Curriculum Vitae: Pieter Hazenberg, PhD

Profile

My career focusses around the theme of *hydrology and hydrometeorology* with over 20 publications on lateral surface and subsurface flow, and land-atmosphere processes. I enjoy working in and leading teams that focus on multi-disciplinary complex questions and need in-depth answers. My experience ranges from topics related to 1) precipitation and temperature variability, 2) groundwater-river interactions, and 3) modeling hydrological extreme events in both current and future climate. I have a special interest in making use of high-performance and cloud computing for fast and detailed analyses, and to enable modeling for operational settings.
To increase societal relevance, I recently have extended my interest to the field of agro-hydrology, reservoir management, and biogeochemistry, linking distributed hydrological models, with agricultural drought and yield forecasts and well as chemical process interactions.

Contact

Leutscherstraat 5, 2496 RD
Den Haag, The Netherlands
+31612163232
Pieter.hazenberg21@gmail.com
linkedin.com/in/pieter-hazenberg-536593197/
11 October 1982
Dutch

Professional Experience

Senior Research Scientist **2021 - current**
Applied Research Center, Florida International Univesity, Miami, Fl, USA

- Leads Hydrological Modeling and GIS team
  - Project management for FIU-DOE Cooperative Agreement
  - Actively supervise team of DOE Fellows
  - Develop model builder approach to speed up modeling development process for any region of interest
- Perform hydrologic research on:
  - Distributed hydrological modeling and performance evaluation
  - Biogeochemical modelling of former nuclear test sites throughout the US to evaluate environmental impact and assess the role of climate change
  - Assess the potential of drone and in situ observations to improve understanding and develop better models.

Senior Advisor/Researcher Deltares **2019 - 2021**
Department of Hydrology, Deltares, Delft, The Netherlands

- Project management for EU, World Bank, and national projects
- Perform hydrologic research on:
  - Distributed modeling and performance evaluation
  - Impact of climate change on extremes (floods and drought)
  - Possibilities of high-performance computing (HPC)
  - Using the public Cloud for advanced model performance
- Develop a research line around the water-energy-food theme:
  - Ensemble-based seasonal forecasting
  - Impact of climate change on agricultural production
  - Global reservoir volume dynamics using models and Earth observations from satellite

Assistant Professor **2016 - 2019**
Department of Hydrology and Atmospheric Sciences
University of Arizona, Tucson, AZ, USA

- General academic work (Teaching, Advising, Writing and Service)
- Set up a research line on semi-arid hydrometeorology:
  - Development field site at Walnut Gulch watershed
  - Operational modeling with NOAA's National Water Model
  - Impact of climate change on hydrometeorological extremes
  - Land-atmosphere processes during North American Monsoon
  - Global lateral hydrological flow modeling in the US Department of Energy E3SM Land Model.

Postdoctoral Research Associate **2012 - 2016**
Institute of Atmospheric Physics
University of Arizona, Tucson, AZ, USA
Group leader: Prof. X. Zeng

- Development of the next generation hyperresolution hydrological model for large scale land surface modeling
- Evaluation of CMIP4/5 models within the southwest US
- Writing scientific manuscripts, (co-)advising undergraduate and graduate students, writing scientific grant proposals

Education

PhD program in Hydrology and Quantitative Water Management **2007-2013**
Wageningen University, The Netherlands
Title: Rainfall estimation for hydrology using volumetric weather radar
Advisors: Prof. dr. ir. Remko Uijlenhoet (WUR), dr. ir. Hidde Leijnse (KNMI), Prof. dr. Guy Delrieu (LTHE, Grenoble, France)

Master of Science degree in Hydrology and Water Quality **2004-2007**
Minor in: Environmental Economics
Wageningen University, The Netherlands
Thesis title: Disaggregation of precipitation using wavelets
Thesis advisor: Drs. Paul Torfs

Bachelor of Science degree in Soil, Water and Atmosphere **2001-2004**
Wageningen University, The Netherlands
Thesis title: Hydrological modelling and the application of a Kalman filter in R
Thesis advisor: Drs. Paul Torfs

Additional Experience

- Author/co-Author of 20+ peer reviewed journal publications and conference proceedings in the field of hydrology, hydrometeorology and hydroclimatology (see below).
- Have been awarded over $ 1.5 million in research grants and contracts both as a PI and co-PI for various funding agencies (US Department of Energy, NOAA, NASA, EU and World Bank) (see below)
- Teacher and curriculum developer for various courses in physical meteorology and hydrology
- Advised multiple undergraduate and graduate students (list is available upon request)
- I have presented my research at different conferences and symposia
- I have been a reviewer for many scientific publications for different journals in the field of hydrology
- Research supervisor for Native American students and teachers for REU summer program

Professional Training

Collaborative learning and teaching (Fall 2018)
Working in projects (Spring 2020)
Planning and Organizing (Summer 2020)
Leading Project Teams (Spring 2021)

Programming Experience

Linux/Windows/Mac, MS Office, R, Python, C++, Fortran, Git, Docker, Kubernetes/Argo, wflow, Modflow, QGis/ArcGIS

Language

Dutch (native language), English (fluent), Spanish (medium)

Interests


Family


Cooking/Dining


Travel


Sports


Real estate


Crypto

Awarded grants and contract

Title:	Changing the fate of the Hindon river by evaluating the impact of agriculture on the water balance: Developing a template for a cleaner Ganga river (Accepted for funding)
Funding agency:	Dutch National Science Foundation (NWO), Indian Department of Science and Technology (DST)
Details/Role:	€ 1,400,000 2021-2025 Deltares %-effort: 20% Co-Principle Investigator
Title:	Support Hydrological Modeling of the Vrbas and Vardar River Basins
Funding agency:	World Bank, Selection no. #1269514
Details/Role:	€ 70,000 12/1/2020-31/12/2021 Deltares %-effort: 50% Co-Principle Investigator
Title:	ACROSS - HPC BIG DATA ARTIFICIAL INTELLIGENCE CROSS STACK PLATFORM TOWARDS EXASCALE
Funding agency:	Funding agency: European Union, Horizon 2020 EuroHPC grant
Details/Role:	€ 415,000 3/1/2021-28/2/2024 Deltares %-effort: 30% Principle Investigator
Title:	Modeling human activities and terrestrial processes: improving representations of process interactions and subgrid variability", US Department of Energy White Paper
Funding agency:	DOE Internal Funding Sources
Details/Role:	~$500K (for UA) 2019-2021 U. Arizona %-effort: 50% co-Investigator (PIs K. Calvin and L. R. Leung, PNNL)
Title:	Improvement of WRF-Hydro National Water Model architecture and calibration methods for semi-arid environments with complex terrain
Funding agency:	NOAA Climate Program Office, Joint Technology Transfer Initiative
Details/Role:	$367,453 9/1/2017-8/31/2020 U. Arizona %-effort: 30% Co-Investigator (PI C. Castro)
Title:	Using SMAP and Variable Bedrock Depth Datasets for land model evaluation and improvement
Funding agency:	NASA SMAP grant
Details/Role:	$504,065 7/1/2016-6/30/2019 U. Arizona %-effort: 10% Co-Investigator (PI X. Zeng)
Title:	Improving the interface processes in the DOE/ACME Model
Funding agency:	US Department of Energy DOE grant DE-FOA-0001482
Details/Role:	$680,124 10/1/2016-9/30/2019 U. Arizona %-effort: 10% Co-Investigator (PI X. Zeng)
Title:	Upscaling precipitation, sensible and latent heat flux observations using links during the NAM
Funding agency:	CUAHSI Instrumentation Discovery Travel Grants
Details/Role:	$1000 Spring 2018 U. Arizona %-effort: 100% Principle Investigator
Title:	Enhancing the Biosphere2 Ground-Based Remote Sensing System to investigate Atmospheric Aerosol-Cloud-Radiation-Precipitation processes and their Interactions
Funding agency:	RDI Shared Equipment Enhancement Fund, University of Arizona, State of Arizona
Details/Role:	$ 99,844 7/1/2016-6/30/2017 U. Arizona %-effort: 60% Principle Investigator

Scientific Publications

1. Driessen, T.L.A., R.T.W.L. Hurkmans, W. Terink, P., Hazenberg, P.J.J.F. Torfs, and R. Uijlenhoet (2010), The hydrological response of the Ourthe catchment to climate change as modelled by the HBV model, *Hydrol. Earth Syst. Sci.*, 14 (4), 651-664, doi: 10.5194/hess-14-651-2010.

2. Hazenberg, P., N. Yu, B. Boudevillain, G. Delrieu, and R. Uijlenhoet, 2011a: Scaling of raindrop size distributions and classification of radar reflectivity-rain rate relations in intense Mediterranean precipitation, *J. Hydrol.*, 402, 179-192, doi: 10.1016/j.jhydrol.2011.01.015.

3. Hazenberg, P., H. Leijnse, and R. Uijlenhoet, 2011b: Radar rainfall estimation of stratiform winter precipitation in the Belgian Ardennes, *Water Resour. Res.*, 47, W02507, doi: 10.1029/2010WR009068.

4. Brauer, C. C., A. J. Teuling, A. Overeem, Y. van der Velde, P. Hazenberg, P. M. M.Warmerdam, and R. Uijlenhoet, 2011: Anatomy of extraordinary rainfall and flashflood in a Dutch lowland catchment, *Hydrol. Earth Syst. Sci.*, 15, 1991-2005, doi: 10.5194/hess-15-1991-2011.

5. van Huijgevoort, M. H. J., P. Hazenberg, H. A. J. van Lanen, and R. Uijlenhoet, 2012: A generic method for hydrological drought identification across different climate regions, *Hydrol. Earth Syst. Sci.*, 16(8), 2437-2451, doi: 10.5194/hess-16-2437-2012.

6. Rakovec O., A. H. Weerts, P. Hazenberg, P. J. J. F. Torfs, and R. Uijlenhoet, 2012: State updating of a distributed hydrological model with Ensemble Kalman Filtering: Effects of updating frequency and observation network density on forecast accuracy, *Hydrol. Earth Syst. Sci.*, 16(9), 3435-3449, doi: 10.5194/hess-16-3435-2012.

7. Rakovec O., P. Hazenberg, P. J. J. F. Torfs, A. H. Weerts, and R. Uijlenhoet, 2012: Generating spatial precipitation ensembles: Impact of temporal correlation structure, *Hydrol. Earth Syst. Sci.*, 16(9), 3419-3434, doi: 10.5194/hess-16-3419-2012.

8. van Huijgevoort, M. H. J., P. Hazenberg, H. A. J. van Lanen, A. J. Teuling, and R. Uijlenhoet, et al., 2013: Global multimodel analysis of drought in runoff for the second half of the 20th century, *J. Hydrometeor.*, 14, 15351552, doi: 10.1175/JHM-D-12-0186.1.

9. Yu, N., G. Delrieu, B. Boudevillain, P. Hazenberg, and R. Uijlenhoet, 2013: Unified formulation of single and multi-moment normalizations of the raindrop size distribution based on the gamma probability density function, *J. Appl. Meteor. Clim.*, 53(1), 166-179, doi: 10.1175/JAMC-D-12-0244.1.

10. Hazenberg, P., P.J.J.F. Torfs, H. Leijnse, G. Delrieu, and R. Uijlenhoet, 2013: Identification and uncertainty estimation of vertical reflectivity profiles using a Lagrangian approach to support quantitative precipitation measurements by weather radar, *J. Geoph. Res. Atm*., 118(18), 10243-10261, doi: 10.1002/jgrd.50726 .

11. Hazenberg, P., H. Leijnse, and R. Uijlenhoet, 2014: The impact of reflectivity correction and accounting for raindrop size distribution variability to improve precipitation estimation by weather radar for an extreme low-land mesoscale convective system, *J. Hydrol.*, 519, 3410-3425, doi: 10.1016/j.jhydro1.2014.09.057.

12. Hazenberg, P., Y. Fang, P. Broxton, D. Gochis, G.-Y. Niu, J.D. Pelletier, P.A. Troch and X. Zeng, 2015a: A hybrid-3D hillslope hydrological model for use in Earth system models, *Water Resour. Res.*, 51, doi: 10.1002/2014WR016842.

13. Hazenberg, P., P. Broxton, D. Gochis, G.-Y. Niu, J.D. Pelletier, P.A. Troch, and X. Zeng, 2015: Testing the hybrid-3D hillslope hydrological model in a controlled environment, *Water Resour. Res.*, 52, 1089–1107, doi: 10.1002/2015WR018106.

14. Pelletier, J.D., P.D. Broxton, D.Gochis, P. Hazenberg , X. Zeng, P.A. Troch, G.-Y. Niu, Z. Williams, M.A. Brunke, and D. Gochis, 2015: A gridded global dataset of soil, immobile regolith, and sedimentary deposit thicknesses for regional and global land surface modeling, *J. Adv. Model. Earth Syst.*, 8, 41–65, doi:10.1002/2015MS000526.

15. Brunke, M.A., P. Broxton, J.D. Pelletier, D.Gochis, P. Hazenberg , D.M. Lawrence, L.R. Leung, G.-Y. Niu, P.A. Troch, and X. Zeng, 2015: Implementing and testing variable soil thickness in the Community Land Model version 4.5, J. Clim., *J. Climate*, 29, 3441–3461, doi: 10.1175/JCLI-D-15-0307.1

16. Hazenberg, P., Broxton, P., Gochis, D., Niu, G.-Y., Pangle, L. A., Pelletier, J. D., Troch, P. A., and Zeng, X. (2016), Testing the hybrid-3-D hillslope hydrological model in a controlled environment, *Water Resour. Res.*, 52, 1089–1107, doi:10.1002/2015WR018106.

17. Bashir, F., X. Zeng, H. Gupta, and P. Hazenberg, 2017: A hydrometeorological perspective on the Karakoram Anomaly using unique valley-based synoptic weather observations, *Geoph. Res. Lett.*, 44, 10,470–10,478, doi: 10.1002/2017GL07528

18. Fan, Y., M. Clark, D.M. Lawrence, S. Swenson, L.E. Band, S.L. Brantley, P.D. Brooks, W.E. Dietrich, A. Flores, G. Grant, J.W. Kirchner, D.S. Mackay, J.J. McDonnell, P.C.D. Milly, P.L Sullivan, C. Tague, H. Ajami, N. Chaney, A, Hartmann, P. Hazenberg, J. McNamara, J. Pelletier, J. Perket, E. Rouholahnejad-Freund, T. Wagener, X. Zeng, E. Beighley, J. Buzan, M. Huang, B. Livneh, B.P. Mohanty, B. Nijssen, M. Safeeq, C. Shen, W. van Verseveld, J. Volk, and D. Yamazaki, 2018, Structures and Functions of Hillslope Hydrology with Relevance to Earth System Modeling: Syntheses and Testable Hypotheses, *Water Resour. Res.*, 55, 1737– 1772, doi: 10.1029/2018WR023903

19. Lahmers, T. M., H. Gupta, C. L. Castro, D. J. Gochis, D. Yates, A. Dugger, D. Goodrich, and P. Hazenberg, 2019: Enhancing the Structure of the WRF-Hydro Hydrologic Model for Semiarid Environments, *J. Hydrometeor.*, 20(4), 691-714.

20. Demaria, E. M. C., P. Hazenberg, R. L. Scott, M. B. Meles, M. Nichols, and D. Goodrich, 2019: Intensification of the North American Monsoon rainfall as observed from a long-term high-density gauge network*, Geoph. Res. Lett.*, , 46, 6839– 6847. Doi: 10.1029/2019GL082461

21. Lahmers, T. M., C. L., Castro, and P. Hazenberg, 2020: Effects of Lateral Flow on the Convective Environment in a Coupled Hydrometeorological Modeling System in a Semiarid Environment, *J. of Hydrometeor*, 21(4), 615-642

22. Lahmers, T. M., P. Hazenberg, H. Gupta, C. L., Castro, D. J., Gochis, A. Dugger, D. Yates, L. Read, L. Karsten and Y.-H. Weng, 2021: Evaluation of NOAA National Water Model Parameter Calibration in Semi-Arid Environments Prone to Channel Infiltration, *J. Hydrometeor.*, Accepted with revisions

23. Aerts, J. P. M., Hut, R. W., van de Giesen, N. C., Drost, N., van Verseveld, W. J., Weerts, A. H., and Hazenberg, P.: Large-sample assessment of spatial scaling effects of the distributed wflow_sbm hydrological model shows that finer spatial resolution does not necessarily lead to better streamflow estimates, *Hydrol. Earth Syst. Sci. Discuss.* [preprint], https://doi.org/10.5194/hess-2021-605, in review, 2021.