbon sequestration. Carbon sequestration removes carbon dioxide from the atmosphere or prevents it from getting there in the first place, and then stores it elsewhere. This storage can be done in the oceans, underground in geologic formations, or even in plants and soils. The fundamental point is that as long as carbon dioxide remains in one of these 'sinks', it is not driving the greenhouse effect. Carbon sequestration therefore represents a way for the world to continue to utilize fossil fuels without facing the full effects of greenhouse gas emissions.

While managed carbon sequestration is only occurring on a very limited scale, it has gathered a great deal of attention in recent years as a potentially important policy option. In this project, I present a series of brief reports on the carbon sequestration options in use, under development, or being proposed. Each report covers one method of carbon sequestration and includes a description of the sequestration action, the decision-makers involved and what outside influences could affect their choice of whether or not to engage in sequestration, the current state of the art, ancillary advantages and disadvantages that could result, and an estimate of how much carbon dioxide could be sequestered.

Friday Morning Presentations

August 9, 2002

9:30 am -12:00 pm

9:30-9:50 am

Integrating Scientific Information with Societal Needs:

Citizen Involvement at Rocky Flats

Natalie Gulsrud

In 1993 the Rocky Flats Citizens Advisory Board was formed amidst the daunting task of cleaning up the heavily contaminated former nuclear weapons production plant, Rocky Flats. Formed with the intent of providing nonpartisan, broad-based policy recommendations to the U.S. Department of Energy and other regulators of Rocky Flats, the board creates a forum in which complex scientific information is successfully conveyed to the public. The Rocky Flats CAB has fulfilled the need in the community for a nonpartisan forum within which stakeholders can both voice their concerns and actively participate in a recommendation making process to the Department of Energy. These recommendations to the DOE have ranged from issues such as the acceptable amount of plutonium in the soil to worker safety at Rocky Flats. While the CAB has made over 100 recommendations to the DOE and other Rocky Flats regulators, these decisions have not always been followed. Other evident issues with the CAB include lack of public interest in the arduous task of serving on the board. Due to the steep learning curve associated with the history and the complicated clean up process of Rocky Flats, and the large time commitment associated with joining a board that functions on a consensus basis, community members have been hesitant to join the board. While public interest in Rocky Flats has been high since the first indication of pollution problems in 1969, the cleanup task has proven to be difficult and laden with complex questions concerning not only issues of science but also societal welfare. In providing this tool for the Rocky Flats stakeholders the DOE has created a forum in which scientific information is pertinent to the public and a more democratic approach to the clean up process is realized.

9:50-10:10 am

Urban Garden Indicators for Community Health

Sheri Kardooni

Issues surrounding inner-city open land use, physical and emotional health, and food security come together in a project largely sponsored by a non-profit organization called Denver Urban Gardens (DUG). This ongoing project is concerned with an evaluation and understanding of urban gardens across Denver, Colorado, as well as the communities that support them. The underlying theme to the study uses neighborhood, community and demographic indicators to assess successful urban gardening communities - where the lives of individuals are being affected in a positive way and in a range of areas from decreasing risk of chronic disease through diet and activity, to emotional benefits that result from a closer connection with the production of food. In time, this study will make it possible to identify if such benefits exist, and subsequently determine those factors that harbor the most successful urban gardening communities including neighborhood assets, city water regulations, and leadership within the gardening community. Changing global climate can have drastic effects on the success of urban farming and gardening. Regulations regarding land use most directly affect whether or not many low income neighborhoods will have access to a major source of food security, and changing conditions can affect seasonal yields. One of the most important qualities of gardens that can be identified is permanence in a variety of areas: fundamentally, permanence of existence, as well as permanence of the land's ability to provide for those who rely on it. If in fact gardens are having the positive impacts that are hypothesized, this study will lead to the development of strategies to maintain existing urban gardens, and to expanding the project so that more communities can be affected in these positive ways.

10:10-10:30 am

Global climate Change Mitigation Policy in Japan and the US:

The Role of the State and Economic Structure

Noah Long

Climate Change mitigation has been a source of contentious international debate, with various countries addressing the problem of global climate change in very different manners, despite nearly universal access to similar scientific information. This paper analyzes the actions

of the US and Japan in the climate change negotiations throughout the FCCC proceedings. It links the internal political and economic structure of each country with its national climate policy. In Japan the climate change debate is contrasted with the Pollution Diet of 1970 to show the relative importance of various constituencies and governmental bodies in the policy making process. The climate debate is linked to the national quest for energy independence. In the US the climate debate is considered within the context of balanced powers of the legislative and executive branches and the relative weakness of the bureaucracies. The role of campaign finances and the interests of the business community are also evaluated. Ultimately the study shows the invalidity of the realist contention in international theory that states behave as rational actors in pursuit of their own best interest, in favor of a claim that policy is the product of the interactions of various forces within a nation-state. The analysis also complicates the various theories of state behavior specific to the US (as the land of entrepreneurial politics) and specific to Japan (as consensus oriented) by comparing these theories to the global climate change policy formation process within each country.

10:30-10:50 am..... Coffee Break

10:50-11:10 am

Cosmic Catastrophes: Credible or Comical?

Brendan M. Mulligan

The history of the Earth, and all the bodies in the solar system, has been marked by cosmic catastrophes of epic proportions: impacts due to asteroids and comets. Large-scale impacts have occurred in the past and, despite a decline in impact flux, the potential for future impacts represents a legitimate threat to human civilization. Communicating the risk that near-Earth objects (NEOs) pose to the general public presents a serious challenge to the astronomical community. The challenge stems, in part, from the unique character of the NEO hazard. The concept of asteroids and comets colliding with the Earth represents the most extreme example of a low probability, high consequence event - outside the domain of our common lived experience. The NEO hazard is highly prone to sensationalism, especially in the wake of two Hollywood blockbusters (*Armageddon* and *Deep Impact*) depicting havoc wreaked by earth-approaching celestial bodies. Finally, cosmic impact events differ from other hazards in that, in theory, impact dates that lie far in the future can be forecasted accurately. Addressing this risk communication challenge has motivated the development of communication tools, most notably the Torino

Impact Hazard Scale, capable of conveying useful information to a diverse audience. An examination of the Torino Scale - devised to place into context the level of public concern that is warranted for any close encounter event within the next century - reveals that it is ineffective; asteroid and comet impact hazard predictions continue to be met with confusion, misunderstanding, and sensationalism.

11:10-11:30 am

Understanding Energy in the American West

Eric Skovsted

Energy use underlies the problem of global warming. Through its consumption and production at local levels we know we have warmed the earth. To better understand the relationship between humans, energy, and a variety of problems, some as wide spread as global warming others as localized as California black outs, the Center for the American West has embarked on an energy initiative, a component of which is a brochure entitled, "What every Westerner should know about energy." Thinking about energy on a regional level can be a profound way to give meaning to its dark realities and our complete reliance on it. In the American West, a discussion on energy quickly becomes a conglomerate of intertwined perspectives that can contradict and agree, but that in the end, help to provide a more holistic understanding of energy use and production. This talk is the result of my efforts, within the ongoing effort of the Center for the American West, to shape the intersection of a few such perspectives into a narrative, a narrative that hopefully will help westerners reach a more useful and comprehensive conception of energy.

11:30-11:50 am

Philosophical Critiques of Scientific Modeling

Carol Braun

A lack of faith in the modernist dream of limitless truth-finding underlies several recent philosophical criticisms of the numerical modeling of complex physical systems. The groundbreaking criticism of that kind came in the form of an article by Naomi Oreskes, Kristen Shrader-Frechette, and Kenneth Belitz, published in *Science* in the February of 1994. Oreskes and her co-authors warn that the process of numerical modeling, widely regarded as a source of verifiable knowledge, can never live up to that role. Their critique is rooted in several basic precepts of logic and elementary philosophy: the under-determination of models by the available data, the impossibility of demonstrating the truth of any proposition except in a closed system,

and the fallacy of affirming the consequent. Arguing from these basic precepts, they conclude that models can be neither verified nor validated. But their conclusion fails to be striking because it is too general: it applies equally to *all* attempts to describe reality. If the philosophical critique of modeling raised by Oreskes et al. is to be made useful in any practical sense, we will have to figure out how complex a physical system can get before our attempts to model it become inappropriate objects of the language of verification.