

Curriculum Vitae

Paul R. Houser, Ph.D.

1. Career Goal

My career goal is to continue my leadership in global water cycle research of direct relevance to society, including local to global land surface-atmospheric process observation and numerical simulation, and development and application of ecohydrologic data assimilation methods. I am also broadly interested in exploring the physical, spatial, and temporal interconnections between all the earth system components as they relate to the global water and energy cycles. My more specific interests include, water and energy flux studies at various scales including vadose zone, surface, and atmospheric interactions, regional land surface-atmospheric hydrologic modeling, remote sensing, surface flux observation, and near surface soil moisture investigation. I am especially interested in applying cutting-edge research to develop practical solutions to water problems faced by society.

2. Professional Preparation

1988-1992, University of Arizona, Hydrology and Water Resources, B.S. Cum Laude
1992-1996, University of Arizona, Hydrology and Water Resources, Ph.D.,
Dissertation: *Remote Sensing Soil Moisture Using Four Dimensional Data Assimilation*
1997, Universities Space Research Association, Post-Doctoral Education

3. Appointments

2009-present, Associate Professor, Geography and Geoinformation Science, George Mason University
2012-present, Associate, Water for Life Solutions LLC, Vienna VA
2009-present, Co-Director, Center for Intelligent Spatial Computing, George Mason University
2012-present, President & Director, CREW Services LLC, Ellicott City MD
2011-2012, Science Advisor, Bureau of Reclamation, Washington DC
2009-2009, Associate Professor, Atmospheric, Ocean, and Earth Sciences, George Mason University
2010-2011, Director of Hydrometeorology, Geovesi Holdings Ltd., Alexandria VA
2008-2010, Director of Hydrometeorology, EarthWater Global, Alexandria VA
2005-2008, Associate Professor, Climate Dynamics, George Mason University
2005-2008, Director, Center for Research on Environment and Water, Calverton MD
2000-2005, Head, Hydrological Sciences Branch, Goddard Space Flight Center, MD
1999-2000, Senior Scientist, NASA Headquarters, Washington DC
1997-2005, Research Scientist, NASA Goddard Space Flight Center, Greenbelt MD
1997, Post-Doctoral Research Scientist: Universities Space Research Association, Greenbelt, Maryland
1992-1996, Research Associate, University of Arizona, Tucson, Arizona
1993-1995, Teaching Assistant, University of Arizona, Tucson, Arizona
1991, Research Assistant: Los Alamos National Laboratory, Los Alamos, New Mexico
1988-1990, Hydrologic Technician (GS-4): U.S. Geological Survey, Portland, Oregon

4. Products (August 1, 2013: Peer-Reviewed Publications: ~122, Citations: ~7650, H-Index: 41)

Impact factors of primary journals

Bulletin of the American Meteorological Society: 5.25
Water Resources Research: 3.149
Journal of Climate: 4.31
Journal of Hydrometeorology: 3.05
Journal of Geophysical Research – Atmospheres: 3.174
Hydrologic Processes: 2.497
Advances in Water Resources: 2.449
Journal of Hydrology: 2.43

Peer-Reviewed Journal Articles

- Feng, X., T. DelSole, and P. R. Houser, 2013: Comparison of potential seasonal predictability in Water Cycle. In preparation.
- MacCracken, R.F. and P.R. Houser. Analysis of the Standard Climate-Viticulture Indices for the Eastern United States. *Journal of Applied Meteorology and Climatology*. Submitted.
- Feng, X., T. DelSole, and P. Houser (2013), Comparison of statistical estimates of potential seasonal predictability, *J. Geophys. Res. Atmos.*, 118, 6002–6016, doi:10.1002/jgrd.50498.
- Luo, Y., Feng, X., Houser, P., Anantharaj, V., Fan, X., De Lannoy, G., Zhan, X., and Dabbiru, L.: Potential soil moisture products from the aquarius radiometer and scatterometer using an observing system simulation experiment, *Geosci. Instrum. Method. Data Syst.*, 2, 113-120, doi:10.5194/gi-2-113-2013, 2013.
- Feng, X., M. Bosilovich, P. Houser, and J.-D. Chern (2013), Impact of land surface conditions on 2004 North American monsoon in GCM experiments, *J. Geophys. Res. Atmos.*, 118, 293–305, doi:10.1029/2012JD018805.
- Arsenault, K. R., Houser, P. R. and De Lannoy, G. J. M. (2012), Evaluation of the MODIS snow cover fraction product. *Hydrol. Process.*. doi: 10.1002/hyp.9636
- Arsenault, K. R., P. R. Houser, G. J. M. De Lannoy, and P. A. Dirmeyer (2013), Impacts of snow cover fraction data assimilation on modeled energy and moisture budgets, *J. Geophys. Res. Atmos.*, 118, doi:10.1002/jgrd.50542.
- Sahoo, A.K., De Lannoy, G.J.M., Reichle, R.H., Houser, P.R., Assimilation and Downscaling of Satellite Observed Soil Moisture over the Little River Experimental Watershed in Georgia, USA, *Advances in Water Resources* (2012), doi: <http://dx.doi.org/10.1016/j.advwatres.2012.08.007>
- Feng, Xia, Timothy DelSole, Paul Houser, 2012: A Method for Estimating Potential Seasonal Predictability: Analysis of Covariance. *J. Climate*, 25, 5292–5308. doi: <http://dx.doi.org/10.1175/JCLI-D-11-00342.1>
- Wood, E., J. K. Roundy, T. J. Troy, R. van Beek, M. Bierkens, E. Blyth, A. de Roo, P. Döll, M. Ek, J. Famiglietti, D. Gochis, N. van de Giesen, P. Houser, P. Jaffe, S. Kollet1, B. Lehner, D. P. Lettenmaier, C. Peters-Lidard, M. Sivapalan, J. Sheffield, A. Wade, P. Whitehead, (2012), Reply to comment by Keith J. Beven and Hannah L. Cloke on “Hyperresolution global land surface modeling: Meeting a grand challenge for monitoring Earth’s terrestrial water”, *Water Resour. Res.*, 48, W01802, doi:10.1029/2011WR011202.
- Gabriëlle J. M. De Lannoy, Rolf H. Reichle, Kristi R. Arsenault, Paul R. Houser, Sujay Kumar, Niko E. C. Verhoest, and Valentijn R. N. Pauwels, 2012: Multiscale assimilation of Advanced Microwave Scanning Radiometer–EOS snow water equivalent and Moderate Resolution Imaging Spectroradiometer snow cover fraction observations in northern Colorado. *Water Resour. Res.*, 48, 1, doi:10.1029/2011WR010588, 2012
- Yilmaz, M. Tugrul; DelSole, Timothy; Houser, Paul R., 2012: Reducing Water Imbalance in Land Data Assimilation: Ensemble Filtering without Perturbed Observations. *Journal of Hydrometeorology*, Feb2012, Vol. 13 Issue 1, p413-420.
- Feng, X., T. DelSole, and P. Houser (2011), Bootstrap estimated seasonal potential predictability of global temperature and precipitation, *Geophysical Research Letter*, 38, L07702, doi:10.1029/2010GL046511.
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- M. Tugrul Yilmaz, M. Tugrul, Paul R. Houser, Roshan Shrestha and Valentine Anantharaj (2010). Optimally Merging Precipitation by Minimizing Land Surface Modeling Errors. *Journal Applied Meteorology and Climatology*, 49(3), 415-423. doi: 10.1175/2009JAMC2305.1
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Invited Presentations (selected)

- Houser, P., 2013: Land and Water Data Assimilation and Integration Systems (Invited). U.S. Water Partnership's Water Data Integration Conference, June 19, 2013, U.S. Geological Survey, Reston, VA.
- Houser, P., 2013: A vision for an ultra-high resolution integrated water cycle observation and prediction system. Invited seminar at UC Davis, July 17 2013 [abstract].
- Houser, P., 2013: A vision for an ultra-high resolution integrated water cycle observation and prediction system. Invited seminar at Lawrence Berkley National Laboratory, July 19 2013 [abstract].
- Houser, P., Washington Youth Summit on the Environment, George Mason University, June 23-28, 2013.
- Houser, P. (participant and teacher): Incorporating Science into Water Conflict Resolution. Meeting supported by the U.S. State Department Bureau of Population, Refugees, and Migration in partnership with the Alliance for Conflict Transformation and George Mason University. June 10-13, 2013. Imperial Palace Hotel, Yerevan, Armenia.

- Houser, P., 2013: How can new observations lead to improvements in water management? INVITED Water Strategy for the World Climate Research Programme To address the WCRP Global Grand Challenge on Past and Future Changes in Water and the GEWEX Science Question on Global Water Resource Systems: 5-7 June 2013, Saskatoon, Canada
- Houser, P., 2013: Spatial Temporal Analysis of Drought Stationarity (invited). Interagency Forum on Climate Change Impacts and Adaptations. NASA-Headquarters, Washington DC. May 22, 2013
- Houser, P., 2013: A vision for an ultra-high resolution integrated water cycle observation and prediction system. A43A. Aerosols, Clouds, Radiation, Precipitation, and Their Feedbacks II. American Geophysical Union, Meeting of the Americas, Cancun Mexico, INVITED.
- Houser, P., 2013: The North American Water Project (invited), Pacific Northwest National Laboratory, Richland Washington, Water Cycle Forum, March 1, 2013.
- Houser, P., 2013: A Satellite View of Global Water and Energy Cycling. VA Water Resources Research Center, Virginia Tech. Geography Colloquium, Feb. 8, 2013. INVITED
- Houser, P., 2012: Land Surface Data Assimilation. Presentation A11N-02 (invited). American Geophysical Union Fall 2012 Meeting, San Francisco CA, December 3-7, 2012.
- P. Houser, 2012: A Satellite View of Global Water and Energy Cycling (Invited). Presentation H13K-02, American Geophysical Union Fall 2012 Meeting, San Francisco CA, December 3-7, 2012.
- Houser, P., 2012: Land Surface Data Assimilation. Presentation A11N-02 (invited). American Geophysical Union Fall 2012 Meeting, San Francisco CA, December 3-7, 2012.
- Houser, P., 2012: Klamath in the Balance: Klamath Whistle Blower. Klamath Falls OR, May 2012. INVITED
- Houser, P., 2012: Land Surface Data Assimilation. Presentation A11N-02 (invited). American Geophysical Union Fall 2012 Meeting, San Francisco CA, December 3-7, 2012.
- Houser, P., 2012: A vision for an ultra-high resolution integrated water cycle observation and prediction system (invited). Center for Urban Environmental Research and Education, University of Maryland,
- Houser, P., 2011. Reclamation's Role in Managing Western Water in Evolving Climate Conditions. INVITED Presentation at the Council of State Governments National Conference, Seattle WA, October 21, 2011
- Houser, P., 2011: A Vision for an Ultra-High Resolution Integrated Water Cycle Observation and Prediction System. University of Oklahoma College of Engineering – WaTER Center Speaker Series, INVITED, 25 February, 2011. [presentation]
- Houser, P. R., A. Schlosser, and J. Lehr, 2009: An updated view of global water cycling (solicited). Geophysical Research Abstracts, European Geosciences Union, EGU2009-13897, NH1.1 INVITED poster presentation, Vienna Austria 19-24 April 2009
- Houser, P., 2008: Value added to data through data assimilation systems. US-Canada GEO Workshop; National Science Foundation. October 28-30, 2008, Arlington, VA, INVITED.
- Houser, P., C. A. Schlosser, B. Lin, and J. Entin, 2008: A Satellite View of Global Water and Energy Cycling. Paper 8.1, American Meteorological Society 2008 Annual Meeting, New Orleans, LA, 20-24 January 2008, INVITED.
- Houser, P., 2008: Enhancing Water & Energy Cycle Research & Applications Connectivity. Joint Panel Discussion 3, American Meteorological Society 2008 Annual Meeting, New Orleans, LA, 20-24 January 2008, INVITED
- De Lannoy, G J, Houser, P R, Reichle, R H, Pauwels, V R, Verhoest, N E, 2007: Dealing with systematic errors in land surface modeling, soil moisture observations and assimilation, H411-04, American Geophysical Union Fall Meeting, San Francisco CA, December 10-14, 2007, INVITED.
- Houser, Paul, 2007: Land Surface Data Assimilation. IUGG General Assembly, Perugia Italy, Session JMS024, July 2-13, 2007, Invited.
- Houser, P., 2007: Water Cycle Variability, Change and Prediction in the Eastern United States. EastFIRE Workshop, Fairfax, VA June 5-8, 2007, Invited.

- Houser, P.; Schlosser, C; Lin, B; Entin, J., 2007: A Satellite View of Global Water and Energy Cycling. Geophysical Research Abstracts, Vol. 9, European Geosciences Union, EGU2007-A-11205, invited presentation/poster.
- Houser, P., WaterNet. NASA Applied Sciences Program: Solutions Networks (SN) Workshop, University of Maryland Conference Center, Adelphi, MD, April 12-13, 2007, invited.
- Houser, P., 2006. Recent Results in Land Surface Data Assimilation, H211-01, American Geophysical Union Fall Meeting, San Francisco CA, December 11-15, 2006, INVITED ORAL presentation.
- Houser, P., 2006. Land Data Assimilation & the Global Water Cycle. Invited seminar at Purdue University, Indiana, Oct 30, 2006.
- Houser, P., J. Entin, 2006. The NASA Energy- and Water-Cycle Study (NEWS). Geophysical Research Abstracts, European Geosciences Union, Vol. 8, 08456, invited presentation.
- Houser, P., and C. Schlosser, 2006. Global Water Cycle Variability and Change. Geophysical Research Abstracts, European Geosciences Union, Vol. 8, 08045, invited presentation
- Liang, X., M. Xu, W. Gao, K. E. Kunkel, J. R. Slusser, Y. Dai, Q. Min, P. R. Houser, M. Rodell, C. B. Schaaf, and F. Gao, 2005. Development of Land Surface Albedo Parameterization Based on MODIS data, 5.6, American Meteorological Society, 85th AMS Annual Meeting (INVITED).
- Wood, E. F., P. R. Houser, 2005. A Strategy for Integrated Water Cycle Observations from Space, American Geophysical Union Fall Meeting, H13J-01, INVITED.
- Peters-Lidard, C., S.V. Kumar, Y. Tian, J. Geiger, M. Garcia, M. Rodell, P. R. Houser, E. F. Wood, J. Sheffield, K. Mitchell, J. Meng, P. Dirmeyer, B. Doty, J. Adams, 2005. The Production and Value of High Resolution Land Surface Data Assimilation Products from the NASA/GSFC Land Information System, GEWEX 5th International Scientific Conference, Costa Mesa, California, 20-24 June, INVITED.
- Walker, J. P. and Houser, P. R., 2001. Temporal and Spatial Resolution Requirements for a Soil Moisture Mission. International Geoscience and Remote Sensing Symposium (IGARSS) [CD-ROM], Sydney, Australia, 9 - 13 July, 2001, 6-8. Invited
- Walker, J. P., and Houser, P. R., 2005. Challenges and Solutions to High Resolution Soil Moisture Mapping, EOS, Transactions American Geophysical Union, 86(18), Joint Assembly Supplement, Abstract G23A-06. Invited
- Zhan, X, Houser, P. R., and Walker, J. P., 2004. Jointly Retrieving Surface Soil Moisture from Active and Passive Microwave Observations Using Cubist Data Mining, EOS, Transactions American Geophysical Union, 85(47), Fall Meeting Supplement, Abstract SF11A-04. Invited
- Houser, P. R., Sun, C. and Walker, J. P., 2001. Continental-scale Assimilation of Remotely Sensed Snow Observations, EOS, Transactions American Geophysical Union, 82(47): F548. Invited

Contributed Presentations (Selected)

- Belvedere, D., P. Houser; P. van Oevelen; R. Schiffer; J. Entin; M. Bosilovich; C. Schlosser; E. Wood; M. Ek, 2012: North American Water Program (NAWP): A Vision to Address North America's Freshwater Sustainability Challenges. Presentation H12C-07. American Geophysical Union Fall 2012 Meeting, San Francisco CA, December 3-7, 2012.
- Houser, P., 2013: Water and Energy Cycle Integration Opportunities. NASA Energy and Water Cycle Workshop. May 1-2, 2013, Goddard Space Flight Center.
- Houser, P., 2013: North American Water Program (NAWP): A Vision to Address North America's Freshwater Sustainability Challenges. H52A. Addressing Water Security Through Large-Scale Hydroclimatology Studies. American Geophysical Union, Meeting of the Americas, Cancun Mexico.
- Houser, P. 2013: Water Cycle Missions Workshop Charge and Challenge, Water Cycle Missions for the Next Decade. Monday, April 29-30, 2013, Linthicum, MD.
- Lakings, J., S. Kilani, B. Bataineh, P. Houser. Groundwater recharge in Northern Jordan from NASA GLDAS water balance products and environmental isotopes analysis. The National and International Conference on Groundwater, April 28 – May 2, 2013, San Antonio, TX

- Houser, P., 2013: The North American Water Program. 11th Annual CPASW Climate Prediction Applications Science Workshop, April 23-25, 2013 Logan, UT.
- Mbongowo Mbuh, Paul Houser, Robert Pavlowsky, Jeffrey Lee, 2013: Geomorphology and human landscape of dust source prediction on the southern high plains of Texas and eastern New Mexico with MODIS imagery and logistic regression models. Association of American Geographers, Annual Meeting, Los Angeles Ca, April 9-13, 2013.
- MacCracken, R.F., E. Wood, M. Pan, A. Sahoo, J. Sheffield, P. Houser, D. Lettenmaier, H. Gao, R. Pinker, Y. Ma, C. Kummerow and J. Bytheway. Assimilating Remotely Sensed and Land Surface Model Data: Diagnosing and Reconciling Differences. American Meteorological Society Annual Meeting, Austin, TX, 6-10 Jan 2013.
- MacCracken, R.F., E. Wood, M. Pan, A. Sahoo, J. Sheffield, P. Houser, D. Lettenmaier, H. Gao, R. Pinker, Y. Ma, C. Kummerow and J. Bytheway. Data Distribution and Uncertainty Documentation for the Following Earth System Data Record: The Global Terrestrial Water Cycle. American Geophysical Union Fall Meeting, San Francisco, CA, 6-11 Dec 2012.
- Feng, X., and P. R. Houser, 2012: Potential seasonal predictability of water cycle in observations and reanalysis. H43A-1308, American Geophysical Union Fall Meeting, San Francisco, CA, December 3-7.
- X. Feng, and P. Houser, 2012: Potential Seasonal Predictability of Water Cycle in Observations and Reanalysis. Presentation H43A-1308, American Geophysical Union Fall 2012 Meeting, San Francisco CA, December 3-7, 2012.
- DelSole, T., M. Yilmaz, P. Houser, 2012: Reducing Water Imbalance in Land Data Assimilation: Ensemble Filtering without Perturbed Observations. Presentation H21J-07, American Geophysical Union Fall 2012 Meeting, San Francisco CA, December 3-7, 2012.
- MacCracken, R., E. Wood; J. Sheffield; D. Lettenmaier; P. Houser; R. Pinker; C. Kummerow; M. Pan; H. Gao; A. Sahoo; J., 2012: Data Distribution and Documenting Uncertainty Information for the Earth System Data Record: The Global Terrestrial Water Cycle. IN11A-1458, American Geophysical Union Fall 2012 Meeting, San Francisco CA, December 3-7, 2012.
- Houser, P., 2012: Prepared for National Science and Technology Council (NSTC) Monthly Committee Meeting on Homeland and National Security, Washington DC, February 14, 2012. .
- Houser, P., 2012: Western U.S.: Observed Hydrology & Vegetation Changes. Presentation to Interagency Working Group.
- Houser, P., 2012: Reclamation's Role in Managing Western Water in Evolving Climate Conditions, Presentation to the Department of the Interior, International Affairs Working Group
- Houser, 2011: Science at Reclamation. Presentation for Alex Hettinger, Office of Management and Budget (OMB), Washington DC, November 1, 2011.
- Houser, P., 2011: Scientific Integrity. Presentation at Reclamation's quarterly stakeholder's meeting, Washington D.C., October 6, 2011.
- Houser, P., 2011: Climate Change Adaptation. Presentation at Reclamation's Managers Conference, Las Vegas, September 7, 2011.
- Houser, P., 2011: Reclamation Climate Change Activities. Presentation for International Visitors, Washington DC., August 2011 .
- Houser, P., 2011: Draft Reclamation Scientific Integrity Policy, Briefing for Reclamation Leadership Team, Denver, CO, June 21, 2011
- Houser, P., 2011: Collaborative Science, Services and Tools to Support Integrated and Adaptive Water Resources Management. Briefing for Reclamation Leadership Team, Denver, CO, June 21, 2011.
- Shrestha, R.*, and P.R. Houser,; A comparative study of model initialization for spinning up the Noah land surface model using LIS, 24th Conference on Hydrology, 90thAMS Annual Meeting, Georgia World Congress Center, Atlanta, Georgia, January 17-21, 2010.
- P.R. Houser*, X. Feng, R. Shrestha, and T. Yilmaz; Precipitation uncertainty: How well do we know this critical hydrological variable? EGU2009-13903

- P.R. Houser, T. Yilmaz, R. Shrestha, and V. Anantharaj; Land surface modeling using optimally merged precipitation data from multiple sources, EGU2009-13899
- Shrestha, R., P.R. Houser; Distributed hydrological modeling using LIS-Noah land surface model, AGU Fall Meeting, Moscone Center, San Francisco, California, December 15-19, 2008.
- M.T. Yilmaz*, R. Shrestha, P.R. Houser, V. Anantharaj; Land surface modeling using optimally merged Precipitation data from multiple sources, AGU Fall Meeting, Moscone Center, San Francisco, California, December 15-19, 2008
- Shrestha, R., P.R. Houser, and M. Bosilovich; Land surface model uncertainty due to forcing heterogeneity, AGU 2008 Joint Assembly, Fort Lauderdale, Florida, May 27-30, 2008. Eos Trans. AGU, 89(23), Jt. Assem. Suppl.
- Yilmaz, M.T., P.R. Houser, R. Shrestha; Effect of land cover classification map resolution in land surface modeling studies, AGU Fall Meeting, Moscone Center, San Francisco, California, December 10-14, 2007. Eos Trans. AGU, 88 (52), Fall Meet. Suppl.
- Shrestha, R., P.R. Houser, M. Bosilovich, and D. Mocko; LIS-Noah land surface model validation in the Southern Great Plains (SGP), AGU Fall Meeting, Moscone Center, San Francisco, California, December 10-14, 2007. Eos Trans. AGU, 88(52), Fall Meet. Suppl.
- Shrestha, R., P.R. Houser, and M. Bosilovich; Anomalies due to heterogeneity of forcing and parameters in Land Surface Models, NASA MAP Program Science Team Meeting, University of Maryland Inn and Conference Center, College Park, Maryland, March 7-9, 2007.
- Njoku, Eni; Spencer, Michael; McDonald, Kyle; Smith, Joel; Houser, Paul; Doiron, Terence; O'Neill, Peggy; Girard, Ralph; Entekhabi, Dara, 2003: The HYDROS Mission: Requirements and Baseline System Design. NASA Technical Report 20070030851. IEEE Aerospace Conference; 6-13 Mar. 2004; Big Sky, MT; United States
- Yilmaz, M. Tugrul, T. DelSole and P. R. Houser, 2010: Introducing water budget constraint to improve land data assimilation performance, 24th Conference on Hydrology, 90th American Meteorological Society Annual Meeting (Atlanta, GA)
- Arsenault, Kristi R., F. Chen, M. Barlage, P. A. Dirmeyer, P. R. Houser, and K. Manning, 2010: Evaluating Modeled Snow-Atmosphere Coupling for Different Atmospheric and Physiographic Conditions, 22nd Conference on Climate Variability and Change, 24th Conference on Hydrology, 90th American Meteorological Society Annual Meeting (Atlanta, GA)
- Shrestha, Roshan K., P. R. Houser, 2010: A comparative study of model initialization for the Noah land surface model using LIS. 18th Conference on Applied Climatology, 22nd Conference on Climate Variability and Change, 24th Conference on Hydrology, 90th American Meteorological Society Annual Meeting (Atlanta, GA)
- Shrestha, R. K., Houser, P., and Gates, L., 2009: Incorporating sub-grid heterogeneity into a coarse resolution land surface model, Eos Trans. AGU, 90(52), Fall Meet. Suppl., Abstract H211-07
- Yang, C., Houser, P., 2009: Cloud Computing for Supporting Earth Sciences: a GMU CISC Practice, Eos Trans. AGU, 90(52), Fall Meet. Suppl., Abstract IN51A-1035.
- Sahoo, A. K., De Lannoy, G. J., R. H. Reichle, P. R. Houser, L., Dumenil-Gates, 2009: Assimilation of Satellite Observed Soil Moisture into the Noah Land Surface Model Using the 3-D EnKF Technique, Eos Trans. AGU, 90(52), Fall Meet. Suppl., Abstract H11G-07.
- L. Maio, P. R. Houser, C. Yang, H. Wu, 2009: Earth Science Data Records Sharing Supported by the MEaSUREs Spatial Web Portal, Eos Trans. AGU, 90(52), Fall Meet. Suppl., Abstract IN43B-1154.
- Su, H., P. R. Houser, Y. Tian, J. Geiger, S. Kumar, L. Gates, 2009: A Prototype Land Information Sensor Web: Design, Implementation and Implication for the SMAP Mission, Eos Trans. AGU, 90(52), Fall Meet. Suppl., Abstract IN23C-1071.
- Wood, E., D. Lettenmaier, P. Houser, R. Pinker, C. Kummerow, M. Pan, H. Gao. A. Sahoo, 2009: Progress on Developing Consistent Earth System Data Records for the Global Terrestrial Water Cycle, Eos Trans. AGU, 90(52), Fall Meet. Suppl., Abstract IN42A-05.

- Pozzi, W., J. Ward, E. Cox, R. Lawford, D. Matthews, P. Houser, M. Doherty, 2009: NASA Water-Cycle Solutions Networks and Community of Practice Approaches to enhance Decision-making, *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract IN34A-08.
- Matthews, D., M. Brilly, G. Gregoric, J. Polajnar, P. Houser, M. Rodell, and M. Lehning, 2009: Community of Practice Applications from WaterNet: The NASA Water Cycle Solutions Network. *Geophysical Research Abstracts*, European Geosciences Union, EGU2009-3295, HS7.1 poster presentation, Vienna Austria 19-24 April 2009.
- De Lannoy, G. J. M., P.R. Houser, N.E.C. Verhoest, and V.R.N. Pauwels, 2009: Fine-scale snow analyses improvement through coarse-scale AMSR-E SWE assimilation or fine scale MODIS SCF assimilation. *Geophysical Research Abstracts*, European Geosciences Union, EGU2009-4491, HS7.3 oral presentation, Vienna Austria 19-24 April 2009.
- Houser, P. R., X. Feng, R. Shrestha, and T. Yilmaz, 2009: Precipitation uncertainty: How well do we know this critical hydrological variable? *Geophysical Research Abstracts*, European Geosciences Union, EGU2009-13903, NH1.1 poster presentation, Vienna Austria 19-24 April 2009
- Houser, P. R., T. Yilmaz, R. Shrestha, and V. Anantharaj, 2009: Land surface modeling using optimally merged precipitation data from multiple sources. *Geophysical Research Abstracts*, European Geosciences Union, EGU2009-13899, NH1.1 poster presentation, Vienna Austria 19-24 April 2009
- Rasmussen, R., V. Grubisic, D. Gochis, D. Yates, K. Miller, P. Houser, C. Lui, K. Ikeda, M. Tewari, and J. Dudhia, 2009: Assessing Precipitation, Snowpack and Runoff over Colorado. *Geophysical Research Abstracts*, European Geosciences Union, EGU2009-11573, AS1.3 poster presentation, Vienna Austria 19-24 April 2009
- Anantharaj, V. G., P. R. Houser, F. J. Turk, C. A. Peterson, F. Hossain, R. J. Moorhead, D. L. Toll, and G. Mostovoy, 2009: A Rapid Prototyping Approach for the Evaluation of Potential GPM-Era Precipitation Products for Water Resources Management Applications. *Geophysical Research Abstracts*, European Geosciences Union, EGU2009-11712, AS1.3 poster presentation, Vienna Austria 19-24 April 2009
- Houser, P., 2008: NEWS Overview. NASA Energy and Water Cycle study (NEWS) PI Meeting, BWI Four Points Sheaton Hotel, November 3-5; Baltimore, MD
- DeLannoy, G., P. Houser and K. Arsenault, 2008. Developing a Practical Snow Data Assimilation Method. Climate Prediction Program for the Americas (CPPA) PI Meeting, Silver Spring, Maryland, Sept 29-Oct 1, 2008.
- Toll, D., B. Li, B. Cosgrove, P. Houser, L. G. de Goncalves., 2008. NASA Land Information System Multi-Model Ensemble Hydrological Predictions. Climate Prediction Program for the Americas (CPPA) PI Meeting, Silver Spring, Maryland, Sept 29-Oct 1, 2008.
- Mitchell, K., J. D. Tarpley, C. Peters-Lidard, M. A. Friedl, X. Zeng, L. Jiang, R. H. Reichle, P. R. Houser, and X. Zhan, 2008: Satellite-Derived Land Surface Fields in the Data Assimilation, Validation and Forcing of the Land Component of NCEP Global and Regional Weather and Climate Prediction Models. Paper 5.2, American Meteorological Society 2008 Annual Meeting, New Orleans, LA, 20-24 January 2008.
- Feng, X., M. G. Bosilovich, P. R. Houser, and J. D. Chern, 2008: Investigation of Land Surface Conditions Impact on Processes and Predictability of the North American Monsoon. Paper J5.2, American Meteorological Society 2008 Annual Meeting, New Orleans, LA, 20-24 January 2008
- Luo, Y., P. R. Houser and X. Zhan, 2008: Accounting for bias of model simulations in land data assimilation. Paper 11.3, American Meteorological Society 2008 Annual Meeting, New Orleans, LA, 20-24 January 2008.
- Houser, P., and C. Larko, 2008: WECHO- A Water and Energy Cycle EOS Clearinghouse Client, Annual ECHO 2008 Workshop; Earth Observing System Clearinghouse (ECHO), Riverdale, Maryland, January 29-31, 2008
- Houser, P., 2008: CAHMDA-III Meeting Summary. Third Catchment-scale Hydrological Modelling & Data Assimilation International Workshop; Melbourne, Australia, January 9-11, 2008.

- De Lannoy, G. J. M., P. R. Houser, V. R. N. Pauwels, N. E. C. Verhoest, 2008: Addressing soil moisture model error using adaptive ensemble Kalman filtering. CAHMDA-3 Workshop, Melbourne Australia, 9-11 January 2008.
- Su, H., Houser, P., Tian, Y., Kumar, S., Geiger, J., Belvedere, D., 2007: Comparison of two perturbation methods to estimate the land surface modeling uncertainty, H31H-0765, American Geophysical Union Fall Meeting, San Francisco CA, December 10-14, 2007.
- Yilmaz, M T, Houser, P, Shrestha, R, 2007: Effect of land cover classification map resolution in land surface modeling studies, H31D-0635, American Geophysical Union Fall Meeting, San Francisco CA, December 10-14, 2007.
- Shrestha, R K, Houser, P, Bosilovich, M, Mocko, D, 2007: LIS-Noah land surface model validation in the Southern Great Plains (SGP), H31D-0646, American Geophysical Union Fall Meeting, San Francisco CA, December 10-14, 2007.
- Luo, Y, Houser, P R, Zhan, X, 2007: Soil Moisture Data Assimilation with the Noah Land Surface Model, IN41B-02, American Geophysical Union Fall Meeting, San Francisco CA, December 10-14, 2007.
- Arsenault, K R, Kumar, S, Hunter, S M, Aman, R, Houser, P R, Toll, D, Engman, T, Nigro, J, 2007: Land Surface Model Biases and their Impacts on the Assimilation of Snow-related Observations, C21B-0463, American Geophysical Union Fall Meeting, San Francisco CA, December 10-14, 2007.
- Gao, X, Schlosser, A C, Houser, P R, Entin, J K, 2007: Analysis of Global Atmospheric and Terrestrial Hydrological Budget Using Merged Satellite Data Sets, GC51B-07, American Geophysical Union Fall Meeting, San Francisco CA, December 10-14, 2007.
- Turk, J, Anantharaj, V, Mostovoy, G, Houser, P, 2007: Development of a Rapid Prototyping Capability for Hydrological Applications of Global Precipitation Measurements, IN41B-04, American Geophysical Union Fall Meeting, San Francisco CA, December 10-14, 2007.
- Turlapaty, A, Younan, N, Du, J, Houser, P, Anantharaj, V, Turk, J, 2007: A data fusion toolbox to optimize precipitation estimates for land surface modeling applications, IN43B-1179, American Geophysical Union Fall Meeting, San Francisco CA, December 10-14, 2007.
- Anantharaj, V, Mostovoy, G, Li, B, Peters-Lidard, C, Houser, P, Moorhead, R, Kumar, S, 2007: Rapid prototyping of soil moisture estimates using the NASA Land Information System, IN31C-04, American Geophysical Union Fall Meeting, San Francisco CA, December 10-14, 2007.
- Ling, Y, Anantharaj, V, Lu, Q, Turk, J, Houser, P, Sanyal, J, 2007: A computational framework for the evaluation of satellite precipitation estimates for hydrological applications, IN43B-1178, American Geophysical Union Fall Meeting, San Francisco CA, December 10-14, 2007.
- Houser, P R, Belvedere, D R, Pozzi, W H, Imam, B, Schiffer, R, Lawford, R, Schlosser, C A, Gupta, H, Welty, C, Vorosmarty, C, Matthews, D, 2007: WaterNet: The NASA Water Cycle Solutions Network, H24A-08, American Geophysical Union Fall Meeting, San Francisco CA, December 10-14, 2007.
- Mostovoy, G, Peters-Lidard, C, Houser, P, O'Neil, P, Owe, M, Anantharaj, V, Aanstoos, J, 2007: An Observing Systems Simulation Experiment for potential soil moisture retrievals using Aquarius instruments, IN43B-1188, American Geophysical Union Fall Meeting, San Francisco CA, December 10-14, 2007.
- Houser, P., D. Belvedere. W. Pozzi, B. Imam, R. Schiffer, C. Welty, R. Lawford, C. Schlosser, H. Gupta, C. Vorosmarty, D. Matthews, 2007: WaterNet: The NASA Water Cycle Solutions Network. NASA Water Management Program IP Meeting, UMUC Inn and Conference Center, Adelphi, Maryland, November 1, 2007.
- Houser, P., D. Belvedere. W. Pozzi, B. Imam, R. Schiffer, C. Welty, R. Lawford, C. Schlosser, H. Gupta, C. Vorosmarty, D. Matthews, 2007: WaterNet: The NASA Water Cycle Solutions Network. IEEE International Geoscience and Remote Sensing Symposium, Session We11MF, Barcelona Spain, July 25, 2007.

- De Lannoy Gabriëlle, Valentijn R. N. Pauwels, Paul R. Houser, Niko E. C. Verhoest, Timothy Gish, 2007: Representativeness of point soil moisture observations, upscaling and assimilation. IUGG General Assembly, Perugia Italy, Session HS2004, July 2-13, 2007.
- Houser, P., 2007: SMAP Value Added Products. Soil Moisture Active Passive Mission (SMAP) Workshop, Arlington VA, July 9-10, 2007.
- Houser, P., 2007: Improving Modeled Land Fluxes through Observational Constraints. LandFLUX Workshop, Toulouse France, May 30-June 3, 2007, Draft Report.
- Kumar, S., R. Reichle, C. D. Peters-Lidard, R. D. Koster, X Zhan, W. T. Crow, J. B. Eylander, P. R. Houser, 2007: An Integrated System for Sequential Hydrologic Data Assimilation using the Land Information System, American Geophysical Union Spring Meeting, Acapulco Mexico, May 22-25, 2007.
- Anantharaj V, G V Mostovoy, C D Peters-Lidard, P R Houser, and B Li, 2007: An Initial assessment of Soil Moisture Fields Simulated by the Noah Land Surface Model at Regional and Local Scales. H51D-02, American Geophysical Union Spring Meeting, Acapulco Mexico, May 22-25, 2007, oral presentation.
- De Lannoy, G., Houser, P., Verhoest, N., Pauwels, V., 2007: Assimilation of soil moisture observations in the OPE3 field with horizontal information propagation in the Community Land Model. Geophysical Research Abstracts, Vol. 9, European Geosciences Union, EGU2007-A-02015, oral presentation.
- Matthews, D., Brilly, M., Houser, P., 2007: WaterNet: The NASA water cycle solutions network. Geophysical Research Abstracts, Vol. 9, European Geosciences Union, EGU2007-A-04795, oral presentation.
- de Goncalves, L. G., Houser, P. R., 2007: The Feasibility of Soil Moisture Estimation through Streamflow Assimilation in Dense Vegetated Areas. Geophysical Research Abstracts, Vol. 9, European Geosciences Union, EGU2007-A-09781, poster presentation.
- Toll, D, Dong, J, Houser, P, Arsenault, K., 2007: NASA and NOAA Surface Water and Energy Balance Data for Water Resources Applications. Geophysical Research Abstracts, Vol. 9, European Geosciences Union, EGU2007-A-10539, poster presentation.
- Houser, P., 2007. Data Assimilation and Modeling. Space Policy Institute Workshop: The Contribution of Satellite Data to Efficient Freshwater Management, George Washington University, 13-14 March 2007.
- Houser, P., 2007. Water Cycle Data Integration, Assimilation & Utilization. Satellite Observations of the Global Water Cycle Workshop, March 7-9 2007, Beckman Center of the National Academies, Irvine CA.
- Houser, P. and J. Entin, 2007. The NASA Energy and Water cycle Study. Satellite Observations of the Global Water Cycle Workshop, March 7-9 2007, Beckman Center of the National Academies, Irvine CA.
- Houser, P., D. Belvedere, B. Imam, R. Schiffer, C. A. Schlosser, H. Gupta, C. Welty, C. Vorosmarty, D. Matthews and R. Lawford, 2007. WaterNet: The NASA Water Cycle Solutions Network. Satellite Observations of the Global Water Cycle Workshop, March 7-9 2007, Beckman Center of the National Academies, Irvine CA.
- Schlosser, C. A. and NASA Energy and Water-cycle Study (NEWS) Water-Budget Integration Team, 2007. The NASA Energy and Water-cycle Study (NEWS) Global Water-Budget Synthesis. Satellite Observations of the Global Water Cycle Workshop, March 7-9 2007, Beckman Center of the National Academies, Irvine CA.
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- Meng, C., P. Houser, K. Mitchell, M. Rodell, and 10 other authors, 2002. Validation of Global LDAS Radiative Forcing, American Geophysical Union Spring Meeting, Washington, 2002.
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5. Research Support

- Houser, P., and X. Feng, 2013-2015: Water Cycle Intensification Indicator (WCI), NASA NNH12ZDA001N- INCA.\$241,762.25, 3mo/yr
- Houser, P., 2013-2014: Workshop: Water Cycle Missions for the Next Decade, NASA- NNH12ZDA001N-TWSC, \$49,400, 1.2 months.
- Houser, P. (PI); 01/12/2011-01/11/2014: Observed Water Cycle Predictability and NEWS Organization. NASA-NEWS Program, \$568,296; 0.3 FTE/yr (GMU).

Wood, E., D. Lettenmaier, P. Houser, C. Kummerow, R. Pinker, 2007-2012: Developing consistent Earth System Data Records for the global terrestrial water cycle. NASA ROSES-2006 NNH06ZDA001N-MEASURES, 0.2 FTE/yr, submitted March 5, 2007, selected Nov 2007.

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Crow, W., X. Zhan, C. Reynolds, P. R. Houser, B. Doorn, T. J. Jackson, 2006-2009: Integrate NASA's Global Soil Moisture Remote Sensing and Modeling Data into USDA's Global Crop Production Decision Support System, GMU. NASA NN-H-04-Z-YO-010-C, \$89.5k, 0.16 FTE/yr. started August 2006.

Restrepo, P., C. D. Peters-Lidard, B. A. Cosgrove, M. Garcia, P. R. Houser, V. Koren, S. Kumar, M. Rodell, D. Seo, M. Smith, D. L. Toll, 2006-2009: Improving NOAA/NWS Forecast Decision Support with NASA Satellite Data and Land Information System Product, GMU. NASA NN-H-04-Z-YO-010-C, \$1,500k, 0.19 FTE/yr, selected June 2005, subcontract from Universities Space Research Association (USRA) started August 2006.

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Bruce, L., V. Anantharaj, G. Mostovoy, and P. Houser, 2007-2008: Optimizing GPM Precipitation Estimation Using High Resolution Land Surface Modeling for Decision Support. GMU. \$85k, 0.05 FTE, subcontract from Mississippi State University, submitted November 2006, selected March 2007, started July 2007.

Anantharaj, V. G. Mostovoy, J. Du, and P. Houser, 2007-2008: A Rapid Prototyping Capability Experiment to Evaluate Potential Soil Moisture Retrievals of Aquarius Radiometer and Scatterometer, GMU. \$95k, 0.05 FTE, subcontract from Mississippi State University, submitted November 2006, selected March 2007, started July 2007.

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Brilly M., G. Gregoric, J. Polajnar, M. Kobold, M. Zagar, H. Knoblauch, M. Staudinger, S. Mecklenburg, M. Lehning, J. Schweizer, G. Balint, I. Cacic, G. Huffman, P. Houser, D. Belvedere, and D. Matthews, 2009-2012: Enhanced Water Resources and Disaster Management Decision Support Systems in Europe by Improved Analysis and Forecasting of Snowpack, Avalanches, Runoff, Floods, Debris Flows and Drought, IGES. NASA-DECISIONS program: NNH07ZDA001N-DECISIONS, \$1197868, 0.05 FTE/yr, submitted August 2008, transferred to Dr. J. Shukla November 2008.

Houser, P., D. Cline, L. Rundquist, 2008-2010: Benchmarking NASA Snow Research Results in NWS Hydrological Decision Support, IGES. NASA-ROSES 2007 A.20; NNH07ZDA001N, \$999k, 0.08 FTE/yr, submitted May 25, 2007, selected December 4, 2007, transferred to Dr. J. Shukla November 2008.

Toll, D., B. Cosgrove, P. Houser, J. Dong, and G. de Goncalves, 2007-2010: NASA Land Information System Development, Application and Validation for Improving Ensemble Hydrologic Prediction in Support of NOAA NWSRFS, IGES. NOAA Climate Program Office (CPO) for Fiscal Year (FY) 2007 funding opportunity (OAR-CPO-2007-2000636), Climate Prediction Program for the Americas (CPPA), \$61k, 0.08 FTE/yr, submitted July 25, 2006, selected March 2007, awaiting award notification, transferred to Dr. J. Shukla November 2008.

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- Sahoo, A., and Houser, P., 2009-2011: Determining the Importance of Land-Atmosphere Coupling on Hydrologic Data Assimilation Performance, IGES. NSF 06-545 Hydrologic Sciences Program, \$459k, 0.04 FTE/yr, submitted June 1, 2008, transferred to Dr. J. Shukla November 2008.
- Pozzi, W., B. Fekete, B. Doorn, M. Piasecki, P. Fox, C. Vorosmarty, P. Houser, D. McGuinness, 2009-2012. Cyberinfrastructure and Architecture of the Operational GEOSS Global Agricultural and Water Cycle Data Integration Systems, GMU. NASA-AIST program: NNH07ZDA001N-AIST, \$1442571, 0.02 FTE/yr, submitted August 2008, transferred to Dr. J. Shukla November 2008.
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- Su, H., P. Houser, V. Anantharaj, D. Lettenmaier, H. Gao, X. Fan, S. Kumar, M. Bosilovich, 2009-2012: A Land Surface OSSE Testbed in Support of the NRC's 2007 Decadal Survey Missions, IGES. NASA-ROSES 2008: NNH08ZDA001N-MAP , \$1734k, 0.08 FTE/yr, submitted May 25, 2008, transferred to Dr. J. Shukla November 2008.
- Su, H., and P. Houser, 2009-2012: A Ground based Sensor Web Testbed to Support Surface Hydrological Studies, IGES. A proposal to NSF-PD 08-1179 - Environmental Implications of Emerging Technologies, \$162502, 0.08 FTE/yr, submitted September 15, 2008, transferred to Dr. J. Shukla November 2008.
- Houser, P, R. Schiffer, C. Schlosser, W. Lapenta, W. Rossow, B. Lin, E. Njoku, 2006-2009: The NASA Energy and Water cycle Study Science Integration Team, IGES.; NASA GWEC Program, \$882k, 0.25 FTE, transferred to Dr. J. Shukla November 2008.
- Bosilovich, M., J. Roads, C. Peters-Lidard, W. K. Lau, P. Houser, D. M. Mocko, 2006-2009: Model Analysis Intercomparison Project for the Coordinated Enhanced Observing Period (CEOP), IGES. NASA NN-H-04-Z-YS-008-N, 0.04 FTE, \$185k, transferred to Dr. J. Shukla November 2008.
- Houser, P., 2006-2009: WEC Project Office, IGES. NASA GWEC Program, \$463k, 0.25 FTE/yr, transferred to Dr. J. Shukla November 2008.
- Houser, P., Y. Tuan, S. Kumar, and J. Geiger, 2006-2009: A Prototype Land Information Sensor Web, IGES. NASA-ROSES 2005 A.33; NNH05ZDA001N-AIST, \$1,175k 0.25 FTE/yr, transferred to Dr. J. Shukla November 2008.
- Houser, P., D. Belvedere, B. Imam, R. Schiffer, C. Schlosser, H. Gupta, C. Welty, C. Vörösmarty, D. Matthews, R. Lawford, 2006-2009: WaterNet: The NASA Water Cycle Solutions Network, IGES. NASA-ROSES 2005 A.24; NNH05ZDA001N-DECISION, \$2084k, 0.25 FTE/yr, selected April 4, 2006, started October 2006, transferred to Dr. J. Shukla November 2008.
- Houser, P., 2007-2010: Towards Operational Snow Data Assimilation, IGES. NOAA Climate Program Office (CPO) for Fiscal Year (FY) 2007 funding opportunity (OAR-CPO-2007-2000636), Climate Prediction Program for the Americas (CPPA), \$385k, 0.08 FTE/yr, submitted July 25, 2006, selected April 16, 2007, started August 2007, transferred to Dr. J. Shukla November 2008.
- Houser, P., and E. Wood, 2007-2010: Establishing a Consistent Global Soil Moisture Earth System Data Record, IGES. NASA-ROSES 2006 A.15; NNH06ZDA001N-EOS, \$1200k, 0.17 FTE/yr, submitted July 18, 2006, selected August 2007, transferred to Dr. J. Shukla November 2008.
- Houser, P., C. Larko, 2007: A Water end Energy Cycle EOS Clearing House Client (WECHO), IGES. NASA-ROSES 2006 A.19; NNH06ZDA001N-ACCESS, \$116k, 0.08 FTE, submitted June 14, 2006; selected Oct. 30, 2006; Started June 2007.
- Anantharaj, V., Houser, P., Peters-Lidard, C., 2006-2007: Evaluation of the NASA Land Information System using the Rapid Prototyping Capabilities, GMU. \$77.7k, 0.195 FTE, subcontract from Mississippi State University starting August 2006.

- Houser, P., Zhan, X., Arsenault, K., Cosgrove, B, 2004-2007: Assimilation of MODIS and AMSR-E Land Products into the Noah LSM, IGES.; Joint Center for Satellite Data Assimilation, \$450k, 0.08 FTE.
- Houser, P., D. Belvedere, B. Imam, R. Schiffer, C. Schlosser, H. Gupta, C. Welty, C. Vörösmarty, D. Matthews, R. Lawford, D. Toll, and F. Policelli, 2005-2008: A Water Cycle Solutions Network, NASA-GSFC. NASA NN-H-04-Z-YO-010-C, withdrawn.
- Entekhabi, D., et al., 2003-2012: HYDROS: The Hydrospheric State Mission. NASA ESSP-3 program, \$175M. 0.04 FTE, (mission cancelled, December 2005).
- Cosgrove, B., Houser, P. 2003-2006: An Enhanced 12 Kilometer North American Land Data Assimilation Systems (NLDAS2), NASA-GSFC. NOAA/GAPP, \$420K
- Reichle, R., Koster, R., Zhan, X., Houser, P. 2003-2006: Assimilation of AMSR-E Data and Application to the Initialization of Soil Moisture Reservoirs in a Seasonal Forecasting System, NASA-GSFC. NRA-03-OES-02 \$600K
- French, A., Houser, P., Pinheiro, A., Meng, J. 2003-2006 Optimal Land Surface Temperature Estimation and Assimilation for Global Hydrological Applications, NASA-GSFC. NRA-03-OES-02 \$750K.
- Houser, P. R., C. Peters-Lidard, K. Mitchell, K. Bender, S. Denning, B. Doty, P. Dirmeyer, and E. Wood, 2002-2005: Land Information System, NASA-GSFC. NASA-HPCC program CAN-00-OES-01, \$1.5M.
- Peters-Lidard, C., Houser, P. R., 2003-2005: Coupling High Resolution Earth System Models Using Advanced Computational Technologies, NASA-GSFC. NASA-NRA-02-OES-04, \$1M.
- Kalma, J. D., Willgoose, G. R., Walker, J. P., Houser, P. R. and Woods, R. A. 2002-2004: Scaling and Assimilation of Soil Moisture and Streamflow. ARC Discovery, NASA-GSFC. AU\$235k.
- Arsenault, K., P. Houser, D. Matthews, C. Hartzell, Steffen Meyer, and Warren Sharp, 2003-2005: The Use of NASA Land Data Assimilated Products to Improve Flood and Drought Risk Analysis and Forecasting for Water Resources Management in the Columbia River Basin, NASA-GSFC. NRA 00-OES-05, \$400k.
- Matthews, D., C. Hartzell, K. R. Arsenault, P. Houser, 2003-2005: Improved Water Demand Forecasting for Water Resources Managers, NASA-GSFC. GEWEX America Prediction Project (GAPP), Office of Global Projects, National Oceanic and Atmospheric Administration, \$210k.
- Koster, R. D., Reichle, R., Reinecker, M., Suarez, M., Walker, J. P. and Houser, P. R. 2002-2004: Assimilation of Satellite Observations of the Land Surface in Support of NASA's Seasonal-to-Interannual Prediction Project NASA-GSFC. NASA NRA 00-OES-07, US\$540k.
- Houser, P. R., 2001-2004: Global Validation of EOS-AQUA Land Surface Dynamics using Data Assimilation, NASA-GSFC. NASA-AQUA NRA-00-OES-03, \$330k.
- Houser, P. R., P. O'Neill, 2002-2005: Active-Passive Soil Moisture Remote Sensing through Dynamic Vegetation, NASA-Global Water and Energy Cycle Program, NASA-GSFC. NRA-00-OES-07, \$350k.
- Famiglietti, J. S., P. R. Houser, F. Olivera, J. P. Walker, and M. Rodell, 2002-2005: A Catchment-Based Global River Routing Scheme for Climate Models and Assimilation of Streamflow and Altimetry Data, NASA-GSFC. NASA-Global Water and Energy Cycle Program NRA-00-OES-07, \$330k.
- Houser, P. R., P. O'Neill, E. Kim, 2002, Quantifying Microwave Transmission Through Dynamic Vegetation, NASA-GSFC 2002 Directors Discretionary Fund (DDF), \$30k.
- Houser, P. R., 2002, A Land Surface Patch-Based Ensemble Kalman Filter, NASA-GSFC. 2002 Directors Discretionary Fund (DDF), \$55k.
- Houser, P. R. and M. Bosilovich, 2002, Miniaturized Eddy Covariance Instrument for small UAVs, NASA-GSFC. 2002 Directors Discretionary Fund (DDF), \$40k.
- Houser, P. R., and J. Entin, 2000-2003: The North American Monsoon's Effect on Land Surface Predictability, NASA-GSFC. NOAA 2000 PACS/GCIP, \$150k.
- Houser, P. R., H. L. Pan, K. Mitchell, M. Bosilovich, J. Walker, B. Cosgrove, and J. Entin, 2000-2003: A Global Land Data Assimilation System, NASA, NASA-GSFC. NRA 99-OES-04, \$900k.

Houser, P. R., P. O'Neill, E. Kim, 2001, Quantifying Microwave Transmission Through Dynamic Vegetation, NASA-GSFC. 2001 Directors Discretionary Fund (DDF), \$25k.

Walker, J, P. R. Houser, J. Foster, and M. Stieglitz, 2000-2003: Assimilation of Remotely Sensed Snow Observations into the NSIPP Land Surface Model, NASA-GSFC. NASA NRA 99-OES-04, \$600k.

Houser, P. R., and J. S. Famiglietti, 1999-2002: Optimal Land Initialization for Seasonal Climate Predictions, NASA-GSFC. NASA NRA 98-OES-07, \$600k.

Houser, P. R., J. R. Wang, and B. Choudhury, 1999-2002: Remote Sensing Soil Moisture using Four Dimensional Data Assimilation of TRMM Microwave Observations, NASA-GSFC. NASA NRA 98-OES-02, \$330k.

Houser, P. R., and B. Choudhury, 1998-2001: Continental-Scale Soil Moisture Data Assimilation, NASA-GSFC. NASA NRA 97-MTPE-12, FY 1998-2000, \$240k.

McLaughlin, D., D. Entekhabi, and P. R. Houser, 1999-2002: Soil Moisture Data Assimilation for Continental-Scale Land Surface Hydrology Applications, NASA-GSFC. NASA NRA-98-OES-11, \$360k,

Peters-Lidard, C., P. R. Houser and P. O'Neill, 1999-2002: Quantifying the Relationship between Remotely-Sensed and Modeled Soil Moisture, NASA-GSFC. NASA NRA-98-OES-11, \$360k.

Shuttleworth, W. J., Houser, P. R., H. Gupta, D. Goodrich, J. Famiglietti, and J. Berglund, 1994-1998: Remote Sensing Soil Moisture Using Four-Dimensional Data Assimilation, UA. NASA Project NAGW-4165, NASA-MTPE Water Cycle Processes Program.

6. Teaching

- Principles of Hydrology; HWR 250, University of Arizona, 1992-1995.
- Land-Climate Interactions, CLIM 714, George Mason University, 2006-2010.
 - Spring 2006 Student Overall Evaluation: Teaching: 4.50
 - Spring 2007 Student Overall Evaluation: Teaching: 4.14, Course: 4.86
 - Spring 2009 Student Overall Evaluation: Teaching: 4.60, Course: 5.00
- The Hydrosphere, EOS 656/EVPP 652/GEOG 570, George Mason University, 2010-2013.
 - Spring 2011 Student Overall Evaluation: Teaching: 4.50, Course: 4.17
 - Spring 2012 Student Overall Evaluation: Teaching: 4.80, Course: 4.60
 - Spring 2013 Student Overall Evaluation: Teaching: 4.83, Course: 4.83
- Physical Climatology, GGS 312, 2012-2013. (DE application pending)
 - Fall 2012 Student Overall Evaluation: Teaching: 4.60, Course: 4.00
- Cold Land Processes and Atmosphere Interactions, Special Topics Course, CSI 996, George Mason University, 2006, 2007.
- Equivalent Water Thickness Analysis, Special Topics Course, CSI 796, George Mason University, 2006.
- Observing the Arctic: A window to climate change; International Summer School, Svalbard 2009.
- Short Course: Incorporating Science into Water Conflict Resolution. Meeting supported by the U.S. State Department Bureau of Population, Refugees, and Migration in partnership with the Alliance for Conflict Transformation and George Mason University. June 10-13, 2013.
- Short Course: Water Infrastructure, Contamination and Risk Assessment, Reconnect Workshop 2013, Command, Control, and Interoperability Center for Advanced Data Analysis. June 2-8, 2013, Morgan State University.
- Lecturer at the NATO Advanced Study Institute on Data Assimilation for the Earth System. Acquafredda, Maratea, Italy 19 May-1 June 2002.
- Lecturer at the Oxford/RAL Spring School Data Assimilation for the Earth System (March 2004),

7. Synergistic Activities

- Teaching and Training: Advisor and Instructor for many successful undergraduate and graduate students; Developed courses in Principles of Hydrology, Physical Climatology, Land-Climate Interactions, the Hydrosphere, and Cold Land Processes. Numerous short courses on Data Assimilation, Hydrology and the Cryosphere.

- Development of Research Tools: Land Information System (LIS), the North-American Land Data Assimilation System (NLDAS), the Global Land Data Assimilation System (GLDAS), Community Land Model (CLM).
- Computational and Observational Methods: High-performance land modeling and data assimilation software development; global water cycle data systems development; development and operation of a 36-site Rocky Mountain snow, soil moisture and weather observation mesonet; soil moisture, water-level, and snow satellite mission development; water cycle satellite mission.
- Reviewing and Editing: Participation in many NASA, NOAA, DOE, and NSF proposal review panels. Provides frequent peer-reviews for leading journals. DOE, NOAA and NCAR advisory panels. Associate Editor of WIRES Water! And Journal of Applied Remote Sensing; Board member of Geovesi, EarthWater Global, and Water Fund.
- Community Leadership: Project scientist for the NASA Energy and Water cycle Study (NEWS), Founder of the North American Water Project; Chair of the CUAHSI Hydrological Information Systems Standing Committee, American Meteorological Society Hydrology Committee Chair, American Geophysical Union Remote Sensing Committee, NASA Climate Indicators Program Lead.
- Outreach and Committee Work: Project Scientist for the NASA Energy and Water cycle Study, Chair of the GAPP (GEWEX Americas Prediction Project) Scientific Advisory Group, Co-chair of the U.S. Global Change Research Program (USGCRP) water cycle group, American Meteorological Society Hydrology Committee Chair, American Geophysical Union Remote Sensing Committee, NASA representative to the International Global Energy and Water Experiment (GEWEX), National Center for Atmospheric Research Land Working Group Co-Chair, International Satellite Land-Surface Climatology (ISLSCP) Science Panel, NCAR-Research Applications Laboratory Advisory Panel, The Water Fund Advisory Board, GEWEX-Global Land-Atmosphere System Study (GLASS) Panel, American Geophysical Union, American Meteorological Society. The Institute of Electrical and Electronics Engineers, International Association of Hydrological Sciences

8. Honors and Awards (selected)

- Fulbright Senior Specialists Candidate, 2006-2011.
- NASA Software of the Year Award, 2005
- NASA Space Act Award, Land Information System Software, Version 4.0; June 1, 2005.
- Presidential Early Career Award for Scientists and Engineers (PECASE), 2000
- Goddard Space Flight Center Special Act Award, December 1997,1999,2000,2001,2002,2003,2004.
- American Geophysical Union Hydrology Section Outstanding Student Paper, 1996.
- National Aeronautics and Space Administration Fellow in Global Change Research, 1992-1995.
- The National Science Foundation Graduate Fellowship, 1992.
- Department of Energy Environmental Restoration and Waste Management Scholarship, 1990.
- Eagle Scout, Boy Scouts of America, 1984.

9. Professional and Community Support Activities (selected)

- NASA Energy and Water cycle Study (NEWS), Project Scientist, 2003-.
- National Fish Wildlife and Plant Climate Adaptation Strategy, Steering Committee
- Interagency Climate Change Forum, member
- North American Water Program (NAWP), Project Scientist.
- Chair, GMU Grievance Committee, 2012-.
- GGS Chair's Committee, 2012-
- 2012-Chair, Addressing Water Security Through Large Scale Hydroclimatology Studies, American Geophysical Union, Meeting of the Americas, Cancun Mexico.
- Houser, P R., GEOSS Water Strategy Workshop, Discussant, San Francisco, December 2012 (international).

- Workshop Chair and Organizer, Water Cycle Missions for the Next Decade. Monday, April 29-30, 2013, Linthicum, MD (120 International Participants).
- Senior editor, Journal of Applied Remote Sensing, 2006-
- Associate Editor, Wires-Water, Wiley, 2012-
- Editorial board of ESIPRI
- Student Poster Judge, American Geophysical Union Fall Meeting, San Francisco CA, December 2013.
- Workshop Chair and Organizer, NASA Energy and Water Cycle Workshop. May 1-2, 2013, Goddard Space Flight Center. Observing the Arctic: A window to climate change; International Summer School, Svalbard 2009.
- ISSI (International Space Science Institute) International Team: Land Data Assimilation: Making sense of hydrological cycle observations.
- Chair of the Hydrological Information Systems Standing Committee, CUAHSI, 2008-
- Chair of Solutions Networks (SN) Workshop breakout session: Identification of End Users and Their Needs, April 2007.
- Chair of "Climate Aspects of Hydrometeorology", American Meteorological Society Annual Meeting, San Antonio, TX, 14-18 January 2007.
- Chair of "Impacts of Terrestrial Changes on Weather and Climate", American Meteorological Society Annual Meeting, San Antonio, TX, 14-18 January 2007.
- International Association of Hydrological Sciences (IAHS) - International Commission on the Coupled Land-Atmosphere System (ICCLAS) Commission, Vice President, 2007-
- Climate Prediction Program for the Americas, Chair Land-Atmosphere Interaction Session, 14-16 August 2006, Tucson, AZ.
- GEWEX Water and Energy Simulations and Prediction (WESP) – Global Land Data Assimilation Systems working group.
- Computational Rapid Prototyping Capabilities for Advancing Science Toward Societal Benefits; IN31B Session Chairperson, AGU Fall 2006.
- Senior editor, Journal of Applied Remote Sensing, 2006-
- Editorial board, Journal of Advances in Modeling Earth Systems, 2008-
- Editorial board of the special CEOP issue of the Journal of Meteorological Society of Japan, 2006-2007
- Federation of Earth Science Information Partners (ESIP), Water Management Applications Cluster Chair, 2006-
- African Monsoon Multidisciplinary Analysis (AMMA), International Water Cycle Coordinator, 2005-2008
- Workshop to Promote and Coordinate US Contributions to AMMA, Water Cycle Chair, 4-5 May 2006.
- Climate Prediction Program for the Americas (CPPA), Science Panel Member, 2006-
- NASA Energy and Water cycle Study (NEWS), Project Scientist, 2003-
- GEWEX Americas Prediction Project (GAPP), Chair Scientific Advisory Group, 2003-2005
- U.S. Global Change Research Program (USGCRP) water cycle group, Co-Chair, 1999-2000
- American Meteorological Society Hydrology Committee Chair, 2005-
- Coordinated Enhanced Observing Period (CEOP) representative to the Coordinated Observations and Prediction of the Earth System (COPES)
- American Geophysical Union Remote Sensing Committee, 1998-2006.
- NASA representative to the International Global Energy and Water Experiment (GEWEX), 2000
- NASA International Satellite Working Group, Water Cycle Lead, 2002-2005
- National Center for Atmospheric Research Land Working Group, Co-Chair, 2001-2002
- International Satellite Land-Surface Climatology (ISLSCP) Science Panel, 2003-
- NCAR-Research Applications Laboratory Advisory Panel, 2005-

- The Water Fund Advisory Board, 2005-2007
- EarthWater Global Technical Advisory Board, 2007-2010
- United Waters Advisory Board, 2007-2008
- North American Land Data Assimilation System (NLDAS & NLDAS-E) Team Member, 1997-
- Global Land Data Assimilation System (GLDAS) Team Member, 2000-2005
- South American Land Data Assimilation System (SALDAS) Team Member, 2006-
- Belgium STEREO-CROP project steering group, 2003-2006.
- GEWEX-Global Land-Atmosphere System Study (GLASS) Panel, 2000-
- Chair of the American Meteorology Society 20th Conference on Hydrology, 2006
- Chair of the American Meteorology Society 21th Conference on Hydrology, 2007
- Chair for the NASA-NEWS proposal review panel held on March 14-16, 2006
- Panelist for the NOAA-OGP CPPA proposal review panel on October 19-21, 2005
- Panelist for the U.S. Climate Change Science Program, Water Panel, Nov 15, 2005
- Panelist for the Capacity Building in Latin America "Earth Observations in the Service of Water Management", Oct 2005.
- Chair of Theme 3: Roles of Land Fluxes in Water and Energy Cycles, , GEWEX 5th International Scientific Conference, Costa Mesa, California, 20-24 June 2005.
- NASA Hydros ESSP Mission Education and Public Outreach Working Group Lead, 2002-2005.
- NASA Cold Land Processes Working Group Modeling and Assimilation Subgroup Lead, 2004.
- NASA Cold Land Processes Working Group Member, 2000-
- Soil Moisture Mission Working Group, Steering Group Member, 2000-
- NASA WatER Satellite Mission (Water Elevation Recovery) Working Group, 2000-
- European Land Data Assimilation System (ELDAS) Advisory Panel, 2001-2005.

10. Professional Affiliations

- American Geophysical Union, 1992-
- American Meteorological Society, 1992-
- The Institute of Electrical and Electronics Engineers, 1997-
- International Association of Hydrological Sciences, 1992-

11. Collaborators

Anantharaj V (MS), Arsenault K (UMBC/GMU), Bambacus M (NASA), Belvedere D (USRA), Benedict S (GEWEX), Bosilovich M (NASA), Cline D (NOAA), DeLannoy G (UG), Dirmeyer P (GMU), Doorn B (NASA), Ek M (NOAA), Elder K (USFS), Entin J (NASA), Famiglietti J (UCI), Feng X (GMU), Gochis D (NCAR), Hildebrand P (NASA), Lawford R (GEWEX), Lettenmaier D (UW), Leung R (PNNL), Lohmann D (RMS), Matthews D (HydrometDSS), Njoku E (JPL), Pan M (PU), Peters-Lidard C (NASA), Pinker R (UMD), Rasmussen R (NCAR), Restrepo P (NOAA), Rodell M (NASA), Santanello J (ESSIC), Schaake J (NOAA), Schiffer R (USRA), Schlosser C (MIT), Sheffield J (PU), Shrestha, R (COLA), Shuttleworth W (UA), Sorooshian S (UCI), Sun D (GMU), Syed K (UL), Tao W (NASA), Tarpley D (NOAA), Toll D (NASA), Unninayar S (NASA), van Oevelen P (GEWEX), Walker J (UM), Welty C (UMBC), Wood E (PU), Yang C (GMU), Yilmaz, M (USDA)

12. Graduate and Postdoctoral Advisors

Shuttleworth W (UA); Dickinson R (UT); Sorooshian S (UCI); Hutchinson C (UA); Gupta H (UA); Goodrich D (USDA), Kalb M (NOAA), Rood R (UM), Engman E (SAIC)

13. Graduate and Postdoctoral Advisees

Arsenault K, Ph.D., 2011; Li W, Ph.D., 2010. Sahoo A, Ph.D. 2008, postdoc 2009; Su H, Ph.D. 2008, postdoc 2008-2009; MacCracken, R. Ph.D. 2011, postdoc 2011-2013; DeLannoy G, Ph.D. 2006 (UG), postdoc 2006-2009; Moradkhani H, Ph.D. 2004 (UCI); Ruediger C, Ph.D. 2005; Feng X, Ph.D. 2011, postdoc 2011-2013; Pan M, Ph.D. 2006; Yilmaz M, Ph.D., 2011; Rubicam C, MS 2013; Mbuh M, Ph.D.

2015; Walsh, J MS 2012; Fairly A, MS 2012; Flood J., Ph.D. 2013; Tucker E., MS.; Badger, A., Ph.D. 2014; Meitz, B., M.S. 2014; Lewis, M., Ph.D., 2015; Butcher, G, Ph.D., 2014; Heidari, A Ph.D, 2015; Rasure, J, Ph.D. 2015;