Research Accomplishments

**Anthony Westerling**

- Western North American Fire Histories: integrated documentary records of western north American state, federal, and Canadian large fires into a single large fire database for fire-climate research.
- Large montane and subalpine forest fires: analysis of climate driven increase in incidence of large forest fires in western US
- Wildfire forecasting: provide seasonal area burned forecasts to federal fire managers. working with end users to develop earlier forecast information for budget planning.

**Alexander Gershunov**

- Work on extreme daily precipitation events in Climate has yielded a rigorous probabilistic model and a deeper understanding of what climatic and geographical factors control the volatility of precipitation (Panorska, Gershunov and Kozubowski 2005). This stochastic framework is being applied to study Californian precipitation extremes.
- We are also studying the summertime variability and seasonal predictability of daily temperature extremes in the California and the Western United States, due to both natural and anthropogenic factors. Alfaro, et al. (2004, 2005) quantified interannual variability and seasonal predictability,

**Hugo Hidalgo**

- Described the variability of reference evapotranspiration (ETo) from California Irrigation Management Information System (CIMIS).
- Studied patterns of low-frequency variations on western U.S. Palmer Drought Severity Index (PDSI) using gridded tree-ring reconstructions.
- Identified, from a surface energy/hydrology model simulation, differences between seasonal hydrologic structure in regions that are water limited and not water limited in the western U.S., particularly with respect to their response to warming.
Tim Brown

CEFA provides operational fire weather products to the California and Nevada Smoke and Air Committee (CANSAC). To assess the extent that CANSAC is a partnership given synergy characteristics and determinants, and how well the CANSAC structure is functioning in terms of a sustainable partnership, a formal survey was conducted of the Board of Directors, Operational Applications Group and the Technical Advisory Group. Questions covered six general categories: partnership structure, organizational design, availability of resources, CANSAC management, CANSAC leadership, and CANSAC progress. On a scale of 1 (strongly disagree) to 5 (strongly agree), the overall score was 4, indicating that after only one year of operation CANSAC has formed a strong partnership. A journal paper on scientific partnerships and these results is being prepared jointly between CAP/CEFA and CLIMAS.

Mike Dettinger

- Ensemble analysis of 86 IPCC IV projections of 21st Century climate changes over California illustrate that (a) temperature changes in the most recent projections are quite generally about 0.5 to 1.0 C cooler than in previous SRES (IPCC III assessments), even when projections from the same modeling centers and emissions scenarios are compared; however otherwise the amount of scatter and the general temperature tendencies in current projections have changed relatively little overall; and (b) the strong tendency for projections of 21st Century precipitation over California (and indeed over the whole of the midlatitude US) to differ relatively little from 20th Century simulations is even stronger in the IPCC IV ensemble than in the smaller IPCC III ensembles. These results will help to put the emergence of yet another (larger) set of climate-change projections into context for California policy makers, resource managers, and earth scientists. Paper in preparation.
- Trends have been detected in historical records of rain vs snow contributions to precipitation across western US over the past 50 years, such that a smaller fraction of western precipitation has fallen as snow and more as rain in recent decades (in response to warmer temperatures), Paper in review. Another, unexpected trends in the temperatures at which snow actually falls has been detected, reflecting differences in the warming rates near the surface (where the long-term temperatures have usually been measured) and aloft (where the partitioning between rain and snow occurs).
- Long-term historical analyses of conditions that dictate orographic patterns of precipitation and of pineapple-express storms in California have helped to identify the interannual conditions that are associated with strongly orographic precipitation and the occurrence of pineapple-express storms, and have helped to map the areas in California that respond similarly (in these regards) to
various phases of ENSO and PDO. Two proceedings paper describing preliminary results published; research continues.

**Randy Hanson**

Compiled and conducted preliminary analysis of ground-water levels, streamflow and diversions, and precipitation for Central Valley. This will be used in preparation for using the Farm Package with GCM precipitation for simulating ground-water flow.

**Kelly Redmond**

- Developed a western climate anomaly map interface has been developed, for all western states and for the West as a whole, to track climate with daily updates. Awaiting higher end computer to do all states, but for now California, Arizona and West maps are re-computed every day, approximately 2000 maps: http://www.wrcc.dri.edu/anom
- Downloaded California Cooperative Snow Survey data, a very laborious process, and put into WRCC data base. Initial evaluation is under way. Spring 2005. These can be viewed on the Calclim web pages at: http://www.calclim.dri.edu

**Steven Taylor**

Gathered and began to analyze surface wind data (buoy and satellite observations; NCEP Reanalysis and other model fields). Described the spatial and temporal variability of northwesterly surface wind along the California coast, the dominant climatic feature of coastal California in spring and summer. Began analysis of large-scale atmospheric circulation associated with northwesterly surface wind along the California coasts, and to understand seasonal changes in structure.

**Konstantine Georgakakos**

- Towards improved Northern California water resources management, developed a simplified surface air temperature model for the Sacramento River drainage to be used to downscale atmospheric model information. Tests with observed data and comparison with MM5 runs indicate considerable skill and significant computer savings.
- Continued work to develop and assess climate and hydrology ensemble prediction and reservoir management model system for northern and central California water resource management.
Dan Cayan

- Conducted research to describe structure and variability of Santa Ana wind events, which greatly increase potential for extreme wildfire events in Southern California.
- Assembled observations and global model simulation datasets to explore possible regional climate changes in California, with particular attention to impacts on hydrologic variability.
- Continued investigation of effects of climate variability on culex Tarsalis and other species involved in transmission of encephalitis and West Nile virus.

Partners/Collaborators/etc

Dr. Georgakakos has held discussions with Department of Water Resources, CNRFC-National Weather Service and Bureau of Reclamation focus on the development of a strategy for next winter (2005-2006) regarding the implementation and assessment of the end to end climate and hydrology ensemble prediction model and reservoir management model system as part of central valley operations.

Randy Hanson, in conjunction with the USGS-RASA2 project of developing the Farm Package for MODFLOW-2000 and developing a new ground-water/surface-water model of the Central Valley, California we has joined with the California Department of Water Resources in model development and calibration. We have also enlisted the help of NASA to provide monthly precipitation fields for the Central Valley that will be used for scaling the downscaled GCM precipitation.

Dr. Tim Brown co-organized the 2005 National Seasonal Assessment Workshop: Western States and Alaska and the 2005 National Seasonal Assessment Workshop: Eastern and Southern States, organized a one-day climate training workshop for interagency fire weather meteorologists prior to the western assessment workshop Dr. Brown also submitted proposal to Bushfire Collaborative Research Centre and Bureau of Meteorology to organize an Australian national seasonal assessment Under Dr. Brown’s direction, CEFA is receiving the entire North American Regional Reanalysis dataset to perform a variety of fire-climate studies and develop value-added products. The National Interagency Fuels Management Group signed a charter formalizing this partnership as CEFA’s national oversight group.

Dr. Dettinger was inducted as a Member, CALFED (California Bay-Delta Authority) Water Management Science Board, November 2004 to present; is a member of the external Science Steering Group for CCSP interagency Global Water Cycle Working Group, January 2005 to present; Co-author, Chapter 1 of CCSP Synthesis and
Assessment Product 5.3 (Decision-Support Experiments and Evaluation using Seasonal to Interannual Forecasts and Observational Data). Dettinger was the invited Keynote speaker and contributor, USGS/Fish and Wildlife Service "Important Challenges" planning effort for the 21st century, May 2005. Dettinger is member of the organizing committee, 1st Mountain Climate (MTNCLIM) Workshop, March 2005, the organizing committee, Implementation Workshop for National Phenological Network, August 2005 Convener, moderator, and presenter, Climate session, 3rd Biennial CALFED Science Conference, Sacramento, October 2004, and an Organizer, new collaboration between NOAA ETL CALJET program and USGS stable isotopes laboratory to integrate isotopic signals in precipitation with vertical looking radars and other meteorological sensors in California. Dettinger was an invited speaker, “Global Implications of Climate Change for Water Supplies”, National Academy of Sciences’ Sackler Colloquium on the Role of Science in Solving the World’s Emerging Water Problems, Irvine, October 2004, an invited speaker, Western States Water Council’s Western Water Supply Challenges Workshop, Salt Lake City, September 2004, an Invited speaker, American Water Works Research Association Foundation Meetings, March and November 2004; an Invited speaker, Desert Research Institute, Reno, April 2005; an invited speaker (two talks), Annual American River Conference, Sacramento, April 2005; gave an Invited briefing, Climate variability and change in eastern California, Los Angeles Department of Water and Power, Los Angeles, January 2005 coast, winter 2005

Dr. Kelly Redmond participated in the California Climate Change Conference, Sacramento, June 2004. participated in California Energy Commission Model Intercomparison Workshop, Sacramento, June 2004; Visit to National Weather Service Forecast Office, Eureka CA, August 2004; Visited National Park Service, land and other resource managers, California state parks, University of California reserves, and other interests along the California coastline regarding long term observing needs, August 2004; delivered presentation at CalFed Science Conference, Sacramento, October 2004; Presented and participated in the Yosemite Hydroclimate Workshop, Yosemite Valley, October 2004; visited Channel Islands National Park, Ventura, CA, Nov 2004; Mojave Desert Sciences Symposium, presentation on climate and sustainability in California deserts, Redlands CA, November 2004; Participated in Climate Briefing to California agencies, Scripps, November 2004. Dr. Redmond gave Numerous radio, television, and print interviews with local, regional and national media, during Winter 2004-05 about heavy precipitation effects in California. Dr. Redmond attended meeting on California coastal issues and formalization of partnerships, CENCOOS, Central and Northern Coastal Ocean Observing System, San Francisco, March 2005 (Many coastal interests represented. There are two other related groups in California, SCCOOS (Southern California Coastal Ocean Observing System) and PACOOS (Pacific Coastal Ocean Observing System)); visited with CA Dept of Water Resources, NWS Forecast Office, NWS River Forecast Center, regarding California / WRCC activities in 2005, and NOAA successor to Caljet/Pacjet Projects, called "SHARE., Sacramento, April 2005; delivered presentation to UC Davis on California climate activities, exploration of potential connections to California agriculture. Davis, April 2005; delivered presentation
to California Air Resources Board on California climate activities, Sacramento CA, April 2005; Participated in American River Watershed Conference April 22-23 (numerous contacts developed for Sierra Nevada climate monitoring), Sacramento CA 2005; delivered Presentation at AMS Applied Climate Meeting on a small scale network in the Owens Valley, eastern CA, and siting implications for climate monitoring. Savannah GA, June 2005; participated in Boulder workshop on assessment of fire potential for Spring and Summer of 2005 for the western states, meeting organized by Tim Brown of CEFA (Climate, Ecosystem, and Fire Applications project) and by Gregg Garfin of CLIMAS. Dr. Redmond participated in numerous planning teleconferences in Spring and Summer for an upcoming meeting, "Urban Water Supplies and Climate Change in the West," to take place in Las Vegas NV, Sept 22-23, 2005. Audience will be urban water managers from around the West. Most of the scientific presentations will involve RISA participants. Organizers are DRI/WRCC, Southern Nevada Water Authority, and NRDC.

Dr. Hidalgo is collaborating with Julio Betancourt (USGS), Gregory McCabe (USGS), Thomas Piechota (UNLV) on the impacts of climate variability on water supply in the Colorado River basin and other parts of the Western United States.

Dr. Gershunov is Collaborating with Dr. Anna Panorska at the Mathematics Department, University of Nevada, Reno is ongoing. This project titled "Modeling, variability and predictability of North American hydrologic extremes" is funded by NSF and is in support of CAP. Dr. Gershunov has begun a new UC Mexus - CONACYT project "Precipitation extremes in the western US-Mexico border region under current and future climatic conditions," recently selected for funding. This is a collaborative project with Dr. Tereza Cavazos at the Centro de Investigacion Cientifica y de Educacion Superior de Ensenada (CICESE), Ensenada, Mexico. It will support CAP research activities and educational outreach. Dr. Gershunov is a key member of a new NATO Science for Peace project, "Extreme precipitation events: their origins, predictability and societal impacts" has started in February 2005. This project is in collaboration with colleagues from Russia, Germany and the Ukraine and will focus on hydrological extremes in Europe and California. Dr. Gershunov has ongoing collaborations with Dr. Eric Alfaro, Universidad de Costa Rica, Dr. Herve Douville, Meteo-France Alice Favre, Doctoral Student, Universite Lyon 3, France; Drs. Anna Panorska and Tomasz Kozubowski, University of Reno, Nevada Dr. Tereza Cavazos, CICESE, Ensenada, Mexico Drs. Sergey Gulev, Olga Zolina and Igor Zveryaev, P.P. Shirshov Institute for Oceanology, Russia.

Dr. Westerling is working with Krista Gebert, USDA Forest Service Rocky Mountain Research Station, forecast development for Forest Service resource allocation; Haiganoush Preisler, USDA Forest Service Pacific Southwest Research Station, forecast methods development; Thomas Holmes, USDA Forest Service Southern Research Station, climate and vegetation management research; the National Interagency Coordination Center, forecasting for fire management; Jeremy Littell, Fire and Mountain Ecology Lab, University of Washington, ecosystem-based downscaling of historical fire
data; Thomas Swetnam, Laboratory for Tree Ring Research, University of Arizona, linking paleofire reconstructions and documentary fire histories for climate research; Barbara Morehouse, Institute for the Study of Planet Earth, University of Arizona, fire management and climate information needs; Dennis Lettenmaier, Anne Steinemann, Alan Hamelet and Nathalie Voisin (University of Washington), integrated management of western energy and water resources; the California Energy Commission and the Western Energy Coordination Council, integrated management of western energy and water resources; the California Energy Commission, California Climate Change Center at Berkeley (Michael Hanneman), Union of Concerned Scientists (Amy Luers), LBNL Earth Sciences Division (Norman Miller, Margaret Torn), ATMOS Research and Consulting (Katharine Hayhoe), Jeremy Fried (Forest Service), climate change impact analysis for california wildfire regimes.

Dr. Cayan is working closely with the California Energy Commission, leading the physical science component of their California Climate Change Center; the California Department of Water Resources, Cooperative Snow Surveys unit in developing improved climate monitoring in California Watersheds; the Santa Margarita River Ecological Reserve in developing a high density climate monitoring network, with special application to provide high fire danger warnings to neighboring communities; Yosemite National Park, the Devils Postpile National Monument, and the White Mountain Research Station, in developing an improved climate and hydrologic monitoring capability. Cayan is a member of the organizing committees for the CIRMOUNT mountain climate and ecosystems initiative, and the National Phenological Network. He collaborates closely with Dr. Bill Reisen an entomologist from UC Davis who has assembled a multi-institutional team of public health, mosquito control, entomologists and climatologists to understand and predict mosquito-borne disease outbreaks in California, and with Dr. David Stahle, a dendroclimatologist from the University of Arkansas who has assembled a multi-institutional team to study climate variations recorded in blue oak chronologies that are being collected from hundreds of new samples from a very comprehensive set of low to moderate elevation sites in the California Central Valley. Cayan is helping to organize the Yosemite Hydroclimate Workshop, the California Energy Commission’s Climate Change Workshop, and is a scientific lead member to prepare a Report to the California Governor involving scenarios for climate change impacts affecting State resources, ecosystems and other key sectors. Cayan has given briefings to members of the California State and Federal Government, including testimony to the U.S. Senate Commerce, Science and Transportation Committee Chaired by Sen. J. McCain in September 2004. He has provided numerous talks, interviews and outreach, including an invited article for the Sunday “Insight” section of the San Diego Union Tribune, August 15, 2004: Climate Change: a challenge looming for California”. He has several collaborators from academia, State and Federal agencies who are collaborating on CAP-related work to provide better climate information to decision makers in the California region. Cayan works with staff members Mary Tyrre and Larry Riddle to maintain the California Applications Program/California Climate Change Center web site http://meteora.ucsd.edu/cap/ and the Scripps Weather Page
Cayan is working, along with Dr. Georgakakos, as co-advisor of SIO graduate student Steven Taylor, and with Dr. Westerling as an advisor to UCSD Economics Department graduate student Tom Corringham. Cayan is using funding from the California Energy Commission, the California Department of Boating and Waterways, the Department of Energy, and other sources in NOAA to augment the RISA funding in support of CAP.

References


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