Professor Dale R. Durran

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Education

California State Polytechnic University at San Luis Obispo	Mathematics	B.S.	1974
University of California at Berkeley	Mathematics	M.S.	1975
Massachusetts Institute of Technology	Meteorology	Ph.D.	1981

Appointments

2007–present	Professor and Chair, Department of Atmospheric Sciences, University of Washington, Seattle, Washington
1996–2007	Professor, Department of Atmospheric Sciences, University of Washington, Seattle, Washington
1990–1996	Associate Professor, Department of Atmospheric Sciences, University of Washington, Seattle, Washington
1987-1990	Assistant Professor, Department of Atmospheric Sciences, University of Washington, Seattle, Washington
1983–1987	Assistant Professor, Department of Meteorology, University of Utah, Salt Lake City, Utah
1981–1983	Post-Doctoral Fellow, National Center for Atmospheric Research, Boulder, Colorado
1976–1977	Staff Scientist, Systems Applications Inc., San Rafael, California (Numerical modeling of air pollution)

Honors

Fellow of the American Meteorological Society (AMS)

Meetings Organized as co-chair

5th AMS Conference on Mesoscale Processes, Atlanta, GA, 1992.
12th AMS Conference on Mountain Meteorology, Santa Fe, NM, 2006.

Textbook

Durran, D.R., 1999: *Numerical Methods for Wave Equations in Geophysical Fluid Dynamics*. New York: Springer-Verlag, ISBN 0-387-98376-7, 465 p.

Refereed Publications

[1] Lamb, R., and D.R. Durran, 1978: Eddy diffusivities derived from a numerical model of the convective planetary boundary layer. *Il Nouvo Cimento,* **1,** 1-17.

[2] Durran, D.R., M. Meldgin and M.K. Liu, 1979: A study of long-range air pollution problems related to coal development in the Northern Great Plains. *Atmospheric Environment,* **13,** 1021-1037.

[3] Durran, D.R., and J.B. Klemp, 1982: The effects of moisture on trapped mountain lee waves. *J. Atmos. Sci.,* **39,** 2490-2506.

[4] Durran, D.R., and J.B. Klemp, 1982: On the effects of moisture on the Brunt-Väisälä frequency. *J. Atmos. Sci.,* **39,** 2152-2158.

[5] Klemp, J.B., and D.R. Durran, 1983: An upper boundary condition permitting internal gravity wave radiation in numerical mesoscale models. *Mon. Wea. Rev.,* **111,** 430-444.

[6] Durran, D.R., and J.B. Klemp, 1983: A compressible model for the simulation of moist mountain waves. *Mon. Wea. Rev.,* **111,** 2341-2361.

[7] Grossman, R.L., and D.R. Durran, 1984: Interaction of low level flow with the Western Ghat mountains and off-shore convection in the summer monsoon. *Mon. Wea. Rev.,* **112,** 652-672.

[8] Durran, D.R., and R.L. Grossman, 1985: Reply. *Mon. Wea. Rev.,* **113,**, 2178-2181.

[9] Durran, D.R., 1986: Mountain waves. *Mesoscale Meteorology and Forecasting,* P. Ray Ed., American Meteorological Society, Boston, 472-492.

[10] Bower, J.B., and D.R. Durran, 1986: A study of wind profiler data collected upstream during windstorms in Boulder, Colorado. *Mon. Wea. Rev.,* **114,** 1491-1500.

[11] Durran, D.R., 1986: Another look at downslope windstorms. Part I: On the development of analogs to supercritical flow in an infinitely deep continuously stratified fluid. *J. Atmos. Sci.,* **93,** 2527-2543.

[12] Klemp, J.B., and D.R. Durran, 1987: Numerical modelling of bora winds. *Meteorol. Atmos. Phys.,* **36,** 215-227.

[13] Durran, D.R., and L.W. Snellman, 1987: On the diagnosis of synoptic-scale vertical motion in an operational environment. *Weather and Forecasting,* **2,**, 17-31.

[14] Durran, D.R., and J.B. Klemp, 1987: Another look at downslope winds. Part II: Nonlinear amplification beneath wave-overturning layers. *J. Atmos. Sci.,* **44,** 3402-3412.

[15] Durran, D.R., and D.B. Weber, 1988: An investigation of the poleward edges of cirrus clouds associated with mid-latitude jet streams. *Mon. Wea. Rev.*, **116,** 702-714.

[16] Durran, D.R., 1988: A note on the physical mechanism for Rossby wave propagation. *J. Atmos. Sci.*, **45,** 4020-4022.

[17] Durran, D.R., and L.W. Snellman, 1988: Reply. *Weather and Forecasting,* **3,** 348.

[18] Durran, D.R., 1989: Improving the anelastic approximation. *J. Atmos. Sci.*, **46,** 1453-1461.

[19] Durran, D.R., 1990: Mountain waves and downslope winds. *Atmospheric Processes over Complex Terrain,* B. Blumen Ed., American Meteorological Society, Boston, 59-81.

[20] Durran, D.R., 1990: Reply. *J. Atmos. Sci.,* **47,** 1819-1820.

[21] Durran, D.R., 1991: The third-order Adams-Bashforth method: an attractive alternative to leapfrog time differencing. *Mon. Wea. Rev.*, **119,** 702-720.

[22] Miller, P.P., and D.R. Durran, 1991: On the sensitivity of downslope windstorms to the asymmetry of the mountain profile. *J. Atmos. Sci.*, **48,** 1457-1473.

[23] Durran, D.R., 1992: Two-layer solutions to Long's equation for vertically propagating mountain waves: How good is linear theory? *Quart. J. Roy. Meteor. Soc.,* **118,** 415-433.

[24] Fovell, R., D. Durran and J.R. Holton, 1992: Numerical simulations of convectively generated waves in the stratosphere. *J. Atmos. Sci.,* **49,** 1427-1442.

[25] Durran, D.R., M.J. Yang, D.N. Slinn and R.G. Brown, 1993: Towards more accurate wave-permeable boundary conditions. *Mon. Wea. Rev.,* **121,** 604-620.

[26] Durran, D.R., 1993: Comments on "On the Richardson number dependence of nonlinear critical-layer flow over localized topography." *J. Atmos. Sci.,* **50,** 3029-3033.

[27] Pandya, R., D.R. Durran and C. Bretherton, 1993: Comments on "Thermally forced gravity waves in an atmosphere at rest". *J. Atmos. Sci.,* **50,** 4097-4101.

[28] Durran, D.R., 1993: Is the Coriolis force really responsible for the inertial oscillation? *Bull. Amer. Meteo. Soc.,* **74,** 2179-2184.

[29] Nance, L.B., and D.R. Durran, 1994: A comparison of three anelastic systems and the pseudo-incompressible system. *J. Atmos. Sci.,* **51,** 3549-3565.

[30] Alexander, J.M., J.R. Holton and D.R. Durran, 1995: The gravity wave response above deep convection in a squall line simulation. *J. Atmos. Sci.,* **52,**, 2212-2226.

[31] Durran, D.R., 1995: Pseudomomentum Diagnostics for Two-Dimensional Stratified Compressible Flow. *J. Atmos. Sci.,* **52,** 3997-4009.

[32] Durran, D.R., 1995: Do Breaking Mountain Waves Decelerate the Local Mean Flow? *J. Atmos. Sci.,* **52,** 4010-4032.

[33] Durran, D.R., and S.K. Domonkos, 1996: An Apparatus for Demonstrating the Inertial Oscillation. *Bull. Amer. Meteo. Soc.,* **77,** 557-559.

[34] Pandya, R.E., and D.R. Durran, 1996: The influence of convectively generated thermal forcing on the mesoscale circulation around squall lines. *J. Atmos. Sci.*, **53,** 2924-2951.

[35] Schär, C., and D.R. Durran, 1997: Vortex formation and vortex shedding in continously stratified flows past isolated topography. *J. Atmos. Sci.*, **54,** 534-554.

[36] Nance, L.B., and D.R. Durran, 1997: A modeling study of nonstationary trapped mountain lee waves. Part I: Mean flow variability. *J. Atmos. Sci.,* **54,** 2275-2291.

[37] Smith, R., J. 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. Meteo. Soc.*, **78,** 877-892.

[38] Nance, L.B., and D.R. Durran, 1998: A modeling study of nonstationary trapped mountain lee waves. Part II: Nonlinearity. *J. Atmos. Sci.,* **55,** 1429-1445.

[39] Pandya, R.E., D.R. Durran and M.L. Weisman, 2000: The influence of convective thermal forcing on the mesoscale circulation around three-dimensional squall lines. *J. Atmos. Sci.*, **57,** 29-45.

[40] Doyle, J.D., D.R. Durran, C. Chen, M. Georgelin, V. Grubisic, W.R. Hsu, C.Y. Huang, D. Landau, Y.L. Lin, G.S. Poulos, W.Y. Sun, D.B. Weber, M.G. Wurtele, and M. Xue, 2000: An intercomparison of model predicted wave breaking for the 11 January 1972 Boulder windstorm. *Mon. Wea. Rev.,* **128,** 901-914.

[41] Durran, D.R., 2000: Wave Propagation in Quadratic-Finite-Element Approximations to Hyperbolic Equations. *J. Comput. Phys.*, **159,** 448-455.

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[52] Durran, D.R., T. Maric, R.M. Banta, and L.S. Darby, 2003: A comparison of ground-based Doppler lidar and airborne in situ wind observations. *Q. J. R. Meteorol. Soc.*, **129,** 693-713.

53] Durran, D.R., and P.A. Reinecke, 2004: Instability in explicit two-time-level semi-

Lagrangian schemes. *Q. J. R. Meteorol. Soc.*, **130,** 365-369.

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[55] Kirshbaum, D.J. and D.R. Durran, 2004: Factors governing cellular convection in orographic precipitation. *J. Atmos. Sci.,* **61,** 682-698.

[56] Mayr, G.J., L. Armi, S. Arnold, R.M. Banta, L.S. Darby, D.R. Durran, C. Flamant, S. Gaberšek, A. Gohm, R. Mayr, S. Mobbs, L.B. Nance, I. Vergeiner, J. Vergeiner, C.D. Whiteman, 2004: Gap flow measurements during the Mesoscale Alpine Programme. *Meteorol. Atmos. Phys.,* **86,** 99-119.

[57] D.R. Durran and C. Bretherton, 2004: Comments on "The roles of the horizontal component of the Earth's angular velocity in nonhydrostatic linear models." *J. Atmos. Sci.,* **61,** 1982-1986.

[58] Gaberšek, S.A., and D.R. Durran, 2004: The dynamics of gap flow over idealized topography: Part I: Forcing by large-scale winds in the nonrotating limit. *J. Atmos. Sci.,* **61,** 2846-2862.

[59] Kirshbaum, D.J. and D.R. Durran, 2005: Observations and Modeling of Banded Orographic Convection. *J. Atmos. Sci.,* **62,** 1463-1479.

[60] Mullendore, G.L., D.R. Durran and J.R. Holton, 2005: Cross-tropopause tracer transport in midlatitude convection. *J. Geophys. Res.,* 110, D06113, doi:10.1029/2004JD005059.

[61] 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.

[62] Kirshbaum, D.J. and D.R. Durran, 2005: Atmospheric factors governing banded orographic convection. *J. Atmos. Sci.,* **62,** 3758-3774.

[63] Gaberšek, S.A., and D.R. Durran, 2006: The dynamics of gap flow over idealized topography: Part II. Effects of rotation and surface friction. *J. Atmos. Sci.,* **63,** 2720-2739.

[64] Stiperski, I., I. Kavčič, B. Grisogono, and D.R. Durran, 2007: A modified Prandtl model of katabatic flow with Coriolis effect. *Q. J. R. Meteorol. Soc.*, **133,** 101-106.

[65] Kirshbaum, D.J., G.H. Bryan, R. Rotunno and D.R. Durran, 2007: The triggering of orographic rainbands by small-scale topography. *J. Atmos. Sci.,* **64,** 1530-1549.

[66] Anders, A.M., G.H. Roe, D.R. Durran and J.R. Minder, 2007: Small-scale spatial gradients in climatological precipitation on the Olympic Pennisula. *J. Hydrometeorology*, **8,** 1068-1081.

[67] 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.

[68] Mayr, G.J., L. Armi, A. Gohm, G. Zängl, D.R. Durran, C. Flamant, S. Gabersĕk, S. Mobbs, A. Ross and M. Weissmann, 2007: Gap flows: results from the Mesoscale Alpine Programme MAP. *Quart. J. Roy. Meteorol. Soc.*, **133,** 881-896.

[69] Doyle, J.D. and D.R. Durran, 2007: Rotor and sub-rotor dynamics in the lee of three-dimensional terrain. *J. Atmos. Sci.,* **64,** 4202-4221.

[70] Durran, D.R. and A. Arakawa, 2007: Generalizing the Boussinesq approximation to stratified compressible flow. *Comps Rendus Mecanique,* **355,** 655-664.

[71] Reinecke, P.A. and D.R. Durran, 2008: Estimating topographic blocking using a Froude number when the static stability is non-uniform. *J. Atmos. Sci.,* **65,** 1035-1048.

[72] Durran, D.R., 2008: A physically motivated approach for filtering acoustic waves from the equations governing compressible stratified flow. *J. Fluid Mech.,* **601,** 365-379.

[73] Blossey, P.N. and D.R. Durran, 2008: Selective monotonicity preservation in scalar advection. *J. Comput. Phys.,* **227,** 5160-5183.

[74] Minder, J.R., D.R. Durran, G.H. Roe and A.M. Anders, 2008: The climatology of small-scale precipitation over the Olympic mountains: Patterns and processes. *Q. J. R. Meteorol. Soc.*, in press.

[75] Maric, T. and D.R. Durran, 2008: Observations of gap flow in the Wipp Valley on 20 October 1999: Are they consistent with the shallow-water model? *J. Atmos. Sci.,* accepted subject to revision,

[76] Harris, L.M. and D.R. Durran, 2008: Lee vortices in evolving large-scale flows. *J. Atmos. Sci.,* accepted subject to revision.

[77] Reinecke, P.A. and D.R. Durran, 2008: The over-amplification of gravity waves in numerical solutions for flow over topography. *Mon. Wea. Rev.,* submitted.

Selected Unrefereed Publications

Durran, D.R., 1975: The Inverse Liouville Transformation. Master's Thesis, Department of Mathematics, University of California at Berkeley.

Durran, D.R., 1981: The effects of moisture on mountain lee waves. Ph.D Thesis, Department of Meteorology, Massachusetts Institute of Technology.

Sethian, J.A., D.R. Durran, D. Dee and D.L. Williamson, 1981: Normal modes of an atmospheric prediction model. *NCAR Tech. Note:* NCAR/TN–186+STR, Boulder, National Center for Atmospheric Research.

Durran, D.R. and J.B. Klemp, 1982: A nonhydrostatic mountain wave model with radiating boundary conditions. *Collection of Lecture Notes on Mesoscale Models,* Proc. of CIMMS Symposium, Norman Oklahoma. University of Oklahoma—National Oceanic and Atmospheric Administration, 187-206.

Stankov, B.B., D.R. Durran and J.B. Klemp, 1982: A preliminary analysis of lee waves over the Alps as observed by aircraft during ALPEX. *ALPEX Preliminary Results:* GARP-ALPEX No. 7, WMO, Geneva, Switzerland, 205-217.

Lilly, D.K. and D.R. Durran, 1982: Stably stratified airflow over mountainous terrain. *Proc. First Sino-American Workshop on Mountain Meteorology,* E.R. Reiter, Z. Baozhen, Q. Yongfu eds., Science Press, Beijing and American Meteorological Society, Boston, 569-608.

Durran, D.R., 1982: *Rocky Mountain Wave Clouds.* Color movie originally available through

Publications Office, National Center for Atmospheric Research, Boulder, CO; now available on CD directly from Durran.

Durran, D.R., and J.B. Klemp, 1986: Numerical modelling of moist airflow over topography. *Proc. International Symposium on the Qinghai-Xizang Plateau and Mountain Meteorology,* X. Yigang ed., Science Press, Beijing and American Meteorological Society, Boston, 960-974.

Durran, D.R., 1992: Orographic wave drag on the middle and lower troposphere—the importance of trapped waves. *Physical Processes in Atmospheric Models*, D.R. Sikka and S.S. Singh eds., Wiley Eastern Limited, New Delhi, 319-332.

Holton, J.R., and D.R. Durran, 1993: Convectively generated stratosopheric gravity waves: the role of mean wind shear. *Coupling Processes in the Lower and Middle Atmosphere,* E.V. Thrane et al (eds.), Kluwer Academic Publishers, 175-189.

Durran, D.R., 2001: Open Boundary Conditions: Fact and Fiction. *IUTAM Symposium on Advances in Mathematical Modelling of Atmosphere and Ocean Dynamics,* P.F. Hodnett, Ed., Kluwer Academic Publishers, 1-18.

Students Supervised (degree and current affiliation)

J. Brent Bower	M.S.	NOAA	Seattle, WA
Peter Miller	M.S.	RETEC Group	Fort Collins, CO
Daniel Weber	M.S.	CAPS	Norman, OK
Stephen Ascher	M.S.	unknown	—
Simon Ward	M.S.	unknown	—
Marie Ammerman	M.S.	PPM Energy	Portland, OR
Louisa Nance	Ph.D	NCAR	Boulder, CO
Rajul Pandya	Ph.D	NCAR	Boulder, CO
Craig Epifanio	Ph.D	Texas A&M	College Station, TX
Claudio Piani	Ph.D	Intl. Centre Theor. Physics	Trieste, Italy
Gretchen Mullendore	Ph.D	U. North Dakota	Grand Forks, ND
Saša Gaberšek,	Ph.D	NRL	Monterey, CA
Daniel Kirshbaum	Univ. of Reading	Reading	UK
Chih-Chieh Chen	Ph.D	NCAR	Boulder, CO
Tomislav Marič	Ph.D	U. Washington	Seattle, WA