

## Curriculum Vitae, January 2020

### Darryn W Waugh

Dept. of Earth and Planetary Sciences,  
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#### EDUCATION

| <u>College/University</u>     | <u>Major</u>  | <u>Degree &amp; Year</u> |
|-------------------------------|---------------|--------------------------|
| University of Waikato, N.Z.   | Mathematics   | BSc, 1986                |
| University of Waikato, N.Z.   | Mathematics   | MSc, 1988                |
| University of Cambridge, U.K. | Applied Math. | PhD, 1992                |

#### PROFESSIONAL APPOINTMENTS

Jul. 04 to present - Johns Hopkins University; Professor.  
Jan. 17 to present - University of New South Wales; Professor.  
Jan. 07 to Jun. 12 - Johns Hopkins University; Chair of E&PS  
Jan. 01 to Jun. 04 - Johns Hopkins University; Associate Professor.  
Jan. 98 to Dec. 00 - Johns Hopkins University; Assistant Professor.  
Jan. 95 to Dec. 97 - Monash University, Australia; Research Fellow  
Jan 92 to Dec 94 - MIT, USA; post-doctoral fellow.

#### PRIZES AND AWARDS

- Stanley Jackson Award for Ndarana and Waugh paper (award by South African Society of Atmospheric Sciences), 2012
- AGU Editors Citation for Excellence in Refereeing (2006).
- NASA Group Achievement Award for SOLVE campaign (2001).
- AGU Editors Citation for Excellence in Refereeing (1999).
- NASA Group Achievement Award for POLARIS campaign (1998).
- AGU Editors Citation for Excellence in Refereeing (1995).
- NASA Group Achievement Award for ASHOE/MAESA campaign (1995).
- Francois N. Frenkiel award (for Phys. Fluids paper) (1993).
- J.T. Knight Prize (for student essay) (1990).
- U.K. Commonwealth Scholarship (1988).

#### PROFESSIONAL SERVICE

- AMS Middle Atmosphere committee (1999-2004); Chair (2001-2004)
- AGU Atmospheric Dynamics committee (1999-)
- International Commission on the Middle Atmosphere (ICMA) committee (1999-)
- Lead author of chapter 2 of 1998 NASA "Scientific Assessment of the Atmospheric Effects of Stratospheric Aircraft"
- Co-author of chapter 7 of 1998 WMO/UNEP "Scientific Assessment of Ozone Depletion"

- Lead author of chapter 6 of 2006 WMO/UNEP “Scientific Assessment of Ozone Depletion”
- Co-author of chapter 4 of 2014 WMO/UNEP “Scientific Assessment of Ozone Depletion”
- Executive Committee SPARC CCMVal / CCMi (2003-2013)
- Editor, Journal of Climate (2016-)

## **STUDENT AND POSTDOCTORAL ADVISING**

### *PhD Graduate Students:*

- Ping-ping Rong (PhD 2003) now at Hampton University,
- Andrea Molod (PhD 2004) now at NASA GSFC,
- Beatriz Funasti (PhD 2006) now at LMD Paris
- Hong Zhang (PhD 2006), now at JPL,
- Ju-Mee Ryou (PhD 2009), now at UC Berkely,
- Thando Ndarana (PhD 2010) now at South African Weather Service,
- Scott Guzewich (PhD 2013) now at NASA GSFC.
- Chang Lang (PhD 2013) now in private sector
- Jordan Thomas (PhD 2018) now in private sector
- Olga Tweedy (PhD 2018) now at NASA GSFC
- Anna Scott (PhD 2018) now in private sector
- Gaige Kerr (current).
- Molly Menzel (current)
- Jacob Shultis (current)

### *Undergraduates:*

- Margaret Hurwitz (Senior Thesis, 2003)
- Kathleen Schiro (Senior Thesis 2011)
- Arlene Alpert (Senior Thesis 2012)
- Chloe Gao (Senior Thesis 2013)

### *Postdoctoral fellows:*

- Jun Ma (2000-2002) now research scientist at NRL
- Luke Oman (2006-2009) now research scientist at at NASA GSFC.
- Chaim Garfinkel (2011-2013) now faculty at Hebrew University, Israel.
- Lei Wang (2011-2103) now research scientist at Columbia University.
- Rolando Olivas-Saunders (2013-2015)
- William Servior (2014-2018) now faculty at University of Exter
- Huang Yang (2015-2019) now research scientist at UCLA

## PUBLICATIONS

Google Scholar: [https://scholar.google.com/citations?user=fDDIf\\_AAAAAJ&hl=en](https://scholar.google.com/citations?user=fDDIf_AAAAAJ&hl=en)  
ResearcherID: <http://www.researcherid.com/rid/K-3688-2016>

1. Hosking R.J., Sneyd A.D., and Waugh, D.W. Viscoelastic response of a floating ice plate to a steadily moving load. *J. Fluid Mech.*, 196,409-430, 1988.
2. Waugh, D.W. and Dritschel, D.G., The stability of filamentary vorticity in two-dimensional geophysical vortex-dynamics models. *J. Fluid Mech.*, 231, 575-598, 1991.
3. Waugh, D.W., Forced vortex merger. In 1991 Summer Study in Geophysical Fluid Dynamics. Woods Hole Oceanographic Institution Technical Report, 1991.
4. Waugh, D.W., The efficiency of symmetric vortex merger. *Phys. Fluid A.*, 4, 1745-1758, 1992.
5. Dritschel D.G. and Waugh D.W., Quantification of inelastic interactions of vortices in two dimensional vortex dynamics. *Phys. Fluids A.*, 4, 1737-1744, 1992.
6. Waugh, D.W., Contour Surgery simulations of a forced polar vortex. *J. Atmos. Sci.*, 50, 714-730, 1993.
7. Waugh, D.W., Subtropical stratospheric mixing linked to disturbances on the polar vortices. *Nature*, 365, 535-537, 1993.
8. Plumb, R.A. and D.W. Waugh, High-resolution contour advection using NWP products. In ECMWF workshop on the Stratosphere and NWP, 1993.
9. Polvani, L.M., Waugh, D.W., and Plumb, R.A., On the subtropical edge of the stratospheric surf zone *J. Atmos. Sci.*, 52, 1288-1309, 1995. Waugh, D.W. and Plumb, R.A., Contour Advection with Surgery: A technique for investigating fine scale structure in tracer transport. *J. Atmos. Sci.*, 51, 530-540, 1994.
10. Waugh, D.W., Plumb, R.A., et al., Transport of material out of the stratospheric Arctic vortex by rossby wave breaking. *J. Geophys. Res.*, 99, 1071-1088, 1994.
11. Plumb, R.A., Waugh, D.W., et al., Intrusions into the lower stratospheric arctic vortex during the winter of 1991/92. *J. Geophys. Res.*, 99, 1089-1106, 1994.
12. Waugh, D.W., Polvani, L.M., and Plumb, R.A., Nonlinear, barotropic response to a localized topographic forcing: formation of a 'tropical surf zone' and its effect on interhemispheric propagation. *J. Atmos. Sci.* 51, 1401-1416, 1994.
13. Waugh, D.W., Plumb, R.A., et al., Fine-scale, poleward transport of tropical air during AASE 2. *Geophys. Res. Lett.* 21, 2603-2606, 1994 1994.
14. Polvani, L.M., Waugh, D.W., and Plumb, R.A., On the subtropical edge of the stratospheric surf zone *J. Atmos. Sci.*, 52, 1288-1309, 1995.
15. Polvani, L.M., Waugh, D.W., and Plumb, R.A., Reply *J. Atmos. Sci.*, 53, 2772-2775, 1996.
16. Waugh, D.W., Seasonal variation of transport out of the tropical stratosphere. *J. Geophys. Res.*, 101, 4007-4023, 1996.
17. Peters, D., and Waugh D.W., Influence of barotropic shear on the poleward advection of upper tropospheric air. *J. Atmos. Sci.*, 53, 3013-3031, 1996.
18. Hall, T. M. and Waugh, D.W., Tracer transport in the tropical stratosphere due to vertical diffusion and horizontal mixing, *Geophys. Res. Lett.*, 24, 1383-1387, 1997.
19. Waugh D.W, T.M. Hall, et al., Three-dimensional simulations of long-lived tracers using winds from MACCM2, *J. Geophys. Res.*, 102, 21493-21513, 1997.

20. Waugh, D.W., Plumb, R.A., et al., Mixing of polar vortex air into middle latitudes as revealed by tracer-tracer scatter plots. *J. Geophys. Res.* 102, 13119-13134,, 1997.
21. Waugh, D.W., Elliptical diagnostics of stratospheric polar vortices, *Q. J. R. Meteorol. Soc.* 123, 1725-1748, 1997.
22. Hall, M. and Waugh, D.W. Timescales for the Stratospheric Circulation Derived from Tracers *J. Geophys. Res.* 102, 8991-9001, 1997.
23. Sobel, A. , Plumb, R.A. and Waugh, D.W., On Methods of Calculating Transport Across the Polar Vortex Edge. *J. Atmos. Sci.*, 54, 2241-2260, 1997.
24. Waugh, D.W., J.M. Sisson, and D.J. Karoly, Predictive Skill of a NWP model in the Southern Lower Stratosphere, *Q. J. R. Meteorol. Soc.*, 125, 2181-2200, 1998.
25. Hall, T. M. and Waugh, D.W., The influence of nonlocal chemistry on tracer distributions: Inferring the mean age of air from SF6. *J. Geophys. Res.*, 103, 13327-13336, 1998.
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  42. Waugh, D.W., and Rong, P.P, Interannual Variability in the Decay of Lower Stratospheric Arctic Vortices. *J. Meteor. Soc. Japan*, 80, 997-1012, 2002.
  43. Hall, T.M., T.W.N. Haine, and D.W. Waugh, Inferring the Concentration of Anthropogenic Carbon in the Ocean from Tracers. *Global Biogeochem. Cycles*, 16, 10.1029/2001GB001835, 2002
  44. Peters, D., and Waugh D.W., Rossby Wave Breaking in the Southern Hemisphere Wintertime Upper Troposphere, *Mon. Wea. Rev.*, 131, 2623-2634, 2003.
  45. Molod, A., Salmun, H., and Waugh D.W., A new look at modeling surface heterogeneity: Extending its influence in the vertical. *J. Hydrometeorology*, 4, 810-825, 2003.
  46. Waugh, D.W., Hall, T.M., and T.W.N. Haine, Relationships among Tracer Ages, *J. Geophys. Res.*, 108, 5, 10.1029/2002JC001325, 2003
  47. Ma, J., Waugh, D.W., Douglass, A.R., and Kawa S.R., Evaluation of the transport in the GSFC 3D chemical transport model using the "Equivalent Length" diagnostic, *J. Geophys. Res.*, 108, 6, 10.1029/2002JD002268, 2003.
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74. Kvaleberg E., T.W.N. Haine., D.W. Waugh, Spreading of CFC-11 in the subpolar North Atlantic, *J. Geophys. Res.*, *J. Geophys. Res.*, 113, C08019, doi:10.1029/2007JC004104. 2008.
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95. Oman, L., et al.: Multi-model assessment of the factors driving stratospheric ozone evolution over the 21st century, *J. Geophys. Res.*, 115, D24306, doi:10.1029/2010JD014362.
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## RESEARCH GRANTS

### Current

- NASA Hemispheric differences in tropical lower stratospheric transport , 04/2017 to 05/2020, \$402K, PI
- NASA Transport from the Northern Hemisphere Midlatitude Surface 3/1/19-2/28/22, \$250K, Co-I
- NSF Hadley Cells and Subtropical Jets: Dynamics and Tracer Transport, 05/01/19-04/30/22, \$567K, PI
- NASA Atmospheric Transport in Polar Vortices on Mars and Titan, 10/01/2019-09/30/2022, \$ 361K, Co-I.

### Past

- NASA, "Transport and mixing in the stratosphere and troposphere from chemical tracer measurements", \$227,208, 4/1/98 to 3/30/01
- NASA, "Middleworld Transport Within Three-Dimensional Models: Characterization and Sensitivities to Model Formulation", \$203,206, 4/1/98 to 3/30/01.
- NASA, "Dynamical coupling of the troposphere with the polar stratosphere", \$119,376, 5/1/99 to 4/30/02.
- NSF, "Kinematics of the tropopause", \$42,861, 9/01/99 - 8/31/02.
- NASA, "Atmospheric Transport: Comparison of Observations and Models", \$105,752, 5/15/00 - 5/14/03.
- NSF "Tropical Upper Tropospheric Dynamics and Transport", \$267,136, 4/01/01 - 3/31/04.
- NASA, "Inferring Stratospheric and Tropospheric Transport from chemical tracer measurements", NASA, \$289,003, 9/01/01 - 8/31/04.
- NSF "Transport Timescales, Pathways, and Carbon Uptake in the North Atlantic Ocean", \$542,283, 9/2003-8/2006. (PI: Tom Haine)
- NOAA "Anthropogenic Carbon in the Oceans Estimated Using Transit-Time Distributions." 5/2004-3/2007.
- NSF The Dynamical Influence of the Stratosphere on the Troposphere", \$273,000, 1/2005– 12/2007.
- NASA "Quantifying Stratospheric and Upper Tropospheric Transport and its Impact on Chemical Composition", \$ 509,609, 3/2006-3/2008.
- NSF "Global estimates of Past and Future Uptake of Anthropogenic Carbon by the Oceans, \$290,00, 9/2006-8/2011.
- NASA Chemistry---Climate Studies using general circulation models, \$577,00, 7/2006-2011.
- NASA "Upper tropospheric trace gas variability and the role of transport processes", \$361,000, 3/2010 to 2/2013 .
- NSF "Multi-model analysis of stratospheric chemistry-climate coupling", \$364,00, 3/2009 to 02/2012
- NSF "Impact of Stratospheric Ozone on Antarctica and the Southern Ocean, \$399,000, 1/2011 to 12/2013.



- NSF, “IGERT Water, Climate and Health” (PI: G Brush, DoGEE), \$3,250K, 09/2011 to 08/2016
- NSF, “FESD: Open Earth” (PI: Peter Olson), \$2,832K, 09/2011 to 08/2016
- NSF, “FESD: The impact of the ozone hole on the SH climate, 09/2013 to 08/2018, \$1,249K Co-I,
- NIH “Health Effects of Extreme Heat among Vulnerable Populations with Asthma and COPD, 04/2013 – 03/2015 \$400K Co-I
- NASA Investigation of Mars Vortex Dynamics 04/2014 – 03/2017 \$420K PI
- NSF Collaborative Research: Timescales of Large-Scale Tropospheric Transport Inversions of trace-gas measurements and connections with dynamics, 07/2014 to 06/2017, \$525K, PI
- NASA Timescales of Large-Scale Tropospheric Transport: Inversions of aircraft trace-gas measurements, 10/2014 to 09/2017, \$232K, PI