

MAHTA MOGHADDAM

Professor of Electrical Engineering and Computer Science University of Michigan

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Education:

- Ph.D., Electrical Engineering, 1991.
University of Illinois at Urbana-Champaign, Urbana, IL
Thesis Advisor: Weng Cho Chew
Thesis Title: Forward and Inverse Scattering Problems in the Time Domain
- M.S., Electrical Engineering, 1989.
University of Illinois at Urbana-Champaign, Urbana, IL
Thesis Advisor: Weng Cho Chew
Thesis Title: Response of an Eccentric Dipole in Cylindrically Layered Media
- B.S. with *Highest Distinction*, Electrical Engineering, 1986.
University of Kansas, Lawrence, KS

Positions Held:

- Professor of Electrical Engineering and Computer Science (and of Applied Physics), University of Michigan, Ann Arbor, MI.
- 9/2006- 8/2009: Associate Professor (with tenure) of Electrical Engineering and Computer Science (and of Applied Physics), University of Michigan, Ann Arbor, MI.
- 9/2003- 8/2006: Associate Professor (without tenure) of Electrical Engineering and Computer Science, University of Michigan, Ann Arbor, MI.
- 1991-August 2003: Radar Science and Engineering Section, Jet Propulsion Laboratory, Pasadena, CA. Last position title: Senior Engineer.

Awards, Honors, and Memberships:

- Fellow, IEEE (2009)
- Education Excellence Award, College of Engineering, The University of Michigan (2009)
- Outstanding Section Professional Award, IEEE Southeastern Michigan Section (2009)
- Elected member of URSI Commission B (1998)
- Member/Fellow of the Electromagnetics Academy (2001)
- Member of Phi Kappa Phi, Tau Beta Pi, Eta Kappa Nu (Vice President, 1985-1986).
- NASA Certificate of Recognition: Dual low-frequency radar for soil moisture under vegetation and at-depth (2004)

- NASA Certificate of Recognition: Single-chip high-density FPGA implementation of the SAR azimuth prefilter (2003)
- NASA Certificate of Recognition: Dual frequency stacked-patch array for large aperture antenna feed (2004)
- NASA Certificate of Recognition: Cassini Program, Cassini Radar Team (1997)
- NASA Group Achievement Award: Cassini Program, Cassini Radar Team (1997)

Research Areas:

I have focused my recent research on the emerging interdisciplinary areas of environmental remote sensing, subsurface characterization, smart environmental sensor webs, and physics-based medical imaging. The techniques involved are closely related, even though the applications may be diverse. Each of these areas requires the development of state-of-the-art sensors as well as sophisticated statistical signal processing and physical models to characterize the sensors and their interaction with their intended environments. The synergy of physics-based modeling, statistical approaches, and state-of-the-art experimentation provide for fundamentally new analysis and unprecedented products in each of these areas.

The specific problems currently under investigation in my group include:

- Sensor system and algorithm development for high-resolution subsurface and subcanopy characterization; novel lower-RF radar signal processing algorithms and nonlinear statistically based inverse scattering techniques (application areas: deep and subcanopy soil moisture, water resource monitoring, detection of underground structures, planetary subsurface characterization, permafrost characterization in the arctic)
- Smart sensor web design using dynamic data assimilation and optimal control (application areas: environmental monitoring, scaling between in-situ and satellite-based observations, validation of satellite-derived estimates of environmental variables at multiple spatial scales)
- Large-scale environmental mapping using satellite radar imagery and high-dimensional multi-modal analysis (application areas: mapping of circumboreal wetlands for global change studies, quantifying the changes in wetlands and permafrost in northern high latitudes as an immediate result of global warming)
- Physics-based radar processing at low frequencies that penetrate the targets: integrating inverse scattering into traditional radar signal processing (application areas: subsurface detection, subsurface structure characterization, river channel profile mapping)

- Nonlinear inverse scattering and imaging; theoretical and experimental development of combined acoustic and microwave imaging using physics-based models and statistically based inversion (application area: super-resolution in medical imaging)

Teaching Portfolio at the University of Michigan:

- EECS 230 – Electromagnetics I (undergraduate)
- EECS 330 – Electromagnetics II (undergraduate)
- EECS 530 – Electromagnetic Theory (graduate)
- EECS 631 – Advanced Electromagnetic Scattering (graduate)
- EECS 632 – Active Microwave Remote Sensing (graduate)
- *Consistently among highly ranked instructors in the College of Engineering*

Selected Internal Service:

- Chair, EE Program Committee, 01/2007-2009
- ECE Chair Search Committee, 2007-2008
- Rackham Graduate School: Michigan Mentoring Initiative Committee (renamed MORE), 2007-2010
- EECS Curriculum Committee, 2004-present
- College of Engineering Curriculum Committee, 01/2007-present
- College of Engineering, Research Strategy Committee, 01/07-05/07
- Graduate Student Symposium, Judge, 11/2007
- EECS Ad-Hoc Committee for Undergraduate Advising, 2006-2007
- Graduate Admissions Committee, EECS U of M, 2003-2004
- Undergraduate Advisor, EE Program, 2004-2005, 2005-2006, and 2006-2007
- Faculty Representative, EE Program Curriculum Committee, 2004-2005
- College Representative, multiple College of Engineering Faculty Candidate interviews
- Qualifying exams (~30)
- Ph.D. committees (~25)

Professional Activities and External Service:

- Associate Editor, IEEE Transactions on Geoscience and Remote Sensing, 2005-present
- Associate Editor, J. Electromagnetics Waves and Applications, 2008-present
- Guest Associate Editor, IEEE JSTARS, Special Issue on Microwave Remote Sensing for Land Hydrology Research and Applications, 2009
- Chapter Chair, IEEE-GRS Southeastern Michigan, 2005-present
- Guest Editor, IEEE Transactions on Instrumentation and Measurement, ICONIC07 Special Issue.
- Science Team, Japanese Earth Exploration Agency ALOS/PALSAR mission
- Science Definition Team, NASA Soil Moisture Active/Passive (SMAP) mission, 2008-2012
- Chair, Algorithms Working Group, SMAP mission, 2008-2012

- Co-Chair, SMAP Algorithms and Cal/Val Workshop, June 2009
- Steering Committee, Microwave Land Hydrology Workshop, October 2008
- Co-Chair, NASA ESTO Radar Technology Panel, 2003
- Member, NASA Surface Water Working Group
- Member, NASA ESTO Radar/Radiometer Technology Working Group
- Thesis Opponent, Chalmers University of Technology, Sweden, May 2007
- Reviewer for:
 - IEEE Transactions on Geoscience and Remote Sensing
 - IEEE Transactions on Microwave Theory and Techniques
 - IEEE Transactions on Antennas and Propagation
 - Inverse Problems
 - IEEE Geoscience and Remote Sensing Letters
 - IEEE Microwave and Wireless Components Letters
 - Radio Science
 - Remote Sensing of Environment
 - Journal of Computational Physics
 - Electronics Letters
 - Tellus
 - Journal of Electromagnetic Waves and Applications
 - Journal of the Optical Society of America
 - International Journal of Applied Earth Observation and Geoinformation
 - Canadian Journal of Remote Sensing
 - IJPRS Journal of Photogrammetry and Remote Sensing
 - Journal of Optics
 - Sensors
 - Journal of Geophysical Research, Atmospheres
 - Journal of Geophysical Research, Biogeochemistry
- Organizer of numerous conference sessions
- Chair/co-Chair of numerous conference sessions
- Proposal reviews, routinely
- Member of Technical Program Committees, multiple conferences

Research Awards:

- “Ground Network Design and Dynamic Operation for Near-Real-Time Validation of Space-Borne Soil Moisture Measurements,” (2009-2012) (PI, NASA AIST; \$1.382M)
- “Collaborative research: Linking heterogeneity of above-ground and subsurface processes at canopy patch scales to ecosystem level dynamics,” (2009-2012) (Co-I, NSF HS; \$319.5k)
- “Optimal use of active/passive microwave observations at differing spatial and temporal scales to estimate root-zone soil moisture in dynamic, heterogeneous terrains,” (2009-2013) (Co-I, NASA/THP; \$607.8k project, \$136k for Moghaddam)
- “SMAP Science Definition Team – Soil Moisture Retrieval Algorithms” (2009-2012) (PI, NASA SMD; \$190k)

- “Atmospheric Propagation for an X-band Venus Altimeter,” (2008) (co-PI, JPL/DRDF Spontaneous Concepts; \$20k)
- “Mapping Wetlands Dynamics for Reducing Uncertainties in the Boreal North American Carbon Budget,” (2008-2011) (PI, NASA CARBON; \$386k)
- “High-Resolution Integrated Ultrasound and Microwave Imaging for Early-Stage Breast Cancer Diagnosis,” (2008-2011) (PI, NSF CBET; \$300k)
- “An Inundated Wetlands ESDR,” (2008-2013) (Co-PI, lead for boreal segment, NASA MEaSURES; \$5M project, \$665k for Moghaddam)
- “Sand Mapping Radar,” 2007-2010 (Co-I, KAUST; \$1.7M project, \$210k for Moghaddam)
- “Soil Moisture Smart Sensor Web using Data Assimilation and Optimal Control,” 2006-2009 (PI, NASA AIST; \$1.199M)
- “Noncontact River Cross Section Measurement with Radar,” 2005-2009 (PI, USGS; \$109k)
- “Dual-low-frequency Radar for Soil Moisture Under Vegetation Canopy and At-depth,” 2002-2005. (PI, NASA ESTO Instrument Incubator program; \$4.02M)
- “Biomass and Wetlands Maps of the North American Boreal Region from SAR Imagery,” 2001-2005. (PI, NASA CARBON; \$496k)
- JPL Technical Lead, “Application of Remote Sensing Technology to the Alameda Corridor, Los Angeles, CA.” 2001-2002. (Applications Program; \$110k)
- “Fusion of Radar and Optical Remote Sensing Data: Estimating Inputs to Ecosystem Models,” 1997-2000. (PI, NASA TE; \$309k)
- “Radar Scattering Inversion: Forested Areas,” 1994-96. (PI, NASA MPE; \$300k)
- “Assessing Fire Susceptibility and Post-Fire Vegetation Recovery.” 2000-indefinite. Japanese Space Agency, PI, NASDA. No-cost basis data.
- “The Niono Irrigation Project and Malaria: A Computer Model,” 2002-2006. (Co-I. NIH/UCLA lead; \$3M project, \$100k for Moghaddam)
- “Synthetic Aperture Radar (SAR) On-Board Azimuth Pre-Filter Processor,” 2000-2002. (Co-I, NASA ATIP)
- “Multi-Gigabit/sec Optical Communication Transceiver for Earth Science,” 2001-2002.(Co-I, NASA AIST)
- “Assimilation of SAR-Derived Parameter Maps into BIOME-BGC Process Model Over BOREAS Study Area,” 1997-1999 (Co-I, NASA).
- “Estimation of Hydrological Parameters in Boreal Forest Using SAR Data,” 1993-96. (Co-I, NASA)

Current Graduate Students:

- Ruzbeh Akbar, Ph.D., started 09/09
- Majid Albahkali, Ph.D., started 09/07
- Mariko Buergin, Ph.D., started 01/09
- Nicole Campbell, Ph.D. expected 05/10
- Xueyang Duan, Ph.D., expected 05/11
- Yuriy Goykhman, Ph.D. Expected 08/10
- Mark Haynes, Ph.D. expected 05/11

- Line van Nieuwstadt, Ph.D. expected 08/10
- Jane Whitcomb, Ph.D., expected 12/10

Past Graduate Students:

- Pan Liang, Ph.D. 12/04 (now with Atmospheric and Environmental Research (AER))
- Preston Partridge, MS, 5/04 (now with Aerospace Corporation)
- Chih-Hao Kuo, Ph.D. 12/07 (now with Schlumberger-Doll Research)
- Alireza Tabatabaenejad, Ph.D., 09/08 (post-doc at University of Michigan)

Post-Doctoral Fellows:

- Maha Ali, 11/2006-present
- Alireza Tabatabaenejad, 10/2008-present

Undergraduate Student Projects:

- Mark Haynes
- Song Liang
- Nathaniel Osborn
- Edwin Kek
- Lester Peh
- Junhui Loh
- Brian Foster
- Scott Rudolph
- Lai Wei

Advising of Visiting Students:

- Daniel Clewley, University of Wales, Aberystwyth, Summer 2007 (MS Thesis)
- Mariko Buerger, ETH, Zurich, Switzerland, 01/08-08/08 (MS Thesis)

Student Awards:

- Yuriy Gokhman, MIT Lincoln Laboratories, Graduate Student Fellowship, 2008-2009
- Mark Haynes, DoD Congressionally Directed Medical Research Program (BCRP), predoctoral Fellowship, 2008-2011
- Line van Nieuwstadt, NASA Harriet Jenkins Graduate Student Fellowship (2006-2009)
- Nicole Campbell, GEM Graduate Fellowship (2005-2007)
- Mark Haynes, University of Michigan Regents Fellowship for Graduate studies (2006-2007)
- Mark Haynes, Michigan Space Grant Consortium Undergrad Fellowship, (2005-2006)
- Alireza Tabatabaenejad, URSI Young Scientist Award, General Assembly of the International Union of Radio Science (2005).

Journal Papers:

1. Haynes, M., and M. Moghaddam, "Method for Large, Low-Contrast Acoustic Inverse Scattering with Born Iterations for Ultrasound Breast Imaging," *in review*.
2. Entekhabi, D., et al., "The soil moisture active and passive (SMAP) mission," *in review*.
3. Kuo, C.H., and M. Moghaddam, "An inversion algorithm for the retrieval of the subsurface properties of layered soil media from stepped frequency VHF and UHF radar measurements," *in review*.
4. Tabatabaenejad, A., and M. Moghaddam, "Study of validity region of small perturbation method (SPM) for one-dimensional two-layer rough surfaces," *in review*.
5. Duan, X., M. Moghaddam, D. Wenkert, S. Smrekar, and R. Jordan, "X-band model of Venus atmosphere permittivity," *in revision*.
6. Ali, M., and M. Moghaddam, "3D time-domain nonlinear superresolution technique for breast cancer detection", *in revision*.
7. Tabatabaenejad, A., and M. Moghaddam, "Inversion of dielectric properties of layered rough surface using the simulated annealing method," *IEEE Trans. Geosci. Remote Sensing*, vol. 47, no. 7, pp. 2035-2046, July 2009.
8. Whitcomb, J., M. Moghaddam, K. McDonald, J. KelIndorfer, and E. Podest, "Mapping wetlands of Alaska from L-band SAR imagery," *C. J. Remote Sensing*, vol. 35, no. 1, pp. 54-72, February 2009.
9. Kuo, C.H., and M. Moghaddam, "A theoretical analysis of backscattering enhancement of surface plasmons from multilayer rough surfaces," *IEEE Trans. Antennas Propagat.*, vol. 56, no. 4, pp. 1133-1143, April 2008.
10. Moghaddam, M., Y. Rahmat-Samii, E. Rodriguez, D. Entekhabi, D. Moller, J. Hoffman, L. Pierce, "Microwave Observatory of Subcanopy and Subsurface (MOSS): A mission concept for global deep and subcanopy soil moisture observations," *IEEE Trans. Geosci. Remote Sensing*, vol. 45, no. 8, pp. 2630-2644, August 2007.
11. Kuo, C.H., and M. Moghaddam, "Electromagnetic scattering from multilayer rough surfaces separated by media of arbitrary dielectric profiles for remote sensing of soil moisture," *IEEE Trans. Geosci. Remote Sensing*, vol. 45, no. 2, pp. 349-367, Feb 2007.
12. Entekhabi, D., and M. Moghaddam, "Mapping Recharge From Space: Roadmap to Meeting The Grand Challenge," *Hydrogeology Journal*, vol. 15, no.1, pp. 105-116, January 2007.
13. Kuo, C.H., and M. Moghaddam, "Scattering from Multilayer Rough Surfaces based on the Extended Boundary Condition Method and Truncated Singular Value Decomposition," *IEEE Trans. Antennas Propagat.*, vol. 54, no. 10, pp. 2917-2930, October 2006.

14. Kuo, C.H., and M. Moghaddam, "Electromagnetic Scattering From a Buried Cylinder in layered media with Rough Interfaces," IEEE Trans. Antennas Propagat., vol. 54, no. 8, pp. 2392-2401, August 2006.
15. Tabatabaenejad, A., and M. Moghaddam, "Bistatic scattering from layered rough surfaces," IEEE Trans. Geosci. Remote Sensing, vol. 44, no. 8, pp. 2102-2115, August 2006.
16. Lucas, R., A. Lee, N. Cronin, M. Moghaddam, C. Witte, and P. Tickle, "Empirical relationships between AIRSAR backscatter and forest biomass, Queensland, Australia," Remote Sensing of Environment, Volume 100, Issue 3, 15 February 2006, Pages 407-425.
17. Lucas, R., N. Cronin, M. Moghaddam, A. Lee, and C. Witte, "Integration of SAR and Landsat-derived Foliage Projected Cover for Woody Regrowth Mapping, Queensland, Australia," Remote Sensing of Environment, Volume 100, Issue 3, 15 February 2006, pp. 388-406.
18. Diuk-Wasser, M., G. Dolo, MA. Bagayoko, N. Sogoba, M. B. Toure, M. Moghaddam, N. Manoukis, S. Rian, S. F. Traore, C. E. Taylot, "Patterns of irrigated rice growth and malaria vector breeding in Mali using multitemporal ERS-2 synthetic aperture radar," Int. J. Remote Sensing, vol. 27, no.3, pp. 535-548, 2006. (first author was a UCLA student that worked with me on substantial parts of her thesis while I was at JPL.)
19. Liang, P., L. Pierce, and M. Moghaddam, "Radiative Transfer Model for Microwave Bistatic Scattering from Forest Canopies," IEEE Trans. Geosci. Remote Sensing, vol. 43, no. 11, pp. 2470-2483, 2005.
20. Liang, P., M. Moghaddam, L. Pierce, and R. Lucas, "Radar Backscattering Model for Multilayer Mixed Species Forests," IEEE Trans. Geosci. Remote Sensing, vol. 43, no. 11, pp. 2612-2626, 2005.
21. Lucas, R., M. Moghaddam, and Natasha Cronin, "Microwave scattering from mixed species forests, Queensland, Australia," IEEE Trans. Geosci. Remote Sensing, vol. 42, no. 10, pp. 2142-2159, 2004.
22. Gamon, J., K.F. Huemmerich, D. Peddle, J. Chen, D. Fuentes, F. Hall, J. Kimball, S. Goetz, J. Gu, K. McDonald, J. Miller, M. Moghaddam, A. Rahman, J. Roujean, E. Smith, S. Walthall, P. Zarco-Tejada, B. Hu, R. Fernandes, J. Cihlar, "Remote sensing in BOREAS: Lessons learned." *Remote Sensing of Environ*, vol. 89, pp. 139-162, 2004.
23. Moghaddam, M., J. Dungan, and S. Acker, "Forest variable estimation from fusion of SAR and multispectral optical data," IEEE Trans. Geosci. Remote Sensing, vol. 40, no. 10, pp. 2176-2187, 2002.
24. Lorenz RD, Elachi C, West RD, Johnson WTK, Janssen MA, Moghaddam M, Hamilton GA, Liepack O, Bunker A, Roth LE, Wall SD, Dente L, Casarano D, Posa F, "Cassini Radio Detection and Ranging (RADAR): Earth and Venus observations," J. Geophys. Res. – Space Physics, vol. 106, no. A12, pp. 30271-30279, December 2001.
25. Saatchi, S. and M. Moghaddam, "Estimation of crown and stem water content and biomass of Boreal forest using polarimetric SAR imagery," IEEE Trans. Geosci. Remote Sensing, vol. 38, no. 2, pp. 697-709, March 2000.

26. Moghaddam, M., S. Saatchi, and R. Cuenca, "Estimating subcanopy soil moisture with radar," *J. Geophys. Res. - Atmospheres*, vol. 105, no. D11, pp. 14899-14911, June 16, 2000.
27. Moghaddam, M., "Effect of medium symmetries on parameter estimation with polarimetric interferometry," *J. Electromag. Waves Appl.*, vol. 14, no. 2, pp. 173-184, 2000.
28. Njoku, E., Y. Rahmat-Samii, J. Sercel, W. Wilson, and M. Moghaddam, "Evaluation of an inflatable antenna concept for microwave sensing of soil moisture and ocean salinity," *IEEE Trans. Geosci. Remote Sensing*, vol. 37, no. 1, pp. 63-78, 1999. Featured on Cover.
29. Moghaddam, M., and S. Saatchi, "Monitoring tree moisture using an estimation algorithm applied to SAR data from BOREAS," *IEEE Trans. Geosci. Remote Sensing*, vol. 37, no. 2, pp. 901-916, 1999. Featured on Cover.
30. Treuhaft, R., S. Madsen, M. Moghaddam, and J. van Zyl, "Vegetation characteristics and underlying topography from interferometric radar," *Rad. Sci.*, vol. 31, no. 6, pp. 1449-1485, 1996.
31. Chew, W., G. Otto, W. Weedon, J.H. Lin, C.C. Lu, Y.M. Wang, and M. Moghaddam, "Nonlinear diffraction tomography: The use of inverse scattering for imaging," *Int. J. Imaging Sys. Tech.*, vol. 7, pp. 16-24, 1996.
32. Moghaddam, M., and S. Saatchi, "Analysis of scattering mechanisms in SAR imagery over boreal forest: Results from BOREAS '93," *IEEE Trans. Geosci. Remote Sensing*, vol. 33, no. 5, pp. 1290-1296, 1995
33. Moghaddam, M., S. Durden, and H. Zebker, "Radar measurement of forested areas during OTTER," *Remote Sensing Environment*, vol. 47, no. 2, pp. 154-166, 1994.
34. Moghaddam, M., and W. C. Chew, "Study of some practical issues in inversion with the Born iterative method using time-domain data," *IEEE Trans. Antennas Propagat.*, vol. 41, no. 2, pp. 177-184, 1993.
35. Moghaddam, M., and W. C. Chew, "Simultaneous inversion of compressibility and density in the acoustic inverse problem," *Inverse Probl.*, vol. 9, pp. 715-730, 1993.
36. M. Moghaddam and W. C. Chew, "Variable-density linear acoustic inverse problem," *Ultrasonic Imaging*, vol. 15, pp. 255-266, 1993.
37. Moghaddam, M., and W. C. Chew, "Nonlinear two-dimensional velocity profile inversion using time-domain data," *IEEE Trans. Geosci. Remote Sensing*, vol. 30, no. 1, pp. 147-156, 1992.
38. Moghaddam, M., W. C. Chew, B. Anderson, E. Yannakakis, and Q. H. Liu, "Computation of transient electromagnetic waves in inhomogeneous media," *Rad. Sci.*, vol. 26. no. 1, pp. 265-273, 1991.
39. Moghaddam, M., E. Yannakakis, W. C. Chew, and C. Randall, "Modeling of the subsurface interface radar," *J. Electromagn. Waves Appl.* vol. 5, no. 1, pp. 17-39, 1991.
40. Lee, S.M., W. C. Chew, M. Moghaddam, M. Nasir, S. L. Chuang, R. W. Herrick, and C. L. Balestra, "Modeling of rough-surface effects in an optical turning mirror using the finite-difference time-domain method," *J. Lightwave Technol.*, vol. 9, no. 11, pp. 1471-1480, 1991.

41. Moghaddam, M., W. C. Chew, and M. Oristaglio, "Comparison of the Born iterative method and Tarantola's method for an electromagnetic time-domain inverse problem," *Int. J. Imaging Sys. Tech.*, vol. 3, pp. 318-333, 1991.

Journal Papers (in preparation):

- Duan, X., and M. Moghaddam, "Vector electromagnetic scattering from 2D arbitrary random rough surfaces for remote sensing of soil moisture," to be submitted November 2009.
- Duan, X., and M. Moghaddam, "Atmospheric propagation effects on design of an X-band radar altimeter and interferometer system for Venus surface topography," to be submitted December 2009.
- Goykhman, Y., and M. Moghaddam, "An efficient method of retrieval of parameters for three-layer nonsmooth subsurface structures," to be submitted October 2009.
- Whitcomb, J., and M. Moghaddam, "Full-wave 3D solution for the bistatic scattering from randomly rough surfaces," to be submitted December 2009.

Book Chapters:

- M. Moghaddam, "Polarimetric SAR Phenomenology and Inversion Techniques for Vegetated Terrain," in *SAGE Remote Sensing Handbook*, T. Warner, Ed., Sage Publications, London, 2009.
- W. Chew, W. Weedon, and M. Moghaddam, "Inverse Scattering and Imaging Using Broadband Time-domain Data," in *Ultra-Wideband Short-Pulse Electromagnetics*, L. Carin and L Felsen, Eds., Plenum Press, New York, 1995.
- M. Moghaddam, W. Chew, E. Yannakakis, and C. Randall, "Modeling of the Subsurface Interface Radar," in *Review of Progress in Quantitative Nondestructive Evaluation*, vol. 10A, D. Thompson and D. Chimenti, Eds., Plenum Press, New York, 1991.

Other Publications:

- M. Moghaddam and T. Jackson (Workshop Report), "Planning for a Soil Moisture Mission," EOS, 01 September, 2009.
- P. O'Neill, M. Moghaddam, and T. Jackson (Workshop Report), "SMAP Algorithms and cal/val workshop, Oxnard, CA (June 9-11, 2009)," Earth Observer, submitted.
- M. Moghaddam, E. Rodriguez, D. Moller, and Y. Rahmat-Samii, NASA Tech Brief: "Dual low-frequency radar for soil moisture under vegetation and at-depth." (2004)
- M. Gudim (Aung), M. Moghaddam, et al., NASA Tech Brief: "Single-chip high-density FPGA implementation of the synthetic aperture radar azimuth prefilter for on-board data reduction," (2004)
- D. Evans and M. Moghaddam, Eds., "LightSAR Science Requirements Document," JPL Publication D-13945, 1998.

Refereed Conference Proceedings:

1. Albahkali, M., and M. Moghaddam, "3D SAR focusing for subsurface point targets," Proc. IEEE-IGARSS09, July 2009, 4 pages.
2. Whitcomb, J., M. Moghaddam, K. McDonald, E. Podest, and B. Chapman, "Decadal change in northern wetlands based on differential analysis of JERS and PALSAR data," Proc. IEEE-IGARSS09, July 2009, 4pages.
3. Whitcomb, J., M. Moghaddam, K. McDonald, and E. Podest, "Mapping Canadian wetlands using L-band radar satellite imagery," Proc. IEEE-IGARSS09, July 2009, 4 pages.
4. Buergin, M., J. Jung, M. Moghaddam, and M. Crawford, "Model-based integration of INSAR and Lidar for canopy structure," Proc. IEEE-IGARSS09, July 2009, 2 pages.
5. Goykhman, Y., and M. Moghaddam, "Retrieval of subsurface parameters for three-layer media," Proc. IEEE-IGARSS09, July 2009, 2 pages.
6. Entekhabi, D., E. Njoku, P. O'Neill, W. Crow, T. Jackson, J. Johnson, J. Kimball, R. Koster, K. McDonald, M. Moghaddam, S. Moran, R. Reichle, J. C. Shi, L. Tsang, J. van Zyl, J. Entin, K.Kellogg, "High resolution mapping of soil moisture with SMAP radar and radiometer in support of new approaches to water cycle science and applications," Proc. IEEE-IGARSS09, July 2009, 2 pages.
7. Haynes, M., and M. Moghaddam, "A method for large, low-contrast acoustic inverse scattering with Born iterations," Proc. IEEE-APS, June 2009, 4 pages.
8. Duan, X., and M. Moghaddam, "Full Wave Vector Electromagnetic Scattering from Two-Dimensional Arbitrary Random Rough Surfaces," proc. IEEE-APS, June 2009, 4 pages.
9. Moghaddam, M., D. Entekhabi, Y. Goykhman, M. Liu, A. Mahajan, A. Nayyar, D. Shuman, and D. Teneketzis, "A soil moisture smart sensor web using data assimilation and optimal control: formulation and first laboratory demonstration," Proc. IEEE-IGARSS08, Boston, MA, July 2008, 4 pages.
10. Tabatabaeenejad, A., and M Moghaddam, "Sensitivity analysis of the simulated annealing method to measurement noise for the inversion of subsurface parameters of two layer rough surfaces," Proc. IEEE-IGARSS08, Boston, MA, July 2008, 4 pages.
11. Ali, M., and M. Moghaddam, "3D Nonlinear Time-Domain Inversion Technique for Medical Imaging," Proc. IEEE-APS, San Diego, CA, July 2008, 4 pages.
12. Partridge, P., M. Moghaddam, Y. Rahmat-Samii, M. Haynes, L. van Nieuwstadt, J. Vitaz, J. Huang, and V. Cable, "A Dual Polarized UHF/VHF Honeycomb Stacked-Patch Array Antenna: Overview of An Enabling Technology for the MOSS Mission," Proc. IEEE-APS, San Diego, CA, July 2008, 4 pages.
13. Moghaddam, M., D. Entekhabi, L. Farhadi, Y. Goykhman, M. Liu, A. Mahajan, A. Nayyar, D. Shuman, and D. Teneketzis, "Initial analyses and demonstration of a soil moisture smart sensor web," Proc. Earth Science Technology Conference, Adelphi, MD, June 2008, 8 pages.
14. Kuo, C.H., and M. Moghaddam, "Electromagnetic scattering from multilayer rough surfaces with arbitrary dielectric profiles for remote sensing of subsurface soil moisture," IEEE-APS, Honolulu, HI, June 2007, pp. 4797-4800.

15. Kuo, C.H., and M. Moghaddam, "A Novel Multi-Frequency Inversion Algorithm for the Retrieval of the Subsurface Properties of Layered Soil Media," IEEE-APS, Honolulu, HI, June 2007, pp. 1785-1788.
16. Kuo, C.H., and M. Moghaddam, "Two-Dimensional Full-wave Scattering from Discrete Random Media in Layered Rough Surfaces for Subsurface Remote Sensing," IEEE-IGARSS07, Barcelona, Spain, July 2007, pp. 4801-4804.
17. Whitcomb, J., M. Moghaddam, K. McDonald, J. KelIndorfer, and E. Podest, "Wetlands Map of Alaska Using L-Band Radar Satellite Imagery," IEEE- IGARSS07, Barcelona, Spain, July 2007, pp. 2487-2490.
18. Tabatabaeenejad, A., and M Moghaddam, "Inversion of a Layered Rough Surface Model: Maximizing the Number of Retrievable Parameters for the Design of Future Subsurface Sensing Radar Systems," IEEE-IGARSS07, Barcelona, Spain, July 2007, pp. 4376-4378.
19. Haynes, M., and M. Moghaddam, "River depth sensing using a VHF pulsed-CW radar," Proc. IEEE-ICONIC, St. Louis, MO, June 2007, 5 pages.
20. Moghaddam, M., et al., "Dual Polarized UHF/VHF Honeycomb Stacked-Patch Feed Array for a Large-Aperture Space-borne Radar Antenna," Proc. IEEE Aerospace Conference, Big Sky, MT, March 2007, 10 pages.
21. Moghaddam, M., D. Entekhabi, M. Liu, and D. Teneketzis, "Soil moisture smart sensor web concept using data assimilation and optimal control," Proc. IEEE Aerospace Conference, Big Sky, MT, March 2007, 6 pages.
22. Tabatabaeenejad, A., and M. Moghaddam, "Scattering of Electromagnetic Waves from an N-Layer Dielectric Structure with Slightly Rough Boundaries," IEEE-APS/URSI, Albuquerque, NM, July 2006, pp. 657-660.
23. Kuo, C.H., and M. Moghaddam, "Backscattering of surface plasmons from multilayer rough surfaces," IEEE-APS/URSI, Albuquerque, NM, July 2006, pp. 749-752.
24. Kuo, C.H., and M. Moghaddam, "Electromagnetic scattering from a buried cylinder in layer media with rough surfaces," IEEE-APS/URSI, Albuquerque, NM, July 2006, pp. 653-656.
25. Kuo, C.H., and M. Moghaddam, "Electromagnetic Scattering from Multilayer Rough Surfaces Separated by Arbitrary Dielectric Profiles," IGARSS'06, Denver, CO, August 2006, pp. 454-457.
26. Tabatabaeenejad, A., M. Moghaddam, "Inversion of Parameters of a Multilayered Rough Surface by a New Approach to Simulated Annealing," Proc. IGARSS'06, Denver, CO, August 2006, pp. 2107-2108.
27. Kuo, C.H., and M. Moghaddam, "Scattering from Multilayer Rough Surfaces Based on Extended Boundary Condition Method and Scattering Matrix Approach," Proc. IGARSS'05, Seoul, Korea, July 2005, 4 pages.
28. Lucas, R., A. Milne, A. Lee, M. Moghaddam, N. Cronin, C. Witte, P. Ticke, and M. Williams, "The contribution of PACRIM II to forest assessment in Queensland, Australia," Proc. IGARSS'05, Seoul, Korea, July 2005, 4 pages.
29. Moghaddam et al., "Microwave Observatory of Subcanopy and Subsurface (MOSS) IIP: Final Results and Next Steps," ESTC-2005, Washington DC, June 2005, 6 pages.

30. Tabatabaeenejad, A., and M. Moghaddam, "Backscattering of Electromagnetic Waves from Layered Rough Surfaces and Its Application in Estimating Deep Soil Moisture," IGARSS'04, Anchorage, AK, September 2004, pp. 3526-3528.
31. Liang, P., M. Moghaddam, and L. Pierce, "Backscattering simulation for nonuniform forest canopies using multilayer MIMICS," Proc. IGARSS'04, Anchorage, AK, September 2004, pp. 1021-1024.
32. Moghaddam, M., and R. Lucas, "Quantifying the biomass of Australian subtropical woodlands using SAR inversion models," Proc. IGARSS'03, Toulouse, France, July 2003, pp. 1619-1621.
33. Moghaddam et al., "Microwave Observatory of Subcanopy and Subsurface (MOSS): A Low-frequency Radar for Global Deep Soil Moisture Measurements," IGARSS'03, Toulouse, France, July 2003, 3 pages.
34. Lucas, R., A. Lee, A. Milne, N. Cronin, and M. Moghaddam, "Remote sensing to support Australia's commitment to international agreements: a role for synthetic aperture radar," Proc. IGARSS'03, Toulouse, France, July 2003, pp. 1477-1479.
35. Moghaddam, M., K. McDonald, J. Cihlar, and W. Chen, "Mapping wetlands of the north American boreal zone from satellite radar imagery," Proc. IGARSS'03, Toulouse, France, July 2003, pp. 261-263.
36. Chen, W., J. Cihlar, G. Pavlic, Q. Zhang, R. Fernandes, S. Wang, J. Kerr, C. Ung, D. Price, M. Moghaddam, and K. McDonald, "Improving temporal and spatial consistency of forest biomass data by integrating forest yield tables and satellite radar data," Proc. IGARSS'02, Toronto, Canada, June 2002, pp. 1777-1779.
37. Gudim, M., F. Cheng, S. Madsen, R. Johnson, C. le, M. Moghaddam, M. Marina, "Single-chip high-density FPGA implementation of the synthetic aperture radar azimuth prefilter for on-board data reduction," Proc. Earth Science Technology Conference, Pasadena, CA, June 2002, 7 pages.
38. Moghaddam, M., E. Rodriguez, Y. Rahmat-Samii, D. Moller, J. Hoffman, J. Huang, and S. Saatchi, "Microwave observatory of subcanopy and subsurface (MOSS): a low-frequency radar for global deep soil moisture measurements," Proc. IGARSS'03, Toulouse, France, July 2003, pp. 500-502.
39. Moller, D., E. Rodriguez, M. Moghaddam, and J. Hoffman, "A dual-low frequency radar for subcanopy and deep soil moisture measurements," presented at Aerospace Conference, Big Sky, MT, March 2003, pp. 1103-1113.
40. Moghaddam, M., E. Rodriguez, Y. Rahmat-Samii, and D. Moller, "Dual-low-frequency Radar for Soil Moisture Under Vegetation and At-depth," URSI General Assembly, Maastricht, The Netherlands, August 2002, 3 pages.
41. Moghaddam, M. "Estimation of comprehensive forest variable sets from multiparameter SAR data over a large area with diverse species," Proc. IGARSS'01, Sydney, Australia, July 2001, pp. 1660-1662.
42. Moghaddam, M., and J. Dungan, "Estimation of forest variables from fusion of SAR and TM data and analytical scattering and reflectance models," Proc. IGARSS'01, Sydney, Australia, July 2001, pp. 885-887.
43. Moghaddam, M., and S. Saatchi, "Estimation of vegetation variables using AIRSAR data containing multiple scattering mechanisms," Proc. IGARSS'00, Honolulu, HI, July 2000, pp. 1408-1410.

44. Moghaddam, M., and J. Dungan, "Fusion of SAR and TM data for quantitative estimation of forest variables over an extended range of validity," Proc. IGARSS'00, Honolulu, HI, July 2000, pp.
45. West, R., M. Moghaddam, et al., "Cassini observes the Earth with Ku-band radar and radiometer," IGARSS'2000, Honolulu, HI, USA, presented July 2000.
46. Moghaddam, M., J. Dungan, and J. Coughlan, "Fusion of AIRSAR and TM data for parameter estimation and classification in dense and hilly forests," Proc. IGARSS'99, Hamburg, Germany, June 1999, pp. 305-307.
47. Moghaddam, M., "Effect of medium symmetries in limiting the number of parameters estimated with polarimetric radar interferometry," Proc. IGARSS'99, Hamburg, Germany, June 1999, pp. 2221-2223.
48. Saatchi, S., and M. Moghaddam, "Estimation of boreal forest biomass using spaceborne SAR systems," Proc. IGARSS'99, Hamburg, Germany, June 1999, pp. 1646-1648.
49. Treuhaft, R., and M. Moghaddam, "A unified analysis of radar interferometry and polarimetry for the estimation of forest parameters," Proc. IGARSS'98, Seattle, WA, July 1998, pp. 1373-1375.
50. Treuhaft, R., M. Moghaddam, and B. Yoder, "Forest vertical structure from multibaseline interferometric radar for studying growth and productivity," Proc. IGARSS'97, Singapore, August 1997, pp. 1884-1886.
51. Moghaddam, M., S. Saatchi, and R. Treuhaft, "Estimating soil moisture in a boreal old jack pine forest," Proc. IGARSS'97, Singapore, August 1997, pp. 1881-1883.
52. Treuhaft, R., M. Moghaddam, J. J. van Zyl, and K. Sarabandi, "Estimating vegetation and surface topographic parameters from multibaseline radar interferometry," Proc. IGARSS'96, Lincoln, NE, May 1996, pp. 978-980.
53. Moghaddam, M., and S. Saatchi, "Estimation of moisture content of forest canopy from SAR data," Proc. IGARSS'96, Lincoln, NE, May 1996, pp. 730-732.
54. Moghaddam, M., and S. Saatchi, "Forest modeling of jack pine trees for BOREAS," Proc. IGARSS'94, Pasadena, CA, August 1994, pp. 232-234.
55. Saatchi, S., M. Moghaddam, "Biomass Distribution in Boreal Forest Using SAR Imagery", Proc. EUROPTO, SPIE, vol. 2314, Rome, Italy, September 1994, pp. 437-449.
56. Moghaddam, M., and S. Saatchi, "An inversion algorithm applied to SAR data to retrieve surface parameters," Proc. IGARSS'93, Tokyo, Japan, August 1993, pp. 587-589.
57. Moghaddam, M., S. L. Durden, and H. A. Zebker, "Effects of environmental change on radar backscatter in the Oregon transect," Proc. IGARSS'93, Tokyo, Japan, August 1993, pp. 580-582.
58. Chew, W.C., G. Otto, W. Weedon, J. Lin, C. Liu, Y. Wang, and M. Moghaddam, "Nonlinear diffraction tomography - The use of inverse scattering for imaging," Proc. 27th Asilomar Conference on Signals, Systems and Computers, Pacific Grove, CA, November 1993, pp. 120-129.
59. Freeman, A., M. Moghaddam, M. Zink, and H. Zebker, "Radiometric correction of SAR images of varying terrain heights," Proc. IGARSS'92, Houston, TX, May 1992, pp. 271-273.

60. M. Moghaddam, S. Durden, H. Zebker, and J. Klein, "Radar measurement of forested areas during OTTER," Proc. IGARSS '92, Houston, Texas, May 1992, pp. 1135-1137.
61. Moghaddam, M., and W. C. Chew, "Simultaneous nonlinear inversion of permittivity and permeability profiles using time-domain data," Proc. IEEE-APS Int. Symp., Chicago, Illinois, July 1992, pp. 213-216.
62. Moghaddam, M., and W. C. Chew, "Nonlinear two-dimensional velocity profile inversion in the time domain," Proc. IEEE-APS Int. Symp., London, ON, Canada, June 1991, pp. 1570-1573.
63. Moghaddam, M., and W. C. Chew, "Stabilizing Liao's absorbing boundary conditions using single-precision arithmetic," Proc. IEEE-APS Int. Symp., London, ON, Canada, June 1991, pp. 430-433.
64. Moghaddam, M., W. C. Chew, and E. Yannakakis, "Time-domain scattering in 2.5 dimensions," Proc. IEEE-APS Int. Symp., Dallas, Texas, May 1990, pp. 22-25.
65. Chew, W.C., and M. Moghaddam, "Resonant frequencies of the axially symmetric modes in a dielectric resonator," Proc. IEEE-MTT International Symposium," Las Vegas, Nevada, June 1987, pp. 303-305.

Refereed Conference Abstracts:

1. Goykhman, Y., and M. Moghaddam, "Sensitivity of SAR-derived variable estimates of non-smooth layered surfaces to uncertainties in the knowledge of ancillary parameters," accepted for presentation at IEEE-APS/URSI, June 2009.
2. Van Nieuwstadt, and M. Moghaddam, "A microwave breast imaging system simulator and sensitivity analyses," accepted for presentation at IEEE-APS/URSI, June 2009.
3. Goykhman, Y., and M. Moghaddam, "An efficient method of retrieval of parameters for three-layer nonsmooth-interface media," National Radio Science Meeting, Boulder, CO, January 2009.
4. Duan, X., M. Moghaddam, S. Smrekar, D. Wenkert, and R. Jordan, "Complex Permittivity Model of Venus Atmosphere and Implications for Design of Imaging Altimeter and INSAR Orbiters," AGU Fall Meeting, San Francisco, CA, December 2008.
5. Whitcomb, J., M. Moghaddam, K. McDonald, E. Podest, and B. Chapman, "Decadal Change in Northern Wetlands Based on Analysis of ALOS/PALSAR and JERS SAR Data," AGU Fall Meeting, San Francisco, CA, December 2008.
6. Podest, E., K. McDonald, B. Chapman, L. Hess, M. Moghaddam, J. Kimball, E. Matthews, C. Prigent, "An Inundated Wetlands Earth System Data Record: Global Monitoring of Wetland Extent and Dynamics," AGU Fall Meeting, San Francisco, CA, December 2008.
7. Moghaddam, M., and Y. Goykhman, "Inversion of Soil Moisture Profiles Under Tall Vegetation with Low-Frequency Radar: Theory and Experiment," URSI General Assembly, Chicago, IL, August 2008, 1 page.
8. Kuo, C.H., and M. Moghaddam, "Multi-Frequency Inversion Algorithm for the Retrieval of Subsurface Properties of Layered Soil Media from VHF/UHF Radar Measurements," Proc. IEEE-IGARSS08, Boston, MA, July 2008.

9. Tabatabaeenejad, A., and M. Moghaddam, "Forward and inverse models of electromagnetic scattering from layered media with slightly rough interfaces," PIERS08, Boston, MA, July 2008, 1 page.
10. Haynes, M., and M. Moghaddam, "Spatial frequency domain solution of the proxy forward problem," Proc. URSI/IEEE-APS/URSI, San Diego, CA, July 2008, 1 page.
11. Tabatabaeenejad, A., Y. Goykhman, and M. Moghaddam, "Inversion of Subsurface Soil Moisture Using Iterative Synthetic Aperture Focusing and Simulated Annealing: Application to Field Data," Proc. URSI-NA, Ottawa, ON, Canada, July 2007, 1 page.
12. Tabatabaeenejad, A., M. Moghaddam, and E. Michielssen, "Derivation of Validity Region of SPM Simulation of One-Dimensional Two-Layer Rough Surfaces Using a Fast Solver and Simulated Annealing Method," Proc. IGARSS'07, Barcelona, Spain, July 2007, 1 page.
13. Moghaddam, M., Y. Goykhman, and A. Tabatabaeenejad, "Estimating Forest Parameters and Underlying Layers of Soil Moisture with Low-Frequency Radar," IEEE- IGARSS07, Barcelona, Spain, July 2007, 1 page.
14. Moghaddam, M., et al. "Recent developments of the soil moisture smart sensor web concept using data Assimilation and optimal control," presented at Fall'07 AGU, San Francisco, CA, December 2007, 1 page.
15. Moghaddam, M., A. Tabatabaeenejad, and C.H. Kuo, "Forward and Inverse Scattering Models for Radar Remote Sensing of Planetary Subsurfaces," AGU Fall Meeting, San Francisco, CA, December 2006, 1 page.
16. Goykhman, Y., C.H. Kuo, and M. Moghaddam, "An Efficient Forward Scattering Model for Through-the-Wall Imaging of an Arbitrary 2D Object," IEEE-APS/URSI, Albuquerque, NM, July 2006, 1 page.
17. Tabatabaeenejad, A., M. Moghaddam, and E. Michielssen, "SPM Simulations of One-Dimensional Two-Layer Rough Surfaces: Accuracy and Validity," IEEE-APS/URSI, Albuquerque, NM, July 2006, 1 page.
18. Kuo, C.H., and M. Moghaddam, "Backscattering Enhancement of Surface Plasmons from Multilayer Rough Surfaces," URSI National Meeting, Boulder, CO, January 2006, 1 page.
19. Whitcomb, J., M. Moghaddam, J. KelIndorfer, and K. McDonald, "Use of JERS Satellite Imagery for Boreal Wetlands Mapping," AGU Fall Meeting, December 2005, 1 page.
20. Moghaddam, M., et al., "Microwave Observatory of Subcanopy and Subsurface (MOSS): A Mission for Global Observations of Deep Soil Moisture," presented at AGU Fall Meeting, San Francisco, CA, December 2005, 1 page.
21. Moghaddam, M., Y. Rahmat-Samii, E. Njoku, E. Rodriguez, and D. Entekhabi "A Combined Radar and Radiometer Concept for a Next-Generation Surface-to-Depth Soil Moisture Mission," PIERS'05, August 2005, 1 page.
22. Moghaddam, M., and A. Tabatabaeenejad, "VHF Scattering from Mixed Forests on Multilayer Rough Ground," IEEE-APS, Washington DC, July 2005, Seoul, Korea, July 2005, 1 page.
23. Pierce, L., and M. Moghaddam, "The MOSS VHF/UHF Spaceborne SAR System Testbed," IGARSS'05, Seoul, Korea, July 2005, 1 page.

24. Moghaddam, M., and A. Tabatabaeenejad, "VHF scattering model from multilayer mixed species forests on top of a multilayer rough ground," Proc. IGARSS'05, Seoul, Korea, July 2005, p. 5526, 1 page.
25. Tabatabaeenejad, A., and M. Moghaddam, "Inversion of Subsurface Properties of a Layered Medium with Rough Boundaries," IEEE-APS, Washington DC, July 2005.
26. Kuo, C.H., and M. Moghaddam, "Scattering from Multilayer Rough Surfaces Based on Extended Boundary Condition Method and Scattering Matrix Approach," IEEE-APS/URSI, Washington DC, July 2005, 1 page.
27. Partridge, P., et al., "Design, Fabrication, and Measurement of a Dual Polarized UHF/VHF Honeycomb Stacked-Patch Array Antenna for use in Space-borne Radar Applications," IEEE-APS, Washington DC, July 2005, 1 page.
28. Moghaddam, M., L. Pierce, A. Tabatabaeenejad, and E. Rodriguez, "A Tower-based Prototype VHF/UHF Radar for Subsurface Sensing: System Description and Data Inversion Results," presented at the Workshop on Radar Investigations for Planetary Applications, Lunar and Planetary Institute, Houston, Texas, February 2005, 1 page.
29. Moghaddam, M., L. Pierce, A. Tabatabaeenejad, and E. Rodriguez, "Estimation of Soil Moisture at Multiple Depth Layers Using a VHF/UHF Radar," IGARSS'04, Anchorage, AK, September 2004, 1 page.
30. Liang, P., M. Moghaddam, and L. Pierce, "Radar Backscattering Model for Mixed Species Forests," IGARSS'04, Anchorage, AK, September 2004, 1 page.
31. Tabatabaeenejad, A., and M. Moghaddam, "Scattering of Electromagnetic Waves from three-layer Rough Surfaces Using the Small Perturbation Method," IEEE-APS/URSI, Monterey, CA, June 2004, 1 page
32. Pierce, L., M. Moghaddam, E. Rodriguez, and P. Siqueira, "A VHF/UHF Simulator for Soil Moisture Beneath Forest Canopies," IEEE-APS/URSI, Monterey, CA, June 2004, 1 page.
33. Moghaddam, M., C.H. Kuo, A. Tabatabaeinejad, and L. Pierce, "Inversion of Scattering Properties of a Multilayer Subsurface with Rough Interfaces," IEEE-APS/URSI, Monterey, CA, June 2004, 1 page.
34. Liang, P., M. Moghaddam, and L. Pierce, "Multilayer bistatic MIMICS," IEEE-APS/URSI, Monterey, CA, June 2004, 1 page.
35. Rodriguez, E., D. Moller, and M. Moghaddam, "Synthetic aperture processor prototype for a tower-based UHF and VHF soil moisture radar," Proc. IGARSS'03, Toulouse, France, July 2003, 1 page.
36. Huang, J., Y. Rahmat-Samii, and M. Moghaddam, "A VHF/UHF dual-band dual-polarized microstrip array," PIERS'2003, Hangzhou, China, 2003, 1 page.
37. M. Moghaddam, "Sensitivity of Vegetation Biomass Estimation Accuracy to SAR Parameter-Diversity using an Analytically Based Algorithm," presented at PIERS'02, Cambridge, MA, July 2002, page.
38. Moghaddam, M., K. McDonald, J. Cihlar, and W. Chan, "Mapping wetlands of Alaska and Canada from satellite radar imagery," AGU Fall Meeting, San Francisco, CA, December 2002, 1 page.
39. Lucas, R., et al., "Use of AIRSAR data for quantifying the biomass of woodlands, Queensland, Australia," AIRSAR workshop, Pasadena, CA, March 2002, 1 page.

40. Moghaddam, M., and R. Treuhaft, "Estimating forest vegetation variables by combining INSAR and POLSAR data and minimizing the need for ancillary data," PIERS-2000, Cambridge, MA, USA, July 2000, 1 page.
41. J. Dungan and M. Moghaddam, "Statistical characteristics of optical and radar data used for estimating continuous vegetation variables," PIERS-2000, Cambridge, MA, USA, July 2000, 1 page.
42. Moghaddam, M., J. Dungan, and J. Coughlan, "Fusion of AIRSAR and TM data for variable estimation and classification in dense and hilly forests," Fusion of Earth Data Conference, Sophia Antipolis, France, January 2000.
43. Moghaddam, M., S. Saatchi, and R. Cuenca, "Estimating subcanopy soil moisture with AIRSAR data," Annual AIRSAR Workshop," Pasadena, CA, USA, February 1999, 1 page.
44. Moghaddam, M., and R. Treuhaft, "Limitations in the number of parameters estimated with polarimetric interferometry," PIERS'98 Workshop, Baveno, Italy, July 1998.
45. Moghaddam, M., and R. Treuhaft, "A hybrid algorithm for estimating forest parameters from POLSAR and INSAR data: an approach to minimizing the need for ancillary data," PIERS'98, Nantes, France, July 1998, 1 page.
46. Treuhaft, R., and M. Moghaddam, "A unified analysis of radar interferometry and polarimetry for the estimation of forest parameters," PIERS'98, Nantes, France, July 1998, 1 page.
47. Moghaddam, M., R. Treuhaft, S. Saatchi, and J. van Zyl, "A hybrid algorithm for estimating forest canopy parameters from polarimetric and interferometric SAR," PIERS'97, Cambridge, MA, July 1997, 1 page.
48. Saatchi, S., and M. Moghaddam, "Estimation of boreal forest biomass using multichannel SAR imagery," PIERS'97, Cambridge, MA, July 1997, 1 page.
49. Treuhaft, R., M. Moghaddam, and J. van Zyl, "Combining radar interferometry and polarimetry to estimate forest vegetation and surface parameters," PIERS'97, Cambridge, MA, July 1997, 1 page.
50. Treuhaft, R., E. Rodriguez, M. Moghaddam, K. Sarabandi, and J. J. van Zyl, "Multibaseline, Multifrequency Interferometric SAR for Vegetation and Surface Topographic Parameter Estimation," URSI 25th General Assembly, Lille, France, August 1996, 1 page.
51. Moghaddam, M., and S. Saatchi, "Inversion of moisture content of forest canopy and floor from SAR data," PIERS'96, Innsbruck, Austria, July 1996, 1 page.
52. Moghaddam, M., "Using an inversion algorithm to retrieve parameters and monitor changes over forested areas from SAR data," PIERS'95, Cambridge, MA, July 1995, 1 page.
53. Treuhaft, R., M. Moghaddam, E. Rignot, S. Saatchi, and J. van Zyl, "Extracting vegetation topographic and scattering characteristics from interferometric SAR," presented at the National Radio Science Meeting, Boulder, CO, January 1995, 1 page.
54. Moghaddam, "Retrieval of forest canopy parameters for OTTER using an optimization technique," Proc. SPIE Symposium on Satellite and Remote Sensing, Rome, Italy, September 1994,

55. Saatchi, S., and M. Moghaddam, "Biomass distribution in a Boreal forest using SAR imagery," Proc. SPIE Symposium on Satellite and Remote Sensing, Rome, Italy, September 1994.
56. Saatchi, S., M. Moghaddam, K. McDonald, and S. Durden, "Microwave scattering from forest canopies," Proc. IGARSS'04, Pasadena, CA, August 1994, 1 page.
57. Saatchi, S., M. Moghaddam, K. McDonald, and S. Durden, "Comparison of microwave scattering models of vegetation," Proc. IEEE-APS/URSI Int. Symp., Seattle, Washington, June, 1994, 1 page.
58. Moghaddam, M., and B. Houshmand, "Nonlinear inverse scattering applied to calculation of effective permittivity of random collections of scatterers," Proc. IEEE-APS/URSI Int. Symp., Seattle, Washington, June 1994, 1 page.
59. Chew, W., W. Weedon, and M. Moghaddam, "Inverse scattering and imaging using broad-band time-domain data," Int. Conf. on Ultrawideband, short-pulse Electromagnetics, Brooklyn, NY, April 1994, 1 page.
60. Moghaddam, "NASA/JPL AIRSAR: System overview and introduction to data interpretation," Keynote presented at the Australasian Remote Sensing Conference, Melbourne, Australia, March 1994, 1 page.
61. Moghaddam, M., and B. Houshmand, "An inverse scattering approach to calculation of effective permittivity of random cylindrical scatterers," National Radio Science Meeting, Boulder, Colorado, January 1994, 1 page.
62. Moghaddam, M., "A general rough-surface inversion algorithm: Theory and application to SAR data," Proc. PIERS'93, JPL, Pasadena, California, July 1993, 1 page.
63. Moghaddam, M., and W. C. Chew, "Variable-Permittivity linear inverse problem for the H_2 -polarized case," PIERS'93, Pasadena, California, July 1993, 1 page.
64. Moghaddam, M., and A. Freeman, "Modifications to the three-component classification algorithm for SAR data," Proc. PIERS'93, JPL, Pasadena, California, July 1993, 1 page.
65. Chew, W.C., G. P. Otto, J. H. Lin, W. H. Weedon, C. C. Lu, Y. M. Wang, and M. Moghaddam, "Nonlinear inverse scattering techniques and their use in processing microwave experimental data," PIERS'93, JPL, Pasadena, California, July 1993, 1 page.
66. Moghaddam, M., and B. Houshmand, "Calculation of effective permittivity of a random collection of dielectric cylinders," Proc. IEEE-APS/URSI, Ann Arbor, MI, June 1993, 1 page.
67. Moghaddam, M., and W. C. Chew, "Variable-density linear acoustic inverse problem," Proc. Int. Radio Sci. Meeting, Boulder, Colorado, Jan. 1993, 1 page.
68. Moghaddam, M., and W. C. Chew, "Simultaneous inversion of permittivity and conductivity profiles using time-domain data," Proc. Int. Radio Sci. Meeting, Boulder, Colorado, 1992, 1 page.
69. Moghaddam, M., and W. C. Chew, "Effect of multiple scattering in inversion using time-domain data," Proc. IEEE-APS International Symposium, Chicago, Illinois, 1992, p. 1715.
70. Chew, W.C., M. Moghaddam, and E. Yannakakis, "Modeling of the subsurface interface radar," Proc. IGARSS'90, College Park, MD, may 1990, P. 31.

71. Moghaddam, M., E. Yannakakis, and W. C. Chew, "Modeling of the subsurface interface radar," Proc. Rev. of Prog. in Quant. Nondestruct. Eval. (QNDE), La Jolla, CA, 1990.
72. Chew, W.C., B. Anderson, E. Yannakakis, M. Moghaddam, and Q. H. Liu, "Computation of transient electromagnetic waves in inhomogeneous media," Proc. URSI Int. Symp., Stockholm, Sweden, 1989, 1 page.
73. Moghaddam, M., and W. C. Chew, "Response of a point source in multicylindrically layered half spaces," Proc. IEEE-APS/URSI, Syracuse, NY, 1988, 1 page

Invited Conference Presentations:

1. Albahkali, M., and M. Moghaddam, "3D SAR focusing for subsurface point targets," accepted for presentation, IEEE-IGARSS09, July 2009, 4 pages.
2. Whitcomb, J., M. Moghaddam, K. McDonald, E. Podest, and B. Chapman, "Decadal change in northern wetlands based on differential analysis of JERS and PALSAR data," accepted for presentation, IEEE-IGARSS09, July 2009, 4 pages.
3. Whitcomb, J., M. Moghaddam, K. McDonald, and E. Podest, "Mapping Canadian wetlands using L-band radar satellite imagery," accepted for presentation, IEEE-IGARSS09, July 2009, 4 pages.
4. Buergin, M., J. Jung, M. Moghaddam, and M. Crawford, "Model-based integration of INSAR and Lidar for canopy structure," accepted for presentation, IEEE-IGARSS09, July 2009, 2 pages.
5. Goykhman, Y., and M. Moghaddam, "Retrieval of subsurface parameters for three-layer media," accepted for presentation, IEEE-IGARSS09, July 2009, 2 pages.
6. Entekhabi, D., E. Njoku, P. O'Neill, W. Crow, T. Jackson, J. Johnson, J. Kimball, R. Koster, K. McDonald, M. Moghaddam, S. Moran, R. Reichle, J. C. Shi, L. Tsang, J. van Zyl, J. Entin, K. Kellogg, "High resolution mapping of soil moisture with SMAP radar and radiometer in support of new approaches to water cycle science and applications," accepted for presentation, IEEE-IGARSS09, July 2009, 2 pages.
7. Haynes, M., and M. Moghaddam, "A method for large, low-contrast acoustic inverse scattering with Born iterations," Proc. IEEE-APS, June 2009, 4 pages.
8. Goykhman, Y., and M. Moghaddam, "An efficient method of retrieval of parameters for three-layer nonsmooth-interface media," National Radio Science Meeting, Boulder, CO, January 2009.
9. Moghaddam, M., and Y. Goykhman, "Inversion of Soil Moisture Profiles Under Tall Vegetation with Low-Frequency Radar: Theory and Experiment," URSI General Assembly, Chicago, IL, August 2008, 1 page
10. Partridge, P., M. Moghaddam, Y. Rahmat-Samii, M. Haynes, L. van Nieuwstadt, J. Vitaz, J. Huang, and V. Cable, "A Dual Polarized UHF/VHF Honeycomb Stacked-Patch Array Antenna: Overview of An Enabling Technology for the MOSS Mission," Proc. IEEE-APS, San Diego, CA, July 2008, 4 pages.
11. Goykhman, Y., and M. Moghaddam, "An Efficient Forward Scattering Model for a Three Layer Medium Representing Bodies of Fresh Water," Proc. URSI/IEEE-APS, San Diego, CA, July 2008, 1 page.

12. Kuo, C.H., and M. Moghaddam, "Multi-Frequency Inversion Algorithm for the Retrieval of Subsurface Properties of Layered Soil Media from VHF/UHF Radar Measurements," IEEE-IGARSS08, Boston, MA, July 2008, 1 page.
13. Moghaddam, M., D. Entekhabi, Y. Goykhman, M. Liu, A. Mahajan, A. Nayyar, D. Shuman, and D. Teneketzis, "A soil moisture smart sensor web using data assimilation and optimal control: formulation and first laboratory demonstration," Proc. IEEE-IGARSS08, Boston, MA, July 2008, 4 pages.
14. Tabatabaenejad, A., and M. Moghaddam, "Forward and inverse models of electromagnetic scattering from layered media with slightly rough interfaces," PIERS08, Boston, MA, July 2008, 1 page.
15. Moghaddam, M., et al. "Recent developments of the soil moisture smart sensor web concept using data Assimilation and optimal control," presented at Fall'07 AGU, December 2007, San Francisco, CA, 1 page.
16. Moghaddam, M., Y. Goykhman, and A. Tabataeenejad, "Estimating Forest Parameters and Underlying Layers of Soil Moisture with Low-Frequency Radar," IEEE- IGARSS07, Barcelona, Spain, July 2007, 1 page.
17. Moghaddam, M., et al., "Dual Polarized UHF/VHF Honeycomb Stacked-Patch Feed Array for a Large-Aperture Space-borne Radar Antenna," presented at the Aerospace Conference, Big Sky, Montana, March 2007, 10 pages.
18. Whitcomb, J., M. Moghaddam, J. Kellndorfer, K. McDonald, and E. Podest, "A Wetlands Map of Alaska Using L-Band Radar Satellite Imagery," AGU, San Francisco, CA, December 2006, 1 page.
19. Moghaddam, M., et al., "Microwave Observatory of Subcanopy and Subsurface (MOSS): A Mission for Global Observations of Deep Soil Moisture," presented at AGU Fall Meeting, San Francisco, CA, December 2005, 1 page.
20. Moghaddam, M., Y. Rahmat-Samii, E. Njoku, E. Rodriguez, and D. Entekhabi" "A Combined Radar and Radiometer Concept for a Next-Generation Surface-to-Depth Soil Moisture Mission," PIERS'05, August 2005, 1 page.
21. Lucas, R., A. Milne, A. Lee, M. Moghaddam, N. Cronin, C. Witte, P. Ticke, and M. Williams, "The contribution of PACRIM II to forest assessment in Queensland, Australia," Proceedings IGARSS'05, Seoul, Korea, July 2005, 4 pages.
22. Moghaddam et al., "Microwave Observatory of Subcanopy and Subsurface (MOSS) IIP: Final Results and Next Steps," ESTC-2005, Washington DC, June 2005, 6 pages.
23. Moghaddam et al., "Microwave Observatory of Subcanopy and Subsurface (MOSS): A Low-frequency Radar for Global Deep Soil Moisture Measurements," IGARSS'03, Toulouse, France, July 2003, 3 pages.
24. Huang, J., Y. Rahmat-Samii, and M. Moghaddam, "A VHF/UHF dual-band dual-polarized microstrip array," PIERS'2003, 1 page.
25. Moghaddam, M., "Sensitivity of Vegetation Biomass Estimation Accuracy to SAR Parameter-Diversity using an Analytically Based Algorithm," PIERS'02, Cambridge, MA, July 2002, 1 page.
26. J. Dungan and M. Moghaddam, "Statistical characteristics of optical and radar data used for estimating continuous vegetation variables," PIERS-2000, Cambridge, MA, USA, presented July 2000, 1 page.

27. Moghaddam, M., and S. Saatchi, "Estimation of vegetation variables using AIRSAR data containing multiple scattering mechanisms," PIERS-2000, Cambridge, MA, July 2000, 1 page.
28. Moghaddam, M., "Effect of medium symmetries in limiting the number of parameters estimated with polarimetric interferometry," IGARSS'99, Hamburg, Germany, June 1999, pp. 2221-2223.
29. Moghaddam, M., S. Saatchi, and R. Cuenca, "Estimating subcanopy soil moisture with AIRSAR data," Annual AIRSAR Workshop, Pasadena, CA, USA, February 1999, 1 page.
30. Moghaddam, M., and R. Treuhaft, "A hybrid algorithm for estimating forest parameters from POLSAR and INSAR data: an approach to minimizing the need for ancillary data," PIERS'98, Nantes, France, July 1998, 1 page.
31. Treuhaft, R., and M. Moghaddam, "A unified analysis of radar interferometry and polarimetry for the estimation of forest parameters," PIERS'98, Nantes, France, July 1998, 1 page.
32. Treuhaft, R., M. Moghaddam, and B. J. Yoder, "Forest Vertical Structure from Multibaseline Interferometric Radar for Studying Growth and Productivity" IGARSS'97, Singapore, August 1997, pp. 1884-1886.
33. Moghaddam, M., S. Saatchi, and R. Treuhaft, "Estimating soil moisture in a boreal old jack pine forest," IGARSS'97, Singapore, August 1997, pp. 1881-1883.
34. Saatchi and M. Moghaddam, "Estimation of boreal forest biomass using multichannel SAR imagery," PIERS'97, Cambridge, MA, July 1997, 1 page.
35. Treuhaft, R., M. Moghaddam, and J. van Zyl, "Combining radar interferometry and polarimetry to estimate forest vegetation and surface parameters," PIERS'97, Cambridge, MA, July 1997, 1 page.
36. Treuhaft, R., E. Rodriguez, M. Moghaddam, K. Sarabandi, and J. J. van Zyl, "Multibaseline, Multifrequency Interferometric SAR for Vegetation and Surface Topographic Parameter Estimation," URSI 25th General Assembly, Lille, France, August 1996, 1 page.
37. Chew, W., W. Weedon, and M. Moghaddam, "Inverse scattering and imaging using broad-band time-domain data," Int. Conf. on Ultrawideband, short-pulse Electromagnetics, Brooklyn, NY, April 1994, 1 page.
38. Moghaddam, M., "NASA/JPL AIRSAR: System overview and introduction to data interpretation," Keynote presented at the Australasian Remote Sensing Conference, Melbourne, Australia, March 1994, 1 page.

Recent Invited Seminars and Colloquia (non-conference):

1. Invited Seminar, "Subsurface Sensing: Recent Advances in Instrumentation and Analysis Techniques," MIT Lincoln Labs, August 2009.
2. Invited Seminar, "Latest Advances in Theoretical Developments of High-Resolution Quantitative Imaging of Early-Stage Breast Cancer Using Microwave and Ultrasound," University of Michigan Department of Radiology, School of Medicine, June 2009.
3. Invited Seminar, "Subsurface sensing across scales: from the global environment to medical imaging," UCLA Physical Electronics Seminar Series, EE Department, May

2009.

4. Invited Seminar, "Noninvasive sensing of complex objects using electromagnetic and acoustic inversion techniques," IEEE Southeastern Michigan Spring Meeting, April 2009.
5. Invited presentation, "Overview of Research Activities Related to Subsurface Characterization," DARPA Workshop on Underground Technologies, September 2008.
6. Invited seminar, "Overview of research activities in radar remote sensing," presented at Communication Technologies Lab, ETH Zurich, Switzerland, August 2008.
7. Invited lecture, "Latest advances in subsurface soil moisture inversion techniques from radar data," presented in CEE 682, UM, March 2008
8. Invited presentation, "Boreal wetland mapping using L-band radar satellite imagery," presented at CiCAT 2nd annual meeting, Ottawa, April 2008.
9. Invited presentation, "Radar remote sensing: a brief introduction to sub-gigahertz imaging," presented at Chalmers University, May 2007.
10. Invited seminar, "Potential for Measuring Deep and Undercanopy Soil Moisture: a Tower-Based Radar Prototype System and Measurement Results." Presented at the Earth Observation seminar series, Purdue University School of Engineering, November 2006.
11. Invited seminar, "High-Depth-Resolution Radar Imaging at Low Frequencies." Presented at the National Reconnaissance Office (NRO), September 2006.
12. Invited seminar at the Applied Physics Program (UM) Weekly Seminars, November 2005.
13. Invited seminar, "Potential for measuring deep and undercanopy soil moisture: a tower-based radar prototype system and measurement results," Harvard University, Atmospheric Sciences, October 2005.
14. Invited seminar, "Prototype Tower Based Multifrequency and Polarimetric Radar for Subcanopy and Deep Soil Moisture," Integrated Program Office, Washington, DC, for the NPOESS Soil Moisture Working Group, September 2005.
15. Invited seminar, "Inversion of Scattering Properties of a Multilayer Subsurface with Rough Interfaces," ECE Electromagnetics Seminar Series, University of Illinois Urbana-Champaign, October 2004.
16. Invited seminar, "Microwave Observatory of Subcanopy and Subsurface (MOSS): A Low-frequency Radar for Global Deep Soil Moisture and Structure Measurements," AOSS department (UM), April 2004.