

GREGORY P. ASNER

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My professional interests combine ecology, biogeochemistry, biodiversity science, and remote sensing. Specific interests center on the role of spatial ecology in climate policy decision-making, environmental conservation, and natural resource management. I develop scientific approaches for large-scale assessments of forest carbon dynamics, biological diversity, and ecosystem responses to climate change. I also maintain an active research program on the evolutionary and ecological origins of forest canopy structure and functioning. My long-term programmatic initiatives include the CLASlite forest monitoring and training program, Spectranomics biodiversity project, and the Carnegie Airborne Observatory.

Professional Academic Experience

2001 - Faculty, Dept of Global Ecology, Carnegie Institution for Science
2007 - Professor, Dept of Earth System Science, Stanford University
2002 - Professor, Emmett Interdisciplinary Program in Environment and Resources, Stanford
2004 - 2007 Assoc Professor, Dept of Geological & Environmental Sciences, Stanford University
2001 - 2004 Asst Professor, Dept of Geological & Environmental Sciences, Stanford University
1999 - 2001 Asst Professor, Geological Sciences & Environmental Studies, University of Colorado
1998 - 1999 Postdoctoral Fellow, Geological & Environmental Sciences, Stanford University
1996 - 1998 Visiting Scientist, National Center for Atmospheric Research, Boulder CO

Education

1997 Ph.D., Biology (biogeochemistry, remote sensing), U. of Colorado at Boulder
1995 M.S., Geography (ecology), U. of Colorado at Boulder
1991 B.S., Engineering (radiative physics), U. of Colorado at Boulder

Honors and Awards

- Fellow, Ecological Society of America, 2016
- Fellow, American Geophysical Union, 2015
- IFOF Honoree Award in Aviation, 2015
- Elected to U.S. National Academy of Sciences, 2014
- Association for American Geographers Outstanding Contributions Award, 2014
- Nominet Trust 100 Award for Social Innovation, 2014
- Popular Science Magazine Brilliant Ten Award, 2007
- Presidential Early Career Award for Scientists and Engineers (PECASE), 2000
- NASA Early Career Award, 2000
- NASA Group Achievement Award, 1999
- NASA Earth System Science Fellowship, 1996-1998
- NSF Biosphere-Atmosphere Interactions Fellowship, 1996-1998
- W.M. Keck Foundation Fellowship Award, 1995-1996
- Mabel Duncan Conservation Biology Award, 1994

National & International Service

Current Major Service Activities

2006-present	Principal Investigator; <i>Carnegie Airborne Observatory</i> ; Supporting hundreds of research projects in numerous countries; Data provisioning to and capacity building of the international science and conservation communities
2008-present	Principal Investigator; <i>CLASlite Forest Monitoring and Training Program</i> ; Providing training on forest change mapping to support carbon emissions reduction programs; As of December 2016, more than 2700 organizations in 137 countries signed up for course
2008-present	Science and technology advisor to the Peruvian Ministry of Environment
2008-present	Working Group Member; NASA HypsIRI satellite development team
2013-present	Working Group 3 Member; Group on Earth Observations - Biodiversity Observation Network (GEO-BON)
2014-present	Editorial Board Member; <i>Proceedings of the National Academy of Sciences</i>
2015-present	Panelist; NAS Decadal Survey for Earth Science and Applications from Space

Past Service Examples

(major contributions in bold)

1996-1997	Science Team member; NASA Lewis & Clark Missions
1998	Panelist; NASA Triana Mission
1998-2008	Panelist; NASA Large-scale Biosphere-Atmosphere Experiment in Amazonia Program
1998	Co-chair; International Forum on BRDF Remote Sensing
1998	Panelist; NOAA Climate and Global Change Program
1998-2015	Panelist; Natural Environment Research Council, United Kingdom
1999-2001	Member; NSF Long-term Ecological Research (LTER) Technology Committee
1999	Panelist; University of California, Digital Media Innovation Program
1999	Co-organizer; NASA Large-scale Biosphere-Atmosphere Experiment in Amazonia
1999	Advisor; Fundação Floresta Tropical (Tropical Forest Foundation), Brazil
1999-2009	Panelist; U.S. Strategic Environmental Research and Development Program
2000	Panelist; NASA New Millennium Program
2000-2001	Member; Land-use Committee; Ecological Society of America
2001-2014	Panelist; NSF Environmental Biology Panels
2001	Panelist; NASA Visions Working Group for Decadal Strategic Plan
2002	Panelist; NASA Terrestrial Ecology Program
2002	Panelist; NASA New Investigator Program
2003	Co-convenor; AGU Chapman Conference “Ecosystem Interactions with Land-use Change”
2003	Steering committee; International Symposium on Remote Sensing; Honolulu, HI
2003	Panel chair; NASA Terrestrial Ecology Program
2003	Panel co-chair; NASA Northern Eurasia Environmental Science Program Initiative (NEESPI), Yalta, Ukraine
2003-2007	Scientific Steering Committee; NASA-Brazil Large-scale Biosphere-Atmosphere Experiment in Amazonia Program
2003-2006	Scientific Steering Group; U.S. Carbon Cycle Program
2004	Panelist; NASA Carbon Cycle and Ecosystems Review
2004-2006	Ecological Society of America (ESA) Habitat Change Rapid Response Team
2005	Panelist; World Bank Rural Days Conference;
2005	NSF Committee for Environmental Research and Education
2005-2009	NASA Senior Review Committee (Chair, 2007-2009)

2005 Co-convener; Environmental Defense Fund (EDF) Global Deforestation and Forest Degradation Workshop

2005 Search committee; USFS Institute for Pacific Islands Forestry

2005-2006 Panel chair; NASA North American Carbon Program

2005 Panel chair; Tropical Deforestation and Climate Change; UN Framework Convention on Climate Change COP-11, Montreal

2006-2007 Lead author; U.N. Livestock in a Changing Landscape forum

2007 Lead author; FLORA satellite mission concept. National Academy Decadal Survey

2007 Instructor; ASP Colloquium; National Center for Atmospheric Research

2007 Co-author; NASA Plant Physiology and Functional Types Working Group

2006-2007 Advisory Committee; Department of Land and Natural Resources; State of Hawaii

2008 Panel chair; NASA Carbon Cycle and Ecosystems Joint Science Workshop

2008-2010 Advisor; National Ecological Observatory Network (NEON)

2008-2011 Steering Committee; bioDISCOVERY Program, Diversitas International

2009-2013 PI; Google Earth Engine program, Google.org and Google Inc.

2009 Panelist; Tropical Extinction Symposium, Museum of Natural History; Smithsonian

2009 Panelist; US Congressional panel on satellite monitoring for carbon markets

2009 Pacific Domain Science and Education Coordination Committee; NSF NEON

2009 Author; GOFCC-GOLD Source Book on deforestation and degradation

2009 Panelist; U.S. Congressional panel on satellite monitoring of deforestation

2009 Delegate; U.N. Framework Convention on Climate Change COP-15, Copenhagen

2010 Steering committee; Center for Tropical Forest Science, Smithsonian Institute

2010-2015 Editorial Board; Remote Sensing of Environment

2010 Panelist; International Plant Biology Symposium, Harvard University

2010 Co-author; UN FAO Historical Forest Degradation report

2010 Delegate; Convention on Biological Diversity COP-10, Nagoya; United Nations

2010-2013 Working group member, Reduced Emissions from Deforestation and Degradation (REDD), Governors' Climate and Forests (GCF) Task Force, State of California

2010 Delegate; Ambassadors for Forests, Nagoya, World Wildlife Fund

2010 PI; Global Terrestrial Ecosystem Observatory proposal, Jet Propulsion Laboratory, NASA Earth Ventures

2010 Delegate; Framework Convention on Climate Change COP-16, Cancun; United Nations

2011-2013 Senior Fellow, Energy and Climate Partnership; US State Department

2011 Advisor; World Bank; Carbon monitoring for the UNFCCC climate treaty

2012 Special issue editor; Biodiversity; *Remote Sensing* journal

2012 PI; Land Ecosystem Assessment & Forecast mission proposal, Jet Propulsion Laboratory, NASA Earth Ventures

2012 Panelist; Forest Carbon Partnership Facility; World Bank

2012 Panelist; Latin American Development Bank

2013 Panelist; Prince's Rainforest Project; London

2013 PI; Linnaeus mission proposal; Jet Propulsion Laboratory, NASA Earth Ventures

2013-present Advisory Board; Amazon Aid Foundation

2014-present Member; Scientific Steering Committee, NGEF-Tropics, Department of Energy

2015-present Advisor; California Air Resources Board and CA Dept of Forestry and Fire Protection

2016-present Working Group; Rapid Ohia Death Task Force; State of Hawaii

Academic Advising

Graduate student advisees

Name (year, degree), current employer

David Lobell (2003, PhD), Stanford U.	Roberta Martin (2003, PhD), Carnegie Inst.
Thomas Harris (2003, MS), Excelis Corp.	Charles Wheeler (2004, MS), U. Arizona
Timothy Varga (2007, MS), Climate Pol. Inst.	John Clark (2009, MS), Google Inc.
Matthew Colgan (2012, PhD), Blueriver Inc.	Kyla Dahlin (2012, PhD), Michigan State U.
Eben Broadbent (2013, PhD), U. Florida	Angelica Almeyda (2013, PhD), U. Florida
Kelly McManus (2016, PhD)	K. Dana Chadwick (2016, PhD), Carnegie Inst.
Emily Francis	Rebecca Niemiec
Christa Anderson	Rachel Engstrand
Elsa Ordway	

Post-doctoral advisees

Name (years in lab), current employer

Sharon Hall (1999-01), Arizona State U.	Jeffrey Hicke (2000-03), U. Idaho
Lydia Olander (2003-04), Duke U.	Andrew Elmore (2003-04), U. Maryland
Roberta Martin (2004-06), Carnegie Institution	Natalie Boelman (2005-06), Columbia U.
Maoyi Huang (2005-08), Pacific NW Nat. Lab.	Choying Huang (2006-08), Taiwan Nat U.
Chris Doughty (2008-10), Oxford U.	Shaun Levick (2008-10), Max Planck Inst.
Scott Loarie (2008-10), Cal Acad. Sciences	Jim Kellner (2008-11), Brown U.
Joseph Mascaro (2010-13), Planet Labs	Jean-Baptiste Féret (2010-13), U. Montpellier
Nick Vaughn (2012-13), Carnegie Institution	Mark Higgins (2011-14), World Res. Inst.
Claire Baldeck (2012-15), Yale U.	Paulo Brando (2013-15), Woods Hole R.C.
David Marvin (2014-2016), Nature Conservancy	Andrew Davies (2014-)
Jomar Barbosa (2014-2016), Univ. Madrid	Chris Balzotti (2015-)
Tarin Paz-Kagan (2016-)	Fred Draper (2016-)
Philip Brodrick (2016-)	Dana Chadwick (2016-)

Other graduate student committees

Stanford U.	Toby Ahrens, Michael Beman, Kate Brauman, Claire Lunch, Stephen Porder
U. of Colorado	Laura Belanger, Jon Carrasco, Kathleen Farley, Cory Cleveland, Nancy Golubiewski, Amanda Warner, Khatib Nader, David Kinner, David Mixon, Jennifer Mengan
U. of Arizona	Dawn Browning
Colorado State U.	Lara Prihodko
U. of Brasilia	Ana Paula Ferreira de Carvalho, Zayra do Prado
U. of Florida	Ane Alencar
U. of Paris	Jean-Baptiste Féret, Lena Maatoug
U. of Grenoble	Guillaume Tochon
U. of Pretoria	Russell Main, Laven Naidoo
U. of Witwatersrand	Penelope Mograbi
U. of San Marcos-Peru	Raul Tupayachi, Felipe Sinca
Yale University	Kim Carlson

Peer-reviewed Publications

1996-1999

1. Asner, G.P. and S.W. Beatty. 1996. Effects of an African grass invasion on Hawaiian shrubland nitrogen biogeochemistry. *Plant and Soil* 186:205-211.
2. Asner, G.P., T.R. Seastedt, and A.R. Townsend. 1997. The decoupling of terrestrial carbon and nitrogen cycles. *BioScience* 47:226-234.
3. Asner, G.P. and G. Goldstein. 1997. Correlating stem biomechanical properties of Hawaiian canopy trees with hurricane wind damage. *Biotropica* 29:145-150.
4. Asner, G.P. and C.A. Wessman. 1997. Scaling PAR absorption from the leaf to landscape level in spatially heterogeneous ecosystems. *Ecological Modelling* 103:81-97.
5. Asner, G.P., C.A. Wessman, and J.L. Privette. 1997. Unmixing the directional reflectances of AVHRR sub-pixel landcovers. *IEEE Transactions on Geoscience and Remote Sensing* 35:868-878.
6. Asner, G.P., B.H. Braswell, D.S. Schimel, and C.A. Wessman. 1998. Ecological research needs from multi-angle remote sensing data. *Remote Sensing of Environment* 63:155-165.
7. Asner, G.P. 1998. Biophysical and biochemical sources of variability in canopy reflectance. *Remote Sensing of Environment* 64:234-253.
8. Asner, G.P., C.A. Wessman, and S. Archer. 1998. Scale dependence of absorption of photosynthetically active radiation in terrestrial ecosystems. *Ecological Applications* 8:906-925.
9. Wessman, C.A. and G.P. Asner. 1998. Ecosystems and the problems of large-scale measurements. Successes, Limitations, and Frontiers in Ecosystem Ecology. P. Groffman and M. Pace (eds.) Springer-Verlag, Berlin.
10. Asner, G.P., C.A. Wessman, D.S. Schimel, and S. Archer. 1998. Variability in leaf and litter optical properties: implications for canopy BRDF model inversions using AVHRR, MODIS, and MISR. *Remote Sensing of Environment* 63:200-215.
11. Asner, G.P., C.A. Wessman, and D.S. Schimel. 1998. Heterogeneity of savanna canopy structure and function from imaging spectrometry and inverse modeling. *Ecological Applications* 8:926-941.
12. Asner, G.P., C.A. Bateson, J.L. Privette, N. Z. El Saleous, and C.A. Wessman. 1998. Vegetation structural effects on carbon uptake using satellite data fusion and inverse modeling. *Journal of Geophysical Research* 103:28839-28853.
13. Mesarch, M.A., E.A. Walter-Shea, G.P. Asner, E.M. Middleton, and S.S. Chan. 1999. A revised measurement methodology for conifer needle spectral optical properties. *Remote Sensing of Environment* 68:177-192.
14. Asner, G.P., A.R. Townsend, and M.C.M. Bustamante. 1999. Spectrometry of pasture condition and biogeochemistry in the Central Amazon. *Geophysical Research Letters* 26:2769-2772.
15. Diner, D.J., G.P. Asner, R. Davies, J.-P. Muller, B. Pinty, C.B. Schaaf, and J. Stroeve. 1999. New directions in Earth observing: scientific applications of multiple-view-angle remote sensing. *Bulletin of the American Meteorological Society* 80 (11):2209-2228.

2000-2002

16. Bateson, C.A., G.P. Asner, and C.A. Wessman. 2000. Endmember bundles: A new approach to incorporating endmember variability in spectral mixture analysis. *IEEE Transactions on Geoscience and Remote Sensing* 38:1083-1094.
17. White, M.A., G.P. Asner, R.R. Nemani, J.L. Privette, and S.W. Running. 2000. Monitoring fractional cover and leaf area index in arid ecosystems: digital camera, radiation transmittance, and laser altimetry results. *Remote Sensing of Environment* 74:45-57.
18. Privette, J.L., G.P. Asner, F. Huemmrich, et al. 2000. The Prototype Validation Exercise (PROVE) for EOS land and atmosphere products. *Remote Sensing of Environment* 74:1-12.

19. Asner, G.P., C.A. Wessman, C.A. Bateson, and J.L. Privette. 2000. Impact of tissue, canopy and landscape factors on reflectance variability of arid ecosystems. *Remote Sensing of Environment* 74:69-84.
20. Asner, G.P. and D.B. Lobell. 2000. A biogeophysical approach for automated SWIR unmixing of soils and vegetation. *Remote Sensing of Environment* 74:99-112.
21. Asner, G.P. 2000. Contributions of multi-view angle remote sensing to land surface and biogeochemical research. *Remote Sensing Reviews* 18:137-162.
22. Asner, G.P., A.R. Townsend, and B.H. Braswell. 2000. Satellite observation of El Niño effects on Amazon forest phenology and productivity. *Geophysical Research Letters* 27:981-984.
23. Asner, G.P., A.R. Townsend, W. Riley, P.A. Matson, J.C. Neff, and C.C. Cleveland. 2001. Physical and biogeochemical controls of terrestrial ecosystems responses to nitrogen deposition. *Biogeochemistry* 54:1-39.
24. Neff, J.C. and G.P. Asner. 2001. Dissolved organic carbon in terrestrial ecosystems: synthesis and model. *Ecosystems* 4:29-48.
25. Lobell, D.B., G.P. Asner, B. Law, R. Treuhaft. 2001. Sub-pixel canopy cover estimation of coniferous forest using SWIR imaging spectrometry. *Journal of Geophysical Research* 106:5151-5160.
26. Asner, G.P. 2001. Cloud cover in Landsat observations of the Brazilian Amazon. *International Journal of Remote Sensing* 22:3855-3862.
27. Asner, G.P. and R.O. Green. 2001. Imaging spectroscopy measures desertification in the Southwest U.S. and Argentina. *EOS Transactions* 82(49):601-606.
28. Asner, G.P., M. Keller, R. Pereira, and J. Zweede. 2002. Remote sensing of selective logging in Amazônia: Assessing limitations based on detailed field measurements, Landsat ETM+ and textural analysis. *Remote Sensing of Environment* 80(3):483-496.
29. Lobell, D.B., G.P. Asner, B. Law, R. Treuhaft. 2002. View angle effects on canopy reflectance and spectral mixture analysis of coniferous forests using AVIRIS. *International Journal of Remote Sensing* 23:2247-2262.
30. Lobell, D.B. and G.P. Asner. 2002. Moisture effects on soil reflectance. *Soil Science Society of America Journal* 66:722-727.
31. Asner, G.P. and K.B. Heidebrecht. 2002. Spectral unmixing of vegetation, soil and dry carbon in arid regions: Comparing multi-spectral and hyperspectral observations. *International Journal of Remote Sensing* 23:3,939-3,958.
32. Treuhaft, R.N., G.P. Asner, B.E. Law, and S. Van Tuyl. 2002. Forest leaf area density profiles from the quantitative fusion of radar and hyperspectral data. *Journal of Geophysical Research* 107:4568 doi:10.1029/2001JD000646
33. Lobell, D.B., G.P. Asner, I. Ortiz-Monasterio, and T. Benning. 2002. Remote sensing of regional crop production in the Yaqui Valley, Mexico: Estimates and uncertainties. *Agriculture, Ecosystems and Environment* 94(2):205-220.
34. Asner, G.P., M. Palace, M. Keller, R. Pereira Jr., J.N.M. Silva, and J.C. Zweede. 2002. Estimating canopy structure in an Amazon forest from laser rangefinder and IKONOS satellite observations. *Biotropica* 34:483-492.
35. Hicke, J.A., G.P. Asner, J. Randerson, S. Los, S. Birdsey, C.J. Tucker, and C.B. Field. 2002. Changes in North American net primary production, 1982-1998. *Geophysical Research Letters* 29:69-73.
36. Hicke, J.A., G.P. Asner, J.T. Randerson, S. Los, R. Birdsey, J.C. Jenkins, C.J. Tucker, and C.B. Field. 2002. Trends in North American net primary productivity derived from satellite observations, 1982-1998. *Global Biogeochemical Cycles* 16 doi:10.1029/2001GB001550.
37. Townsend, A.R., G.P. Asner, C.C. Cleveland, M. Lefer, and M.M.C. Bustamante. 2002. Unexpected changes in soil phosphorus dynamics following forest-to-pasture conversion in the humid tropics. *Journal of Geophysical Research* 107:8,067-8,076.

38. Pereira, R., J. Zweede, G.P. Asner, and M. Keller. 2002. Forest canopy damage from conventional and reduced impact selective logging in Eastern Amazon, Brazil. *Forest Ecology and Management* 168:77-89.
39. Townsend, A.R., G.P. Asner, P.P. Tans, and J.W.C. White. 2002. Land use effects on atmospheric ¹³C imply a sizable terrestrial CO₂ sink in tropical latitudes. *Geophysical Research Letters* 29 doi:10.1029/2001GL013454.
40. Lobell, D.B., J.I. Ortiz-Monasterio, C.L. Addams, and G.P. Asner. 2002. Soil, climate and management impacts on regional agricultural productivity. *Agricultural and Forest Meteorology* 114:31-43.
41. Lobell, D.B., J.A. Hicke, G.P. Asner, C.B. Field, C.J. Tucker, and S. O. Los. 2002. Satellite estimates of productivity and light use efficiency in United States agriculture, 1982-1998. *Global Change Biology* 8:722-735.

2003-2005

42. Asner, G.P., J.M.O. Scurlock, and J.A. Hicke. 2003. Global synthesis of leaf area index observations: Implications for ecological and remote sensing studies. *Global Ecology and Biogeography* 12:195-205.
43. Hicke, J.A., G.P. Asner, E.S. Kasishke, N.H.F. French, J.T. Randerson, G.J. Collatz, B.J. Stocks, C.J. Tucker, S.O. Los, C.B. Field. 2003. Postfire response of North American boreal forest net primary productivity. *Global Change Biology* 9:1145-1157.
44. Zavaleta, E.S., B.D. Thomas, N.R. Chariello, G.P. Asner, M.R. Shaw, and C.B. Field. 2003. Plants reverse warming effect on ecosystem water balance. *Proceedings of the National Academy of Sciences* 100:9892-9893.
45. Asner, G.P., S.A. Archer, R.F. Hughes, J.N. Ansley, and C.A. Wessman. 2003. Net changes in regional woody vegetation cover and carbon storage in North Texas rangelands, 1937-1999. *Global Change Biology* 9:316-335.
46. Lobell, D.B. and G.P. Asner. 2003. Climate and management contributions to recent trends in U.S. agricultural yields. *Science* 299:1032.
47. Lobell, D.B. and G.P. Asner. 2003. Comment on climate and management contributions to recent trends in U.S. agricultural yields. *Science* 300:1505.
48. Asner, G.P., C. Borghi, and R. Ojeda. 2003. Desertification in Central Argentina: Regional changes in ecosystem carbon-nitrogen. *Ecological Applications* 13:629-648.
49. Harris, A.T., G.P. Asner, and M.E. Miller. 2003. Changes in vegetation structure following long-term grazing in pinyon-juniper ecosystems. *Ecosystems* 6:368-383.
50. Martin, R.E., G.P. Asner, R.J. Ansley, and A.R. Mosier. 2003. Effects of woody vegetation encroachment on soil nitrogen oxide emissions in a temperate savanna. *Ecological Applications* 13:897-910.
51. Treuhaft, R.N., G.P. Asner, and B.E. Law. 2003. Structure-based forest biomass from fusion of radar and hyperspectral observations. *Geophysical Research Letters* 30:1472-1476.
52. Asner, G.P. and K.B. Heidebrecht. 2003. Imaging spectroscopy for desertification studies: Comparing AVIRIS and EO-1 Hyperion in Argentina drylands. *IEEE Transactions on Geoscience and Remote Sensing* 41:135-155.
53. Lobell, D.B. and G.P. Asner. 2003. Comparison of Earth Observing-1 ALI and Landsat ETM+ for crop identification and yield prediction in Mexico. *IEEE Transactions on Geoscience and Remote Sensing* 41:128-134.
54. Harris, A.T. and G.P. Asner. 2003. Grazing gradient detection with airborne imaging spectroscopy on a semi-arid rangeland. *Journal of Arid Environments* 55:391-404.
55. Asner, G.P., M.M.C. Bustamante, and A.R. Townsend. 2003. Scale dependence of biophysical structure in deforested lands bordering the Tapajós National Forest, Central Amazon. *Remote Sensing of Environment* 87:507-520.

56. Asner, G.P. and A.S. Warner. 2003. Canopy shadow in IKONOS satellite observations of tropical forests and savannas. *Remote Sensing of Environment* 87:521-533.
57. Hurtt, G., X. Xiao, M. Keller, M. Palace, G.P. Asner, et al. 2003. IKONOS imagery for the Large Scale Biosphere-Atmosphere Experiment in Amazônia (LBA). *Remote Sensing of Environment* 88:111-127.
58. Asner, G.P., J.A. Hicke, and D.B. Lobell. 2003. Per-pixel analysis of forest structure: Vegetation indices, spectral mixture analysis and canopy reflectance modeling. *Methods and Applications for Remote Sensing of Forests: Concepts and Case Studies*. M. Wulder and S.E. Franklin (eds.) Kluwer Academic Publishers, New York.
59. Asner, G.P. 2004. Biophysical remote sensing signatures of arid and semi-arid regions. *Remote Sensing for Natural Resources, Management and Environmental Monitoring*. S. Ustin (ed.) John Wiley & Sons, New York.
60. Ustin, S.L., S. Jacquemoud, P.J. Zarco-Tejada, and G.P. Asner. 2004. Remote sensing of environmental processes: State of the science and new directions. *Remote Sensing for Natural Resources, Management and Environmental Monitoring*. S. Ustin (ed.) John Wiley & Sons, New York.
61. Ustin, S.L., D.A. Roberts, J.A. Gamon, G.P. Asner, and R.O. Green. 2004. Using imaging spectroscopy to study ecosystem processes and properties. *BioScience* 54:523-534.
62. Treuhhaft, R.N., B.E. Law, and G.P. Asner. 2004. Forest attributes from radar interferometric profiling and its fusion with optical data. *BioScience* 54:561-571.
63. Hall, S.J., G.P. Asner, and K. Kitayama. 2004. Land use, climate and substrate controls over soil nitrogen dynamics and N-oxide emissions in Borneo. *Biogeochemistry* 70:27-58.
64. Galloway, J., et al., G.P. Asner, et al. 2004. Regional and global N cycles: Past, present and future. *Biogeochemistry* 70:153-226.
65. Hicke, J.A., R.L. Sherriff, T.T. Veblen, and G.P. Asner. 2004. Carbon accumulation in Colorado ponderosa pine stands. *Canadian Journal of Forest Research* 34:1283-1295.
66. Asner, G.P., A.R. Townsend, M.M.C. Bustamante, G.B. Nardoto, and L.O. Olander. 2004. Pasture degradation in the Central Amazon: Linking carbon and nutrient dynamics with remote sensing. *Global Change Biology* 10:844-862.
67. Keller, M., M. Palace, G.P. Asner, R. Pereira Jr., and J.N.M. Silva. 2004. Coarse woody debris in undisturbed and logged forests in the Eastern Brazilian Amazon. *Global Change Biology* 10:784-795.
68. Asner, G.P., M. Keller, and J.N.M. Silva. 2004. Spatial and temporal dynamics of forest canopy gaps following selective logging in the eastern Amazon. *Global Change Biology* 10:765-783.
69. Lobell, D.B., I. Ortiz-Monasterio, and G.P. Asner. 2004. Relative importance of soil and climate variability for nitrogen management in irrigated wheat. *Field Crops Research* 87:155-165.
70. Defries, R., J. Foley, and G.P. Asner. 2004. Trade-offs from land-use change: Using ecological knowledge to balance human needs and ecosystem function. *Frontiers in Ecology and Environment* 2:249-257.
71. Boyer E.W., R.W. Howarth, J.N. Galloway, F.J. Dentener, C. Cleveland, G.P. Asner, P. Green, and C. Vörösmarty. 2004. Current nitrogen inputs to world regions. *Agriculture and the Nitrogen Cycle: Assessing the Impact of Fertilizer Use on Food Production and the Environment*. A.R. Mosier, K. Syers, and J.R. Freney (eds.) Island Press, Washington, DC.
72. Hicke, J.A., D.B. Lobell, and G.P. Asner. 2004. Cropland area and net primary production computed from 30 years of USDA agricultural harvest data. *Earth Interactions* 8:1-20.
73. Asner, G.P., A. Elmore, L. Olander, R.E. Martin, and A.T. Harris. 2004. Grazing systems, ecosystem responses and global change. *Annual Review of Environment and Resources* 29:261-299.
74. Asner, G.P. and K.B. Heidebrecht. 2004. Desertification alters ecosystem-climate interactions. *Global Change Biology* 10:1-13.
75. Lobell, D.B. and G.P. Asner. 2004. Cropland distributions from temporal unmixing of MODIS data. *Remote Sensing of Environment* 93:412-422.

76. Keller, M., G.P. Asner, J.N.M. Silva, and M. Palace. 2004. Sustainability of selective logging of upland forests in the Brazilian Amazon: Carbon budgets and remote sensing as tools for evaluation of logging effects. *Working Forests in the Tropics: Conservation through Sustainable Management?* D. Zarin, J. Alavalapati, F.E. Putz, M. Schmink (eds.) Columbia University Press, New York.
77. Houghton, R.A., F. Joos, G.P. Asner. 2004. The effects of land use and management on the global carbon cycle. *Land Change Science: Observing, Monitoring and Understanding Trajectories of Change on the Earth's Surface*. G. Gutman, A.C. Janetos, C.O. Justice et al. (eds.) Kluwer Academic Publishers, London.
78. Wessman, C.A., S. Archer, L.C. Johnson, and G.P. Asner. 2004. Woodland expansion in the US grasslands: Assessing land-cover change and biogeochemical impacts. *Land Change Science: Observing, Monitoring and Understanding Trajectories of Change on the Earth's Surface*. G. Gutman, A.C. Janetos, C.O. Justice et al. (eds.) Kluwer Academic Publishers, London.
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Patents

Remote Sensing Analysis of Forest Disturbances; United States Patents 8189877, 20090214084, 20120288159-A1 and 20130216103; International Classification G06K9/62; Expiration: May 21, 2028. Patent applies to a general methodology for monitoring any forest disturbances with satellite imagery. The patents protect the Carnegie Landsat Analysis System (CLAS), Carnegie Landsat Analysis System-Lite (CLASlite), Automated Monte Carlo Unmixing (AutoMCU), and Multispectral and Hyperspectral Libraries. The invention can be used to monitor any type of forest disturbance or degradation including selective logging, agricultural expansion, cattle ranching, and natural hazards such as fire and windstorms.

Professional Organizations

American Geophysical Union
American Association for the Advancement of Science
Association for Tropical Biology and Conservation
Ecological Society of America (lifetime member)
International Society for Reef Studies
Organization for Tropical Studies
U.S. National Academy of Sciences (lifetime member)

Outreach Examples

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