

# CURRICULUM VITAE

**CLIFFORD F. MASS**

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## **Personal Data**

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## **Education**

B.S., Cornell University 1974  
Major - Physics  
Ph.D., University of Washington 1978  
Atmospheric Sciences  
Doctoral Thesis: "A Numerical and Observational Study of African Wave  
Disturbances." J. R. Holton, adviser.

## **Professional Experience**

Mid 1981 to present Assistant, Associate Professor, and Professor, Department of  
Atmospheric Sciences, University of Washington.

1978 to mid 1981 Assistant Professor, Department of Meteorology, University of  
Maryland.

1974 to 1978 Research Assistant at Department of Atmospheric Sciences,  
University of Washington.

## **Books**

*The Weather of the Pacific Northwest*, University of Washington Press

## **Refereed Publications**

C. F. Mass and B. Dotson, 2009: Major windstorms of the Pacific Northwest. Submitted to *Mon. Wea. Rev.*

Bond, N. and C. F. Mass, 2009: Development of Skill by Students Enrolled in a Weather Forecasting Laboratory. Accepted in *Bulletin of the American Meteorological Society*

- Hahn, R.S. and C. F. Mass, 2009: The impact of positive definite moisture advection over orography. Accepted in *Mon. Wea. Rev.*
- Mass, C., S. Joslyn, J. Pyle, P. Tewson, T. Gneiting, A. Raftery, J. Baars, J. M. Sloughter, D. Jones and C. Fraley, 2009: PROBCAST: A Web-Based Portal to Mesoscale Probabilistic Forecasts. Accepted for publication in the *Bulletin of the American Meteorological Society*
- Stoelinga, M.. M. Albright and C. Mass: Snowpack trends over the Pacific Northwest, 2009. Submitted to *J. of Climate*.
- Wedam, G. B. , L. A. McMurdie, and C. F. Mass, 2009: Comparison of model forecast skill of sea-level pressure along the East and West Coasts of the United States. *Weather and Forecasting*, **24**, 843-854
- Ancell B. C, Mass C. F., 2008: The variability of adjoint sensitivity with respect to model physics and basic-state trajectory. *Monthly Weather Review*, **136**, 4612-4628
- Salathe, E. P., P. H. Zahn, R. Steed, and C. F. Mass, 2008. A high-resolution climate model for the United States Pacific Northwest: Mesoscale feedbacks and local responses to climate change. *J. Climate*, **21**, 5708-5726.
- Mass, C. F., J. Baars, G. Wedam, E. Gritmit, and R. Steed, 2008: Removal of systematic model bias on a model grid. *Wea. Forecasting*, **23**, 438–459.
- Gritmit, E. P., and C. F. Mass, 2007: Measuring the Ensemble Spread–Error Relationship with a Probabilistic Approach: Stochastic Ensemble Results. *Monthly Weather Review*, **135**, 203–221
- Garvert, M., B. Smull, and C. Mass, 2007: Multiscale mountain waves influencing a major orographic precipitation event. *J. Atmos. Sci*, **64**, 711-737
- Maurer, E. P, and C. F. Mass, 2006. Using radar data to partition precipitation into rain and snow in a hydrologic Model. *Journal of Hydrologic Engineering* **11**, 214-221
- Ancell B. C. and C. F. Mass, 2006: Structure, growth rates, and tangent linear accuracy of adjoint sensitivities with respect to horizontal and vertical resolution. Accepted in *Monthly Weather Review*. **134**, 2971–2988
- Tinis, S. W., R. E. Thomson, C. F. Mass, and B. M. Hickey, 2006: Comparison of MM5 and meteorological buoy winds from British Columbia to northern California. *Atmos. Ocean*, **44**, 65–81
- Mass, C., 2006: The Uncoordinated Giant: Why U.S. weather operations and research is not meeting its potential. *Bull. Amer. Meteor. Soc.*, **87**, 573-584
- Baars, J. and C. Mass, 2005: Performance of National Weather Service forecasts compared to operational, consensus, and weighted model output statistics, *Weather and Forecasting*, **20**, 1034–1047

Garvert, M. F., B. A. Colle, and C. F. Mass, 2005: The 13–14 December 2001, IMPROVE-2 Event. Part I: Synoptic and Mesoscale Evolution and Comparison with a Mesoscale Model Simulation. *Journal of the Atmospheric Sciences*, **62**, 3474–3492

Colle B. A., M. F. Garvert, J. B. Wolfe, C. F. Mass and C. P. Woods. 2005: The 13–14 December 2001 IMPROVE-2 Event. Part III: Simulated Microphysical Budgets and Sensitivity Studies. *Journal of the Atmospheric Sciences*, **62**, 3535–3558.

Garvert, M. F., C. P. Woods, B. A. Colle, C. F. Mass, P. V. Hobbs, M. T. Stoelinga and J. B. Wolfe, 2005. The 13–14 December 2001 IMPROVE-2 Event. Part II: Comparisons of MM5 Model Simulations of Clouds and Precipitation with Observations. *Journal of the Atmospheric Sciences*. **62**, 3520–3534.

Eckel, F. A. and C. F. Mass, 2005: Effective mesoscale, short-range ensemble forecasting. *Weather and Forecasting*, **20**, 3238-350

Hobbs, P.V., C. F. Mass, M. T. Stoelinga, 2005: Preface. *J. Atmos. Sci.*, 3427–3428

Sharp, J. and C. F. Mass, 2004: The climatological influence and synoptic evolution associated with Columbia Gorge gap flow events. *Weather and Forecasting*, **19**, 970-992

Stoelinga M. T., P. V. Hobbs, C. F. Mass, J. D. Locatelli, B. A. Colle, R. A. Houze, Jr., A. L. Rangno, N. A. Bond, B. F. Smull, R. M. Rasmussen, G. Thompson, and B. R. Colman, 2003: Improvement of Microphysical Parameterizations through Observational Verification Experiment (IMPROVE). *Bulletin. Amer. Meteor. Soc.*, **12**, 1807–1826

Vaughan J., B. Lamb, R. Wilson, C. Bowman, C. Kaminsky, S. Otterson, M. Boyer, C. Mass, M. Albright, J. Koenig, Alice Collingwood, Mike Gilroy and Naydene Maykut, 2004: A Numerical Daily Air-Quality Forecast System for the Pacific Northwest. *Bull. Amer. Meteor. Soc.*, **85**, 549–561.

McMurdie, L., and C. F. Mass, 2004: Major Numerical Forecast Failures in the Northeast Pacific. *Weather and Forecasting*, **19**, 338-356

C.F. Mass, 2003: Reply to Comments on "IFPS and the Future of the National Weather Service". *Weather and Forecasting*, **18**, 1305-1306

C. F. Mass et al;. 2003: IFPS and the Future of the National Weather Service. *Weather and Forecasting*, **18**, 75-79

C. F. Mass et al;. 2003: Regional Environmental Prediction over the Pacific Northwest Prototype. *Bull. Amer. Meteor. Soc.*, **84**, 1353-1366

Sharp, J., and C. F. Mass, 2002: Columbia Gorge flow: insights from observational analysis and ultra-high resolution model simulation. *Bull. Amer. Meteor. Soc.*, **18**, 75-79

- Grimit, E. P., and C. F. Mass, 2002: Initial results of a mesoscale short-range ensemble forecasting system over the Pacific Northwest, *Weather and Forecasting*, **17**, 192–205
- Mass, C., D. Ovens, M. Albright, and K. Westrick, 2002: Does Increasing Horizontal Resolution Produce Better Forecasts?: The Results of Two Years of Real-Time Numerical Weather Prediction in the Pacific Northwest. *Bull. Amer. Meteor. Soc.*, **83**, 407–430.
- Westrick, K. J., P. Storck, and C. F. Mass, 2002, Description and evaluation of a hydrometeorological forecast system for mountainous watersheds. *Weather and Forecasting*, **17**, 250–262.
- Colle, B.A., C. F. Mass, and D. Ovens, 2001: Evaluation of the timing and strength of MM5 and Eta surface trough passages over the eastern Pacific. *Weather and Forecasting*, **16**, 553–572
- Chien, F.-C., C. F. Mass, and P. J. Neiman, 2001: An observational and numerical study of an intense land-falling front along the northwest coast of the U.S. during COAST IOP2. *Mon. Wea. Rev.*, **129**, 934–955.
- Colle, B. A., C. F. Mass, and K. J. Westrick, 2000: MM5 precipitation verification over the Pacific Northwest during the 1977–1999 cool seasons. *Weather and Forecasting*, **15**, 730–744.
- Westrick, K. and C. Mass, 2001: An evaluation of a high resolution hydrometeorological modeling system for the prediction of a cool-season flood event in a coastal mountainous watershed. *Journal of Hydrometeorology*, **2**, 161–180
- Davis, C., S. Low-Nam, and C. F. Mass, 2000: Dynamics of a Catalina Eddy revealed by numerical simulation. *Mon. Wea. Rev.*, **128**, 2885–2904
- Colle, B. A. and C. F. Mass, 2000: High-resolution observations and numerical simulations of easterly gap flow through the Strait of Juan de Fuca on 9–10 December 1995. *Mon. Wea. Rev.*, **128**, 2363–2396
- Colle, B. A. and C. F. Mass, 2000: The 5–9 February 1996 flooding event over the Pacific Northwest: sensitivity studies and evaluation of the MM5 precipitation forecasts. *Mon. Wea. Rev.*, **128**, 593–617
- Mass, C. and J. Steenburgh, 2000 An Observational and Numerical Study of an Orographically Trapped Wind Reversal along the West Coast of the U.S. *Mon. Wea. Rev.*, **128**, 2363–2396
- Westrick, K., C. Mass, and B. Colle, 1999: Is meteorological radar useful for quantitative precipitation estimation over the western U.S.? *Bull. Amer. Meteor. Soc.*, **80**, 2289–2298
- Colle, B. A., K. J. Westrick, and C. F. Mass, 1999: Evaluation of MM5 and Eta-10 precipitation forecasts over the Pacific Northwest during the cool season. *Weather and Forecasting*, **14**, 137–154

- Colle, B. A., C. F. Mass and B. F. Smull, 1999: An observational and numerical study of a cold front interacting with the Olympic Mountains during Coast IOP 5. *Mon. Wea. Rev.*, **127**, 1310-1334
- Colle, B. A. and C. F. Mass, 1998: Windstorms along the western side of the Washington Cascade Mountains, Part I: a high resolution observational and modeling study of the 12 February 1995 event. *Mon. Wea. Rev.*, **126**, 28-52
- Colle, B. A. and C. F. Mass, 1998: Windstorms along the western side of the Washington Cascade Mountains, Part II: characteristics of past events and three-dimensional idealized simulations. *Mon. Wea. Rev.*, **126**, 53-71
- Mass, C. and Y.-H. Kuo, 1998: Regional real-time numerical weather prediction: current status and future potential. *Bull. Amer. Meteor. Soc.*, **79**, 253-263
- Bond, N. A., C. F. Mass, B. F. Smull, R. A. Houze, M.-J. Yang, B. A. Colle, S. A. Braun, M. A. Shapiro, B. C. Colman, P. J. Neiman, J. E. Oveland, W. D. Neff, and J. D. Doyle, 1997: The coastal observation and simulation with topography (COAST) experiment. *Bull. Amer. Meteor. Soc.* **78**, 1941-1955
- Smith, R., H. Paegle, T. Clark, W. Cotton, D. Durran, G. Forbes, J. Marwitz, C. Mass, J. McGinley, H.-L. Pan, and M. Ralph, 1997: Local and remote effects of mountains on weather: research needs and opportunities. *Bull. Amer. Meteor. Soc.*, **5**, 877-892
- Mass, C. F., and N. A. Bond, 1997: Reply to Dorman's Comments on "Coastally Trapped Wind Reversals Along the U.S. West Coast During the Warm Season : Part II, Synoptic Evolution" *Mon. Wea. Rev.*, **125**, 1695-1697
- Steenburgh, J., C. F. Mass, and S. A. Ferguson, 1997: The influence of gaps in a coastal mountain barrier on temperature and snow level. *Weather and Forecasting*, **12**, 208-227
- Chien, F. C., C. F. Mass, and Y.-H. Kuo, 1997: A numerical study of the interaction between a warm-season frontal system and the coastal mountains of the western U.S., Part I: prefrontal pressure ridge, onshore push, and alongshore southerlies. *Mon. Wea. Rev.*, **125**, 1705-1729
- Chien, F. C. and C. F. Mass, 1997: A numerical study of the interaction between a warm-season frontal system and the coastal mountains of the western U.S., Part II: Evolution of a Puget Sound Convergence Zone. *Mon. Wea. Rev.*, **125**, 1730-1752
- Bond, N. A., C. F. Mass, and J. Overland, 1996: Coastally-trapped southerly flow along the U.S. West Coast: Part I, climatology and temporal evolution. *Mon. Wea. Rev.*, **124**, 430-445
- Mass, C. F. and N. A. Bond, 1996: Coastally-trapped southerly flow along the U.S. West Coast: Part II, synoptic evolution. *Mon. Wea. Rev.*, **124**, 446-461
- Mass, C., 1996: Are we graduating too many atmospheric scientists? *Bull. Amer. Meteor. Soc.*, **77**, 1255-1267

- Colle, B. and C. F. Mass, 1996: An observational and modeling study of the interaction of low-level southwesterly flow with the Olympic Mountains during COAST IOP4. *Mon. Wea. Rev.*, **124**, 2152-2175
- Steenburgh, J. and C. F. Mass, 1996: The interaction of an intense midlatitude cyclone with coastal orography. *Mon. Wea. Rev.*, **124**, 1329-1352
- Mass, C., S. Businger, M. Albright and Z. Tucker, 1995: A windstorm in the lee of a gap in a coastal mountain barrier. *Mon. Wea. Rev.*, **123**, 315-331
- Mass, C., 1995 The relative importance of synoptic-scale forcing versus marine layer dynamics along the West Coast of North America. *J. Atmos. Sci.*, **52**, 2313-2318
- Colle, B. and C. F. Mass, 1995: The structure and evolution of shallow cold surge east of the Rocky Mountains. *Mon. Wea. Rev.*, **123**, 2577-2610
- W. J. Steenburgh and C. F. Mass, 1994: The structure and evolution of a simulated Rocky Mountain lee trough. *Mon. Wea. Rev.*, **122**, 2740-2761
- Mass, C., 1993: The application of compact discs in the atmospheric and related fields: An update. *Bull. Amer. Meteor. Soc.*, **74**, 1901-1908.
- Ferber, G., C. Mass, G. Lackmann and M.W. Patnoe, 1993: Snowstorms over the Puget Sound lowlands. *Wea. and Forecast*, **8**, 481-504.
- Mass, C., and D. Schultz, 1992: Structural development of a simulated midlatitude cyclone. *Mon. Wea. Rev.*, **121**, 889-917.
- Schultz, D., and C. Mass, 1992: The structure and evolution of an occluded front in a midlatitude cyclone over land. *Mon. Wea. Rev.*, **121**, 918-940.
- Mass, C., J. Steenburgh, and D. Schultz, 1991: Diurnal surface pressure variations over the continental U.S. and the influence of sea level reduction. *Mon. Wea. Rev.*, **119**, 2814-2830.
- Mass, C., 1991: Synoptic frontal analysis: Time for a reassessment. *Bull. Amer. Meteor. Soc.*, **72**, 348-363.
- Mass, C., and D. Portman, 1990: Reply to Dutton. *Journal of Climate*, **3**, 1181-1182.
- Mass, C., and G. Ferber, 1990: Surface pressure perturbations produced by an isolated topographic barrier, Part I: General characteristics and dynamics. *Monthly Weather Review*, **118**, 2579-2596.
- Mass, C., and G. Ferber, 1990: Surface pressure perturbations produced by an isolated mesoscale topographic barrier. Part II: Regional effects and forecasting implication. *Mon. Wea. Rev.*, **118**, 2597-2606.

- Hermann, A.J., B. Hickey, C. Mass, and M. Albright, 1990: Coastally trapped atmospheric gravity currents in the Pacific Northwest and their oceanic response. *J.G.R.*, **95**, 13169-13193.
- Ulrickson, B.L., and C. Mass, 1990: Numerical investigation of mesoscale circulations in the Los Angeles Basin: A verification study. *Mon. Wea. Rev.*, **118**, 2340-2357.
- Ulrickson, B.L., and C. Mass, 1990: Numerical investigation of mesoscale circulations and pollutant transport in the Los Angeles Basin. *Mon. Wea. Rev.*, **118**, 2357-2401.
- Mass, C., 1989: The origin of the Catalina eddy. *Mon. Wea. Rev.*, **117**, 2406-2436.
- Mass, C., and D. Portman, 1989: The effect of major volcanic eruptions of the last century on surface temperature, pressure and precipitation. *J. Climate*, **2**, 566-593.
- Dempsey, D., and C. Mass, 1989: Reply to "Calculation of the pressure-gradient force in the one level model of Mass and Dempsey". *Mon. Wea. Rev.*, **117**, 1110-1111.
- Mass, C., and M. Albright, 1988: Reply to the comment of C. Dorman on "Coastal southerlies and along shore surges of the West Coast of North America." *Mon. Wea. Rev.*, **116**, 2407-2410.
- Mass, C., H. Edmon, E. Recker, H. Friedman and N. Cheney, 1987: The use of compact disks for the storage of large meteorological data sets. *Bull. Amer. Meteor. Soc.*, **68**, 1556-1558.
- Mass, C., 1987: The "banana belt" of the southern Oregon coast. *Wea. Forecasting*, **2**, 187-198.
- Mass, C., and M. Albright, 1987: Coastal southerlies and alongshore surges of the west coast of North America: Evidence of mesoscale topographically trapped response to synoptic forcing. *Mon. Wea. Rev.*, **115**, 1707-1738.
- Mass, C., D. Brees and M. Albright, 1986: The onshore surge of marine air into the Pacific Northwest: a coastal region of complex terrain. *Mon. Wea. Rev.*, **114**, 2602-2627.
- Mass, C., and D. Dempsey, 1985: A simple one-level model for diagnosing surface winds in mountainous and coastal regions. *Mon. Wea. Rev.*, **113**, 1211-1227.
- Mass, C., and D. Dempsey, 1985: A topographically forced convergence line in the lee of the Olympic Mountains. *Mon. Wea. Rev.*, **113**, 659-663.
- Mass, C., and M. Albright, 1985: A severe windstorm in the lee of the Cascade mountains of Washington State. *Mon. Wea. Rev.*, **113**, 1261-1281.
- Mass, C., and A. Robock, 1982: The short-term influence of the Mount St. Helens eruption on surface temperature in the northwest United States. *Mon. Wea. Rev.*, **110**, 614-622.
- Robock, A., and C. Mass, 1982: The Mount St. Helens volcanic eruption of 18 May 1980: Large short-term effects. *Science*, **216**, 595-610.

- Mass, C., 1982: The topographically forced diurnal circulations of western Washington State and their influence on precipitation. *Mon. Wea. Rev.*, **110**, 170-183.
- Mass, C., 1981: Topographically forced convergence in western Washington State. *Mon. Wea. Rev.*, **109**, 1335-1347.
- Mass, C., 1980: The Puget Sound convergence zone. *Weatherwise*, **33**, 272-274.
- Mass, C., 1979: A linear primitive equation model of African wave disturbances. *J. Atmos. Sci.*, **36**, 2075-2092.
- Mass, C., and S. H. Schneider, 1977: Statistical evidence on the influence of sunspots and volcanic dust on long-term temperature records. *J. Atmos. Sci.*, **34**, 1995-2004.
- Holton, J. R., and C. Mass, 1976: Stratospheric vacillation cycles. *J. Atmos. Sci.*, **33**, 2218-2225.
- Mass, C., and C. Sagan, 1976: A numerical circulation model with topography for the Martian southern hemisphere. *J. Atmos. Sci.*, **33**, 1418-1430.
- Schneider, S. H., and C. Mass, 1975: Volcanic dust, sunspots, and temperature trends. *Science*, 190.

### **Electronic Publications**

- National Meteorological Center Grid Point Data Set CD-ROM (Versions I and II).  
GALE Experiment CD-ROM.  
North American Observational Data for August-December 1987 CD-ROM.  
World Weather Disc CD-ROM.  
Climate Analysis Center Global Gridded Data

### **Offices and Honors**

- Fellow, American Meteorological Society  
Max Eaton Award, American Meteorological Society  
President, Puget Sound Chapter, American Meteorological Society.  
Program Chairman, Puget Sound Chapter, AMS.  
Treasurer, Puget Sound Chapter, AMS.  
Chairman, UCAR (University Corporation for Atmospheric Research), UNIDATA Data Access Committee.  
Associate Editor, Monthly Weather Review.  
Consulting Editor, Encyclopedia of Climate and Weather.  
Chairman, UCAR Committee on Meteorological Data Sets  
Chairman, 15th AMS Conference on Weather Analysis and Forecastings  
Chairman, Special Workshop on Real-Time Mesoscale NWP in the University Community  
Chairman, AMS Mesoscale Meteorology Committee

## **National Committees**

WRF Research Applications Board  
NRC Committee on Atmospheric Predictability  
AMS Ad-Hoc Committee on Community Fora  
Chairman and member, USWRP CONDUIT committee  
USWRP Science Advisory Board  
WRF Science Board  
Chairman and member, AMS Mesoscale Committee  
USWRP PDT#4 on Mountain Meteorology  
USWRP PDT#9 on Hydrology  
AMS Committee on Weather Analysis and Forecasting  
MM5 Community Oversight Committee  
AMS Information Systems Committee  
UCAR/NWS Local Digital Library Committee  
UNIDATA Steering and Data Access Committees  
National Academy of Sciences Geophysical Data Committee  
UCAR COMET Advisory Committee  
Search Committee for New NWS Director  
Executive Committee, Board of Oceans and Atmosphere, National Association of State Universities  
and Land Grant Colleges

## **Regional Committees**

Puget Sound Upper Air Observations Committee  
Chairman, Profiler Management Committee  
Northwest Mesoscale Modeling Committee

## **University Committees and Organizations**

Member, University Senate 1988-1990, current  
Department Computer Committee  
Arts and Sciences Graduation Committee  
Department Rules and Computer Committees  
University Electronic Classroom Committee  
University Football Seminar Committee

## **Past Graduate Students**

Kucera, T., 1981: M.S. on mesoscale modeling in complex terrain.  
Delman, A., 1981: M.S. on diurnal wind and temperature variations and air quality in Washington,  
D.C. area.  
Dubofsky, D., 1981: M.S. on a diagnostic study of Hurricane David.  
Dempsey, D., 1985: Ph.D. on mesoscale modeling in complex terrain.  
Pam Speers, 1985: M.S. on precipitation diagnoses and modeling in complex terrain.  
David Portman, 1988: M.S. Effects of major eruptions on surface temperature and pressure.  
Daniel Brees, 1988: M.S. Onshore push of the Pacific Northwest.

Brian Ulrickson, 1989: Ph.D. 3D primitive equation modeling of flow in the LA basin.  
Garth Ferber, 1991 M.S. Mesoscale pressure perturbations forced by the Olympic Mountains.  
David Schultz, 1992, M.S. Structural analysis of a midlatitude cyclone over land.  
Brian Colle, 1994, M.S. Northerly surges to the east of the Rocky Mountains.  
Jim Steenburgh, 1995, Ph.D: Mesoscale modeling of synoptic/orographic interactions.  
Brian Colle, 1997, Ph.D: Dynamics of windstorms in three dimensional terrain  
Fang-Ching Chien, 1997, Ph.D: Interaction of fronts with coastal topography.  
Ken Westrick, 1998, M.S.: Coupling of atmospheric and distributed hydrological models.  
Richard Steed, 1999, M.S.: Initialization of mesoscale forecasting models.  
Eric Gritmit, 2001, M.S.; A Short-Range Ensemble Prediction System  
Justin Sharp, 2002: M.S.: A Study of the Meteorology of the Columbia River Gorge  
Tony Eckel, 2004: Ph.D. Effective Short-Range Mesoscale Ensemble Prediction.  
Eric Gritmit, 2004: Ph.D. Predicting Forecast Skill Using a Mesoscale Ensemble System  
Justin Sharp, 2005, Ph.D. Modeling study of the flow in the Columbia River Gorge.  
Brian Ancell, 2006, Ph.D. Adjoint and ensemble-based forecast sensitivity  
Bri Dotson, 2007, M.S.. Structure and dynamics of major Pacific windstorms.  
Garrett Wedam, 2008, M.S. Errors in numerical prediction models  
Robert Hahn, 2008, M.S. Understanding of microphysical errors in numerical models.