Integrated Climate and Ecosystem-Response Sciences in Western North American Mountains

...the CIRMOUNT Initiative

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WHAT?

CIRMOUNT aspires to be a Consortium that is:

• Collaborative, transparent, & open

• Interdisciplinary

• Responsive to society

• Research clearinghouse

• Emphasis on mountain climate & ecosystem- effect sciences

• Regional focus (w NA), globally aware
WHY?

CIR_MOUNT responds to four urgent situations in western NA mountains

1. Mountain regions are vastly under-instrumented for measuring climate & long-term changes

Of 404 Weather Stations in California only 6 are >2500 m and only 3 > 2750 m
2. Research on western mountain climates & ecosystems is intensive, but scattered & poorly integrated

- Vertebrate Studies
  - Moritz, Patton
  - UCB

- Passive samplers for $O_3$ and $HNO_3$ vapor in Sierra Nevada
  - A Bytnerowicz, USFS

- Rock Glaciers and Periglacial Rock-Ice Features in the Eastern Sierra Nevada, CA
  - Mapping, Classification, Origins, & Significance
  - Connie Millar
    - Sierra Nevada Research Center
    - PSW Research Station
    - USDA Forest Service, Albany, CA

- Yosemite NP Hydro Met Monitoring System
  - Dettinger, Cayan, Lundquist
  - USGS, UC Scripps

- A Bytnerowicz, USFS

- Basagic & Fountain, PSU
3. Demands on western mountain ecosystems are escalating, placing new & cumulative stresses on communities, natural resources, & goods demanded by society

Photos A Hansen
4. Climate change has been widely ignored in mountain land-use planning and natural-resource policy.
SPECIFIC CIRMOUNT GOALS

1. Implement coordinated high-elevation climate, hydrologic, and ecosystem monitoring
Relationships between low & high elevation stations cannot be considered constant

Differences in measurement - Instruments, methods, exposure, vegetation, setting, or

Real differences in climate - Orographic, atmosphere/elevation, ENSO effects

To distinguish, measurements need to be made consistently for long periods

Redmond, 2004
Monitoring Changes in Glaciers, Snow & Water

Grinnell Glacier, MT

Compiled by Fountain, 2004
Relative Trends in April 1 Snowpack, 1950-1997

Mote et al., 2004
Trends in Timing of Peak Snowpack

Hamlet et al., 2004
Monitoring changes in ecosystem processes & components

Annual Western U.S. Area Burned

Westerling 2004
Pinyon Pine (*Pinus edulis*) began dying *en masse* in summer 2002 from drought and *Ips* bark beetle outbreak.
Mountain Pine Beetle & Lodgepole Pine in British Columbia

Photo N For Products Assn
Compiled by Logan, 2004
North American Chapter of GLORIA
Global Observation Research Initiative in Alpine Regions

Sierra Nevada, CA
White Mtns, CA
Glacier National Park, MT

Directorate: Vienna, Austria
http://www.gloria.ac.at/res/gloria_home/

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2. Promote integrated research within and among mountain regions

Change in Date of Peak Snowpack

Hamlet et al 2004

Change in Peak Streamflow

Stewart et al

2080-2099
Synchronous stand replacing fire years in Southern Rockies correspond with major drought years

Margolis et al., in prep, Slide from Swetnam
Fire suppression and wet climate periods fostered high tree densities, increasing vulnerability to drought stress & beetle outbreaks.

Drought and warmer temperatures further stressed trees, triggering rapid increases in bark beetle populations, which result in massive forest dieback and associated insect outbreak dynamics.

Allen, 2004
Signs of Mountain Pine Beetle Leap-Frogging into Jack Pine, SE USA, and Industrial Forest Belt

Logan & Powell 2001
Logan 2004

The consequent changes in disturbance regimes can be more important than the (direct effect of) changes in temperature and precipitation
3. Communicate research findings among disciplines and provide sound science for resource planning & management.

Climate change is routinely ignored in resource management.
4. Develop long-term, policy-relevant mountain climate and ecosystem databases for public information and decision-support
5. Develop CIRMOUNT as a pilot regional model at the international scale (MRI) and engage CIRMOUNT projects and scientists in global mountain-climate science and assessments.
CIRMOUNT Core Group

Co-Chairs

Henry Diaz (NOAA CDC)
Connie Millar (USFS Research) with:

Dan Cayan, UC SIO
Dan Fagre, USGS BRD
Greg Greenwood, MRI
Dave Peterson, USFS PNW
Kelly Redmond, DRI WRCC
Tom Swetnam, U AZ

Mike Dettinger, USGS WRD
Lisa Graumlich, MSU BSI
Malcolm Hughes, U AZ
Frank Powell, UC WMRS
Nate Stephenson, USGS BRD
Connie Woodhouse, NOAA

Paleoeclimatology

+ Work Group Leaders from Six Work Groups
CIRMOUNT’s Bottom-Up Approach

“Grass Roots”

Absent:

- Dedicated budget
- Mandated charge or charter
- Institutional infrastructure
- Governance & oversight
- Obligations

Present:

- Pressing scientific and societal problems
- Significant scientific gaps (knowledge, discipline, or integration)
- Opportunity, incentive, flexibility
- Freedom to risk
- Commitment & ownership
WHAT HAS CIRMOUNT DONE?

Host Email Group-List (455 scientists & resource Managers)

Maintain Website: http://www.fs.fed.us/psw/cirmount/

Sponsor Conferences, Workshops, Special Sessions

Technical

- Ongoing:
  MTNCLIM Conferences, 19-22 Sept 06, Oregon USA
  AGU Session, Extreme Events 5-9 Dec 05, SF Cal

- Opportunistic: e.g., OSC Perth

Resource Managers: Workshops on tour
Focus on MTNCLIM Conferences

MTNCLIM 2005
Consortium for Integrated Climate Research in Western Mountains
Anticipating Challenges to Western Mountain Ecosystems and Resources
www.fs.fed.us/psw/mtnclim

MTNCLIM 2006
19-22 Sept 2006
Timberline Lodge, Mt Hood, Oregon USA
Develop & Coordinate Technical Work Groups

- Mountain Climate Network
- Hydrologic Observatories
- International Relations
- North American GLORIA
- Paleoclimatic Archives for Resource Managers
- Ecosystem Responses to Climate

Publish Reports, Articles, & Web Presentations

Coordinate with Mountain Climate Research & Management Efforts

WMI, USFS, MRI, GLOCHAMORE, MIREN
Focus on Work Groups
CIRMOUNT Ahead…

2006:

- Publish “Mapping New Terrain”

-MTNCLIM 2006 Conference, Mt Hood, OR

- CONCORD Meeting, Mendoza, Argentina, 4-6 April 2006

- Concentrate efforts to seek dedicated funds for CIRMOUNT Program Office