

# Mark Decker

## Curriculum Vitae

Level 4 Mathews Building UNSW  
2052 Sydney  
Australia

+61 (04) 016 00022

m.decker@unsw.edu.au

<https://mark-decker.github.io/>

ORCID id: 0000-0003-1071-611X

## Summary

I am a United States citizen working at the nexus of hydrology, atmospheric sciences, ecology, weather, and climate. I focus on developing and utilizing large scale hydrological, land surface, and climate models to address grand challenges relating to weather, climate, and water resources. I have experience developing courses and teaching both graduate and undergraduate students.

## Education

2006–2010 **PhD Atmospheric Science**, *University of Arizona*, Tucson, GPA - 4.00.

2003–2006 **Ms Atmospheric Science**, *University of Arizona*, Tucson, GPA - 4.00.

1999–2003 **BS Engineering Mathematics**, *University of Arizona*, Tucson, GPA - 3.78.

## Research Specialties

- Land surface model development, testing, and validation
- Climate model development and evaluation
- Large scale hydrological modeling
- Surface processes including land-atmosphere interactions, water, and energy
- Atmospheric processes including boundary layer - land surface processes
- Utilizing observation products in novel ways to constrain models

## Research Positions

2013–Present **Research Fellow**, *University of New South Wales*, Centre of Excellence in Climate System Science, Sydney, Australia.

Developed the Australian land surface model with a focus on hydrology and land-atmosphere interactions.

- Developed a physically based pore scale model of soil evaporation in collaboration with ETH-Zurich;
- Formulated a groundwater model and parameterization for subgrid scale soil moisture processes including runoff;
- Demonstrated the necessity of using coupled simulations for projections of irrigation demand.

2010–2013 **Postdoctoral Research Fellow**, *University of New South Wales*, Climate Change Research Centre, Sydney, Australia.

Utilized remote sensing products and land surface models to quantify groundwater-transpiration variability in semiarid regions.

2003–2010 **Research Assistant**, *University of Arizona*, Tucson.  
Derived novel numerical solution to the non-linear partial differential equation governing soil water flow.

## Teaching Positions

- 2016–2017 **Course coordinator and lead lecturer**, *University of New South Wales*, Climate Change Research Centre, Sydney, Australia.  
Taught undergraduate course 'Fundamentals of atmospheric science'.  
Developed the course material, including lectures and assignments.
- 2012–2015 **Co-coordinator and lecturer**, *University of New South Wales*, Climate Change Research Centre, Sydney, Australia.  
Taught sections of the undergraduate courses 'Fundamentals of atmospheric science'.  
Taught sections of the undergraduate courses 'Climate System Science'.  
Developed the course material, including lectures and assignments.
- 2007–2010 **Teaching Assistant**, *University of Arizona*, Department of Atmospheric Sciences, Tucson, Arizona.  
Taught graduate level course when professor was traveling.  
Graded Assignments.

## Service

- American Geophysical Union
- American Meteorological Society
- Australian Atmospheric and Oceanographic Society
- Leader of the land group at the Climate Change Research Centre
- Reviewer for Journal of Climate, Journal of Hydrometeorology, Journal of Advances in Modeling Earth Systems

## Funding Awards

- 2017 Summer Student Intern Scholarship Award: Can land surface models benefit from adapting current practices in hydrological models? Student: Afzal Ahmad Supervisors: Dr Mark Decker and Professor Andy Pitman
- 2013 Summer Student Intern Scholarship Award: Incorporating Groundwater Processes in Land Model Simulations over Australia Student: Vittoria Capuano@hotmail.com Supervisors: Dr Mark Decker and Professor Andy Pitman

## Scholarship Awards

- 2008 University of Arizona Department of Atmospheric Sciences Outstanding Student Scholar Award
- 2007 Galileo Circle Scholar, University of Arizona, College of Science (Highest award from the College of Science)
- 2006 NCAR Advanced Study Program Summer Colloquium, The Art of Climate Modeling
- 2001–2002 Space Grant Intern (NASA)
- 1999–2003 University of Arizona Undergraduate Out of State Tuition Waiver
- 1999–2002 University of Arizona Robert B. Cook Memorial Scholarship

## Publications

- **Total Citations - 1936. Top five papers have 1567, 150, 85, 38, 36. H index - 8**

### In Progress

- **Decker, M.**, X. Zeng, P.J. Ross (2018), Comparing numerical solutions to Richards Equation for land surface modeling: Adequate accuracy for a conceptual model, *Hydrology and Earth System Science*, submission imminent.
- Ahmed, A., **M. Decker**, A.J. Pitman (2018), Quantifying the benefits and transferability of optimized canopy and soil parameters in CABLE, *Hydrology and Earth System Science*, In progress.
- Tangdamrongsub, N., Han, S., **Decker, M.** (2018) Comparison of estimated soil moisture and groundwater from combining WGHM, CABLE, PCR-GLOBWB, W3 with GRACE intersatellite tracking data, *Journal of Remote Sensing, Special Issue: Remote Sensing and Groundwater*, submission by December 20.

Ukkola, A., A.J. Pitman, M.G. De Kauwe, G. Abramowitz, N. Herger, J.P. Evans, **M. Decker**, (2017) Evaluating CMIP5 model agreement for multiple drought metrics, *Journal of Hydrometeorology*, in review.

Tangdamrongsub, N., Han, S., **Decker, M.** (2017) On the use of GRACE intersatellite tracking data for improved estimation of soil moisture and groundwater in Australia, *Hydrology and Earth System Science*, doi:10.5194/hess-2017-318, in review.

**Decker, M.**, S. Ma, and A.J. Pitman (2017) Local land-atmosphere feedbacks limit irrigation demand, *Environmental Research Letters*, 12, 054003, doi:10.1088/1748-9326/aa65a6.

**Decker, M.**, D. Or., A.J. Pitman, and A.M. Ukkola (2017) New turbulent resistance parameterization for soil evaporation based on a pore scale model: impact on surface fluxes in CABLE, *Journal of Advances in Modeling Earth Systems*, 9, doi:10.1002/2016MS000832.

Ukkola, A., M.G. De Kauwe, A.J. Pitman, M.J. Best, G. Abramowitz, V. Haverd, **M. Decker**, N. Houghton, (2016) Land surface models systematically overestimate the intensity, duration and magnitude of seasonal-scale evaporative droughts, *Environmental Research Letters*, 11, 104012.

Ukkola, A., A.J. Pitman, **M. Decker**, M.G. De Kauwe, G. Abramowitz, J. Kala, and Y.P. Wang, (2016) Modelling evapotranspiration during precipitation deficits: identifying critical processes in a land surface model, *Hydrology and Earth System Science*, 20, 2403-2419.

**Decker, M.**, A.J. Pitman, and J. Evans, (2015) Diagnosing the seasonal land-atmosphere correspondence over northern Australia: dependence on soil moisture state and correspondence strength definition, *Hydrology and Earth System Science*, 19, 3433-3447, doi:10.5194/hess-19-3433-2015.

**Decker, M.**, (2015) Development and evaluation of a new soil moisture and runoff parameterization for the CABLE LSM including subgrid-scale processes, *Journal of Advances in Modeling Earth Systems*, 7, 1788-1809, doi:10.1002/2015MS000507.

Kala, J., **M. Decker**, J.F. Exbrayat, A.J. Pitman, C. Carouge, J. Evans, and G. Abramowitz (2014) Influence of leaf area index prescriptions on simulations of heat, moisture, and carbon fluxes, *Journal of Hydrometeorology*, 15, 448-503.

**Decker, M.**, A.J. Pitman, and J. Evans, (2014) Applying scaled vegetation greenness metrics to constrain simulated transpiration anomalies: a study over Australia, *Journal of Hydrometeorology*, 15, 1607-1623, doi:10.1175/JHM-D-13-070.1.

Kala, J., J.P. Evans, A.J. Pitman, C.B. Schaaf, **M. Decker**, C. Carouge, D. Mocko, and Q. Sun, (2014), Implementation of a soil albedo scheme in the CABLEv1.4b land surface model and evaluation against MODIS estimates over Australia, *Geoscientific Model Development*, 7, 2121-2140, doi:10.5194/gmd-7-2121-2014.

**Decker, M.**, A.J. Pitman, and J. Evans, (2013) Groundwater constraints on simulated transpiration variability over Southeastern Australian forests, *Journal of Hydrometeorology*, 14, 534–559, doi:10.1175/JHM-D-12-058.1.

**Decker, M.**, M.A. Brunke, K. Sakaguchi, X. Zeng, and M. Bisolovich, (2012), Evaluation of the reanalysis products from GSFC, NCEP, and ECMWF using flux tower observations, *Journal of Climate*, 25, 1916–1944, doi:10.1175/JCLI-D-11-00004.1.

Wang, Z., X. Zeng, **M. Decker**, (2010), Improving snow processes in the Noah land model, *Journal of Geophysical Research*, 115, 2156–2202, doi:10.1029/2009JD013761.

Zeng, X., and **M. Decker**, (2010), Reply to Improving the Numerical Solution of Soil Moisture-Based Richards Equation for Land Models with a Deep or Shallow Water Table, *Journal of Hydrometeorology*, 11, 1051–1054, DOI: 10.1175/2010JHM1199.1.

Oleson, K., et al., **M. Decker**, (2010), Technical Description of version 4.0 of the Community Land Model (CLM), NCAR/TN-478+STR, NCAR TECHNICAL NOTE.

**Decker, M.** and X. Zeng, (2009), Impact of modified Richards equation on global soil moisture simulation in the Community Land Model (CLM3.5), *Journal of Advances in Modeling Earth Systems*, 1, 5, 22 pp, doi:10.3894/JAMES.2009.1.5.

Zeng, X., and **M. Decker**, (2009), Improving the numerical solution of soil moisture-based Richards equation for land models with a deep or shallow water table, *Journal of Hydrometeorology*, 10, 308–319, doi:10.1175/2008JHM1011.1.

**Decker, M.**, and X. Zeng, (2006), An empirical formulation of soil ice fraction based on in situ observations, *Geophysical Research Letters*, 33, L05402, doi:10.1029/2005GL024914.

---

## References

### Andy Pitman

Director  
COE ARCSS  
University of New South Wales  
Sydney, Australia  
a.pitman@unsw.edu.au  
+61-2-9385-7075

### Dani Or

Professor  
Soil Terrestrial Environmental Physics  
ETH Zurich  
dani.or@env.ethz.ch  
+41-44-633-60-15

### Xubin Zeng

Professor  
Department of Atmospheric Sciences  
University of Arizona  
Tucson, Arizona  
xubin@atmo.arizona.edu  
+1-520-621-4782

### Jason Evans

Associate Professor  
Climate Change Research Centre  
University of New South Wales  
Sydney, Australia  
jason.evans@unsw.edu.au  
+61-2-9385-7066