CU Proposal No. 0912.75.1754B

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:	November 1, 2012
Proposed Duration:	12 months
Amount Requested:	$9,131
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
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Klaus Wolter
Principal Investigator

Seasonal climate forecasts for Colorado
Project Duration: January - July 2013
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:

(1) *Compute seasonal precipitation forecasts* for Southwestern U.S., including Colorado, for cardinal Water year seasons at appropriate lead-times (up to four months out). This task consists of:

(1a) 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;

Labor: 1.0 days per forecast times FOUR for forecasts made in January, March, May, and July 2013 (*Total Cost: $2,186 for 4.0 days*)

(1b) The post-processing (transformation) of all forecast values (from Task 1a) into forecast tilts towards wet (dry, near-normal) conditions, the creation of forecast display maps, and an ongoing assessment of skill (based on verification seasons since 2000).

Labor: 0.5 days per forecast times FOUR for forecasts made in January, March, May, and July 2013 (*Total Cost: $1,093 for 2.0 days*)

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

(2a) 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: 1.25 days per forecast times FOUR for presentations in January, March, May, and July 2013 (*Total Cost: $2,733 for 5.0 days*)

(2b) Presentation of powerpoint (Task 2a) and participation in WATF (and one CWCB board) meetings, including the creation and handout of 'Executive Summary' one-pagers, and availability for follow-up questions.

Labor: 0.4 days per forecast times FIVE for presentations in January, March (twice), May, and July 2013 (*Total Cost: $1,093 for 2.0 days + $149 for travel and materials*)

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

(3a) 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;

Labor: 0.5 days per forecast for presentation in March (*Total Cost: $273 for 0.5 days*)

(3b) Presentation of flooding risk info integrated into WATF powerpoint.

Labor: 0.15 days per forecast for presentation in March (*Total Cost: $82 for 0.15 days*)

Total Labor: 13.65 days during January through July 2013 (Total Cost before 20% overhead is added on: $7609, ending up as $9131; this includes costs for IT support, transportation, and materials).

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PROPOSED BUDGET DETAILS

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

Title: Continuation of: Seasonal climate forecasts for Colorado

Principal Investigator: Klaus Wolter

Duration: 11/1/12 - 10/31/13

	Amount Requested
A. Salaries and Wages	
Principal Investigator:K Wolter	
13.65 person days	4,633
IT Support: TBN	
16% time, 1 month	1,066
Total Salaries and Wages	5,699
B. Fringe Benefits	
PI/Other: 30.9% of salary	1,761
Total S/W and Fringe Benefits	7,460
C. Travel	
Domestic	
PI mileage to attend regional project meetings.	
$.50/mile x 250 miles	125
Total Travel	125
D. Other Direct Costs	
1. Materials and Supplies:	24
Total Other Costs	24
E. Total Direct Costs	7,609
F. Indirect Costs	
Off Campus Research:	
20% of TDC per agency guidelines.	1,522
G. Total Costs	9,131

ABBREVIATED CURRICULUM VITAE

Klaus Wolter — *August 2012*

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Physical Sciences Division
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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: (post-UW Madison)

1988 -now — CIRES Research Associate, University of Colorado - Boulder

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, 2012: Chapter 5: Evolving weather and climate conditions of the Southwest United States. *National Climate Assessment, Southwest Regional Technical Report*, 50pp., in press.

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, 2012: Monitoring and Understanding Changes in Extreme Storm Trends: State of Knowledge. *Bull. Amer. Meteor. Soc.*, **49**, in press.

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.climatesci.org/publications/pdf/R-313.pdf

Chase, T.N., **K. Wolter**, R.A. Pielke Sr., and Ichtiaque 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.climatesci.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.climatesci.org/publications/pdf/R-285.pdf

SELECTED EARLIER PUBLICATIONS

Wolter, K., S.J. Lubker, and S.D. Woodruff, 2003: Quality control in recent and pending COADS releases. *Advances in the Applications of Marine Climatology – The Dynamic Part of the WMO Guide to the Applications of Marine Climatology*, WMO/TD-No. **1081** (JCOMM Technical Report No. 13), 116-123. [whole WMO Report at: *http://icoads.noaa.gov/jcomm_tr13.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%281999%29012%3C3255%3ASTCEOT%3E2.0.CO%3B2*

Wolter, K., and M.S. Timlin, 1998: Measuring the strength of ENSO events - how does 1997/98 rank? *Weather*, **53**, 315-324. Downloadable at: *http://www.esrl.noaa.gov/psd/enso/mei/WT2.pdf*

Wolter, K., 1997: Trimming problems and remedies in COADS. *J. Climate*, **10**, 1980-1997. < *http://journals.ametsoc.org/doi/abs/10.1175/1520-0442%281997%29010%3C1980%3ATPARIC%3E2.0.CO%3B2* >

Hastenrath, S., and **K. Wolter**, 1992: Large-scale patterns and long-term trends of circulation variability associated with Sahel rainfall anomalies. *J. Meteor. Soc. Japan*, **70**, 1045-1055.

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%281989%29002%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%281987%29026%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 'SWcasts' for the interior southwestern U.S.: *http://www.esrl.noaa.gov/psd/people/klaus.wolter/SWcasts/*

Under the WWA umbrella, I have also engaged in climate studies with the Colorado State Climatologist, focusing on assessments of drought and temperature trends in Colorado – among several papers on this topic, the 2008 report to the Governor is the most recent one, at: *http://cwcb.state.co.us/public-information/publications/Documents/ReportsStudies/ClimateChangeReportFull.pdf*

On a larger scale, I have become involved in recent national assessments of both extreme weather and climate events as well as overall climate change, with two recent papers that have been accepted, and two more 'in the pipeline'. 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.