

## **Imtiaz Rangwala**

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### **Appointments**

- Research Scientist II, NOAA's Physical Sciences Division (PSD) & U. Colo., Boulder (2013-)
- Climate Science Team Lead, USGS's North Central Climate Science Center, Fort Collins (2015-)
- CIRES lead for Attribution & Predictability Assessment Team at NOAA PSD (2016-)
- Research Associate, Dept. of Marine and Coastal Sciences, Rutgers U., NJ (2011-2013)
- UCAR PACE Postdoctoral Fellow, Boulder (2009-2011)
- Lecturer, Dept. of Geography, Rutgers U., NJ (2009)

### **Education**

#### **Ph.D. (2008), Environmental Sciences, Rutgers University, NJ**

*Dissertation:* "Influence of Increasing Surface Humidity on Winter Warming at High Altitudes through the 21<sup>st</sup> Century"

#### **M.S. (2003), Environmental Sciences, Rutgers University**

*Thesis:* "Silver deprivation limits fecundity and survivability in the freshwater crustacean *Daphnia magna*"

#### **B.S. (1999), Chemical Engineering, University of Mumbai, India**

*Thesis:* "Denitrification of heavy metal effluent using a fluidized bed reactor"

### **Research**

**Research Scientist, Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado at Boulder, and Physical Sciences Division, NOAA ESRL (Apr 2013-present)**

- Regional climate change, drought and weather extremes
- Regional climate scenarios for natural resource management
- High elevation climate change

**Research Associate, Dept. of Marine and Coastal Sciences, Rutgers University (Nov 2011-Apr 2013)**

- Climate feedbacks in mountain regions - Tibetan Plateau/Himalayas, Colorado Rocky Mountains
- Climate projections in high elevation regions

**Postdocs Applying Climate Expertise (PACE) Research Fellowship, UCAR (2009-2011)**

- Collaborative research with NOAA, Western Water Assessment and Bureau of Reclamation to understand the impact of climate and hydrological changes in the Colorado River Basin
- Analysis of regional climate model projections for the southwestern US
- High elevation climate change

### **Environmental Sciences, Rutgers University (1999-2009)**

- Analysis of observed and modeled climate data to elucidate the mechanisms of observed and projected climate change over different regions of the world including Mainland China, Tibetan Plateau, and the southern Colorado Rocky Mountains.  
*Postdoctoral Research: Oct 2008 – Aug 2009*  
*Doctoral Research: Jan 2004 – Oct 2008 (Advisor – James R. Miller)*
- Effect on calcifying ability of marine coccolithophore, *Emiliana huxleyi*, due to acidification of the ocean caused by increasing concentrations of atmospheric carbon dioxide  
*Pre- Doctoral Research: Jan – Aug 2003 (Advisor – Paul Falkowski)*
- Investigation of deprivation of silver on the fecundity and lifespan of freshwater crustacean, *Daphnia magna*  
*M.S. Thesis Project: Sep 2001 – Dec 2002 (Advisor – Kathleen. I. Keating)*
- Sampling and analysis of Polycyclic Aromatic Hydrocarbons (PAHs) in the New Jersey air  
*Masters Rotation Project: Jan 2000 – Aug 2001 (Advisor – Steve Eisenriech)*

### **Publications**

Cohen, S., J. Meldrum, J. Macknick, K. Averyt, **I. Rangwala** (Submitted in 2017), Climate-Water-Electricity Evaluating how climate change affects water availability and the future of the U.S. electricity sector. *Environmental Science & Technology*.

Dewes C., **I. Rangwala**, M. Hobbins, J. Barsugli and S. Kumar (2017). Drought risk assessment under climate change is sensitive to methodological choices for the estimation of evaporative demand. *PLoS ONE*, 12(3): e0174045. doi:10.1371/journal.pone.0174045

**Rangwala, I.**, C. Dewes, and J. Barsugli (2016). High Resolution Climate Modeling for Regional Adaptation. *Eos*, Vol. 97, doi: 10.1029/2016EO048615, March 25.

**Rangwala I.**, E. Sinsky and J. Miller (2016). Potential Drivers for Projected Elevation Dependent Warming in Boreal Midlatitude Winter in CMIP5 Climate Models. *Climate Dynamics*, 46(7-8), 2115-2122, doi: 10.1007/s00382-015-2692-0.

Pepin, N., R. Bradley, H. Diaz, M. Baraer, E. Caceres, N. Forsythe, H. Fowler, G. Greenwood, M. Hashmi, X. Liu, J. Miller, L. Ning, A. Ohmura, E. Palazzi, **I. Rangwala**, W. Schoener, I. Severskiy, M. Shahgedanova, M. Wang, S. Williamson, and D. Yang (2015). Elevation- dependent warming in mountain regions of the world. *Nature Climate Change*, 5, 424-430, doi: 10.1038/NCLIMATE2563.

Naud C., **I. Rangwala**, M. Xu and J.A. Miller (2014). A satellite view of the radiative impact of clouds on surface downward fluxes in the Tibetan Plateau. *Journal of Applied Meteorology and Climatology*, doi: 10.1175/JAMC-D-1114-0183.1171.

- Chen, Y., C. Naud, **I. Rangwala**, C. Landry and J. Miller (2014). Comparison of the sensitivity of surface downward longwave radiation to changes in water vapor at two high elevation sites. *Environmental Research Letters*. 9(11): 114015.
- Naud C., Y. Chen, **I. Rangwala** and J. Miller (2013). Sensitivity of downward longwave surface radiation to moisture and cloud changes in a high elevation region. *Journal of Geophysical Research*. 118, 10,072–10,081, doi: 10.1002/jgrd.50644.
- Rangwala I.**, E. Sinsky and J. Miller, (2013). Amplified warming projections for high altitude regions of the Northern hemisphere mid-latitudes from CMIP5 models. *Environmental Research Letters*. 8 (2013) 024040.
- Rangwala I.**, (2012). Amplified Water Vapor Feedback at High Altitudes during Winter. *International Journal of Climatology*. doi: 10.1002/joc.3477.
- Rangwala I.** and J. Miller, (2012). Climate Change in Mountains: A Review of Elevation Dependent Warming and its Possible Causes. *Climatic Change*. doi: 10.1007/s10584-012-0419-3.
- Rangwala I.**, J. Barsugli, K. Cozzetto, J. Neff and J. Prairie, (2012). Mid-21st Century Projections in Temperature Extremes in the Southern Colorado Rocky Mountains from Regional Climate Models. *Climate Dynamics*. doi: 10.1007/s00382-011-1282-z.
- Rangwala I.** and J. Miller, (2010). 20<sup>th</sup> Century Temperature Trends Colorado's San Juan Mountains. *Arctic, Antarctic and Alpine Research*, 42(1): 89-97.
- Rangwala I.**, J. Miller, G. L. Russell and M. Xu, (2010). Using A Global Climate Model To Evaluate The Influences Of Water Vapor, Snow Cover And Atmospheric Aerosol On Warming In The Tibetan Plateau During The 21st Century. *Climate Dynamics*, 34: 859-872, doi: 10.1007/s00382-009-0564-1.
- Rangwala I.**, J. Miller and M. Xu, (2009). Warming In The Tibetan Plateau: Possible Influences Of The Changes In Surface Water Vapor. *Geophysical Research Letters*. 36, doi: 10.1029/2009GL037245.
- Rangwala I.** and K.I. Keating, (2007). Silver Deprivation Limits Fecundity And Survivability In The Freshwater Crustacean *Daphnia Magna*. *Biological Trace Element Research*. doi: 10.1007/s12011-007-0016-x
- Rangwala I.**, J. Miller, G. L. Russell and M. Xu, (2006). Analysis Of Global Climate Model Experiments To Elucidate Past And Future Changes In Surface Insolation And Warming In China. *Geophysical Research Letters*, 33 (20), CiteID L20709. doi: 10.1029/2006GL027778.

## Other Publications (Reports and Book Chapters)

- Rondeau, R., B. Neely, M. Bidwell, **I. Rangwala**, L. Yung, K. Clifford, and T. Schultz (2017), Spruce-Fir Landscape: Upper Gunnison River Basin, Colorado. Social-Ecological Climate Resilience Project. Report prepared for the North Central Climate Science Center, Ft. Collins, Colorado, pp. 55.
- Rondeau, R., B. Neely, M. Bidwell, **I. Rangwala**, L. Yung, K. Clifford, and T. Schultz (2017), Sagebrush Landscape: Upper Gunnison River Basin, Colorado: Social-Ecological Climate Resilience Project. Report prepared for the North Central Climate Science Center, Ft. Collins, Colorado, pp. 56.
- Rangwala, I.**, Bardsley, T., Pescinski, M., and J. Miller (2015). SNOTEL sensor upgrade has caused temperature record inhomogeneities for the Intermountain West: Implications for climate change impact assessments. Western Water Assessment Climate Research Briefing. [http://wwa.colorado.edu/publications/reports/snotel\\_report.pdf](http://wwa.colorado.edu/publications/reports/snotel_report.pdf)
- Rangwala, I.**, M. Hobbins, J. Barsugli, and C. Dewes (2015). EDDI: A Powerful Tool For Early Drought Warning. WWA 2-pager document. [http://wwa.colorado.edu/publications/reports/EDDI\\_2-pager.pdf](http://wwa.colorado.edu/publications/reports/EDDI_2-pager.pdf)
- Rangwala I.**, N. Pepin, M. Vuille and J. Miller, (2015). Influence of Climate Variability and Large-Scale Circulation on Mountain Cryosphere. In *“The High-Mountain Cryosphere: Environmental Changes and Human Risks”*, edited by C. Huggel, J Clague, A. Käab and M. Carey. Chapter 2. Cambridge University Press.
- Lukas J., J. Barsugli, N. Doesken, **I. Rangwala** and K. Wolter (2014). Climate Change in Colorado: A Synthesis to Support Water Resources Management and Adaptation. *A Report for the Colorado Water Conservation Board.*
- Pepin N., **Rangwala I.** and Tandong Y. (2014). Proposal to Quantify Elevation Dependent Surface Warming [EDW] at the Mountain Surface. White paper for the Mountain Research Initiative’s (Switzerland) *“Global Campaign to Assess Elevation Dependent Warming.”*
- Cayan, D., M. Tyree, K. E. Kunkel, C. Castro, A. Gershunov, J. Barsugli, A. J. Ray, J. Overpeck, M. Anderson, J. Russell, B. Rajagopalan, **I. Rangwala**, and P. Duffy, (2013). “Future Climate: Projected Average.” In Assessment of Climate Change in the Southwest United States: A Report Prepared for the National Climate Assessment, edited by G. Garfin, A. Jardine, R. Merideth, M. Black, and S. LeRoy, 101–125. A report by the Southwest Climate Alliance. Washington, DC: Island Press.
- Miller, J., **I. Rangwala** and D. Ghatak, (2012). Potential Climate and Hydrological Changes in the Aral Sea Region. In *Disaster by Design*, Edited by Michael R. Edelstein, Astrid Cerny and Abror Gadaev, ISBN: 978-1-78190-375-9, Chapter 5. Emerald Group Publishing Limited.

Cozzetto, K., **I. Rangwala** and J. Lukas, (2011). Examining Regional Climate Model (RCM) projections: What do they add to our picture of future climate in the region? *Featured article in the July issue of "Intermountain West Climate Summary" by NOAA's Western Water Assessment.*

Cozzetto, K., **I. Rangwala** and J. Neff, (2011). Downscaled Air Temperature And Precipitation Projections For The San Juan Mountain Region. *Narrative on regional climate model projections submitted to the San Juan Public Land Center, Durango, Colorado.*

Nydick, K., Crawford, J., Bidwell, M., Livensperger, C., **Rangwala, I.**, and Cozzetto, K. 2012. Climate Change Assessment for the San Juan Mountain Regions, Southwestern Colorado, USA: A Review of Scientific Research.

**Rangwala I.** and J. Miller, (2010). Long-Term Temperature Trends In The San Juan Mountains. In *EASTERN SAN JUAN MOUNTAINS: Their Geology, Ecology and Human History*, edited by Rob Blair and George Bracksieck, University Press of Colorado. [Book Chapter]

## Presentations

- **Rangwala, I.** (Mar 29, 2017). Elevation dependent warming and communicating future climate change scenarios. Plenary talk presented at the session titled "Robust Decision Making in a World of Uncertainty" at the Utah State University's Spring Runoff Conference. <http://water.usu.edu/conference/2017/index>
- **Rangwala, I.** and G. Senay (Mar 21, 2017). Monitoring the exchange of moisture between the land and atmosphere to improve our understanding of drought. NCCWSC Ecological Drought webinar series presentation. <https://nccwsc.usgs.gov/webinar/DroughtSenayRangwala>
- **Rangwala, I.** and R. Rondeau (Feb 8, 2017). Developing Scenarios for the Landscape-Scale. Presentation made to the Social-Ecological Resilience and Changing Landscapes Webinar Series. <https://www.fs.fed.us/rmrs/social-ecological-resilience-and-changing-landscapes-webinar-series>
- **Rangwala, I.** (Jan 25, 2017). NCCSC's Climate Foundational Science Area. Webinar presented to the review committee of the NCCSC 5-year review.
- **Rangwala, I.** (Jan 27, 2017). Development and Use of Climate Scenarios for Natural Resource Management in Southwestern Colorado. Lecture to graduate course @ Masters in Environmental Management at Western State Colorado University, Gunnison
- Clifford, K.R., W. Travis, **I. Rangwala**, R. Rondeau and L. Yung (2016). Using Interviews And Focus Groups With Resource Managers To Explore Risk Perceptions And Responses To Climate Scenarios. AGU Fall 2016 Meeting.
- Dewes C., **I. Rangwala**, M. Hobbins, and J. Barsugli (Dec 13, 2016). Assessing drought risk under climate change in the US Great Plains via evaporative demand from downscaled GCM projections. AGU Fall 2016 Meeting.
- **Rangwala, I.**, C. Dewes and T.W. Fish. (Oct 18, 2016). Trends in snow, rain and streamflow in Wyoming's Wind River Mountain Range. MTNCLIM 2016 Conference, Leavenworth, WA.

- Dewes C., **I. Rangwala**, M. Hobbins, J. Barsugli and S. Kumar (Oct 18, 2016). Uncertainties in drought risk assessment under climate change because of differences in methodological choices for the estimation of evaporative demand. MTNCLIM 2016 Conference, Leavenworth, WA.
- **Rangwala I.** (Aug 28, 2016). Changing Water Regimes in the US West during the 21<sup>st</sup> century: *Useful Insights from Our Current State of Scientific Understanding*. NSF Western Water Workshop, Lake Tahoe, NV. (Invited)
- Fish, T.W. and **I. Rangwala** (Jul 28, 2016). Trends in snow, rain and streamflow in Wyoming's Wind River Mountain Range. RECCS Summer Intern Poster Session at UCAR Center Green, Boulder, CO.
- **Rangwala, I.**, C. Dewes, T.W. Fish, J. Barsugli and M. Hobbins (Jul 26, 2016). Climate Change and Hydrological Impacts in the Wind River Indian Reservation region. Wind River Drought Preparedness Project's Workshop, Fort Washakie, WRIR, WY.
- Dewes C., **I. Rangwala**, M. Hobbins, J. Barsugli and S. Kumar (May 13, 2016). Drought risk under climate change: Uncertainties in drought risk assessment under climate change because of differences in methodological choices for the estimation of potential evapotranspiration. CIRES Rendezvous, CU-Boulder.
- **Rangwala I.** (Apr 27, 2016). Climate Change and its Influence on Land Surface Processes in the US Great Plains. Soil Carbon in Semi-Arid Grasslands Workshop at Colorado's Nature Conservancy in Boulder, CO. (Invited)
- **Rangwala I.** (Jan 29, 2016). Atmospheric foundations of Climate Science. Presentation to "Science of Climate Mitigation and Adaptation" Course at WSCU, Gunnison.
- Dewes C., **I. Rangwala**, M. Hobbins and J. Barsugli (Dec 16, 2015). Evaluating Evaporative Demand in CMIP5 Models and its Role in Characterizing Drought over the U.S. Northern Great Plains. AGU Fall 2015 Meeting.
- Arvidson, L and **I. Rangwala**, (Dec 17, 2015). Trends in Observed Summer Daily Temperature Maximum Across Colorado. AGU 2015 Fall Meeting, San Francisco, CA
- **Rangwala I.** and coauthors (Dec 15, 2015). The Understanding of Elevation Dependent Warming from Climate Models. AGU Fall 2015 Meeting (Invited Talk).
- **Rangwala I.** and coauthors (Dec 18, 2015). Development and Application of Future Climate Scenarios for Natural Resource Management in Southwestern Colorado. AGU 2015 Fall Meeting.
- **Rangwala I.** and G. Senay (Dec 7, 2015). Emerging Drought Risk Under Climate Change: Consideration of new tools and approaches. USGS sponsored workshop on Ecological Drought: Impacts. Resistance and Recovery.
- **Rangwala I.** (Nov 16, 2015). Climate Science for Ecological Impacts Assessment and Adaptation Planning. Webinar presented to the participants of the Climate Adaptation Workshop at Fort Collins, CO (Dec 9-10).
- **Rangwala, I.**, J. Barsugli and C. Dewes (Oct 27, 2015). Briefing on the workshop on "High Resolution Climate Modeling in the Northern Great Plains". Webinar presented at the NCCSC monthly call.
- **Rangwala, I.**, J. Lukas, J. Barsugli, C. Dewes and A. Ray (Jul 28, 2015). 2015-16 El Niño: Potential Impacts for the North Central US. NCCSC Webinar.  
<http://nccsc.colostate.edu/news/nc-csc-el-nino-webinar-draws-crowd>  
<http://www.wylnet.com/water/188-weather/5659-el-nino-impacts-predicted-to-influence-warm-dry-winter-in-west>

- Rondeau, R., D. Anderson and **I. Rangwala** (May 20, 2015). Climate Change and Mesa Verde Rare Plants. NCCSC Open Science Conference, Ft. Collins.
- **Rangwala, I.**, R. Rondeau, C. Wyborn and K. Clifford (May 20, 2015). Development and Use of Climate Scenarios for Natural Resource Management in Southwestern Colorado. NCCSC Open Science Conference, Ft. Collins.
- **Rangwala, I.** and Joe Barsugli (May 20, 2015). NCCSC Foundational Science Area – Climate (*Plenary Talk*). NCCSC Open Science Conference, Ft. Collins.
- **Rangwala, I.**, R. Rondeau, C. Wyborn and K. Clifford (May 1, 2015). Development and Use of Climate Scenarios for Natural Resource Management in Southwestern Colorado. CIRES Rendezvous, CU-Boulder.
- **Rangwala, I.** (Mar 24, 2015). Climate Scenarios for Southwest Colorado. Webinar in preparation of the Social Ecological Response Model (SERM) workshops in Gunnison and San Juans.
- **Rangwala, I.** (Mar 3, 2015). Climate Scenarios for Southwest Colorado. Ecological response model development workshop for Sagebrush and Spruce Fir landscapes. Gunnison.
- **Rangwala, I.**, R. Rondeau and C. Wyborn (2014). “Actionable” Climate Scenarios for Natural Resource Managers in Southwestern Colorado. AGU Fall meeting.
- Miller J., C. Naud, Y. Chen, D. Ghatak, **I. Rangwala**, E. Sinsky and M. Xu (2014). The Impact of Changes in Water Vapor, Clouds, and Snow Cover on Elevation Dependent Warming. AGU Fall meeting.
- **Rangwala, I.** (Dec 4, 2014). Developing Usable Climate Information For Decision Making. APA meeting. Physical Sciences Division, NOAA ESRL, Boulder.
- **Rangwala, I.** (Nov 20, 2014). Climate Scenarios for Upper Gunnison Basin. *In* workshops to develop ecosystem response models for “sagebrush landscapes” and “spruce-fir ecosystem” in the Upper Gunnison Basin. Western State Colorado University, Gunnison.
- **Rangwala, I.** (2014). Elevationally-Sensitive Warming Response: What insights do climate models provide? *MtnClim 2014*, Homestead, Utah
- Johnstone, J. and **I. Rangwala** (Jul 31, 2014). Analysis of Streamflow in Upper Gunnison Basin: Is there a climate change signal? Research Experience for Community College Students (RECCS) Poster Session at UCAR.
- **Rangwala, I.** (Oct 3, 2014). Climate Change in Colorado: Evidence, Projections & Uncertainties. Seminar for Master in Environmental Management Program, Western State Colorado University, Gunnison, CO.
- **Rangwala, I.** and E. Gordon (Jul 28, 2014). Past and Future Climate on the Colorado Front Range. NREL, Golden, CO.
- **Rangwala, I.** (May 7, 2014). Climate Change in Southwest Colorado. Presentation made to the *Gunnison Climate Working Group* at the Upper Gunnison River Water Conservancy District Office.
- **Rangwala, I.**, E. Sinsky and J. Miller (May 2, 2014). Amplified Warming Projections For High Elevation Regions From CMIP5 Models. *CIRES Rendezvous – 2014*, University of Colorado, Boulder.
- **Rangwala, I.** (Apr 30, 2014). Developing Actionable Climate Scenarios For Decision Making at Regional Scales. Presentation made to UCAR’s *Regional Climate Group*.
- Miller J., C. Naud, Y. Chen, D. Ghatak, **I. Rangwala**, and E. Sinsky (Apr 29, 2014). Amplified Warming Rates in High Elevation Regions. *EGU Meeting 2014* (EGU2014-14674).

- **Rangwala, I.** (Apr 16, 2014). Reconciling Global Climate Projections at Regional Scales in the Southwest US Hydrologic Sciences and Water Resources Engineering Seminar.
- **Rangwala, I.** (Apr 14, 2014). Climate Change in Colorado: Evidence, Projections & Uncertainties. *Brown Bag Seminar at the Nature Conservancy, Boulder, CO.*
- Clifford, K. R., **I. Rangwala**, W. Travis (2013). Co-Producing Future Climate Scenarios for Adaptation and Management in the Gunnison Basin: An Integrative Framework for Developing Usable Climate Information. *AGU Fall Meeting, 2013.*
- Chen, Y., C. M. Naud, **I. Rangwala**, and J. Miller (2013). Sensitivity of downward longwave surface radiation to humidity and clouds at a high elevation site. *AGU Fall Meeting, 2013.*
- **Rangwala, I.**, E. Sinsky and J. Miller (2013). Amplified Warming Projections For High Elevation Regions From CMIP5 Models. *AGU Fall Meeting, 2013.*
- **Rangwala, I.** (Nov 6, 2013). CMIP5 vs. CMIP3 - Do the new Global Climate Model results give a different picture of future Colorado River streamflows? *Upper Colorado River Basin Water Conference.* Grand Junction, Colorado.
- **Rangwala, I.** (2013). CMIP5 Updated Climate Models: Implications for Western Water Management. *Webinar presented for Carpe Diem West.* Oct 15, 2013
- **Rangwala, I.** (Jul 24, 2013). CMIP3 vs CMIP5 Projections: With relevance to the western US. *Front Range Climate Change Working Group (FRCCG) meeting.* Univ. of Colorado, Boulder.
- **Rangwala, I.**, J. Miller, C. Naud and Y. Chen (2012). Quantifying Climate Feedbacks in High Elevation Regions. *AGU Fall Meeting, 2012.*
- Sinsky, E., **I. Rangwala** and J. Miller (Nov 9, 2012). Examining elevation sensitive warming in global climate models. Symposium by Climate Change Initiative at Rutgers.
- **Rangwala, I.**, J. Miller and J. Barsugli (2012). Amplified Water Vapor Feedback at High Elevation during Winter. *MtnClim 2012, Estes Park, Colorado (Oct 1-4).*
- **Rangwala, I.** (2012). Climate Change in Colorado Rocky Mountains from Regional Climate Models. *Rutgers' Environmental Sciences Graduate Student Seminar Series – Spring 2012.*
- **Rangwala, I.**, J. Barsugli and J. Miller (2011). Amplified Water Vapor Feedback at High Altitudes during Winter. *AGU Fall Meeting, 2011.*
- J. J. Barsugli, Mearns, L. O., Prairie, J. R., **I. Rangwala**, Brekke, L. D., Briggs, J. (2010). Does Dynamical Downscaling Matter for Climate Change Adaptation on the Colorado River? *AGU Fall Meeting, 2010.*
- **Rangwala, I.** and J. Barsugli (2010). Investigating Future Warming in the Colorado Rocky Mountains from High Resolution “NARCCAP” Models. *AGU Fall Meeting, 2010.*
- **Rangwala, I.** (2010). Observed and Expected Warming in the San Juans. “*Managing For Resiliency In The San Juan Mountains–Adaptation and Planning for Climate Change*”, October 7-9, 2010 in Silverton, Colorado.
- **Rangwala, I.** (2010). Examining Climate Change in the Colorado Rocky Mountains from High Resolution Climate Models. “*Global Change and the World’s Mountains*” at Perth, Scotland, September 2010.
- **Rangwala, I.** and J. Barsugli, (2010). Examining climate change between the late 20th and mid 21st century in Colorado’s San Juan Mountains from high resolution climate models. *MtnClim 2010, Blue River, Oregon (Jun 7-10).*



- **Rangwala I.** (May 12, 2010). Recent and Expected Temperature Changes in the San Juan Mountains. *SJPLC Meeting: Adapting to Climate Change on the San Juan National Forest*. Durango.
- **Rangwala I.** and J. Miller, (2009). 20<sup>th</sup> Century Temperature Trends Colorado's San Juan Mountains. *AGU Fall Meeting*, San Francisco, CA, 2009.
- **Rangwala I.** and J. Miller, (2009). 20<sup>th</sup> Century Temperature Trends Colorado's San Juan Mountains. *Rocky Mountain Hydrologic Research Center Meeting, October 2009*.
- **Rangwala, I.** The climatic changes in the San Juan Mountain region during the 20<sup>th</sup> century. *MtnClim 2008, Silverton (Jun 9-12)*. <http://www.fs.fed.us/psw/mtnclim>
- **Rangwala, I.**, Miller, J. R., Russell, G. L. and Xu, M. Influence of Increasing Surface Humidity on Winter Warming at High Altitudes through the 21st Century. *AGU Fall Meeting*, San Francisco, CA, 2008.

## **Funded Grants**

- Colorado State University (2014) for “Evaporation, Drought, and the Water Cycle Across Timescales: Climate Foundational Sciences for the North Central Climate Science Center”
- NOAA Sectoral Applications Research Program (2014) for “Balancing Severe Decision Conflicts under Climate Extremes in Water Resource Management”  
[http://sciencepolicy.colorado.edu/research\\_areas/bsdc/index.html](http://sciencepolicy.colorado.edu/research_areas/bsdc/index.html)
- North Central Climate Science Center (2013) for “Natural Resource Management Decision-Making under Climate Uncertainty: Building Social-Ecological Resilience in Southwestern Colorado”
- NSF – AGS (2011) for “Quantifying Feedbacks Affecting High Altitude Climate Change”
- Mountain Studies Institute (2007) for “Assessment of changes in the hydrological cycle in the San Juan Mountains due to the past and projected future climate changes in the region”

## **Climate Service**

- Providing historical EDDI data for impacts research to Multiple land managers and ecologists incl. Renee Rondeau (CNHP), Chris Pague (TNC), Zachary Wurtzebac (CSU, USFS), Shelley Crausbay (NCCSC).
- Advised and reviewed the report on temperature and precipitation extremes for Boulder and Larimer counties by Rocky Mountain Climate Organization (Nov 2015, Sep 2016).  
<http://rockymountainclimate.org/images/extremes/BoulderExtremesFinal.pdf>
- Karin Decker & Renee Rondeau. Colorado Natural Heritage Program, Ft. Collins, CO. Guidance on future climate scenarios and providing EDDI datasets for research (2016-)
- Zachary Wurtzebac, CSU and US Forest Service. Guidance related to potential strategies for broad-scale climate and water monitoring, and information delivery to individual Forests and Regions. (Aug 2016 – present)
- Outreach re. Climate Adaptation Planning with the Public Water Works personnel (Ashlee Grace and others) at the City of Denver (July 2016)
- Media outreach with Climate Wire (Erika Bolstad) about climate change in northern Great Plains (July 2016). <http://www.eenews.net/stories/1060042691>

- Media outreach with Mountain Magazine (Evelyn Spence) on farming in mountain regions under climate change (May 2016).
- Alexander Bryan, UMass and North East CSC. Reviewed and provided guidance for a Scenario Planning summary report for Acadia National Park. (Feb-Apr, 2016)
- Glenn Patterson, Colorado State University. Guidance with diagnosing physical process in analysis of observed data from Rocky Mountain National Park (Jan 2016).
- Outreach with media on the 2015 *Nature Climate Change* (CIRES, DOI, Boulder's Daily Camera, KGNU radio)
- Outreach with Southern Rockies Landscape Conservation Cooperatives (SRLCC) on developing climate scenarios for their Regions 2 and 4 (2015).
- Outreach with GLISA scientists on climate scenarios (July 6, 2015)
- Panelist, Landscape Conservation Cooperatives (LCC): Landscape by Design, NCCSC Open Science Conference (May 21, 2015)
- Technical reviewer for Bureau of Reclamation's West-wide Climate Risk Assessment's (WWCRA) Climate Projection Selection technical document (October, 2015). <http://www.usbr.gov/watersmart/wcra/docs/WWCRAClimateProjectionSelection.pdf>
- High school climate change curriculum development with the Mountain Studies Institute, Durango & Silverton, Colorado. (2012-present)
- Science and Filmmaking Outreach with Earth Explorers. Westview Middle School, Longmont (Spring 2014) (contact: Carolyn Wiley)
- Climate outreach with Carpe Diem West (2013-2014) (contact: Kimery Wiltshire) <http://www.carpediemwest.org/reports/confluence-march-2014>
- Reviewer and advisor to Aspen Global Change Institute, Aspen, Colorado (2013-2014) (contact: James Arnott)
- Member and frequent contributor to “A Global Campaign on Accelerated Climate Warming at High Elevations” led by the Mountain Research Initiative, Switzerland. (2012-present) (contact: Greg Greenwood)
- AGU 2013 press outreach effort with CIRES, CU-Boulder (contact: Katy Human)
- Contributor and reviewer to the four page WWA/CIRES preliminary assessment report on “Severe Flooding On the Colorado Front Range, September 2013” (Sept. 25, 2013)
- Panelist, 3rd annual RMBL Geek Week Panel Discussion, titled “What Will the Gunnison Country Look Like in 25 Years?” Organized by Rocky Mountain Biological Lab. August 1, 2013 in Crested Butte.
- Speaker and Panelist, 4H Climate and Environmental Change Teen Summit, December 12, 2012 at Rutgers University.
- Contributor to the 2012 Southwest Climate Assessment Technical Report, Chapter 6.
- Speaker and Panelist, 4H Climate and Environmental Change Teen Summit, March 15, 2012 at Rutgers University.
- Technical reviewer, *Climate Projections FAQ*, Gen. Tech. Rep. RMRS-GTR-277WWW, prepared by Rocky Mountain Research Station, Forest Service, USDA.
- Regional climate expert at the Gunnison Vulnerability Assessment Review Workshop, May 12-13, 2011 at Western State College, Gunnison.
- Speaker and facilitator, “Dealing with Drought-Adapting to a Changing Climate” workshop Oct. 2009 organized by NOAA-WWA. [http://wwa.colorado.edu/climate\\_change/drought09.html](http://wwa.colorado.edu/climate_change/drought09.html)

- Conducted four workshops on climate change titled “Rapid Changes Demand Rapid Solutions: Greedy Actors vs. Conscious Citizens” at Franklin Ave Middle School, Franklin Lakes NJ. April 9, 2009.
- Panelist, Panel Discussion on Global Warming organized by the Rutgers Undergraduate Environmental and Ecological Club (EEC). November 15, 2007.

## **Organizational Experience and Leadership**

- Co-chair, AGU 2014 session (GC21G) on “Climate Change in Mountains: Elevational Dependency and Diverse Impacts”
- Co-chair, AGU 2013 special session (A11A) on “Accelerated Warming at High Elevations: Evidence, Processes, and Future Projections”
- Member, Climate Change Technical Advisory Group, Colorado Water Conservation Board (2013-present)
- Member, Center for Conservation Science & Strategy, The Nature Conservancy at Colorado – Boulder (2013-present)
- Member, Gunnison Climate Working Group (2013-present)
- Member, Eco-Dharma Sangha, Boulder, CO (2013-present)
- Co-organizer, 2010 Climate Conference: Managing for Resiliency in the San Juan Mountains–Adaptation and Planning for Climate Change, Silverton, CO, October 7-9, 2010. [http://wwa.colorado.edu/climate\\_change/Silverton\\_Oct\\_2010.html](http://wwa.colorado.edu/climate_change/Silverton_Oct_2010.html)
- Member, Colorado River Hydrology Work Group, Bureau of Reclamation (2009-2011)
- Coordinator, *Science Inquiry Course*, Summer 2009, offered by the Office of Special Programs at the School of Environmental and Biological Studies, Rutgers.
- President (2004-07), Vice President (2002-04) and Seminar Coordinator (2001-02), Environmental Science Graduate Student Association (ESGSA), Rutgers.
- Extensive interdisciplinary participation in environmental sciences, ecology, human ecology, geography, oceanography, geology and environmental microbiology.

## **Other Recognition**

- Review paper on “elevation dependent warming in mountains” cited in a news article (*Glaciologists to target the third pole*) in *Nature* on April 2, 2012 (Vol. 484, Issue 7392)
- Research on the San Juan Mountains reported in media - *The Durango Herald* (April 10, 2008), *High Country News* (Jul 19, 2010) and *Silverton Standard* (Vol. 136, Issue 16, Oct 14, 2010)
- Postdoctoral Fellowship, UCAR Postdocs Applying Climate Expertise (PACE) program 2009-2011
- Recipient of the mini-grant (\$2,500) from the Mountain Studies Institute, Silverton, Colorado (2007).
- Climate change research on China featured in the AGU Journal Highlights - 6 November 2006
- Certificate in “Human Dimensions of Environmental Change”, Rutgers University (2005).

- Recipient of the PVSC (Passaic Valley Sewerage Commissioners) Award (\$1,500) from the N.J. Water Environment Association Scholarship Committee (2002)
- Selected as an Intern at the Chemical Engineering Division at Bhabha Atomic Research Centre, India, for undergraduate research and training (1998).

## **Teaching**

### **Research Associate - Rutgers University**

- **Byrne Seminar: Climate Change & Water Resources** (*Spring 2013*)

### **Lecturer - Rutgers University**

- **Earth Systems** (*Spring 2009*)  
Geography-101 course co-taught with Roger Balm.
- **Science Inquiry Course** (*Summer 2009*)  
Syllabus designing and supervision of the course.

### **Teaching Assistant - Rutgers University**

*Lab Instructor to Courses in Biology and Environmental Sciences*

- **Concepts in Biology** (*Spring 2002- Spring 2008*)
- **Principles in Biology** (*Fall 2001*)
- **Introduction to Environmental Sciences** (*Spring 2000*)
- **General Biology** (*Fall 2000*)

## **Mentoring**

- Candida Dewes, Postdoctoral Research Scientist, CIRES, U. Colorado, Boulder, 2015-present
- Thomas Ward Fish, RECCS undergraduate summer intern, CIRES, U. Colorado, Boulder, 2015
- Lisa Arvidson, RECCS undergraduate summer intern, CIRES, U. Colorado, Boulder, 2015
- Jessica Johnstone, RECCS undergraduate summer intern, CIRES, U. Colorado, Boulder, 2014
- Katie Clifford, MS Geography, U. Colorado, Boulder, 2013
- Eric Sinsky, undergraduate Rutgers University, 2012-2013
- Marcus Pescinski, undergraduate, Rutgers, 2013
- Justin Briggs, intern with Western Water Assessment, U. Colorado, Boulder, 2010-11
- Neil Ramchandani, undergraduate at Rutgers, 2008

## **Areas of expertise**

Climate diagnostics  
Global/regional climate models  
Large Dataset: Analysis and Visualization  
Earth system science

Extensive outreach experience with land/water managers  
Ecosystem & hydrological modeling  
Environmental field sampling  
Social-ecological systems

## **Scientific Reviewing**

### Journals & Technical Documents

- *Climatic Change (2)*
- *Climate Dynamics (2)*
- *Global and Planetary Change*
- *Theoretical and Applied Climatology*
- *Water Resources Research*
- *International Journal of Climatology (2)*
- *Arctic, Antarctic and Alpine Research*
- *Journal of Climate*
- *Climate Risk and Management*
- *Oxford University Publications*
- *USBR Technical Document*

### Proposal

- *Graduate Women in Science – National Fellowship Program (2014)*