

CURRICULUM VITAE

CRAIG S. HARTSOUGH, Ph.D.

2014

ADDRESS: 1919 Enchantment Dr.
Fort Collins, CO 80525
(970) 310-5743 (cell)
(970) 495-0917 (home)
cshartsough@yahoo.com

EDUCATION:

Indiana University, Bloomington, Indiana 1978-1980

The Ohio State University, Columbus, Ohio 1981-1982 (B.S., Astrophysics)

University of Colorado, Boulder, CO 1982-1989 (M.S., Atmos. Sci. (1985))

(Ph.D., Atmos. Sci. (1989))

Thesis: "Frontal Interactions with Orography: Objective Cross-Sectional Analysis of ALPEX Data"

Regis University, School for Professional Studies 2003-2007 (B.S., Computer Information Systems)
award: Aida Lovelace Finalist, based on highest grade average

Continuing Education, Front Range Community College: Introduction to Networking; January 2013

CAREER INTERESTS:

Satellite data validation and analysis

Solar-terrestrial interactions

Quality Control of measurements

Verification and Validation

Software engineering

Computer Networking

RESEARCH EXPERIENCE:

Associate Scientist II
UCAR Atmospheric Chemistry Division (ACD)
Boulder, CO
Oct 2006-June 2013

Scientific Consultant
Weather Insight, LLP
Boulder, CO
2008-2011

Associate Scientist II
UCAR Climate and Global Dynamics (CGD) Division
Boulder, CO
Nov 2003-Sep 2006

Support Scientist
Colorado Research Associates
3280 Mitchell Lane
Boulder, CO
Nov 2002-Mar 2003

Scientific Consultant
Foresight Weather
Boulder, CO
2001-2003

Associate Scientist II
UCAR COMET Program/High Altitude Observatory
Boulder, CO
1999-2002

NRC Research Associate/CIRA Contractor: Research Meteorologist
NOAA Forecast Systems Laboratory
Boulder, CO
1990-1998

UCAR Visiting Scientist
Naval Oceanic and Atmospheric Research Laboratory (NOARL)
Monterey, CA
1989--1990

TEACHING EXPERIENCE:

Adjunct Instructor, Astronomy
Front Range Community College
Fort Collins, CO
2008-present

SOFTWARE ENGINEERING EXPERIENCE:

PLATFORMS:

Expertise in **UNIX** systems, primarily Sun workstations
Expertise in **PC** systems, primarily Windows XP
Experience with Cray (UNICOS system), IBM (AIX system), SGI (IRIX system)

LANGUAGES:

Expertise with **Fortran, C, IDL**, and **Matlab**
Experience with C++, Java, Perl, Python

MODELS and ANALYSIS PACKAGES:

UCAR: Advanced Weather Interactive Processing System (**AWIPS**)
General Meteorological Package (**GEMPAK**)
Thermospheric General Circulation Models (**TGCMs**) post-processor
DAYMET weather and Climate summaries analysis package
Biome-BGC Carbon cycle model
Hi-Resolution Dynamics Limb Sounder (**HIRDLS**)

FSL: Local Analysis and Prediction System (**LAPS**)

Mesoscale Analysis and Prediction System (**MAPS**), also called Rapid Update Cycle (**RUC**)
MAPS Surface Analysis System (**MSAS**), also called Rapid Update Cycle, Surface (**RUCS**)
MM5 model

Misc:

Naval Regional Model (**NORAPS**)
Air Force **MARKIV-B** system
MM5 models at Foresight Weather

GRAPHICS:

Expertise in **IDL** and AVS Visualization
Experience with GNUplot

DATABASE DEVELOPMENT:

Experience with MYSQL, SQL, MS Access

INTERNET:

Experience in developing and maintaining Web sites:
CGD: Web project: <http://www.gridbgc.ucar.edu/>
HAO: data dissemination (no longer available)
COMET: AWIPS Validation (no longer available)
UCAR: Team forecast contest page: (no longer available)

PUBLICATIONS:

Kinnison, D.E., Gille, J.C., Barnett, J., Randall, C., Harvey, V.L., Lambert, A., Khosravi, R., Alexander, M.J., Bernath, P.F., Boone, C.D., Cavanaugh, C.P., Coffey, M.T., Craig, C.A., Dean, V.C., Eden, T. Ellis, D., Fahey, D.W., Francis, G.L., Halvorson, C.M., Hannigan, J.W., **Hartsough, C.S.**, C. Hepplewhite, C., Krinsky, C., Lee, H., Mankin, W.G., Marcy, T.P., Massie, S.T., Nardi, B., Packman, D., Popp, P.J., Santee, M.L., Yudin, V., Walker, K.A. Global observations of HNO₃ from the High Resolution Dynamics Limb Sounder (HIRDLS): First results. *Journal of Geophysical Research -Atmospheres*, 113, D16S44. 2008.

Hagan, M. E., R. G. Roble, **C. Hartsough**, J. Oberheide, and M. Jarisch, The dynamics of the middle atmosphere during CRISTA-2 as simulated by the NCAR TIME-GCM, submitted to *J. Geophys. Res.*, March 2001.

Kaufmann, M., O. A. Gusev, K. U. Grossmann, R. G. Roble, M. E. Hagan, **C. Hartsough**, and A. A. Kutepov, The vertical and horizontal distribution of CO₂ densities in the upper mesosphere and lower thermosphere as measured by CRISTA, submitted to *J. Geophys. Res.*, March 2001.

Hartsough, C. S., and W. Blumen, 1990: Objective cross-sectional analysis of diabatic circulations and vertical motions using ALPEX data. *Meteor. and Atmos. Phys.*, 43, 221--230.

Blumen, W. and **C. S. Hartsough**, 1985: Reflection of hydrostatic gravity waves in a stratified shear flow. Part II: Application to downslope surface windstorms. *J. Atmos. Sci.*, 42, 2319--2331.

SELECTED CONFERENCE PAPERS and POSTERS:

Hartsough, C.S., M.E. Hagan, and R.G. Roble, 2002: Sampling the TIME-GCM model along the SABER satellite orbit track. CEDAR Workshop, Longmont CO, June 2002.

Hartsough, C. S., M. E. Hagan, and R. G. Roble, 2001: Geomagnetic activity effects in the lower thermosphere: Highlights of an April 1-11, 1993 TIME-GCM simulation. CEDAR Workshop, Longmont, CO, June 2001.

Hartsough, C.S., J.L. Mahoney, J.K.Henderson, and H.R. Hudson, 1999: Verification of the Aviation Weather Center's convective SIGMET outlooks using RTVS. Preprints, Eighth Conference on Aviation, Range, and Aerospace Meteorology, 10-15 Jan, 1999, Dallas, Amer. Meteor. Soc., 100-104.

Hartsough, C.S., P.A. Miller, M.F. Barth, and M.H. Savoie, 1998: The LDAD observation Quality Control and Monitoring System: Results from the spatial consistency check applied to surface observations. Preprints, Tenth Symposium on Meteorological Observations and Instrumentation, 11-16 Jan, Phoenix, AZ, Amer. Meteor. Soc., 202-206.

Hartsough, C.S., and J.M. Cram, 1994: Assessment of satellite upgrades using a mesoscale modeling system. Preprint Volume, Seventh Conference on Satellite Meteorology and Oceanography, Monterey, CA, June 6--10, 1994.

Hartsough, C.S., 1992: Downslope windstorm analysis using the Local Analysis and Prediction System (LAPS). Preprint Volume, Sixth Conference on Mountain Meteorology, September 29--October 2, 1992, Portland, OR.

TECHNICAL REPORTS:

Hartsough, C.S., L. Neilley, S. Jesuroga, and G. Byrd, 1999: AWIPS Validation, Phase 1: Qualitative Assessment of Basic Fields. Submitted to NWS AWIPS Program Office, May 1999.

Hartsough, C.S., J.R. Smart, F.H. Merram, and J.A. McGinley, 1993: Analysis of the accuracy of MARK IV-B: Final report. United States Air Force.

SUMMARY OF RESEARCH:

Master's thesis. (1982-1985)

My Master's research examined partial reflection of internal gravity waves and their contribution to the production of downslope windstorms. I used a linear two-dimensional model with continuously varying static stability and horizontal winds to compute the reflection coefficient, $R(z)$, of the wave energy

Doctoral thesis. (1985-1989)

"Frontal Interactions with Orography: Objective Cross-Sectional Analysis of ALPEX Data"

My PhD research used cross-sectional analyses of data collected during the Alpine Experiment (ALPEX) to examine ageostrophic motions during a frontal interaction with the Alps on 4-5 March 1982. Diabatic heating increased vertical ascent through the frontal zone and during lee cyclogenesis. The merging of the upper-level and lee-side potential vorticity maximums coincided with a lee cyclogenesis event.

UCAR Postdoctoral work. (1989-1990)

My research at NOARL focused on improvement of data assimilation methods in the Naval regional forecast model, NORAPS. I developed tests of the predictability characteristics of the model for various scales of motion. My results verified earlier work using the NCAR MM4 model, specifically that small-scale perturbations tend to be quickly damped while large-scale perturbations grow with time.

Forecast Systems Lab. (1990-1998)

I performed research in the quality control of the Local Analysis and Prediction System (LAPS) at the Forecast Systems Laboratory (NOAA/FSL). My work included writing Fortran programs that tested input data for errors, and validating the LAPS output fields. I then worked with an in-house version of the RAMS model, trying to design and implement experiments for the United States Air Force, which simulated satellite-based model initialization.

In the Aviation Division at FSL, my research activities focused mainly on the Mesoscale Analysis and Prediction System (MAPS, which is also run operationally at the National Meteorological Center (NMC) in Washington, D.C., under the name Rapid Update Cycle (RUC). My duties included assisting in the quality control of code changes, implementation of changes through a standardized written protocol both at FSL and at NMC, maintenance of software change logs and verification data, and construction and update of MAPS information manuals. I also participated heavily in the development of MAPS Surface Analysis System (MSAS) development, and worked part time on Quality Control portion of the Real-Time Verification System (RTVS). This included development of IDL code to test various data sources, as well as to display and monitor the results.

I also worked on a three-member team working on the Real-Time Verification System (RTVS). RTVS is a two-part system, with a real-time data ingest and a graphical user interface. My duties primarily focused on the real time data ingest portion of RTVS, as well as upgrades to the IDL routines to allow for sorting of observation types by intensity, height, and geographical region. I was also responsible for the convective SIGMET verifications, including implementation of new methods for using lightning data to verify the forecasts, and I worked on generating the Web-based display of the convective SIGMET results and Turbulence Evaluation results.

UCAR/NCAR (1999-2002)

During In UCAR's COMET program I validated products and displays on the AWIPS workstation. This work focused primarily on the AWIPS Volume Browser, a tool for generating spatial and temporal cross-sections of selected model data. Initial results were submitted in a technical report to the NWS AWIPS Program Office.

While working in NCAR's High Altitude Observatory I split my responsibilities between software engineering work under the supervision of Ben Foster and scientific research under Dr. Maura Hagan. Under Ben Foster I managed the post-processor for the Thermospheric General Circulation Models (TGCM), including fixing software problems, upgrading the display and computation capabilities, and porting the code to various platforms. I was also responsible for handling requests from outside users of the model and helping provide support to short term visitors.

With Dr. Hagan, I worked on two main areas of research, tidal effects in the lower thermosphere and propagation of solar storm influences through the upper atmosphere. This included supporting other the scientific efforts of researchers inside and outside of HAO and working independently on my own research. I presented posters at CEDAR Workshops and gave a talk at the Fall AGU conference to communicate my research.

Colorado Research Associates (Nov 2002-Mar 2003)

My duties as a support scientist with Dr. David Fritts and Dr. Joseph Werne included running turbulence models on Cray supercomputers, porting results to local machines, and running a series of post-processing routines. Similar procedures were applied to two separate projects, one to study atmospheric turbulence for the Air Force, the other to examine submarine wakes for the Navy.

Consulting work, Foresight Weather (2001-2003)

This consulting work involved writing synoptic discussions for the Foresight Daily Newsletter – assessing the various model forecasts and writing a short summary of upcoming weather which was submitted to customers over the internet. I extended my consulting work to include development of verification routines in Perl, to help determine how well the Foresight forecasts were doing for their customers. (Foresight Weather went out of business in 2004).

UCAR Climate Division (2003-2006)

I worked with Dr. Peter Thornton in the Terrestrial Sciences Section (TSS) of CGD under a three-year NASA grant to develop a Web-based portal for remote carbon cycle modeling, the Grid-BGC project. Our goal was to allow remote scientists to access the computing and data storage capabilities at UCAR, by creating a Web interface for them to download data, select model run options, and upload model results. My role was very diverse--at times working as an associate scientist, and at other times as a software engineer, database manager, and Web designer.

UCAR Chemistry Division (2006-present)

I most recently worked under Dr. John Gille in the Atmospheric Chemistry Division (ACD) at NCAR. I worked with data support and science support for the Hi-Resolution Dynamics Limb Sounder (HIRDLS) instrument on the AURA satellite. Problems during launch caused issues with the collection of radiances from the instrument, and I have helped write and test quality control algorithms to improve the Level II products. I also assisted in the study of some fields, primarily water vapor.

ENRICHMENT ACTIVITIES:

Astronomy Instructor. I have taught introductory undergraduate Astronomy classes at the Front Range Community College, Larimer campus since Fall 2008. This experience has improved my ability to present ideas coherently and in an entertaining way. I plan to add meteorology instructing in Spring 2014.

Employee Activities Committee. While at the University Corporation for Atmospheric Research (UCAR), I volunteered for the EAC, the committee which helps with annual parties and other social activities. I developed a number of Web-based weather quizzes for which the employee could submit entries. These included topics such as Groundhog Day and the Vernal Equinox, mixing researched facts and humorous answers. I also started the singing group, the UCARolers, which performs regularly at the annual Holiday and Awards party each December, and I have often participated in the annual Spring Fling party.

WxChallenge. Oklahoma University manages an annual weather forecasting contest open to all higher education institutions. Cities are chosen around the country for up to 1000 participants (college students, staff, researchers, etc.) to test their forecasting skills over two-weeks intervals. I was a member of the UCAR team for the 2001-2002 contest (when it was hosted by Penn State), and was the top forecaster on our team for the year and the top forecaster in the country for two of the thirteen cities. I was the NCAR team manager 2003-2012.

Daily Weather Briefings. The Forecast Systems Laboratory (FSL), part of the National Oceanic and Atmospheric Administration (NOAA), provided a daily weather briefing for interested staff and visitors. Volunteers prepared a 30-minute talk on the current weather situation using the AWIPS workstations developed by FSL for the National Weather Service. I was a regular briefer during my 8-9 years at FSL and learned how to adjust the level of my presentations to that of the particular audience.

Visitor talks. FSL also had a Visitor Program, providing tours and seminars for the general public on a daily basis. I was one of the regular speakers for the Program and gave walking tours and workstation demonstrations to groups ranging from elementary school children to government dignitaries. I continue to provide help to NCAR's Education and Outreach Program whenever asked, including as a member of the science team for the 2011 Super Science Saturday program.

Weather Insight Newsletter Discussions. I spent three years as a consultant with Weather Insight. The company provides daily newsletters for subscribers, mostly in the energy industry, with forecasts and discussions of the different meteorological models. I have been preparing the Synoptic Discussion section 1-2 days each month for approximately five years.

Volunteering with children. I have also volunteered in several ways with school children outside of work-sponsored programs. For example, several years ago I gave weekly chess talks to three second grade classes at Timnath Elementary and helped establish a new after-school chess club (at which I also volunteered). I also helped the Enrichment Coordinator at Timnath with a semester of weekly Science Club weather talks for the 3-5 grade gifted/talented students.