

# Curriculum Vitae

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## 1- Research Interests:

Mathematical and computational environmental sciences; applied mathematics; nonlinear dynamical systems and processes in geophysics; mathematical geosciences and high performance computing of multiscale atmospheric flows; numerical methods; geophysical fluid dynamics as applied to atmospheric processes; polar vortex dynamics; impact of stratospheric dynamics on the redistribution of trace gases; gravity and planetary waves, spectral and statistical analysis of large datasets from simulations and observations; regional climate change and sustainability research; multiscale modeling of urban atmospheres; urban pollution and health.

## 2- Employments and Academic Appointments:

2011 –present:

Associate Professor, School of Mathematical and Statistical Sciences, Arizona State University, Tempe, USA.

2010 -present:

Senior Sustainability Scientist, Global Institute Of Sustainability (GIOS), Arizona State University, Tempe, USA.

2004 -2011:

Associate Research Scientist, School of Mathematical and Statistical Sciences, Arizona State University, Tempe, USA.

2003 - 2004:

Research position, Laboratoire de Météorologie Dynamique, Ecole Normale Supérieure (LMD/ENS), Paris, France.

2001 -2003:  
Research position, SCRIPPS Institution of Oceanography,  
University of California, San Diego, USA.

2000 - 2001:  
Visiting Scientist, Centre de National de Recherches  
Météorologiques at Meteo-France (CNRM/Meteo-France),  
Toulouse, France.

1998 - 2000:  
Research position, Laboratoire de Météorologie Dynamique,  
Ecole Normale Supérieure (LMD/ENS), Paris, France.

1996 - 1998:  
Postdoctoral position, Laboratoire de Météorologie Dynamique,  
Ecole Polytechnique (LMD/X), Palaiseau, France.

### **3- Current Awards:**

2009 - 2014:  
**NSF, Co-PI:** *Collaboration in Mathematical Geosciences (CMG):  
Multiscale Modeling of Urban Atmospheres in a Changing  
Climate: \$774,986.*

2011 - 2014:  
**NSF, Co-PI:** Decadal and Regional Climate Prediction Using  
Earth System Models (EaSM), Type I. Collaborative Research:  
Assessing decadal climate change impacts on urban populations  
in the Southwestern USA: **\$750,000.**

2012 - 2017:  
**NSF, Co-PI:** Mentoring through Critical Transition Points  
(MCTP): Mathematics Mentoring Partnership Between Arizona  
State University And The Maricopa County Community College  
District: **\$1,641,584.**

#### 4- Education:

1993 - 1995:

PhD in Atmospheric Sciences at Ecole polytechnique /University of Paris XII. Granted with the Honor: "**Tres Honorable avec les Felicitations du Jury**"; ("**Highly Honorable with Praise**".) Title: "Impact of gravity waves and the polar vortex structure on fluctuations observed in vertical profiles of ozone." (Adviser, H. Teitelbaum)

1992 - 1993:

Diplome d'Etude Aprofondies (DEA, MS) at the University of Paris VII, Paris, France

1988 - 1990:

Maitrise in Theoretical Physics at the University Hassan II, Casablanca, Morocco.

#### 5- Refereed Articles:

**Moustaoui, M**, A. Mahalov and E. J. Kostelich (2013), A numerical method based on Leapfrog and a fourth-order implicit time filter, *Monthly Weather Review*, *In press*.

**Moustaoui, M**, H. Teitelbaum, and A. Mahalov (2013), Observation and simulation of wave breaking in the southern hemispheric stratosphere during VORCOR, *Annales Geophysicae*, doi:10.5194/angeo-31-675-2013.

Salamanca, F, M Georgescu, A Mahalov, **M Moustaoui**, M Wang and B M Svoma (2013), Assessing summertime urban air conditioning consumption in a semiarid environment, *Environ. Res. Lett.*, doi:10.1088/1748-9326/8/3/034022.

Mahalov, A., **Moustaoui, M**. (2013), Multi-Scale nested simulations of Rayleigh-Taylor instabilities in ionospheric flows. *Journal of Fluids Engineering*, doi:10.1115/1.4025657.

Georgescu, M., A. Mahalov, and **M. Moustaoui** (2012), Seasonal Hydro-Climatic Impacts of Sun Corridor Expansion, *Environ. Res. Letters*, 7 034026 doi:10.1088/1748-9326/7/3/034026.

- Georgescu, M., **M. Moustouai**, A. Mahalov, and J. Dudhia (2012), Summer-time climate impacts of projected megapolitan expansion in Arizona, *Nature Climate Change*, doi:10.1038/nclimate1656
- Mahalov, A., **Moustouai, M.**, and Grubišić, V.: A numerical study of mountain waves in the upper troposphere and lower stratosphere, *Atmos. Chem. Phys.*, 11, 5123-5139, doi:10.5194/acp-11-5123-2011, 2011.
- Georgescu, M., **M. Moustouai**, A. Mahalov, and J. Dudhia (2011), An alternative explanation of the semiarid urban area "oasis effect", *J. Geophys. Res.*, 116, D24113, doi:10.1029/2011JD016720.
- Moustouai, M.**, A. Mahalov, H. Teitelbaum and V. Grubisic, 2010: Nonlinear modulation of O<sub>3</sub> and CO induced by mountain waves in the upper troposphere and lower stratosphere during terrain-induced rotor experiment, *J. Geophys. Res.*, 115, D19103, doi:10.1029/2009JD013789.
- Mahalov A. and **M. Moustouai**, 2010: Characterization of atmospheric optical turbulence for laser propagation, *Laser and Photonics review*, 4, 144-159. / DOI 10.1002/lpor.200910002
- Mahalov A. and **M. Moustouai**, 2009: Vertically nested nonhydrostatic model for multi-scale resolution of flows in the upper troposphere and lower stratosphere, *Journal of Computational Physics*, 228, 1294-1311.
- Mahalov A., **M. Moustouai** and B. Nicolaenko, 2009: Three-dimensional instabilities in non-parallel shear stratified flows, *Kinetics and Related Models, American Institute of Mathematical Sciences*, 2, 215-229.
- Teitelbaum, H., H. Treut, **M. Moustouai**, G.C. Cabrera and G. Iba, 2008: Deep Convection East of the Andes Cordillera: A Test Case Analysis of Air mass Origin, *Monthly Weather Review*, 136, 2201-2209.
- Mahalov, A, **M. Moustouai** and B. Nicolaenko, 2007: Computational Studies of Inertia-Gravity Waves Radiated from Upper Tropospheric Jets, *Theoretical and Computational. Fluid Dynamics*, 21, No. 6, p. 399-422.

- Moustaoui, M.**, B. Joseph, and H. Teitelbaum, 2004: Mixing layer formation near the tropopause due to gravity wave-critical level interactions in a cloud-resolving model. *Journal of the Atmospheric Sciences*, **61**, 3112-3124.
- Moustaoui, M.**, H. Teitelbaum, and F. P. J. Valero, 2003: Ozone laminae inside the Antarctic vortex produced by poleward filaments. *Quarterly Journal of the Royal Meteorological Society*, **129**, 3121-3136.
- Moustaoui, M.**, H. Teitelbaum, and F. P. J. Valero, 2003: Vertical displacements induced by quasi-stationary waves in the southern hemisphere stratosphere during Spring. *Monthly Weather Review*, **131**, 2279-2289.
- Moustaoui, M.**, H. Teitelbaum, C. Basdevant, and Y. Boughaleb, Linked behavior of twin tropical cyclones. *Journal of Geophysical Research*, **107(D19)**, 4378, doi: 10.1029/2000JD000066, 2002.
- Moustaoui, M.**, J.F. Royer and F. Chauvin, 2002: African easterly wave activity in a variable resolution GCM. *Climate Dynamics*, **19**, 289-301.
- Teitelbaum, H.; **M. Moustaoui**, and M. Fromm, 2001: Exploring polar stratospheric cloud and ozone minihole formation: The primary importance of synoptic-scale flow perturbations. *Journal of Geophysical Research*, **106(D22)**, 28173-28188.
- Teitelbaum, H., **M. Moustaoui**, C. Basdevant, and J. R. Holton, 2000: An alternative mechanism explaining the hygropause formation in tropical regions, *Geophysical Research Letters*, **27**, 221-224.
- Joseph, B. and **M. Moustaoui**, 2000 : Transport, moisture, and rain in a simple, monsoon-like flow, *Journal of the Atmospheric Sciences*, **57**, 1817-1838.
- Teitelbaum, H., C. Basdevant, and **M. Moustaoui**, 2000: Explanations for simultaneous laminae in water vapor and aerosol profiles found during the SESAME experiment, *Tellus*, **52A**, 190-202.
- Teitelbaum, H., **M. Moustaoui**, R. Sadourny, and F. Lott, 1999: Critical levels and mixing layers induced by convectively generated

gravity waves during CEPEX, *Quarterly Journal of the Royal Meteorological Society*, **125**, 1715-1734.

**Moustaoui, M.**, H. Teitelbaum, P.F.J. Van Velthoven, and H. Kelder, 1999: Analysis of gravity waves during the POLINAT experiment and some consequences for stratosphere-troposphere exchange, *Journal of the Atmospheric Sciences*, **56**, 1019-1030.

Teitelbaum, H., **M. Moustaoui**, P.F.J. Van Velthoven, and H. Kelder, 1998: Decrease of total ozone at low latitudes in the southern hemisphere by combination of adiabatic and diabatic processes, *Quarterly Journal of the Royal Meteorological Society*, **124**, 2625-2644.

Mariotti, A., **M. Moustaoui**, H. Teitelbaum, and B. Legras, 1997: Comparison between vertical ozone soundings and reconstructed potential vorticity maps by contour advection with surgery: Dynamical mixing and the ozone hole, *Journal of Geophysical Research*, **102 (D5)**, 6131-6142.

Teitelbaum, H., **M. Moustaoui**, J. Ovarlez, and H. Kelder, 1996: The role of atmospheric waves in the laminated structure of ozone profiles at high latitude, *Tellus*, **48A**, 442-455.

## **6- Refereed Conference Proceedings:**

Mahalov, A and **M. Moustaoui**, 2008: Ensemble forecasting of high-impact stratospheric optical turbulence, In 'Atmospheric Propagation of Electromagnetic Waves', *Proc. of SPIE*, 6878, p. 1-15.

Mahalov, A, **M. Moustaoui** and B. Nicolaenko, 2007: Multi-Scale Predictability of High-Impact Stratospheric Clear Air Turbulence Events, IEEE Proceedings of DoD High Performance Computing Modernization Program Conference, *IEEE Computer Society Publications* p. 57-63.

Mahalov, A, **M. Moustaoui** and B. Nicolaenko, 2006: Characterization of Stratospheric Clear Air Turbulence, IEEE Proceedings of DoD High Performance Computing Modernization Program Conference, *IEEE Computer Society Publications*, p. 288-295.

## **7- Book Chapters:**

Mahalov,A and M. Moustouai, 2012: Multi-Scale Nesting and High Performance Computing of Environmental Flows. Handbook of Environmental Fluid Dynamics: Systems, Pollution, Modeling, and Measurements. Taylor and Francis Group, LLC.

## **8- Conferences Presentations:**

Evaluation of WRF for fine scale surface energy balance modeling in Phoenix, The American Geophysical Union (AGU), Fall Meeting, San Francisco, CA, 12 Dec 2013.

Nonlinear wave-wave and vortex interactions and impact on Lagrangian transport of Chemicals in the atmosphere, The American Mathematical Society (AMS) meeting, Tucson, Arizona, October 28-29, 2012.

Local and Remote Hydro-Climatic Impacts of Projected Sun Corridor Expansion. AGU meeting, San Francisco, December 5 – 9, 2011.

Nonlinear modulation of tracers in the upper troposphere and lower stratosphere using WRF-ARW. 12th Annual WRF Users' Workshop at the National Center for Atmospheric Research (NCAR), Boulder, Colorado, June 20 - 24, 2011.

On improved representation of the diurnal cycle over a semi-arid, metropolitan area: WRF-ARW vs RAMS. 12th Annual WRF Users' Workshop at the National Center for Atmospheric Research (NCAR), Boulder, Colorado, June 20 - 24, 2011.

Coupling WRF-ARW with high-resolution CFD and acoustic propagation models to forecast highway noise pollution. . 12th Annual WRF Users' Workshop at the National Center for Atmospheric Research (NCAR), Boulder, Colorado, June 20 - 24, 2011.

Nonlinear modulation of Ozone and Carbene Monoxide induced by mountain waves in the UTLS during TREX. The Extra-Tropical UTLS: observations, concepts and future directions, National Center for Atmospheric Research (NCAR), Boulder, Colorado, October 19 - 22, 2009.

Nesting in WRF with vertical grid refinement and implicit relaxation. The 10th WRF Users' Workshop at the National Center for Atmospheric Research (NCAR), Boulder, Colorado, June 23 - 26, 2009.

Multi-scale simulations using WRF with vertical nesting and implicit relaxation: case studies from T-REX. The 10th WRF Users' Workshop at the National Center for Atmospheric Research (NCAR), Boulder, Colorado, June 23 - 26, 2009.

Modulation of O3 and CO in the UTLS induced by mountain waves during T-REX. Geophysical Research Abstracts, Vol. 11, EGU2009-6270, European Geosciences Union General Assembly 2009, Vienna, Austria, April 19 - 24, 2009.

Multi-scale simulations of three dimensional laminated structures induced by mountain waves in the UTLS region during T-REX. Geophysical Research Abstracts, Vol. 11, EGU2009-3798, European Geosciences Union General Assembly 2009, Vienna, Austria, April 19 - 24, 2009.

Mountain waves and inertia-gravity waves during T-REX experiment, Vol. 11, EGU2009-2813, European Geosciences Union General Assembly 2009, Vienna, Austria, April 19 - 24, 2009.

Observation of a Tongue Pulled Out from the Antarctic Vortex Edge due to Barotropic Instability. The 4th SPARC General Assembly, Bologna, Italy, 31 August - 5 September, 2008.

Vertically nested nonhydrostatic model for multi-scale resolution of flows in the upper troposphere and lower stratosphere. The 9th WRF Users' Workshop at the National Center for Atmospheric Research (NCAR), Boulder, Colorado, June 23 - 27, 2008.

Multi-scale predictability of high-impact stratospheric turbulence; The 88th American Meteorological Society (AMS) Annual Meeting, New Orleans, LA, 20-24 January 2008.

WRF and vertical nesting: multi-scale resolution of T-REX measurements. The 8th WRF Users' Workshop at the National Center for Atmospheric Research (NCAR), Boulder, Colorado, June 11 - 15, 2007.



## **9- Teaching Experience:**

Modern Differential Equations (MAT 275): Spring 2010, Fall 2011, and Spring 2014

Elementary Differential Equations (MAT 274): Spring 2012

Calculus for Engineers I: Spring 2013

Calculus for Engineers II (MAT 266): Spring 2011

Calculus for Engineers III: Spring 2012, Fall 2013

Applied Linear Algebra: Fall 2012, Spring 2013

Nonlinear Dynamics, Environmental Sciences and Sustainability (MAT 591): Fall 2011

Research (MAE 792): Fall 2011

## **10- Undergraduate Students Supervised:**

### ***A- Research Projects:***

#### **2011:**

Christian Wake, Hershey Kelly, Angelica Deibel, Peter Bradshaw, Tim Lai, Zachary M. Harrison.

#### **2012:**

James Upton, Scott Van Buren, Eric Van Buren.

#### **2013:**

Lauren Johnson, Lee Burke, Christopher Barton.

- Undergraduate Student Peter Bradshaw won the AMS Outstanding Presentation award for his AMS presentation.
- Undergraduate Student Eric Van Buren won NIH graduate trainee ships for Ph.D study in bio-statistics at the university of North Carolina at Chapel Hill, and received an honorable mention in the NSF graduate competition.
- Undergraduate Student Scott Van Buren won NIH graduate trainee ships for Ph.D study in bio-statistics at the university of North Carolina at Chapel Hill and received an honorable mention in the NSF graduate competition.
- Undergraduate Student Tim Lai received an honorable mention in the NSF graduate competition.

***B- Honors Projects:***

**2011:**

Connor Wiegand, Kailey Rumbo, Jennifer Mincieli, Stephanie Maxwell, Shea Loges, Bijan Fakhri, Abhishek Dharan, Aidan Coyle, Herbert Cofer, Dillon Card.

**2012:**

Zachariah Wolfe, Austin Tanner, Lena Snyder, Keon Seif-Naraghi, Kegan Scowen, Paye Ray, Mounica Rao, Brady Laughlin, Anais Gomez, Breton Goers, Alex Gale, William Evans, Rachel Cook, Katelyn Conrad, Julia Cambron.

**2013:**

Connor Alfheim, Ryan Brazones, Christina Findley, Lisa Irimata, Shelby Isa, Sudarshan Iyer, Danyal Kadi, Nitin Karki, Katherine Martin, Ian Mcleod, Trevor Meiss, Erik Misiak, Adam Polak, Olivia Reidell, Benjamin Roos, Daniel Sanchez, Santiago Trevino, Matthew Askins, Nicholas Kemme, Andrew Luc, Jacob Roy.

**11- Graduate Students Supervised:**

Stephen Shaffer (current PhD student): Committee chair

**12- Post Doctoral Fellows Advised:**

Francisco Salamanca (current)  
Jialun Li (current)