

GREGORY J. HAKIM

Department of Atmospheric Sciences, Box 351640
University of Washington, Seattle, WA 98195-1640
phone: 206.685.2439 fax: 206.543.0308
<http://www.atmos.washington.edu/~hakim>

EMPLOYMENT

Associate Professor, Department of Atmospheric Sciences, University of Washington, Seattle, WA. September 2005–present.

Assistant Professor, Department of Atmospheric Sciences, University of Washington, Seattle, WA. March 1999–August 2005.

Postdoctoral Fellow, Advanced Study Program, National Center for Atmospheric Research, Boulder, CO. August 1997–March 1999.

REFEREED PUBLICATIONS

Torn, R. D., and **G. J. Hakim**, 2008: Performance characteristics of a pseudo-operational ensemble Kalman filter. *Mon. Wea. Rev.*, **136**, accepted.

Hakim, G. J., 2008: A probabilistic theory for balance dynamics. *J. Atmos. Sci.*, **64**, accepted.

Torn, R. D., and **G. J. Hakim**, 2008: Ensemble-based sensitivity analysis. *Mon. Wea. Rev.*, **136**, 663–677.

Ancell, B., and G. J. Hakim, 2007: Interpreting adjoint and ensemble sensitivity toward the development of optimal observation targeting strategies. *Met. Zeitschrift*, **16**, in 635–642.

Ancell, B., and **G. J. Hakim**, 2007: Comparing adjoint and ensemble sensitivity analysis. *Mon. Wea. Rev.*, **135**, 4117–4134.

Chen, C.-C., **G. J. Hakim**, and D. R. Durran, 2007: Transient mountain waves and their interaction with large scales. *J. Atmos. Sci.*, **64**, 2378–2400.

Dirren, S., R. D. Torn, and **G. J. Hakim**, 2007: A data assimilation case-study using a limited-area ensemble Kalman filter. *Mon. Wea. Rev.*, **135**, 1455–1473.

Hakim, G. J., and R. D. Torn, 2006: Ensemble Synoptic Analysis. *Fred Sanders*

Monograph, American Meteorological Society, accepted. (**invited**).

Torn, R., D., G. J. Hakim, and C. Snyder, 2006: Boundary conditions for limited-area ensemble Kalman filters. *Mon. Wea. Rev.*, **134**, 2490–2502.

Chen, C.-C., D. R. Durran, and **G. J. Hakim**, 2005: Mountain wave momentum flux in an evolving synoptic-scale flow. *J. Atmos. Sci.*, **62**, 3213–3231.

Stevens, M. R., and **G. J. Hakim**, 2005: Perturbation growth in baroclinic waves. *J. Atmos. Sci.*, **62**, 2847–2863.

Snyder, C., and **G. J. Hakim**, 2005: Cyclogenetic perturbations and analysis errors decomposed into singular vectors. *J. Atmos. Sci.*, **62**, 2234–2247.

Hacker, J., J. Hansen, J. Burner, Y. Chen, G. Eshel, **G. Hakim**, S. Lazarus, S. Majumdar, R. Morss, A. Poje, V. Sheremet, Y. Tang, and C. Webb, 2005: UCAR/NCAR Junior Faculty Forum on future scientific directions: Predictability. *Bull. Amer. Meteor. Soc.*, **86**, 1733–1737.

Dirren, S., and **G. Hakim**, 2005: Toward the assimilation of time-averaged observations. *Geophys. Res. Lett.*, **32**, L04804, doi:10.1029/2004GL021444.

Hakim, G. J., 2005: Vertical structure of midlatitude analysis and forecast errors. *Mon. Wea. Rev.*, **133**, 567–578.

Patoux, J., **G. J. Hakim**, and R. A. Brown, 2005: Diagnosis of frontal instabilities over the Southern Ocean. *Mon. Wea. Rev.*, **133**, 863–875.

Hakim, G. J., and A. Canavan, 2005: Observed cyclone–anticyclone tropopause vortex asymmetries. *J. Atmos. Sci.*, **62**, 231–240.

Hakim, G. J., 2003: Developing wave packets in the North Pacific storm track. *Mon. Wea. Rev.*, **131**, 2824–2837.

Hakim, G. J., 2003: Cyclogenesis. *Encyclopedia of Atmospheric Sciences*, J. Holton, J. Curry, and J. Pyle, Eds., Academic Press, 589–594.

Hakim, G. J., C. Snyder, and D. J. Muraki, 2002: A new surface model for cyclone–anticyclone asymmetry. *J. Atmos. Sci.*, **59**, 2405–2420.

Hakim, G. J., and D. Keyser, 2001: Canonical frontal circulation patterns in terms of Green’s functions for the Sawyer–Eliassen equation. *Quart. J. Roy. Meteor. Soc.*, **127**,

1795–1814.

Muraki, D. J., and **G. J. Hakim**, 2001: Balanced asymmetries of waves on the tropopause. *J. Atmos. Sci.*, **58**, 237–252.

Hakim, G. J., 2000: Role of nonmodal growth and nonlinearity in cyclogenesis initial-value problems. *J. Atmos. Sci.*, **57**, 2951–2967.

Hakim, G. J., 2000: Climatology of coherent structures on the extratropical tropopause. *Mon. Wea. Rev.*, **128**, 385–406.

Dickinson, M. L., L. F. Bosart, W. E. Bracken, **G. J. Hakim**, D. M. Schultz, M. A. Bedrick, and K. R. Tyle, 1997: The March 1993 Superstorm cyclogenesis: Incipient phase synoptic- and convective-scale flow interaction and model performance. *Mon. Wea. Rev.*, **125**, 3041–3072.

Schultz, D. M., W. E. Bracken, L. F. Bosart, **G. J. Hakim**, M. A. Bedrick, M. J. Dickinson, and K. R. Tyle, 1997: The 1993 Superstorm cold surge: Frontal structure, gap flow, and tropical impact. *Mon. Wea. Rev.*, **125**, 5–39.

Hakim, G. J., D. Keyser, and L. F. Bosart, 1996: The Ohio Valley wave-merger cyclogenesis event of 25–26 January 1978. Part II: Diagnosis using quasigeostrophic potential vorticity inversion. *Mon. Wea. Rev.*, **124**, 2176–2205.

Bosart, L. F., **G. J. Hakim**, K. R. Tyle, M. A. Bedrick, W. E. Bracken, M. J. Dickinson, and D. M. Schultz, 1996: Large-scale antecedent conditions associated with the 12–14 March 1993 cyclone (“Superstorm ’93”) over eastern North America. *Mon. Wea. Rev.*, **124**, 1865–1891.

Hakim, G. J., L. F. Bosart, and D. Keyser, 1995: The Ohio Valley wave-merger cyclogenesis event of 25–26 January 1978. Part I: Multiscale case study. *Mon. Wea. Rev.*, **123**, 2663–2692.

Hakim, G. J., and L. W. Uccellini, 1992: Diagnosing coupled jet-streak circulations for a Northern Plains snow band from the operational nested-grid model. *Wea. Forecasting*, **7**, 26–48.

Hakim, G. J., 1992: The eastern United States side-door cold front of 22 April 1987: A case study of an intense atmospheric density current. *Mon. Wea. Rev.*, **120**, 2738–2762.

OTHER PUBLICATIONS

- Hakim, G. J., 2001: Review of *An Introduction to Atmospheric Physics*, by David Andrews. *Eos* **82**, p. 502.
- Hakim, G. J., 2000: Review of *Atmospheric Dynamics*, by John Green. *Eos* **81**, p 129.
- Hakim, G. J., 1999: Cyclogenesis by tropopause coherent structures. **Preprints Eighth Conference on Mesoscale Processes**, Boulder, Colorado, Amer. Meteor. Soc., 200–202.
- Hakim, G. J., and D. J. Muraki, 1999: Tropopause dynamics beyond quasigeostrophy. **Preprints Twelfth Conference on Atmospheric and Oceanic Fluid Dynamics**, New York, New York, Amer. Meteor. Soc., 50–52.
- Hakim, G. J., and D. Keyser, 1997: Tropopause-based precursors to extratropical cyclogenesis: Coherent structures or Rossby waves? **Preprints Eleventh Conference on Atmospheric and Oceanic Fluid Dynamics**, Tacoma, Washington, Amer. Meteor. Soc., J15–J19.
- Hakim, G. J., D. Keyser, and L. F. Bosart, 1996: Diagnosis of tropopause- based coherent structures. **Preprints Seventh Conference on Mesoscale Processes**, Reading, United Kingdom, Amer. Meteor. Soc., 17–20.
- Hakim, G. J., D. Keyser, and L. F. Bosart, 1994: Diagnosis of wave–merger cyclogenesis through quasi-geostrophic potential vorticity inversion. **Preprints International Symposium on the Life Cycles of Extratropical Cyclones**, Vol. II, S. Grønås and M. A. Shapiro, Eds., Geophysical Institute, University of Bergen, Norway, 221–226.
- Bishop, C., D. Keyser, and **G. J. Hakim**, 1994: Vorticity constraints at horizontal boundaries and their implications for pv thinking. **Preprints International Symposium on the Life Cycles of Extratropical Cyclones**, Vol. II, S. Grønås and M. A. Shapiro, Eds., Geophysical Institute, University of Bergen, Norway, 127.
- Bleck, R., H. Bluestein, L. Bosart, W. E. Bracken, T. Carlson, J. Chapman, M. Dickinson, J. R. Gyakum, G. Hakim, E. Hoffman, H. Iskenderian, D. Keyser, G. Lackmann, W. Nuss, P. Roebber, F. Sanders, D. Schultz, K. Tyle, and P. Zwack, 1993: Eighth cyclone workshop scientific summary, Val Morin, Quebec, Canada, 12-16 October 1992. *Bull. Amer. Meteor. Soc.*, **74**, 1361–1373.
- Hakim, G. J., and L. W. Uccellini, 1991: Diagnosing coupled jet streak circulations for a northern plains snow band from the operational nested-grid model. **Preprints First International Symposium on Winter Storms**, New Orleans, La., Amer. Meteor. Soc., 90–96.

RESEARCH GRANTS and CONTRACTS

Agency: Vaisalla Corporation

Dates: Effective 1 October 2006–September 30, 2007.

Role: Co-Principal Investigator.

Amount: \$49,000

Title: “Assimilation of Lightning Data for Use in Mesoscale Model Forecasts over the Pacific Ocean.”

Agency: NASA

Dates: Effective 18 December 2006–September 30, 2009.

Role: Co-Principal Investigator.

Amount: \$307,374

Title: “A Comprehensive Regional Air Quality Decision Support System in the Pacific Northwest.”

Agency: **National Science Foundation**

Title: “Downstream Development over the North Pacific Ocean.”

Dates: December 15, 1999–November 30, 2002.

Role: Principal Investigator.

Amount: \$295,882

Agency: **National Science Foundation**

Title: “Balanced Dynamics.”

Dates: 1 December 2002–30 November 2005.

Role: Principal Investigator.

Amount: \$249,893

Agency: **National Science Foundation (CMG)**

Title: “CMG Collaborative Research: Anisotropic Atmospheric Dynamics Across a Wide Range of Scales.”

Dates: 1 August 1, 2003–July 31, 2007.

Role: Co-Principal Investigator.

Amount: \$655,625

Agency: **National Science Foundation (ITR)**

Title: “Ensemble-Based State Estimation for a Next-Generation Weather Forecasting Model.”

Dates: 15 September 2002–30 August 2006.

Role: Co-Principal Investigator.

Amount: \$287,722

Agency: **National Oceanic and Atmospheric Administration**

Title: “Regional Weather Analysis and Prediction.”

Dates: 1 June 2003–31 May 2006.

Role: Co-Principal Investigator.

Amount: \$373,900

Agency: **Boeing Company**

Title: “Observing System Simulation Experiments for the Impact of Future Aircraft Instrumentation on Weather Analyses and Forecasts”

Dates: 1 June 2005–30 November 2005.

Amount: \$39,167

Agency: **Office of Naval Research**

Title: “Tropical Predictability”

Dates: 1 April 2006–31 March 2009.

Role: Co-Principal Investigator.

Amount: \$278,924

Agency: **National Science Foundation (ATM & OPP)**

Title: “Dynamics and predictability of extratropical vortices”

Dates: 1 August 2006–31 July 2009.

Role: Co-Principal Investigator.

Amount: \$277,784

PROFESSIONAL EXPERIENCE

Associate Editor, *Journal of the Atmospheric Sciences*, 2005–present.

Associate Editor, *Monthly Weather Review*, 2000–2003.

Editorial Board Member, *Journal of Atmospheric and Ocean Science*, 2001–2006.

Board on Enterprise Communication, American Meteorological Society (2006–present).

Modern Applied Mathematics for the Atmospheric and Oceanic Sciences, University of California at Los Angeles, invited lecturer, July 2003.

“Developments in Dynamical Meteorology,” session co-convener, EGS-AGU-EGU Joint Assembly, Nice, France, April 2003.

University Corporation for Atmospheric Research, Member Representative.

Committee on Atmosphere–Ocean Fluid Dynamics, American Meteorological Society (2005–present).

Reviewer for: *Journal of the Atmospheric Sciences*, *Monthly Weather Review*, *The Quarterly Journal of the Royal Meteorological Society*, *Journal of Climate*, *Weather and Forecasting*, *Dynamics of Atmospheres and Oceans*, *Atmosphere–Ocean*, *Journal of Geophysical Research*, *the National Science Foundation*, *EOS*, and *Tellus*.

HONORS

Annual Teaching Award, Department of Atmospheric Sciences, University of Washington, 2000.

The Father James B. Macelwane Annual Awards in Meteorology, American Meteorological Society, 1991, Second Place.

The Father James B. Macelwane Annual Awards in Meteorology, American Meteorological Society, 1990, Second Place.

Narayan Gokhale Award, University at Albany, Dept. of Atmospheric Science, 1990.

University at Albany Presidential Award for Undergraduate Research, 1989, 1990.

Excellence in Research Award, College of Science and Mathematics, University at Albany, 1990.

Phi Beta Kappa.

Sigma Xi, Associate Member.

Sigma Pi Sigma (National Honor Society in Physics).

Signum Laudus (University at Albany Honor Society).

UNIVERSITY of WASHINGTON COMMITTEES

Royalty Research Fund Review Committee (Physical Sciences/Engineering Subcommittee) (2006–present)

Atmospheric Sciences Graduate Program Coordinator, 2006–present.

Faculty Senate representative, 2005–present.

Faculty Search Committee, 2004, Atmospheric Sciences department.

Strategic Planning Committee, 2003–present, Atmospheric Sciences department.

Committee on Qualifying Procedures for the Ph.D. in Atmospheric Sciences, 2002.

Qualifying Examination Committee, 2000–2001, Atmospheric Sciences department.

Undergraduate Curriculum Committee, Atmospheric Sciences department, 2003–present.

Committee on Atmospheric Sciences' Internet Pages, 2002–present.

THESIS and DISSERTATION

Hakim, G. J., 1997: Extratropical Cyclogenesis in Terms of Baroclinic Vortex Dynamics. Ph.D. Dissertation, Department of Earth and Atmospheric Sciences, University at Albany, State University of New York, 210 pp.

Hakim, G. J., 1993: Diagnosis of the Ohio Valley wave–merger cyclogenesis event of 25–26 January 1978. M.S. Thesis, Department of Atmospheric Science, University at Albany, State University of New York, 109 pp.

CONFERENCE, WORKSHOP, AND SYMPOSIA PRESENTATIONS

Hakim, G. J., 2006: Balance and imbalance defined by state estimation. Spontaneous Imbalance Workshop 1: Perspectives from atmospheric and oceanic dynamics. Seattle, WA, August 2006. (**invited**)

Hakim, G. J., and R. D. Torn, 2006: Performance Characteristics of a Pseudo-operational Ensemble Kalman Filter. Ensemble Data Assimilation Workshop. Marble Falls, TX, April 2006. (**invited**)

Hakim, G. J., 2006: State Estimation and Adaptive Control in Atmospheric Science. Robotics, Controls and Mechatronics Colloquium, University of Washington, Seattle, WA. March 2006. (**invited**)

Hakim, G. J., 2005: Ensemble estimation of balanced dynamics. Fourteenth Conference on Atmospheric and Oceanic Fluid Dynamics, Cambridge, MA, June 2005.

Hakim, G. J., and P. Gauthier, 2005: New approaches to data assimilation. THORPEX Pacific Predictability Experiment meeting, Seattle, WA, June 2005.

Hakim, G. J., 2005: CSTAR Report on a regional real-time ensemble Kalman filter. NCEP/NWS headquarters. April 2005.

Hakim, G. J., 2004: Toward a real-time mesoscale ensemble Kalman filter. A Community

Meeting on Real-time and Retrospective Mesoscale Objective Analysis: An Analysis of Record Summit, Boulder, CO, June 2004. (**invited**)

Hakim, G. J., and A. K. Canavan, 2003: Theory and observations of tropopause vortex asymmetries. Twelfth Extratropical Cyclone Workshop, Val Morin, Quebec, Canada, September 2003.

Hakim, G. J., and A. K. Canavan, 2003: Observational analysis of balanced tropopause vortex asymmetries. Thirteenth Conference on Atmospheric and Oceanic Fluid Dynamics, San Antonio, Texas, June 2003.

Hakim, G. J., and A. K. Canavan, 2003: Observational analysis of tropopause vortex asymmetries. EGS-AGU-EGU Joint Assembly, Nice, France, April 2003.

Hakim, G. J., D. J. Muraki, and C. Snyder, 2003: Cyclone–Anticyclone vortex asymmetries in uniform-pv fluids. EGS-AGU-EGU Joint Assembly, Nice, France, April 2003.

Hakim, G. J., 2001: Developing wave packets in the North Pacific storm track. Thirteenth Conference on Atmospheric and Oceanic Fluid Dynamics, Breckenridge, CO, June 2001.

Hakim, G. J., 2001: Downstream development and error growth. THORPEX Science Plan Meeting, Monterey, CA, April 2001.

Hakim, G. J., C. Snyder, and D. J. Muraki, 2001: Balanced turbulence on the tropopause PV interface. European Geophysical Society 26th General Assembly, Nice, France, March 2001.

Hakim, G. J., 2000: Downstream development over the North Pacific Ocean. Eleventh Extratropical Cyclone Workshop, Pacific Grove, CA, August 2000. (**invited**)

Hakim, G. J., 1999: Cyclogenesis by tropopause coherent structures. Eighth Conference on Mesoscale Processes, Boulder, Colorado, June 1999.

Hakim, G. J., and D. J. Muraki, 1999: Tropopause dynamics beyond quasigeostrophy. Twelfth Conference on Atmospheric and Oceanic Fluid Dynamics, New York, New York, June 1999.

Hakim, G. J., and D. Keyser, 1997: Tropopause-based precursors to extratropical cyclogenesis: Dynamical interpretation in terms of coherent structures. Tenth Extratropical Cyclone Workshop, Val Morin, Quebec, Canada, September 1997.

Hakim, G. J., and D. Keyser, 1997: Are tropopause-based precursors to extratropical

cyclogenesis coherent structures or Rossby waves? 1997 Joint Assemblies of the International Association of Meteorology and Atmospheric Sciences & International Association for Physical Sciences of the Oceans, Melbourne, Australia, July 1997.

Hakim, G. J., and D. Keyser, 1997: Tropopause-based precursors to extratropical cyclogenesis: Coherent structures or Rossby waves? Eleventh Conference on Atmospheric and Oceanic Fluid Dynamics, Tacoma, Washington, June 1997.

Hakim, G. J., D. Keyser, and L. F. Bosart, 1996: Diagnosis of tropopause-based coherent structures. Seventh Conference on Mesoscale Processes, Reading, United Kingdom, September 1996.

Hakim, G. J., 1995: Are cyclogenesis precursor disturbances waves or vortices? Ninth Extratropical Cyclone Workshop, Asilomar Conference Center, Pacific Grove, CA, December 1995.

Hakim, G. J., D. Keyser, and L. F. Bosart, 1994: Diagnosis of wave-merger cyclogenesis through quasi-geostrophic potential vorticity inversion. International Symposium on the Life Cycles of Extratropical Cyclones, Bergen, Norway, June 1994.

Hakim, G. J., L. Bosart, and D. Keyser, 1993: An examination of trough merger and cyclogenesis through quasi-geostrophic potential vorticity diagnostics. AMS 13th Conference on Weather Analysis and Forecasting, Vienna, VA, August 1993.

Hakim, G. J., L. F. Bosart, and D. Keyser, 1992: A potential vorticity perspective on trough phasing for a case of extreme continental cyclogenesis. Eighth Cyclone Workshop, Val Morin, Quebec, Canada, October 1992.

Hakim, G. J., 1990: The eastern United States sidedoor cold front: A case study of an intense atmospheric density current. AMS Fourth Conference on Mesoscale Processes, Boulder, CO, June 1990.

OTHER SEMINAR PRESENTATIONS

Ensemble Synoptic Analysis. University of Wisconsin—Madison, 12 April 2004 (**invited**).

Ensemble Synoptic Analysis. University of Chicago, 23 April 2004 (**invited**).

Ensemble Synoptic Analysis. University of Washington, 16 April 2004.

Unifying ensemble prediction and data analysis with a Kalman filter. University of

Washington, 10 January 2003.

Planetary-scale modes of the atmospheric annual cycle. Department of Atmospheric Sciences, University of Washington, 6 December 2002.

A Floquet analysis of the atmospheric planetary-scale circulation. Simon Fraser University, 15 November 2002. (**invited**).

A Floquet analysis of the atmospheric planetary-scale circulation. Department of Applied Mathematics, U. Washington, 29 October 2002. (**invited**)

Downstream development over the North Pacific Ocean. University of Washington, 14 November 2000.

Observationally Motivated Initial-Value Problems on Cyclogenesis. Massachusetts Institute of Technology, 22 September 1999 (**invited**).

Tropopause Dynamics Beyond Quasigeostrophy. University of Washington, 15 April 1999.

Tropopause-based Coherent Structures and Their Role in Surface Cyclogenesis. University of Wisconsin—Madison, 27 April 1998 (**invited**).

Tropopause-based Coherent Structures and Their Role in Surface Cyclogenesis. University of Washington, Seattle, 9 April 1998 (**invited**).

Dynamics of Tropopause-based Coherent Structures and Their Role in Surface Cyclogenesis. Colorado State University, Fort Collins, 5 March 1998 (**invited**).

Tropopause-Based Precursors to Extratropical Cyclogenesis: Coherent Structures or Rossby Waves? National Center for Atmospheric Research, Boulder, Colorado, February 1997 (**invited**).

Diagnosis of the Ohio Valley wave–merger cyclogenesis event of 25–26 January 1978. Meteorologische Institute der Universität München, München, Germany, July 1994.

Diagnosis of the Ohio Valley wave–merger cyclogenesis event of 25–26 January 1978. University at Albany, State University of New York, December 1993.

Diagnosing coupled jet streak circulations for a northern plains snow band from the operational nested-grid model. National Meteorological Center, Camp Springs, Maryland, 10 January 1990 (**invited**).

EDUCATION

Ph.D. Atmospheric Science, University at Albany, May 1997

(Advisors: Prof. Lance F. Bosart and Prof. Daniel Keyser).

M.S. Atmospheric Science, University at Albany, December 1993.

(Advisors: Prof. Lance F. Bosart and Prof. Daniel Keyser).

B.S. with honors, Atmospheric Science and Mathematics, University at Albany, May 1990.

OTHER EDUCATION

Participant in the Summer Institute on Atmospheres, NASA/Goddard Space Flight Center, summer 1989.

FIELD EXPERIENCE

Stormscale Operational and Research Meteorology- Fronts Experiment Systems Test (STORM-FEST) 1992.

Experiment on Rapidly Intensifying Cyclones over the Atlantic (ERICA) 1989.