

REFERENCES

- A. Balenzano, F. Mattia, G. Satalino, and M.W. J. Davidson, "Dense temporal series of C- and L-band SAR data for soil moisture retrieval over agricultural crops," *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, 2011, v. 4, n. 2, pp. 439-450.
- A. J. McDonald, J.C. Bennett, G. Cookmartin, S. Crossley, K. Morrison, and S. Quegan, "The effect of leaf geometry on the microwave backscatter from leaves," *International Journal of Remote Sensing*, 2000, v. 21, n. 2, pp. 395-400.
- A. Kandel, *Fuzzy Expert Systems*, Reading, MA Addison-Wesley, 1988.
- A. Mathur and G.M. Foody, "Crop classification by support vector machine with intelligently selected training data for an operational application," *International Journal of Remote Sensing*, 2008, v. 29, n. 8, pp. 2227-2240.
- A. Monsivais-Huertero, J. Judge, S. Steele-Dunne, and P.W. Liu, "Impact of bias correction methods on estimation of soil moisture when assimilating active and passive microwave observations," *IEEE Transactions on Geoscience and Remote Sensing*, 2016, v. 54, n. 1, pp. 262-278.
- A. Pandey, "Crop signature studies by microwave remote sensing using soft computing techniques," Ph.D. Thesis, Department of Physics, Indian Institute of Technology (BHU), Varanasi, India, 2011.
- A. Quesney, S. Le Hégarat-Masclé, O. Taconet, D. Vidal-Madjar, J.P. Wigneron, C. Loumagne, and M. Normand, "Estimation of watershed soil moisture index from ERS/SAR data," *Remote Sensing of Environment*, 2000, v. 72, n. 3, pp. 290-303.
- A. Tavakoli, K. Sarabandi, and F. T. Ulaby, "Horizontal propagation through periodic vegetation canopies," *IEEE Transactions on Antennas and Propagation*, 1991, v. 39, n. 7, pp. 1014-1023.
- A. Toure, K.P.B. Thomson, G. Edwards, R.J. Brown, and B.G. Brisco, "Adaptation of the MIMICS backscattering model to the agricultural context-wheat and canola at L and C bands," *IEEE Transactions on Geoscience and Remote Sensing*, 1994, v. 32, n. 1, pp. 47-61.
- A.K. Fung, Z. Li, and K.S. Chen, "Backscattering from a randomly rough dielectric surface," *IEEE Transactions on Geoscience and Remote Sensing*, 1992, v. 30, n. 2, pp. 356-369.
- A.M. Shutko, "Microwave radiometry of lands under natural and artificial moistening," *IEEE Transactions on Geoscience and Remote Sensing*, 1982, v. 20, n.1, pp. 18-26.

A.T. Joseph, R. van der Velde, P.E. O'Neill, R. Lang, and T. Gish, "Effects of corn on C- and L-band radar backscatter: A correction method for soil moisture retrieval," *Remote Sensing of Environment*, 2010, v. 114, n. 11, pp. 2417–2430.

A.Y. Nashashibi, F.T. Ulaby, "MMW polarimetric radar bistatic scattering from a random surface," *IEEE Transactions on Geoscience and Remote Sensing*, 2007, v. 45, n. 6, pp. 1743-1755.

B. Basso, D. Cammarano, and E. Carfagna, "Review of crop yield forecasting methods and early warning systems," Report presented to First Meeting of the Scientific Advisory Committee of the Global Strategy to Improve Agriculture and Rural Statistics FAO, Headquarters, Rome, Italy, 2013, pp. 1-56.

B. Brisco, R.J. Brown, J.A. Koehler, G.J. Sofko, and M.J. Mckibben, "The diurnal pattern of microwave backscattering by wheat," *Remote Sensing of Environment*, 1990, v. 34, n. 1, pp. 37–47.

B. Brisco, R.J. Brown, J.G. Gairns, and B. Snider, "Temporal ground-based scatterometer observations of crops in western Canada," *Canadian Journal of Remote Sensing*, 1992, v. 18, n. 1, pp. 14-21.

B. Brisco, R.J. Brown, T. Hirose, H. McNairn and K. Staenz, "Precision agriculture and the role of remote sensing: A review," *Canadian Journal of Remote Sensing*, 2014, v. 24, no. 3, pp. 315-327.

B. Dixon, and N. Candade, "Multispectral land use classification using neural networks and support vector machines: one or the other, or both?," 2008, *International Journal of Remote Sensing*, v. 29, no. 4, pp. 1185-1206.

B.A.M. Bouman and D.H. Hoekman, "Multi-temporal, multi-frequency radar measurements of agricultural crops during the Agriscatt-88 campaign in The Netherlands," *Remote Sensing*, 1993, v. 14, no. 8, pp. 1595-1614.

B.A.M. Bouman and H.W.J. van Kasteren, "Ground-based X-band (3-cm wave) radar backscattering of agricultural crops. I. Sugar, beet and potato; backscattering and crop growth," *Remote Sensing of Environment*, 1990, v. 34, n. 2, pp. 93–105.

B.A.M. Bouman and H.W.J. van Kasteren, "Ground-based X-band (3-cm wave) radar backscattering of agricultural crops. II. Wheat, barley, and oats; the impact of canopy structure," *Remote Sensing of Environment*, 1990, v. 34, n. 2, pp. 107–119.

B.A.M. Bouman, "Crop parameter estimation from ground-based X-band (3-cm wave) radar backscattering data," *Remote Sensing of Environment*, 1991, v. 37, no. 3, pp. 193-205.

C. Elachi and J.J. Van Zyl, Introduction to the physics and techniques of remote sensing: John Wiley & Sons, 2006.

C. Rossi, and E. Erten, "Paddy-rice monitoring using TanDEM-X," *IEEE Transactions on Geoscience and Remote Sensing*, 2014, v. 53, n. 2, pp. 900-910.

C.S. Murthy, P.V. Raju, K.V.S. Badrinath, "Classification of wheat crop with multi-temporal images: performance of maximum likelihood and artificial neural network," *International Journal of Remote Sensing*, 2003, v. 24, n. 23, pp. 4871-4890.

D. Han, H. Yang, C. Qiu, G. Yang, E. Chen, Y. Du, W. Yang, and C. Zhou, "Estimating wheat biomass from GF-3 data and a polarized water cloud model," *Remote sensing letters*, 2019, v. 10, n. 3, pp. 234-243.

D. Jiang, X. Yang, N. Clinton, and N. Wang, "An artificial neural network model for estimating crop yields using remotely sensed information," *International Journal of Remote Sensing*, 2004, v. 25, n. 9, pp. 1723-1732.

D. K. Gupta, P. Kumar, V. N. Mishra, R. Prasad, P.K.S. Dikshit, S.B. Dwivedi, A. Ohri, R. S. Singh, and V. Srivastava, "Bistatic measurements for the estimation of rice crop variables using artificial neural network," *Advances in Space Research*, 2015, v. 55, n. 6, pp. 1613-1623.

D. Mandal, V. Kumar, H. McNairn, A. Bhattacharya, and Y.S. Rao, "Joint estimation of Plant Area Index (PAI) and wet biomass in wheat and soybean from C-band polarimetric SAR data," *International Journal of Applied Earth Observation and Geoinformation*, 2019, v. 79, pp. 24-34.

D. Singh, "A simplistic incidence angle approach to retrieve the soil moisture and surface roughness at X-band," *IEEE transactions on geoscience and remote sensing*, 2005, v. 43, n.11, pp. 2606-2611.

D. Tilman, J. Fargione, B. Wolff, C. D'Antonio, A. Dobson, R. Howarth, D. Schindler, W. H. Schlesinger, D. Simberloff, and D. Swackhamer, "Forecasting agriculturally driven global environmental change," *Science*, 2011, v. 292, no. 5515, pp. 281-284.

D.A. Kasampalis, T.K. Alexandridis, C. Deva, A. Challinor, D. Moshou, and G. Zalidis, "Contribution of remote sensing on crop models: a review," *Journal of Imaging*, 2018, v. 4, n. 4, p. 52.

D.H. Chang, and S. Islam, "Estimation of soil physical properties using remote sensing and artificial neural network," *Remote Sensing of Environment*, 2000, v. 74, no. 3, pp. 534-544.

D.H. Hoekman and B.A.M. Bouman, "Interpretation of C- and X-band radar images over an agricultural area, the Flevoland test site in the Agriscatt-87 campaign," *International Journal of Remote Sensing*, 1993, v. 14, n. 8, pp. 1577-1594.

D.J. Major, A.M. Smith, M.J. Hill, W.D. Willms, B. Brisco, and R.J. Brown, "Radar backscatter and visible infrared reflectance from short-grass prairie," *Canadian Journal of Remote Sensing*, 1994, v. 20, no. 1, pp. 71-77.

E. Ceraldi, G. Franceschetti, A. Iodice and D. Riccio, "Estimating the soil dielectric constant via scattering measurements along the specular direction," *IEEE Transactions on Geoscience and Remote Sensing*, 2005, v. 43, no. 2, pp. 295–305.

E. Erten, C. Rossi, and O. Yüzügüllü, "Polarization impact in TanDEM-X data over vertical-oriented vegetation: The paddy-rice case study," *IEEE Geoscience and Remote Sensing Letters*, 2015, v. 12, no. 7, pp. 1501-1505.

E.F. Wood, D.P. Lettenmaier, V.G. Zartarian, "A land-surface hydrology parameterization with subgrid variability for general circulation models," *Journal of Geophysical Research: Atmospheres*, 1992, v. 97, n. D3, pp. 2717–2728

E.G. Njoku and J.A Kong, "Theory for passive microwave remote sensing of near-surface soil moisture," *Journal of Geophysical Research*, 1977, v. 82, n. 20, pp. 3108-3118.

E.P.W. Attema, and F.T. Ulaby, "Vegetation modeled as a water cloud," *Radio Science*, 1978, v. 13, n. 2, pp. 357-364.

E.T. Engman, "Applications of microwave remote sensing of soil moisture for water resources and agriculture," *Remote Sensing of Environment*, 1991, v. 35, n. 2-3, pp. 213-226.

E.T. Engman, "Progress in microwave remote sensing of soil moisture," *Canadian Journal of Remote Sensing*, 1990, v. 16, n. 3, pp. 6-14.

E.T. Engman, and N. Chauhan, "Status of microwave soil moisture measurements with remote sensing," *Remote Sensing of Environment*, 1995, v. 51, no. 1, pp. 189-198.

F. Del Frate, P. Ferrazzoli, and G. Schiavon, "Retrieving soil moisture and agricultural variables by microwave radiometry using neural networks," *Remote Sensing of Environment*, 2003, v. 84, no. 2, pp. 174-183.

F. Mattia, T.L. Toan., J.C Souyris, C.D. Carolis, N. Floury, F. Posa, and N.G. Pasquariello, "The effect of surface roughness on multifrequency polarimetric SAR data," *IEEE Transactions on Geoscience and Remote Sensing*, 1997, v. 35, n. 4, pp. 954-966.

F. Mattia,, T.L. Toan, G. Picard, F.I. Posa, A. D'Alessio, C. Notarnicola, A.M. Gatti, M. Rinaldi, G. Satalino, and G. Pasquariello, "Multitemporal C-band radar measurements on wheat fields," *IEEE Transactions on Geoscience and Remote Sensing*, 2003, v. 41, n. 7, pp. 1551-1560.

F.T. Ulaby and E.A. Wilson, "Microwave attenuation properties of vegetation canopies," *IEEE Transactions on Geoscience and Remote Sensing*, 1985, v. 23, no. 5, pp. 746–753.

F.T. Ulaby, "Radar measurement of soil moisture content," *IEEE Transactions on Antennas and propagation*, 1974, v. 22, n. 2, pp. 257-265.

F.T. Ulaby, "Radar response to vegetation," *IEEE Transactions on Antennas and Propagation*, 1975, v. 23, n. 1, pp. 36-45.

- F.T. Ulaby, "Vegetation clutter model," *Transactions on Antennas and Propagation*, 1980, v. 28, n. 4, pp. 538–545.
- F.T. Ulaby, A. Aslam, and M.C. Dobson, "Effects of vegetation cover on the radar sensitivity to soil moisture," *IEEE Transactions on Geoscience and Remote Sensing*, 1982, v. 20, n. 4, pp. 476-481.
- F.T. Ulaby, A. Tavakoli, and T.B.A. Senior, "Microwave propagation constant for a vegetation canopy with vertical stalks," *IEEE Transactions on Geoscience and Remote sensing*, 1987, v. 25, n. 6, pp. 714-725.
- F.T. Ulaby, and M.A. El-Rays, "Microwave dielectric spectrum of vegetation-Part II: Dual-dispersion model," *IEEE Transactions on Geoscience and Remote Sensing*, 1987, v. 25, n. 5 550-557.
- F.T. Ulaby, and R. Moore, "Radar sensing of soil moisture," *Antennas and Propagation Society International Symposium, IEEE*, 1973, v. 11, pp. 362-365.
- F.T. Ulaby, and R.P. Jedlicka, "Microwave dielectric properties of plant materials," *IEEE Transactions on Geoscience and Remote sensing*, 1984, v. 22, n. 4, pp. 406-415.
- F.T. Ulaby, D.G. Long, W.J. Blackwell, C. Elachi, A.K. Fung, C. Ruf, K. Sarabandi, H.A. Zebker and J. Van Zyl, *Microwave radar and radiometric remote sensing*, : University of Michigan Press, Ann Arbor, 2014.
- F.T. Ulaby, G.A. Bradley, and M.C. Dobson, "Microwave backscatter dependence on surface roughness, soil moisture, and soil texture: Part II-vegetation covered soil," *IEEE Transactions on Geoscience Electronics*, 1979, v. 17, n. 2, pp. 33-40.
- F.T. Ulaby, P.P. Batlivala, and M. Dobson, "Microwave backscatter dependence on surface roughness, soil moisture, and soil texture: Part I-Bare soil," *IEEE Transactions on Geoscience and Remote Sensing*, 1978, v. 16, n. 4, pp. 286-295.
- F.T. Ulaby, R.K. Moore, A. K. Fung, *Microwave Remote Sensing-Active and Passive*, Norwood, MA: Artech House, v. III, 1986.
- F.T. Ulaby, R.K. Moore, and A.K. Fung, *Microwave remote sensing active and passive-Volume III: From theory to applications*, 1986.
- F.T. Ulaby, R.K. Moore, and A.K. Fung, *Microwave remote sensing active and passive-volume II: Radar remote sensing and surface scattering and emission theory*, Reading, MA: Addison-Wesley, 1982.
- F.T. Ulaby, T. Richard, R.K. Moore, A.K. Fung, *Microwave remote sensing: Active and Passive*, 2, Addison-Wesley Publishing Company, 1982.
- F.T. Ulaby, T.F. Bush, and P.P. Batlivala, "Radar response to vegetation II: 8-18 GHz band," *Transactions on Antennas and Propagation*, 1975, v. 23, n. 5, pp. 608-618.

- F.T. Ulaby., T.E. Van Deventer, J.R. East, T.F. Haddock, and M.E. Coluzzi, "Millimeter-wave bistatic scattering from ground and vegetation targets," *IEEE Transactions on Geoscience and Remote Sensing*, 1988, v. 26, n. 3, pp. 229-243.
- G. Cookmartin, P. Saich, S. Quegan, R. Cordey, P. Burgess-Allen, and A. Sowter, "Modeling microwave interactions with crops and comparison with ERS-2 SAR observations," *IEEE Transactions on Geoscience and Remote Sensing*, 2000, v. 38, n. 2, 658-670.
- G. Dharanibai and Z.C. Alex, "ANN technique for the evaluation of soil moisture over bare and vegetated fields from microwave radiometer data," *Indian Journal of Radio & Space Physics*, 2009, v. 38, no. 5, pp. 283-288.
- G. Krieger, A. Moreira, H. Fiedler, I. Hajnsek, M. Werner, M. Younis, and M. Zink, "TanDEM-X: A satellite formation for high-resolution SAR interferometry," *IEEE Transactions on Geoscience and Remote Sensing*, 2007, v. 45, n. 11, pp. 3317-3341.
- G. Macelloni, S. Paloscia, P.F. Pampaloni, Marliani, M. Gai, "The relationship between the backscattering coefficient and the biomass of narrow and broad leaf crops," *IEEE Transactions on Geoscience and Remote Sensing*, 2001, v. 39, n. 4, pp. 873-884.
- G. Mittal, and D. Singh, "Critical analysis of microwave specular scattering response on roughness parameter and moisture content for bare periodic rough surfaces and its retrieval," *Progress in Electromagnetic Research*, 2010, v. 100, pp. 129-152.
- G. Picard, T.L. Toan, F. Mattia, "Understanding C-band radar backscatter from wheat canopy using a multiple-scattering coherent model," *IEEE Transactions on Geoscience and Remote Sensing*, 2003, v. 41, n. 7, pp. 1583-1591.
- G. Satalino, F. Mattia, M.W.J. Davidson, T.L. Toan, G. Pasquariello and M. Borgeaud, "On current limits of soil moisture retrieval from ERS-SAR data," *IEEE Transactions on Geoscience and Remote Sensing*, 2002, v. 40, n. 11, pp. 2438-2447.
- G.K. Moore, "What is a picture worth? A history of remote sensing," *Hydrological Sciences Bulletin*, 1979, v. 24, n. 4, pp.477-485.
- G.P. De Loor, P. Hoogeboom, and E.P.W. Attema, "The Dutch ROVE program," *IEEE Transactions on Geoscience and Remote Sensing*, 1982, v. 20, n. 1, pp. 3-11.
- H. Fang, S. Liang, and A. Kuusk, "Retrieving leaf area index using a genetic algorithm with a canopy radiative transfer model," *Remote Sensing of Environment*, 2003, v. 85, n. 3, pp. 257-270.
- H. Jiang, and W.R. Cotton, "Soil moisture estimation using an artificial neural network: a feasibility study," *Canadian Journal of Remote Sensing*, 2004, v. 30, n. 5, pp. 827-839.
- H. McNairn, J.B. Boisvert, D.J. Major, Q.H.J. Gwyn, R.J. Brown, and A.M. Smith, "Identification of agricultural tillage practices from C-band radar backscatter," *Canadian journal of Remote Sensing*, 1996, v. 22, n. 2, pp. 154-162.

- H.V. Gupta, S. Sorooshian and P.O. Yapo, "Status of automatic calibration for hydrologic models: Comparison with multilevel expert calibration," *Journal of Hydrologic Engineering*, 1999, v. 4, n. 2, pp. 135-143.
- J. Abonyi, H. Andersen, L. Nagy, and F. Szeifert, "Inverse fuzzy-process-model based direct adaptive control," *Mathematics and Computers in Simulation*, 1999, v. 51, no. 1-2, pp. 119-132.
- J. Shi, J. Wang, A.Y. Hsu, P.E. O' Neill, and E.T. Engman, "Estimation of bare surface soil moisture and surface roughness parameter using L-band SAR image data," *IEEE Transactions on Geoscience and Remote Sensing*, 1997, v. 35, n. 5, pp. 1254-1266.
- J.A. Smith, "LAI inversion using a back-propagation neural network trained with a multiple scattering model," *IEEE Transactions on Geoscience and Remote Sensing*, 1993, v. 31, n. 5, pp. 1102-1106.
- J.B. Boisvert, Q.P. Xu, F. Bonn, R.J. Brown, and A.K. Fung, "Modelling backscatter in bare organic soils," In *IGARSS'98, Sensing and Managing the Environment, IEEE International Geoscience and Remote Sensing. Symposium Proceedings. (Cat. No. 98CH36174)*, IEEE, 1998, v. 5, pp. 2366-2368.
- J.F. Mas, and J.J. Flores, "The application of artificial neural networks to the analysis of remotely sensed data," *International Journal of Remote Sensing*, 2008, v. 29, n. 3, pp. 617-663.
- J.P. Walker, P.R. Houser, and G.R. Willgoose," Active microwave remote sensing for soil moisture measurement: afield evaluation using ERS-2," *Hydrological Processes*, 2004, v. 18, n. 11, pp. 1975-1997.
- J.P. Walker," Estimating soil moisture profile dynamics from near-surface soil moisture measurements and standard meteorological data," Ph.D. dissertation, The University of Newcastle, Australia, 1999.
- J.R. Wang, and T.J. Schmugge," An empirical model for the complex dielectric permittivity of soils as a function of water content," *IEEE Transactions on Geoscience and Remote Sensing*, 1980, v. 18, n. 4, pp. 288-295.
- J.S. Jang, "ANFIS: adaptive-network-based fuzzy inference system," *IEEE transactions on systems, man, and cybernetics*, 1993, v. 23, n. 3, pp. 665-685.
- J.T Drake, Communications phase synchronization using the adaptive network fuzzy inference system (anfis), PhD Thesis, New Mexico State University, Las Cruces, New Mexico, USA, 2000.
- J.T. Johnson, and J.D. Ouellette, "Polarization features in bistatic scattering from rough surfaces," *IEEE Transactions on Geoscience and Remote Sensing*, 2014, v. 52, n. 3, pp. 1616-1626.

K. Nagarajan, P.W. Liu, R. De Roo, J. Judge, R. Akbar, P. Rush, S. Feagle, D. Preston, and R. Terwilleger, "Automated L-band radar system for sensing soil moisture at high temporal resolution," *IEEE Geoscience and Remote Sensing Letters*, 2014, v. 11, n. 2, pp. 504-508.

K. Sarabandi, T.B. Senior, and F.T. Ulaby, "Effect of curvature on the backscattering from a leaf," *Journal of Electromagnetic Waves and Application*, 1988, v. 2, n. 7, pp. 653-670.

K.B. Khadhra, T. Boerner, D. Hounam, and, M. Chandra "Surface parameter estimation using bistatic polarimetric X-band measurements," *Progress in Electromagnetics Research*, 2012, v. 39, pp. 197-223.

K.G. Liakos, P. Busato, D. Moshou, S. Pearson, and D. Bochtis, "Machine learning in agriculture: A review," *Sensors*, 2018, v. 18, n. 8, p. 2674.

K.S. Chen, S.K. Yen, and W.P. Huang, "A simple model for retrieving bare soil moisture from radar-scattering coefficients," *Remote Sensing of the Environment*, 1995. v. 54, no. 2, pp. 121-126.

K.S. Lim, V.C. Koo, and H.T. Ewe, "Multi-angular scatterometer measurements for various stages of rice growth," *Progress in Electromagnetic Research*, 2008, v. 83, pp. 385-396.

L. Bruckler, H. Witono and P. Stengel, "Near surface soil moisture estimation from microwave measurements," *Remote sensing of Environment*, 1988, v. 26, no. 2, pp. 101-121.

L. Busetto, M. Meroni, and R. Colombo, "Combining medium and coarse spatial resolution satellite data to improve the estimation of sub-pixel NDVI time series," *Remote Sensing of Environment*, 2008, v. 112, no. 1, pp. 118-131.

L. Guerriero, N. Pierdicca, L. Pulvirenti, and P. Ferrazzoli, "Use of satellite radar bistatic measurements for crop monitoring: A simulation study on corn fields," *Remote Sensing*, 2013, v. 5, n. 2, pp. 864-890.

L. Krul, "Some results of microwave remote sensing research in the Netherlands with a view to land applications in the 1990s," *International journal of remote sensing*, 1988, v. 9, n. 10-11, pp. 1553-1563.

L. Pan, L. E. Pierce, and M. Moghaddam, "Radiative transfer model for microwave bistatic scattering from forest canopies," *IEEE Transactions on Geoscience and Remote Sensing*, 2005, v. 43, n. 11, pp. 2470-2483.

L. Prevoit, I. Champion, G. Guyot, "Estimating surface soil moisture and leaf area index of a wheat canopy using a dual-frequency (C and X bands) scatterometer," *Remote Sensing of Environment*, 1993a, v. 46, n. 3, pp. 331-339.

L. Prevoit, M. Dechambre, O. Taconet, D. Vidal-Madjar M. Normand, S. Gallej, "Estimating the characteristics of vegetation canopies with airborne radar measurements," *International Journal of Remote Sensing*, 1993b, v. 14, n. 15, pp. 2803-2818.

L. Wang, and J.J. Qu, "Satellite remote sensing applications for surface soil moisture monitoring: A review," *Frontiers of Earth Science in China*, 2009, v. 3, n. 2, pp. 237-247.

L.A. Zadeh, "Fuzzy sets," *Information and Control*, 1965, v. 8, n. 3, pp. 338-353.

M. Brogioni, S. Pettinato, G. Macelloni, S. Paloscia, P. Pampaloni, N. Pierdicca and F. Ticconi, "Sensitivity of bistatic scattering to soil moisture and surface roughness of bare soils," *International Journal of Remote Sensing*, 2010, v. 31, no. 15, pp. 4227-4255.

M. Chakraborty, K.R. Manjunath, S. Panigrahy, N. Kundu, and J.S. Parihar, "Rice crop parameter retrieval using multi-temporal, multi-incidence angle Radarsat SAR data," *ISPRS Journal of Photogrammetry & Remote Sensing*, 2005, v. 59, no. 5, pp. 310-322.

M. Hosseini, H. McNairn, A. Merzouki, A. Pacheco, "Estimation of leaf area index (LAI) in corn and soybeans using multi-polarization C- and L-band radar data," *Remote Sensing of Environment*, 2015, v. 170, pp. 77-89.

M. Jia, L. Tong, Y. Zhang, and Y. Chen, "Multitemporal radar backscattering measurement of wheat fields using multifrequency (L, S, C, and X) and full-polarization," *Radio Science*, 2013, v. 48, n. 5, pp. 471-481.

M. Kurum, R.H. Lang, P.E. O'Neill, A.T. Joseph, T.J. Jackson, and M.H. Cosh, "L-band radar estimation of forest attenuation for active/passive soil moisture inversion," *IEEE Transactions on Geoscience and Remote Sensing*, 2009, v. 47, n. 9, pp. 3026-3040.

M. Kurum, R.H. Lang, P.E. O'Neill, A.T. Joseph, T.J. Jackson, and M.H. Cosh, "A first-order radiative transfer model for microwave radiometry of forest canopies at L-band," *IEEE Transactions on Geoscience and Remote Sensing*, 2011, v. 49, n. 9, pp. 3167-3179.

M. Rodriguez-Cassola, P. Prats, D. Schulze, N. Tous-Ramon, U. Steinbrecher, L. Marotti, M. Nannini, M. Younis, P. López-Dekker, M. Zink, and A. Reigber, "First bistatic spaceborne SAR experiments with TanDEM-X," *IEEE Geoscience and Remote Sensing Letters*, 2011, v. 9, n. 1, pp. 33-37.

M. Rodriguez-Cassola, S.V. Baumgartner, G. Krieger, and A. Moreira, "Bistatic TerraSAR-X/F-SAR spaceborne-airborne SAR experiment: description, data processing, and results," *IEEE Transactions on Geoscience and Remote Sensing*, 2009, v. 48, n. 2, pp. 781-794.

M. Zribi, and M. Dechambre, "A new empirical model to retrieve soil moisture and roughness from C-band radar data," *Remote Sensing of Environment*, 2003, v. 84, n. 1, pp. 42-52.

M.A. Karam and A.K. Fung, "Leaf-shape effects in electromagnetic wave scattering from vegetation," *IEEE Transactions on Geoscience and Remote Sensing*, 1989, v. 27, n. 6, pp. 687-697.

M.A. Karam, A.K. Fung, R.H. Lang, and N.S. Chauhan, "A microwave scattering model for layered vegetation," *IEEE Transactions on Geoscience and Remote Sensing*, 1992, v. 30, n. 4, pp. 767-784.

M.C. Dobson and F.T. Ulaby, "Microwave backscatter dependence on surface roughness, soil moisture, and soil texture: Part III-soil tension," *IEEE Transactions on Geoscience and Remote Sensing*, 1981, v. 19, n. 1, pp. 15-61.

M.C. Dobson, and F.T. Ulaby, "Active microwave soil moisture research," *IEEE Transactions on Geoscience and Remote Sensing*, 1986, v. 24, n. 1, pp. 23-36.

M.C. Dobson, F.T. Ulaby, M.T. Hallikainen, and M.A. El-Rayes, "Microwave dielectric behavior of wet soil-Part II: Dielectric mixing models," *IEEE Transactions on Geoscience and Remote Sensing*, 1985, v. 23, n. 1, 35-46.

M.H. Tseng, S.J. Chen, G.H. Hwang, M.Y. Shen, "A genetic algorithm rule-based approach for land-cover classification," *ISPRS Journal of Photogrammetry & Remote Sensing*, 2008, v. 63, n. 2, pp. 202-212.

M.S. Moran, A. Vidal, D. Troufleau, Y. Inoue, and T.A. Mitchell, "Ku-and C-band SAR for discriminating agricultural crop and soil conditions," *IEEE Transactions on Geoscience and Remote Sensing*, 1998, v. 36, n. 1, pp. 265-272.

M.T. Hallikainen, F.T. Ulaby, M.C. Dobson, M.A. El-Rayes, and L.K. Wu, "microwave dielectric behavior of wet soil-part 1: Empirical models and experimental observations," *IEEE Transactions on Geoscience and Remote Sensing*, 1985, v. 23, n. 1, pp. 25-34.

N. Baghdadi, C. King, A. Bourguignon, and A. Remond, "Potential of ERS and Radarsat data for surface roughness monitoring over bare agricultural fields: Application to catchments in Northern France," *International Journal of Remote Sensing*, 2002, v. 23, no. 17, pp. 3427-3442.

N. Baghdadi, N. Holah, and M. Zribi, "Soil moisture estimation using multi-incidence and multi-polarization ASAR data," *International Journal of Remote Sensing*, 2006, v. 27, n. 10, pp. 1907-1920.

N.J.J. Breda, "Ground-based measurements of leaf area index: a review of methods, instruments and current controversies," *Journal of experimental botany*, 2003, v. 54, n. 392, pp.2403-2417.

O. Taconet, M. Benallegue, D. Vidal-Madjar, L. Prevot, M. Dechambre, and M. Normand, "Estimation of soil and crop parameters for wheat from airborne radar backscattering data in C and X bands," *Remote Sensing of Environment*, 1994, v. 50, n. 3, pp. 287-294.

P. Bertuzzi, A. Chaàny, D. Vidal-Madjar, and M. Autret, "The use of a microwave backscatter model for retrieving soil moisture over bare soil," *International Journal of Remote Sensing*, 1992, v. 13, no. 14, pp. 2653-2668.

- P. Ferrazzoli, and L. Guerriero, "Interpretation and model analysis of MAESTRO 1 Flevoland data," *International Journal of Remote Sensing*, 1994, v. 15, n. 14, pp. 2901-2915.
- P. Ferrazzoli, L. Guerriero, and D. Solimini, "Simulating bistatic scatter from surfaces covered with vegetation," *Journal of Electromagnetic Waves and Application*, 2000, v. 14, n. 2, pp. 233-248.
- P. Ferrazzoli, L. Guerriero, and G. Schiavon, "Experimental and model investigation on radar classification capability," *IEEE Transactions on Geoscience and Remote Sensing*, 1999, v. 37, n. 2, pp. 960-968.
- P. Ferrazzoli, S. Paloscia, P. Pampaloni, G. Schiavon, D. Solimini, and P. Coppo, "Sensitivity of microwave measurements to vegetation biomass and soil moisture content: A case study," *IEEE Transactions on Geoscience and Remote Sensing*, 1992, v. 30, n. 4, pp. 750-756.
- P. Hoekstra and A. Delaney, "Dielectric properties of soils at UHF and microwave frequencies," *Journal of geophysical research*, 1974, v. 79, n. 11, pp. 1699-1708.
- P. Kumar, D.K. Gupta, V.N. Mishra, R. Prasad, "Comparison of support vector machine, artificial neural network, and spectral angle mapper algorithms for crop classification using LISS IV data," *International journal of remote sensing*, 2015, v. 36, n. 6, pp. 1604-1617.
- P. Kumar, R. Prasad, A. Choudhary, V.N. Mishra, D.K. Gupta, P.K. Srivastava, "A statistical significance of differences in classification accuracy of crop types using different classification algorithms," *Geocarto International*, 2017, v. 32, n. 2, pp. 206-224.
- P. Liang, L.E. Pierce, and M. Moghaddam, "Radiative transfer model for microwave bistatic scattering from forest canopies," *IEEE Transactions on Geoscience and Remote Sensing*, 2005, v. 43, n. 11, pp. 2470-2483.
- P. O'Neill, M. Kurum, A. Joseph, J. Fuchs, P. Young, M. Cosh and R. Lang, "L-band active/passive time series measurements over a growing season using the ComRAD ground-based SMAP simulator," In *proceeding of IEEE International Geoscience and Remote Sensing Symposium-IGARSS*, IEEE, 2013, pp. 37-40.
- P. Shanmugapriya, S. Rathika, T. Ramesh, and P. Janaki, "Applications of Remote Sensing in Agriculture-A Review," *International Journal of Current Microbiology Applied Science*, 2019, v. 8, n. 1, pp. 2270-2283.
- P.C. Doraiswamy, S. Moulin, P.W. Cook, and A. Stern, "Crop yield assessment from remote sensing," *Photogrammetric Engineering & Remote Sensing*, 2003, v. 69, n. 6, pp. 665-674.
- P.C. Doraiswamy, T.R. Sinclair, S. Hollinger, B. Akhmedov, A. Stern, and J. Prueger, "Application of MODIS derived parameters for regional crop yield assessment," *Remote Sensing of the Environment*, 2005, v. 92, no. 2, pp. 192-202.

P.C. Doraiswamy, T.R. Sinclair, S. Hollinger, B. Akhmedov, A. Stern, and J. Prueger, "Application of MODIS derived parameters for regional crop yield assessment," *Remote Sensing of Environment*, 2005, v. 97, n. 2, pp. 191-202.

P.C. Dubois, and J. Van Zyl, "An empirical soil moisture estimation algorithm using imaging radar," *Proceedings of IGARSS'94-1994 IEEE International Geoscience and Remote Sensing Symposium*, 1994, v. 3, pp. 1573-1575.

P.C. Dubois, J. Van Zyl, and T. Engman, "Measuring soil moisture with imaging radars," *IEEE Transactions on Geoscience and Remote Sensing*, 1995, v. 33, no. 4, pp. 915-926.

P.E. O'Neill, R.H. Lang, M. Kurum, C. Utku, and K.R. Carver, "Multi-sensor microwave soil moisture remote sensing: NASA's combined radar/radiometer (ComRAD) system," In *Proceedings of IEEE MicroRad*, 2006, pp. 50-54.

P.K. Kingra, D. Majumder, and S.P. Singh, "Application of remote sensing and GIS in agriculture and natural resource management under changing climatic conditions," *Agricultural Research Journal*, 2016, v. 53, n. 3, pp. 295-302.

P.K. Srivastava, P. O'Neill, M. Cosh, R. Lang, and A. Joseph, "Evaluation of radar vegetation indices for vegetation water content estimation using data from a ground-based SMAP simulator," In *Proceedings of IEEE International Geoscience and Remote Sensing Symposium, IEEE*, 2015, pp. 1296-1299.

P.S. Thenkabail, R.B. Smith, and E. De Pauw, "Evaluation of narrowband and broadband vegetation indices for determining optimal hyperspectral wavebands for agricultural crop characterization," *Photogrammetric engineering and remote sensing*, 2002, v. 68, n. 6, pp. 607-621.

P.W. Liu, J. Judge, R.D. De Roo, A.W. England, and T. Bongiovanni, "Uncertainty in soil moisture retrievals using the SMAP combined active-passive algorithm for growing sweet corn," *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, 2016, v. 9, n. 7, pp. 3326-3339.

P.W. Liu, J. Judge, R.D. De Roo, A. England, and A. Luke, "Utilizing complementarity of active/passive microwave observations at L-band for soil moisture studies in sandy soils," In *proceeding of IEEE International Geoscience and Remote Sensing Symposium-IGARSS*, IEEE, 2013, pp. 743-746.

P.W. Liu, J. Judge, R.D. De Roo, A. W. England, T. Bongiovanni and A. Luke, "Dominant backscattering mechanisms at L-band during dynamic soil moisture conditions for sandy soils," *Remote Sensing of Environment*, 2016, v. 178, pp. 104-112.

R. Bindlish and A.P. Barros, "Multifrequency soil moisture inversion from SAR measurements with the use of IEM," *Remote Sensing of Environment*, 2000, v. 71, n.1, pp. 67-88.

- R. Fieuzal and F. Baup, "Estimation of leaf area index and crop height of sunflowers using multi-temporal optical and SAR satellite data," 2016, *International Journal of Remote Sensing*, v. 37, n. 12, pp. 2780-2809.
- R. Prasad, "Estimation of kidney bean crop variables using ground-based scatterometer data at 9.89 GHz," *International Journal of Remote Sensing*, 2011, v. 32, n. 1, pp.31-48.
- R.D. De Roo, and F.T. Ulaby, "Bistatic specular scattering from rough dielectric surfaces," *IEEE Transactions on Antennas and Propagation*, 1994, v. 42, no. 2, pp. 220-23.
- R.R. Jensen, P.J Hardin, and G. Yu, "Artificial neural networks and remote sensing," *Geography Compass*, 2009, v. 3, n. 2, pp. 630-646.
- R.R. Yager and D.P. Filev, "Approximate clustering via the mountain method," *IEEE Transactions on Systems, Man, and Cybernetics*, 1994, v. 24, n. 8, pp. 1279-1284.
- S. Ahmad, A. Kalra, and H. Stephen, "Estimating soil moisture using remote sensing data: A machine learning approach," *Advances in Water Resources*, 2010, v. 33, no.1, pp. 69-80.
- S. Panigrahy, M. Chakraborty, J.S. Parihar, "Evaluation of ERS-1 SAR data for agricultural crop monitoring in India," *Geocarto International*, 2002, v. 17, n. 1, pp. 69 -72.
- S.B. Doreen, "Remote sensing in physical geography: a twenty first century perspective," *In Progress in Physical Geography*, 2009, v. 33, n.4, pp. 451-456.
- S.B. Kim, B.W. Kim, Y.K. Kong, Y.S. Kim, "Radar backscattering measurements of rice crop using X-band scatterometer," *IEEE Transactions on Geoscience and Remote Sensing*. 2000, v. 38, n. 3, pp. 1467-1471.
- S.C. Steele-Dunne, H. McNairn, A. Monsivais-Huertero, J. Judge, P.W. Liu, and K. Papathanassiou, " Radar remote sensing of agricultural canopies: A review," *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, 2017, v. 10, n. 5, pp. 2249-2273.
- S.H. Yueh, J.A. Kong, J.K. Jao, R.T. Shin, and T.L. Toan, "Branching model for vegetation," *IEEE Transactions on Geoscience and Remote Sensing*, 1992, v. 30, n. 2, pp. 390-402.
- S.L. Chiu, "Fuzzy model identification based on cluster estimation," *Journal of Intelligent & fuzzy systems*, 1994, v. 2, no. 3, pp. 267-278.
- S.N. Pradhan, M. Anjum, and P. Jena, "Estimation of soil moisture content by remote sensing methods: A review," *Journal of Pharmacognosy and Phytochemistry*, 2018, pp. 1786-1792.
- S.S. Chai, J.P. Walker, O. Makarynsky, M. Kuhn, B. Veenendaal, and G. West, "Use of soil moisture variability in artificial neural network retrieval of soil moisture," *Remote Sensing*, 2009, v. 2, no. 1, pp. 166-190.

S.S. Durbha, R.L. King, and N.H. Younan, "Support vector machines regression for retrieval of leaf area index from multiangle imaging spectroradiometer," *Remote Sensing of Environment*, 2007, v. 107, no. 1-2, pp. 348-361.

T. Bernardes, M.A. Meriera, M. Adami, A. Giarolle, and B.F.T. Rudorff, "Monitoring biennial bearing effect on coffee yield using MODIS remote sensing imagery," *Remote Sensing*, 2012, v. 4, n. 4, pp. 2492-2509.

T. Jackson, A. Colliander, J. Kimball, R. Reichle, W. Crow D. Entekhabi, P. O'Neill, and E. Njoku, "SMAP Science Data Calibration and Validation Plan," JPL, 2012, smap.jpl.nasa.gov/files/smap2/CalVal_Plan_120706_pub.pdf

T. Sivasankar, D. Kumar, H.S. Srivastava, and P. Patel, "Advances in radar remote sensing of agricultural crops: a review," *International Journal on Advanced Science, Engineering and Information Technology*, 2018, v. 8, n. 4, pp. 1126-1137.

T. Tagaki, and M. Sugeno, "Fuzzy identification of systems and its application to modelling and control," *IEEE Transactions on Systems, Man, and Cybernetics*, 1985, v. 15, n. 1, pp. 116-132.

T.B.A. Senior, K. Sarabandi, and F.T. Ulaby, "Measuring and modeling the backscattering cross section of a leaf," *Radio Science*, 1987, v. 22, n. 6, pp. 1109-1116.

T.J. Schmugge, "Remote sensing of soil moisture: Recent advances," *IEEE Transactions on Geoscience and Remote Sensing*, 1983, v. 3, pp. 336-344.

T.L. Toan, F. Ribbes, L.F. Wang, N. Floury, K.H. Ding, J.A. Kong, M. Fujita, and T. Kurosu, "Rice crop mapping and monitoring using ERS-1 data based on experiment and modeling results," *IEEE Transactions on Geoscience and Remote Sensing*, 1997, v. 35, n. 1, pp. 41-56.

T.L. Toan, F. Ribbes, L.F. Wang, N. Floury, K.H. Ding, J.A. Kong, M. Fujita, and T. Kurosu, "Rice crop mapping and monitoring using ERS-1 data based on experiment and modeling results," *IEEE Transactions on Geoscience and Remote Sensing*, 1997, v. 35, n. 1, pp. 41-56.

U. Wegmuller, "Remote sensing signature studies on agricultural fields with ground-based radiometry and scatterometry," Ph.D. dissertation, University of Bern, Switzerland, 1990.

U. Wegmuller, and C. Werner, "Retrieval of vegetation parameters with SAR interferometry," *IEEE Transactions on Geoscience and Remote Sensing*, 1997, v. 35, n. 1, pp. 18-24.

V. Kumar, M. Kumari, S. Saha, "Discrimination of basmati and non-basmati rice types using polarimetric target decomposition of temporal SAR data," *Current Science*, 2016, v. 110, n. 11, pp. 2166-2169.

- V.N. Mishra, R. Prasad, P. Kumar, D. K. Gupta, and P. K. Srivastava, "Dual-polarimetric C-band SAR data for land use/land cover classification by incorporating textural information," *Environmental Earth Sciences*, 2017, v. 76, n. 1, p. 26.
- V.N. Mishra, R. Prasad, P. Kumar, P.K. Srivastava, P.K. Rai, "Knowledge-based decision tree approach for mapping spatial distribution of rice crop using C-band synthetic aperture radar-derived information," *Journal of Applied Remote Sensing*, 2017, v. 11, n. 4, p. 046003.
- W. Wagner, "Soil moisture retrieval from ERS scatterometer data," Ph.D. Thesis Vienna University of Technology, Austria, 1998
- W. Xiao, and Z. Zengxiang, "A review: Theories, methods and development of soil moisture monitoring by remote sensing," In *Proceedings 2005 IEEE International Geoscience and Remote Sensing Symposium, IEEE*, 2005, v. 6, pp. 4505-4507.
- W.H. Nicholls, *Agricultural Policy: The Place of Agriculture in Economic Development*. In *Economic Development with Special Reference to East Asia*, Palgrave Macmillan, London, 1964.
- W.R. Scott, and G.S. Smith, "Measured electrical constitutive parameters of soil as functions of frequency and moisture content," *IEEE Transactions on Geoscience and Remote Sensing*, 1992, v. 30, n. 3, pp. 621-623.
- X. Blaes, P. Defourny, "Retrieving crop parameters based on tandem ERS 1/2 interferometric coherence images," *Remote Sensing of Environment*, 2003, v. 88, n. 4, pp. 374-385.
- X. Jin, L. Kumar, Z. Li, H. Feng, X. Xu, G. Yang, and J. Wang, "A review of data assimilation of remote sensing and crop models," *European Journal of Agronomy*, 2018, v. 92, pp. 141-152.
- X. Shen, K. Mao, Q. Qin, Y. Hong and G. Zhang, "Bare surface soil moisture estimation using double-angle and dual-polarization L-band radar data," *IEEE Transactions on Geoscience and Remote Sensing*, 2013, v. 51, n.7, pp. 3931-3942.
- Y. Du, F.T. Ulaby and M.C. Dobson, "Sensitivity to soil moisture by active and passive microwave sensors," *IEEE Transactions on Geoscience and Remote Sensing*, 2000, v. 38, n. 1, pp. 105-114.
- Y. Inoue, T. Kurosu, H. Maeno, S. Uratsuka, T. Kozu, K. Dabrowska-Zielinska, and J. Qi, "Season-long daily measurements of multifrequency (Ka, Ku, X, C, and L) and full-polarization backscatter signatures over paddy rice field and their relationship with biological variables," *Remote Sensing of Environment*, 2002, v. 81, n. 2, pp. 194-204.
- Y. Kim, H. Lee, and S. Hong, "Continuous monitoring of rice growth with a stable ground-based scatterometer system," *IEEE Geoscience and Remote Sensing Letters*, 2013, v. 10, n. 4, pp. 831-835.

Y. Kim, T. Jackson, R. Bindlish, H. Lee, and S. Hong, "Monitoring soybean growth using L-, C-, and X-band scatterometer data," *International journal of remote sensing*, 2013, v. 34, n. 11, pp. 4069-4082.

Y. Oh, "Quantitative retrieval of soil moisture content and surface roughness from multipolarized radar observations of bare soil surfaces," *IEEE Transactions on Geoscience and Remote Sensing*, 2004, v. 42, n. 3, pp. 596-601.

Y. Oh, K. Sarabandi, and F.T. Ulaby, "An empirical model and an inversion technique for radar scattering from bare soil surfaces," *IEEE Transactions on Geoscience and Remote Sensing*, 1992, v. 30, n. 2, pp. 370-381.

Y. Oh, S.Y. Hong, Y. Kim, J.Y. Hong, and Y.H. Kim, "Polarimetric backscattering coefficients of flooded rice fields at L-and C-bands: Measurements, modeling, and data analysis," *IEEE Transactions on Geoscience and Remote Sensing*, 2009, v. 47, n. 8, pp. 2714-2721.

Y. Shao, X. Fan, H. Liu, J. Xiao, S. Ross, B. Brisco, R. Brown, G. Staples, "Rice monitoring and production estimation using multi-temporal RADARSAT," *Remote Sensing of Environment*, 2001, v. 76, n. 3, pp. 310-325.

Y.C. Hu, "Sugeno fuzzy integral for finding fuzzy if-then classification rules," *Applied mathematics and computation*, 2007, v. 185, n. 1, pp. 72-83.

Y.C. Hu, "Sugeno fuzzy integral for finding fuzzy if-then classification rules," *Applied mathematics and computation*, 2007, v. 185, no. 1, pp. 72-83.

Y.H. Kim, S.Y. Hong, and H.Y. Lee, "Estimation of paddy rice growth parameters using L, C, X-bands polarimetric scatterometer," *Korean Journal of Remote Sensing*, 2009, v. 25, n. 1, pp. 31-44.

Y.Y. Zhang, and Z.S. Wu, "Bistatic scattering characteristics of wheat and soybean by radiative transfer model in L band and C band," *Progress in Electromagnetic Research B*, 2016, v. 67, pp. 121-136.

Z. Yang, K. Li, Y. Shao, B. Brisco, and L. Liu, "Estimation of paddy rice variables with a modified water cloud model and improved polarimetric decomposition using multi-temporal RADARSAT-2 images," *Remote Sensing*, 2016, v. 8, n. 10, p. 878.