

A Subcontract Proposal to the
Colorado Water Conservation Board
for Continued Support of
Seasonal climate forecasts for Colorado

Name and Address of Institution:

The Regents of the
University of Colorado
572 UCB
Boulder, CO 80309-0572
Telephone: (303) 492-6221
FAX: (303) 492-6421

Institutional Identifiers:

DUNS: 00-743-1505
Cage Code: 4B475
TIN: 84-6000555

Desired Starting Date:

August 1, 2013

Proposed Duration:

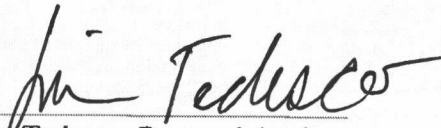
11 months

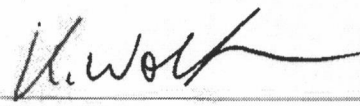
Amount Requested:

\$19,654

Principal Investigator:

Klaus Wolter
Research Associate
Cooperative Institute for Research
in Environmental Sciences
University of Colorado
216 UCB
Boulder, CO 80309-0216
Telephone: 303 497-6340
Fax: 303 492-1149
Klaus.Wolter@noaa.gov


Lisa Tedesco, Proposal Analyst
Office of Contracts and Grants
lisa.tedesco@colorado.edu


Klaus Wolter
Principal Investigator

Seasonal climate forecasts for Colorado

Project Duration: August 2013 – June 2014

PI: Klaus Wolter, CIRES at University of Colorado, Boulder, CO

Scope of Work

In response to the need of CWCB to provide for a long-lead outlook of weather/ climate conditions at its Water Availability Task Force (WATF) meetings, the following describes the work proposed that builds on a decade of forecast experience, but also launches a new effort in predicting basin-wide snowpack, and will be cost-shared with NIDIS:

- (1) *Create enhanced data base* for predictors (regional sea ice data...) and predictands (homogenized snow water equivalent data for all eight major Colorado basins);

Labor: 0.25 months (*Total Cost: \$3,552*)

- (2) *Develop new statistical forecast models* for 1 January and 1 June SWE (1 April SWE will be covered by NIDIS project) with initial conditions through September and February, respectively;

Labor: 0.5 months (*\$7,104*)

- (3) *Compute actual seasonal precipitation forecasts for Southwestern U.S., and snowpack for Colorado.* This task consists of:

(3a) The timely update of input (predictor) information from a variety of sources, including in-house computations, their transfer into a statistical package that is used to manage this data, and the calculation of actual forecast values in spreadsheets that use the existing statistical regression schemes for up to ten output (predictand) regions and six separate base periods in a given forecast season; the post-processing of all forecast values into either forecast tilts (precipitation) or percentiles (SWE), and the creation of forecast display maps.

Labor: 0.4 months for forecasts made in October and March (*\$5,684*)

- (4) *Prepare and present talks at two WATF meetings* (plus one talk at CWCB board meeting in March). This task consists of:

(4a) The preparation of all relevant information on the current and expected El Niño/Southern Oscillation (ENSO) situation, appropriate Climate Prediction Center (CPC) and own seasonal and shorter-range forecasts, verification of recent seasonal precipitation anomalies against seasonal forecast(s) and typical ENSO impacts into powerpoint presentations;

Labor: 0.15 months for presentations in October 2013 and twice in March 2014 (*\$2,131*)

(4b) Presentation of powerpoint (Task 4a) and participation in two WATF and one CWCB board meetings, including the creation and handout of 'Executive Summary' one-pagers, and availability for follow-up questions.

Labor: 0.05 months for presentations in October 2013 and twice in March 2014 (\$710 + \$120 for travel and materials)

(5) Prepare and present talk to Flood Task Force meeting in March. This task consists of:

Ingest of pertinent information on dust loads and preparation of medium-to long-range forecast information to weight medium- to long-range risk of flooding in association with snowmelt, and presentation at joint WATF and FTF meeting in March

Labor: 0.025 months (\$355)

Total Labor: 1.375 months (19,657), includes \$120 for travel to/from Denver, parking, and materials (this is also including the 20% overhead for CWCB contracts).

PROPOSED BUDGET DETAILS

Institution: The Regents of the
University of Colorado
572 UCB
Boulder, CO 80309-0572

Title: Seasonal climate
forecasts for Colorado

Principal Investigator: Klaus Wolter

Duration: 8/1/13-6/30/13

A. Salaries and Wages**Year 1**

Principal Investigator: K Wolter

100% time, 1.375 months

10,112

IT Support: TBN

30% time, 1 month

2,326

Total Salaries and Wages

12,438

B. Fringe Benefits

PI/Other: 30.9% of salary

3,843

Total S/W and Fringe Benefits

16,281

C. Travel

Domestic

PI local travel

Mileage to Denver at \$0.51/mile, parking
for conferences

87

Total Travel

87

D. Other Direct Costs

1. Materials and Supplies:

0

2. Publications:

0

3 Other Direct Costs:

Duplication and printing:

10

Total Other Costs

10

Total Other Direct Costs

10

E. Total Direct Costs

16,378

F. Indirect Costs

Off Campus Research:

20% of TDC per

3,276

G. Total Costs

19,654

ABBREVIATED CURRICULUM VITAE

Klaus Wolter

April 2013

ADDRESS: Cooperative Institute for Research in Environmental Sciences
University of Colorado/NOAA Earth System Research Laboratory
Physical Sciences Division
325 Broadway R/PSD1
Boulder, CO 80305

Phone/Fax/e-mail: (303) 497-6340 / -6449 / klaus.wolter@noaa.gov

PERSONAL: German Citizen / Permanent U.S. Resident

EDUCATION: 1987 Ph.D., Department of Meteorology, University of Wisconsin -
Madison; Dissertation: *Modes of surface circulation and climate over
the tropical Atlantic, Eastern Pacific, and Indian Oceans.*

1981 "Diplom" (equivalent of M.Sc.), Department of Meteorology,
University of Hannover, Germany; Translated thesis title: "*Dust
transports over North Africa and the adjacent Atlantic*".

EXPERIENCE: 1988 -now CIRES Research Associate, University of Colorado - Boulder
(post-UW Madison)

1987 - 88 UCAR Visiting Postdoctoral Scientist, Climate Analysis Center,
National Meteorological Center, Washington, DC

SELECT RECENT REFEREED PUBLICATIONS

- Hoerling, M., M. Dettinger, **K. Wolter**, J. Lukas, J. Eischeid, R. Nemani, B. Liebmann, and K. Kunkel, 2013: Chapter 5: Evolving weather and climate conditions of the Southwest United States. *Assessment of Climate Change in the Southwest U.S., Technical Report*, 509pp., in press.
- Peterson, T.C., R.R. Heim, Jr., R. Hirsch, D.P. Kaiser, H. Brooks, N.S. Diffenbaugh, R.M. Dole, J.P. Giovannetone, K. Guirguis, T.R. Karl, R.W. Katz, K. Kunkel, D. Lettenmaier, G.J. McCabe, C.J. Paciorek, K.R. Ryberg, S. Schubert, V.B.S. Silva, B.C. Stewart, A.V. Vecchia, G. Villarini, R.S. Vose, J. Walsh, M. Wehner, D. Wolock, **K. Wolter**, C.A. Woodhouse, D. Wuebbles, 2013: Monitoring and Understanding Changes in Heat Waves, Cold Waves, Floods and Droughts in the United States: State of Knowledge. *Bull. Amer. Meteor. Soc.*, **94**, (available online at: <http://journals.ametsoc.org/doi/abs/10.1175/BAMS-D-12-00066.1>)
- Kunkel, K.E., T.R. Karl, H. Brooks, J. Kossin, J.H. Lawrimore, D. Arndt, L. Bosart, D. Changnon, S.L. Cutter, N. Doesken, K. Emanuel, P.Ya. Groisman, R.W. Katz, T. Knutson, J. O'Brien, C.J. Paciorek, T.C. Peterson, K. Redmond, D. Robinson, J. Trapp, R. Vose, S. Weaver, M. Wehner, **K. Wolter**, and D. Wuebbles, 2013: Monitoring and Understanding Trends in Extreme Storms: State of Knowledge. *Bull. Amer. Meteor. Soc.*, **94**, 499-514.
- Wolter, K.**, and M.S. Timlin, 2011: El Niño/Southern Oscillation behaviour since 1871 as diagnosed in an extended multivariate ENSO index (MEI.ext). *International J. of Climatology*, **31**, 1074-87. Downloadable at: <http://onlinelibrary.wiley.com/doi/10.1002/joc.2336/abstract>
- Ray, A.J., J.J. Barsugli, K.B. Averyt, **K. Wolter**, M. Hoerling, N. Doesken, B. Udall, and R.S. Webb, 2008: Climate Change in Colorado – A synthesis to support water resources management and adaptation. Report by the Western Water Assessment for the Colorado Water Conservation Board, Boulder, 58pp. Downloadable at: http://cwcb.state.co.us/NR/rdonlyres/B37476F5-BE76-4E99-AB01-6D37E352D09E/0/ClimateChange_FULL_Web.pdf
- Pielke, R.A. Sr., **K. Wolter**, O. Bliss, N. Doesken, and B. McNoldy, 2007: The July 2005 Denver heat wave: How unusual was it? *National Weather Digest*, **31**, 24-35. Downloadable at: <http://www.climateci.org/publications/pdf/R-313.pdf>

ABBREVIATED CURRICULUM VITAE

Klaus Wolter

August 2012

SELECTED EARLIER PUBLICATIONS

- Chase, T.N., **K. Wolter**, R.A. Pielke Sr., and Ichtiague Rasool, 2006: Was the 2003 European summer heat wave unusual in a global context? *Geophys. Res. Lett.*, **33**, L23709, doi:10.1029/2006GL027470. Downloadable at: <http://www.climate-sci.org/publications/pdf/R-310.pdf>
- Pielke, R.A., Sr., N. Doesken, O. Bliss, T. Green, C. Chaffin, J.D. Salas, C.A. Woodhouse, J.J. Lukas, and **K. Wolter**, 2005: Drought 2002 in Colorado: An Unprecedented Drought or a Routine Drought? *Pure Appl. Geophys.*, **162**, 1455-1479. Downloadable at: <http://www.climate-sci.org/publications/pdf/R-285.pdf>
- Wolter, K.**, R.M. Dole, and C.A. Smith, 1999: Short-term climate extremes over the continental U.S. and ENSO. Part I: Seasonal temperatures. *J. Climate*, **12**, 3255- 3272. Downloadable at: [http://journals.ametsoc.org/doi/abs/10.1175/1520-0442\(2000\)12%3C3255%3ASTCEOT%3E2.0.CO%3B2](http://journals.ametsoc.org/doi/abs/10.1175/1520-0442(2000)12%3C3255%3ASTCEOT%3E2.0.CO%3B2)
- Wolter, K.**, 1997: Trimming problems and remedies in COADS. *J. Climate*, **10**, 1980-1997. < [http://journals.ametsoc.org/doi/abs/10.1175/1520-0442\(1997\)10%3C1980%3ATPARIC%3E2.0.CO%3B2](http://journals.ametsoc.org/doi/abs/10.1175/1520-0442(1997)10%3C1980%3ATPARIC%3E2.0.CO%3B2) >
- Wolter, K.**, 1989: Modes of tropical circulation, Southern Oscillation, and Sahel rainfall anomalies. *J. Climate*, **2**, 149 -172. Downloadable at: [http://journals.ametsoc.org/doi/abs/10.1175/1520-0442\(1989\)2%3C0149%3AMOTCSO%3E2.0.CO%3B2](http://journals.ametsoc.org/doi/abs/10.1175/1520-0442(1989)2%3C0149%3AMOTCSO%3E2.0.CO%3B2)
- Wolter, K.**, 1987: The Southern Oscillation in surface circulation and climate over the Atlantic, Eastern Pacific, and Indian Oceans, as captured by cluster analysis. *J. Climate Appl. Meteor.*, **26**, 540-558. < [http://journals.ametsoc.org/doi/abs/10.1175/1520-0450\(1987\)26%3C0540%3ATSOISC%3E2.0.CO%3B2](http://journals.ametsoc.org/doi/abs/10.1175/1520-0450(1987)26%3C0540%3ATSOISC%3E2.0.CO%3B2) >

PRIMARY RESEARCH INTERESTS

My main research interests lie in empirical climate research, in particular the application of statistical methods to climate problems, such as the impact of ENSO (El Niño/Southern Oscillation) on world-wide climate. I have developed and refined a "Multivariate ENSO Index" (MEI) based on tropical Pacific ship-based observations of sea level pressure, near-surface wind fields, sea – and air surface temperatures, as well as total cloudiness. The MEI is more robust than conventional indices in monitoring the ENSO phenomenon, and recently been extended back to the 19th century. Monthly updates and discussions of the MEI as well as relevant publications can be found under <http://www.esrl.noaa.gov/psd/enso/mei/>

In the last decade, I have been able to devote more attention to the analysis and prediction of U.S. climate, being involved in the Western Water Assessment (WWA) project at CU and, more recently NIDIS (National Integrated Drought Information System). In this context, I have developed statistical tools that allow me to make seasonal climate predictions, such as documented at the Colorado Water Conservation Board: <http://cwcb.state.co.us/public-information/flood-water-availability-task-forces/Pages/main.aspx>

I have been involved in recent regional and national assessments of extreme climate events as well as overall climate change (see recent references above). A 2008 report to the Governor is listed here: <http://cwcb.state.co.us/public-information/publications/Documents/ReportsStudies/ClimateChangeReportFull.pdf>

I am also part of the 'Climate Scene Investigation' team here at the NOAA-ESRL Physical Science Division (<http://www.esrl.noaa.gov/psd/csi/>) that attempts to sort out how much if any of recent climate and weather extremes can be attributed to anthropogenic forcing. For instance, we just submitted a revised paper on the record warmth of March 2012 to BAMS: http://www.esrl.noaa.gov/psd/csi/pubs/docs/Making_Extreme_Event_revised_04_12_13.pdf