REFERENCES

[1] I. H. Woodhouse, *Introduction to microwave remote sensing*. CRC press, 2017.

[2] K. Y. You, "Introductory chapter: RF/microwave applications," in *Emerging Microwave Technologies in Industrial, Agricultural, Medical and Food Processing*: IntechOpen, 2018.

[3] O. Calla, "Applications of microwave in remote sensing," 1990.

[4] S. Mohan, "POTENTIALS AND APPLICATIONS OF MICROWAVE REMOTE SENSING," 2013.

[5] P. O'Neill, S. Chan, E. Njoku, T. Jackson, R. Bindlish, and J. Chaubell, "SMAP Enhanced L2 Radiometer Half-Orbit 9 km EASE-Grid Soil Moisture, Version 4, Boulder, Colorado, USA, NASA National Snow and Ice Data Center Distributed Active Archive Center," ed, 2020.

[6] E. M. Fischer, S. I. Seneviratne, P. L. Vidale, D. Luthi, and C. Schar, "Soil moisture - Atmosphere interactions during the 2003 European summer heat wave," (in English), *Journal of Climate,* vol. 20, no. 20, pp. 5081-5099, Oct 15 2007.

[7] S. D. Chen, D. X. She, L. P. Zhang, M. Y. Guo, and X. Liu, "Spatial Downscaling Methods of Soil Moisture Based on Multisource Remote Sensing Data and Its Application," (in English), *Water,* vol. 11, no. 7, Jul 2019.

[8] N. Sanchez, A. Gonzalez-Zamora, J. Martinez-Fernandez, M. Piles, and M. Pablos, "Integrated remote sensing approach to global agricultural drought monitoring," (in English), *Agricultural and Forest Meteorology,* vol. 259, pp. 141-153, Sep 15 2018.

[9] J. Martinez-Fernandez, A. Gonzalez-Zamora, N. Sanchez, A. Gumuzzio, and C. M. Herrero-Jimenez, "Satellite soil moisture for agricultural drought monitoring: Assessment of the SMOS derived Soil Water Deficit Index (vol 177, pg 277, 2016)," (in English), *Remote Sensing of Environment,* vol. 183, pp. 368-368, Sep 15 2016.

[10] P. K. Srivastava, D. W. Han, M. A. Rico-Ramirez, P. O'Neill, T. Islam, and M. Gupta, "Assessment of SMOS soil moisture retrieval parameters using tau-omega algorithms for soil moisture deficit estimation," (in English), *Journal of Hydrology,* vol. 519, pp. 574-587, Nov 27 2014.

[11] J. E. T. McLain and D. A. Martens, "Moisture controls on trace gas fluxes in semiarid riparian soils," (in English), *Soil Science Society of America Journal,* vol. 70, no. 2, pp. 367-377, Mar-Apr 2006.

[12] D. Entekhabi *et al.*, "The Soil Moisture Active Passive (SMAP) Mission," (in English), *Proceedings of the Ieee,* vol. 98, no. 5, pp. 704-716, May 2010.

[13] N. N. Das *et al.*, "The SMAP mission combined active-passive soil moisture product at 9 km and 3 km spatial resolutions," (in English), *Remote Sensing of Environment,* vol. 211, pp. 204-217, Jun 15 2018.

[14] T. Jackson *et al.*, "SMAP science data calibration and validation plan," 2013.

[15] D. Entekhabi, S. Yueh, and G. De Lannoy, "SMAP handbook," 2014.

[16] S. K. Chan *et al.*, "Assessment of the SMAP passive soil moisture product," vol. 54, no. 8, pp. 4994-5007, 2016.

[17] P. E. O'Neill, S. Chan, E. G. Njoku, T. Jackson, R. Bindlish, J. Chaubell, and A. Colliander., "SMAP Enhanced L2 Radiometer Half-Orbit 9 km EASE-Grid Soil Moisture, Version 5 [Data Set]." 2021.

[18] A. Mishra, T. Vu, A. V. Veettil, and D. Entekhabi, "Drought monitoring with soil moisture active passive (SMAP) measurements," (in English), *Journal of Hydrology,* vol. 552, pp. 620-632, Sep 2017.

[19] R. Eswar *et al.*, "SMAP Soil Moisture Change as an Indicator of Drought Conditions," (in English), *Remote Sensing,* vol. 10, no. 5, May 2018.

[20] P. M. Lawston, J. A. Santanello, and S. V. Kumar, "Irrigation Signals Detected From SMAP Soil Moisture Retrievals," (in English), *Geophysical Research Letters,* vol. 44, no. 23, pp. 11860-11867, Dec 16 2017.

[21] A. J. Purdy *et al.*, "SMAP soil moisture improves global evapotranspiration," (in English), *Remote Sensing of Environment,* vol. 219, pp. 1-14, Dec 15 2018.

[22] P. Srivastava, V. Pandey, S. Suman, M. Gupta, and T. Islam, "Available data sets and satellites for terrestrial soil moisture estimation," in *Satellite Soil Moisture Retrieval*: Elsevier, 2016, pp. 29-44.

[23] A. Robock *et al.*, "The Global Soil Moisture Data Bank," (in English), *Bulletin of the American Meteorological Society,* vol. 81, no. 6, pp. 1281-1299, Jun 2000.

[24] D. A. Robinson *et al.*, "Soil moisture measurement for ecological and hydrological watershed-scale observatories: A review," (in English), *Vadose Zone Journal,* vol. 7, no. 1, pp. 358-389, Feb 2008.

[25] W. W. Verstraeten, F. Veroustraete, and J. Feyen, "Assessment of evapotranspiration and soil moisture content across different scales of observation," (in English), *Sensors,* vol. 8, no. 1, pp. 70-117, Jan 2008.

[26] W. Dorigo *et al.*, "A new international network for in situ soil moisture data," vol. 92, no. 17, pp. 141-142, 2011.

[27] P. Dobriyal, A. Qureshi, R. Badola, and S. A. Hussain, "A review of the methods available for estimating soil moisture and its implications for water resource management," (in English), *Journal of Hydrology,* vol. 458, pp. 110-117, Aug 21 2012.

[28] G. P. Petropoulos, H. M. Griffiths, W. Dorigo, A. Xaver, A. J. R. s. o. e. f. Gruber, and s. m. content, "Surface soil moisture estimation: significance, controls, and conventional measurement techniques," pp. 29-48, 2013.

[29] C. Notarnicola, A. C. D'Alessio, F. Posa, D. Casarano, V. J. S. S. T. Sabatelli, and Applications, "Use of a C-band ground-based scatterometer to monitor surface roughness and soil moisture changes," vol. 4, no. 2, pp. 187-206, 2003.

[30] R. Mardeni, N. Ahmad, and C. Yap, "Soil moisture estimation via radio wave reflection method using ground penetrating radar," in *2015 IEEE 5th Asia-Pacific Conference on Synthetic Aperture Radar (APSAR)*, 2015, pp. 533-535: IEEE.

[31] D. K. Gupta, R. Prasad, P. Kumar, and A. K. Vishwakarma, "Soil moisture retrieval using ground based bistatic scatterometer data at X-band," (in English), *Advances in Space Research,* vol. 59, no. 4, pp. 996-1007, Feb 15 2017.

[32] H. A. A. Julham, A. R. Lubis, M. J. I. J. o. E. E. Lubis, and C. Science, "Development of soil moisture measurement with wireless sensor web-based concept," vol. 13, no. 2, pp. 514-520, 2019.

[33] E. Njoku, W. Wilson, S. Yueh, T. Jackson, and V. Lakshmi, "Airborne Observations of Soil Moisture and Vegetation During SGP'99 Using the PALS Sensor," 2000.

[34] M. P. Finn *et al.*, "Remote Sensing of Soil Moisture Using Airborne Hyperspectral Data," (in English), *Giscience & Remote Sensing,* vol. 48, no. 4, pp. 522-540, Oct-Dec 2011.

[35] M. Pause, K. Schulz, S. Zacharias, and A. Lausch, "Near-surface soil moisture estimation by combining airborne L-band brightness temperature observations and imaging hyperspectral data at the field scale," (in English), *Journal of Applied Remote Sensing,* vol. 6, Apr 27 2012.

[36] H. Q. Wang *et al.*, "Soil moisture retrieval over a site of intensive agricultural production using airborne radiometer data," (in English), *International Journal of Applied Earth Observation and Geoinformation,* vol. 97, May 2021.

[37] T. R. Carroll, "Airborne Soil-Moisture Measurement Using Natural Terrestrial Gamma-Radiation," (in English), *Soil Science,* vol. 132, no. 5, pp. 358-366, 1981.

[38] M.-G. Seo, H.-S. Shin, and A. J. I.-P. Tsourdos, "Soil moisture retrieval from airborne multispectral and infrared images using convolutional neural network," vol. 53, no. 2, pp. 15852-15857, 2020.

[39] T. J. Jackson, "Soil moisture estimation using special satellite microwave/imager satellite data over a grassland region," (in English), *Water Resources Research,* vol. 33, no. 6, pp. 1475-1484, Jun 1997.

[40] D. D. Alexakis, F.-D. K. Mexis, A.-E. K. Vozinaki, I. N. Daliakopoulos, and I. K. J. S. Tsanis, "Soil moisture content estimation based on Sentinel-1 and auxiliary earth observation products. A hydrological approach," vol. 17, no. 6, p. 1455, 2017.

[41] D. J. Zhang and G. Q. Zhou, "Estimation of Soil Moisture from Optical and Thermal Remote Sensing: A Review," (in English), *Sensors,* vol. 16, no. 8, Aug 2016.

[42] S. J. A. U. Sharma, Indian Institute of Remote Sensing, Dehradun, India, "Soil moisture estimation using active and passive microwave remote sensing techniques," 2006.

[43] X. Zhang, B. Z. Chen, H. Zhao, T. Li, and Q. F. Chen, "Physical-based soil moisture retrieval method over bare agricultural areas by means of multi-sensor SAR data," (in English), *International Journal of Remote Sensing,* vol. 39, no. 12, pp. 3870-3890, 2018.

[44] Y. H. Kerr *et al.*, "The SMOS Soil Moisture Retrieval Algorithm," (in English), *Ieee Transactions on Geoscience and Remote Sensing,* vol. 50, no. 5, pp. 1384-1403, May 2012.

[45] T. Schmugge, "Remote-Sensing of Surface Soil-Moisture," (in English), *Journal of Applied Meteorology,* vol. 17, no. 10, pp. 1549-1557, 1978.

[46] T. J. Jackson, "Measuring Surface Soil-Moisture Using Passive Microwave Remote-Sensing .3.," (in English), *Hydrological Processes,* vol. 7, no. 2, pp. 139-152, Apr-Jun 1993.

[47] E. J. Burke, J. P. Wigneron, and R. J. Gurney, "The comparison of two models that determine the effects of a vegetation canopy on passive microwave emission," (in English), *Hydrology and Earth System Sciences,* vol. 3, no. 3, pp. 439-444, Sep 1999.

[48] T. Mo, B. J. Choudhury, T. J. Schmugge, J. R. Wang, and T. J. Jackson, "A Model for Microwave Emission from Vegetation-Covered Fields," (in English), *Journal of Geophysical Research-Oceans,* vol. 87, no. Nc13, pp. 1229-1237, 1982.

[49] Y. Y. Liu, A. I. van Dijk, M. F. McCabe, J. P. Evans, R. A. J. G. E. de Jeu, and Biogeography, "Global vegetation biomass change (1988–2008) and attribution to environmental and human drivers," vol. 22, no. 6, pp. 692-705, 2013.

[50] J. P. Grant *et al.*, "Comparison of SMOS and AMSR-E vegetation optical depth to four MODIS-based vegetation indices," (in English), *Remote Sensing of Environment,* vol. 172, pp. 87-100, Jan 2016.

[51] F. Tian *et al.*, "Remote sensing of vegetation dynamics in drylands: Evaluating vegetation optical depth (VOD) using AVHRR NDVI and in situ green biomass data over West African Sahel," (in English), *Remote Sensing of Environment,* vol. 177, pp. 265-276, May 2016.

[52] M. O. Jones, L. A. Jones, J. S. Kimball, and K. C. McDonald, "Satellite passive microwave remote sensing for monitoring global land surface phenology," (in English), *Remote Sensing of Environment,* vol. 115, no. 4, pp. 1102-1114, Apr 15 2011.

[53] M. Neelam and B. P. Mohanty, "On the Radiative Transfer Model for Soil Moisture across Space, Time and Hydro-Climates," (in English), *Remote Sensing,* vol. 12, no. 16, Aug 2020.

[54] I. J. Davenport, J. Fernandez-Galvez, and R. J. Gurney, "A sensitivity analysis of soil moisture retrieval from the Tau-Omega microwave emission model," (in English), *Ieee Transactions on Geoscience and Remote Sensing,* vol. 43, no. 6, pp. 1304-1316, Jun 2005.

[55] P. K. Srivastava, "Satellite Soil Moisture: Review of Theory and Applications in Water Resources," (in English), *Water Resources Management,* vol. 31, no. 10, pp. 3161-3176, Aug 2017.

[56] S. K. Chan *et al.*, "Development and assessment of the SMAP enhanced passive soil moisture product," (in English), *Remote Sensing of Environment,* vol. 204, pp. 931-941, Jan 2018.

[57] S. Suman, P. K. Srivastava, D. K. Pandey, and S. Chaurasia, "SMAP soil moisture retrieval using Single Channel algorithm over agricultural area," 2019.

[58] C.-H. Park *et al.*, "Parameterization of Vegetation Scattering Albedo in the Tau-Omega Model for Soil Moisture Retrieval on Croplands," vol. 12, no. 18, p. 2939, 2020.

[59] P. O'Neill, R. Bindlish, S. Chan, E. Njoku, and T. Jackson, "Algorithm theoretical basis document. Level 2 & 3 soil moisture (passive) data products," 2018.

[60] L. Karthikeyan, M. Pan, D. N. Kumar, and E. F. Wood, "Effect of Structural Uncertainty in Passive Microwave Soil Moisture Retrieval Algorithm," (in English), *Sensors,* vol. 20, no. 4, Feb 2020.

[61] R. J. N. West, Washington, DC, USA, "Soil moisture active and passive mission (SMAP) L1B S0, L1C S0," 2014.

[62] N. N. Das *et al.*, "The SMAP and Copernicus Sentinel 1A/B microwave active-passive high resolution surface soil moisture product," (in English), *Remote Sensing of Environment,* vol. 233, Nov 2019.

[63] O. Merlin, C. Rudiger, A. Al Bitar, P. Richaume, J. P. Walker, and Y. H. Kerr, "Disaggregation of SMOS Soil Moisture in Southeastern Australia," (in English), *Ieee Transactions on Geoscience and Remote Sensing,* vol. 50, no. 5, pp. 1556-1571, May 2012.

[64] J. Kim and T. S. Hogue, "Improving Spatial Soil Moisture Representation Through Integration of AMSR-E and MODIS Products," (in English), *Ieee Transactions on Geoscience and Remote Sensing,* vol. 50, no. 2, pp. 446-460, Feb 2012.

[65] A. Colliander *et al.*, "Spatial Downscaling of SMAP Soil Moisture Using MODIS Land Surface Temperature and NDVI During SMAPVEX15," (in English), *Ieee Geoscience and Remote Sensing Letters,* vol. 14, no. 11, pp. 2107-2111, Nov 2017.

[66] T. Carlson, "An overview of the "triangle method" for estimating surface evapotranspiration and soil moisture from satellite imagery," (in English), *Sensors,* vol. 7, no. 8, pp. 1612-1629, Aug 2007.

[67] T. N. Carlson and G. P. J. I. J. o. R. S. Petropoulos, "A new method for estimating of evapotranspiration and surface soil moisture from optical and thermal infrared measurements: The simplified triangle," vol. 40, no. 20, pp. 7716-7729, 2019.

[68] M. Piles *et al.*, "Downscaling SMOS-derived soil moisture using MODIS visible/infrared data," vol. 49, no. 9, pp. 3156-3166, 2011.

[69] W. Zhao and A. N. Li, "A comparison study on empirical microwave soil moisture downscaling methods based on the integration of microwave-optical/IR data on the Tibetan Plateau," (in English), *International Journal of Remote Sensing,* vol. 36, no. 19-20, pp. 4986-5002, Oct 2015.

[70] K. Knipper, T. Hogue, R. Scott, and K. Franz, "Evapotranspiration Estimates Derived Using Multi-Platform Remote Sensing in a Semiarid Region," (in English), *Remote Sensing,* vol. 9, no. 3, Mar 2017.

[71] L. Fang *et al.*, "An Intercomparison Study of Algorithms for Downscaling SMAP Radiometer Soil Moisture Retrievals," (in English), *Journal of Hydrometeorology,* vol. 21, no. 8, pp. 1761-1775, Aug 2020.

[72] B. Fang, V. Lakshmi, R. Bindlish, T. J. Jackson, M. Cosh, and J. Basara, "Passive Microwave Soil Moisture Downscaling Using Vegetation Index and Skin Surface Temperature (vol 12, 0089, 2013)," (in English), *Vadose Zone Journal,* vol. 12, no. 4, Nov 2013.

[73] M. Minacapilli, M. Iovino, and F. Blanda, "High resolution remote estimation of soil surface water content by a thermal inertia approach," (in English), *Journal of Hydrology,* vol. 379, no. 3-4, pp. 229-238, Dec 30 2009.

[74] B. Molero *et al.*, "SMOS disaggregated soil moisture product at 1 km resolution: Processor overview and first validation results," (in English), *Remote Sensing of Environment,* vol. 180, pp. 361-376, Jul 2016.

[75] M. Han, H. Lu, K. Yang, and J. Shi, "Improvement of Vegetation Water Content Estimation Over the Tibetan Plateau Using Field Measurements," in *2018 IEEE 15th Specialist Meeting on Microwave Radiometry and Remote Sensing of the Environment (MicroRad)*, 2018, pp. 1-5: IEEE.

[76] T. J. Jackson *et al.*, "Vegetation water content mapping using Landsat data derived normalized difference water index for corn and soybeans," (in English), *Remote Sensing of Environment,* vol. 92, no. 4, pp. 475-482, Sep 30 2004.

[77] Y. Gao, J. P. Walker, M. Allahmoradi, A. Monerris, D. Ryu, and T. J. Jackson, "Optical Sensing of Vegetation Water Content: A Synthesis Study," (in English), *Ieee Journal of Selected Topics in Applied Earth Observations and Remote Sensing,* vol. 8, no. 4, pp. 1456-1464, Apr 2015.

[78] J. Judge *et al.*, "Impact of vegetation water content information on soil moisture retrievals in agricultural regions: An analysis based on the SMAPVEX16-MicroWEX dataset," (in English), *Remote Sensing of Environment,* vol. 265, Nov 2021.

[79] D. Y. Chen, J. F. Huang, and T. J. Jackson, "Vegetation water content estimation for corn and soybeans using spectral indices derived from MODIS near- and short-wave infrared bands," (in English), *Remote Sensing of Environment,* vol. 98, no. 2-3, pp. 225-236, Oct 15 2005.

[80] D. Chen, T. J. Jackson, F. Li, M. H. Cosh, C. Walthall, and M. Anderson, "Estimation of vegetation water content for corn and soybeans with a normalized difference water index (NDWI) using Landsat Thematic Mapper data," in *IGARSS 2003. 2003 IEEE International Geoscience and Remote Sensing Symposium. Proceedings (IEEE Cat. No. 03CH37477)*, 2003, vol. 4, pp. 2853-2856: IEEE.

[81] M. T. Yilmaz, E. R. Hunt, and T. J. Jackson, "Remote sensing of vegetation water content from equivalent water thickness using satellite imagery," (in English), *Remote Sensing of Environment,* vol. 112, no. 5, pp. 2514-2522, May 15 2008.

[82] J. H. Zhang *et al.*, "Advances in estimation methods of vegetation water content based on optical remote sensing techniques," (in English), *Science China-Technological Sciences,* vol. 53, no. 5, pp. 1159-1167, May 2010.

[83] Y. C. Huang, J. P. Walker, Y. Gao, X. L. Wu, and A. Monerris, "Estimation of Vegetation Water Content From the Radar Vegetation Index at L-Band," (in English), *Ieee Transactions on Geoscience and Remote Sensing,* vol. 54, no. 2, pp. 981-989, Feb 2016.

[84] Y. Kim, T. Jackson, R. Bindlish, H. Lee, and S. Hong, "Radar Vegetation Index for Estimating the Vegetation Water Content of Rice and Soybean," (in English), *Ieee Geoscience and Remote Sensing Letters,* vol. 9, no. 4, pp. 564-568, Jul 2012.

[85] 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 *2015 IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, 2015, pp. 1296-1299: IEEE.

[86] M. H. Cosh, J. Tao, T. J. Jackson, L. McKee, and P. O'Neill, "Vegetation water content mapping in a diverse agricultural landscape: National Airborne Field Experiment 2006," (in English), *Journal of Applied Remote Sensing,* vol. 4, May 19 2010.

[87] C. Szigarski *et al.*, "Analysis of the radar vegetation index and potential improvements," vol. 10, no. 11, p. 1776, 2018.

[88] D. Mandal *et al.*, "Dual polarimetric radar vegetation index for crop growth monitoring using sentinel-1 SAR data," (in English), *Remote Sensing of Environment,* vol. 247, Sep 15 2020.

[89] T. J. Jackson *et al.*, "Soil moisture mapping at regional scales using microwave radiometry: The Southern Great Plains Hydrology Experiment," (in English), *Ieee Transactions on Geoscience and Remote Sensing,* vol. 37, no. 5, pp. 2136-2151, Sep 1999.

[90] Y. H. Kerr *et al.*, "The SMOS Mission: New Tool for Monitoring Key Elements of the Global Water Cycle," (in English), *Proceedings of the Ieee,* vol. 98, no. 5, pp. 666-687, May 2010.

[91] D. Entekhabi *et al.*, "SMAP handbook–soil moisture active passive: Mapping soil moisture and freeze/thaw from space," 2014.

[92] R. D. Koster, W. T. Crow, R. H. Reichle, and S. P. Mahanama, "Estimating Basin-Scale Water Budgets with SMAP Soil Moisture Data," *Water Resour Res,* vol. 54, no. 7, pp. 4228-4244, Jul 2018.

[93] A. Singh, K. Gaurav, G. K. Meena, and S. Kumar, "Estimation of Soil Moisture Applying Modified Dubois Model to Sentinel-1; A Regional Study from Central India," (in English), *Remote Sensing,* vol. 12, no. 14, Jul 2020.

[94] P. Roger, E. Vermote, and J. Ray, "MODIS surface reflectance user's guide," ed: Collection, 2015.

[95] K. J. I. P. c. Bellingham, May-October, "Stevens water monitoring systems," 2012.

[96] H. Kim, M. H. Cosh, R. Bindlish, and V. J. Lakshmi, "Field evaluation of portable soil water content sensors in a sandy loam," vol. 19, no. 1, p. e20033, 2020.

[97] P. K. Rai and K. Mohan, "Remote Sensing data & GIS for flood risk zonation mapping in Varanasi District, India/Utilizarea SIG si teledetectiei pentru cartarea zonelor de risc la inundatii în districtul Varanasi, India," in *Forum Geografic*, 2014, vol. 13, no. 1, p. 25: University of Craiova, Department of Geography.

[98] A. Feldman, R. Akbar, and D. Entekhabi, "A First-Order Radiative Transfer Model for Global Soil Moisture Retrievals Under Vegetation Canopies," in *IGARSS 2018-2018 IEEE International Geoscience and Remote Sensing Symposium*, 2018, pp. 100-103: IEEE.

[99] B. Choudhury, T. J. Schmugge, A. Chang, and R. J. J. o. G. R. O. Newton, "Effect of surface roughness on the microwave emission from soils," *J. Geophys. Res. Oceans,* vol. 84, no. C9, pp. 5699-5706, 1979.

[100] T. Jagdhuber, "An Approach to Extended Fresnel Scattering for Modeling of Depolarizing Soil-Trunk Double-Bounce Scattering," (in English), *Remote Sensing,* vol. 8, no. 10, Oct 2016.

[101] M. C. Dobson, F. T. Ulaby, M. T. Hallikainen, M. A. J. I. T. o. g. El-Rayes, and r. sensing, "Microwave dielectric behavior of wet soil-Part II: Dielectric mixing models," no. 1, pp. 35-46, 1985.

[102] J. R. Wang and T. J. Schmugge, "An Empirical-Model for the Complex Dielectric Permittivity of Soils as a Function of Water-Content," (in English), *Ieee Transactions on Geoscience and Remote Sensing,* vol. 18, no. 4, pp. 288-295, 1980.

[103] V. L. Mironov, L. G. Kosolapova, and S. V. Fomin, "Physically and Mineralogically Based Spectroscopic Dielectric Model for Moist Soils (vol 46, pg 2059, 2009)," (in English), *Ieee Transactions on Geoscience and Remote Sensing,* vol. 47, no. 7, pp. 2085-2085, Jul 2009.

[104] V. Mironov, Y. Kerr, J. P. Wigneron, L. Kosolapova, and F. Demontoux, "Temperature- and Texture-Dependent Dielectric Model for Moist Soils at 1.4 GHz," (in English), *Ieee Geoscience and Remote Sensing Letters,* vol. 10, no. 3, pp. 419-423, May 2013.

[105] L. L. Tao, G. J. Wang, X. Chen, J. Li, and Q. K. Cai, "Estimation of soil moisture using a vegetation scattering model in wheat fields," (in English), *Journal of Applied Remote Sensing,* vol. 13, no. 4, Oct 10 2019.

[106] Y. Gao *et al.*, "Evaluation of the Tau-Omega Model for Passive Microwave Soil Moisture Retrieval Using SMAPEx Datasets," (in English), *Ieee Journal of Selected Topics in Applied Earth Observations and Remote Sensing,* vol. 11, no. 3, pp. 888-895, Mar 2018.

[107] M. Parrens *et al.*, "Global-scale surface roughness effects at L-band as estimated from SMOS observations," (in English), *Remote Sensing of Environment,* vol. 181, pp. 122-136, Aug 2016.

[108] J. M. Gilliot, E. Vaudour, and J. Michelin, "Soil surface roughness measurement: A new fully automatic photogrammetric approach applied to agricultural bare fields," (in English), *Computers and Electronics in Agriculture,* vol. 134, pp. 63-78, Mar 2017.

[109] L. Tonietto, L. Gonzaga, M. R. Veronez, C. D. Kazmierczak, D. C. M. Arnold, and C. A. da Costa, "New Method for Evaluating Surface Roughness Parameters Acquired by Laser Scanning," (in English), *Scientific Reports,* vol. 9, Oct 21 2019.

[110] N. Verma, P. Mishra, and N. Purohit, "Effect of surface roughness parameter on soil moisture of wheat field in growing stage: an application of Sentinel-1 SAR data," in *IGARSS 2019-2019 IEEE International Geoscience and Remote Sensing Symposium*, 2019, pp. 5929-5932: IEEE.

[111] M. W. J. Davidson, T. Le Toan, F. Mattia, G. Satalino, T. Manninen, and M. Borgeaud, "On the characterization of agricultural soil roughness for radar remote sensing studies," (in English), *Ieee Transactions on Geoscience and Remote Sensing,* vol. 38, no. 2, pp. 630-640, Mar 2000.

[112] P. C. Dubois, J. Vanzyl, and T. Engman, "Measuring Soil-Moisture with Imaging Radars," (in English), *Ieee Transactions on Geoscience and Remote Sensing,* vol. 33, no. 4, pp. 915-926, Jul 1995.

[113] K. S. Rao, G. Chandra, and P. V. N. Rao, "The Relationship between Brightness Temperature and Soil-Moisture - Selection of Frequency-Range for Microwave Remote-Sensing," (in English), *International Journal of Remote Sensing,* vol. 8, no. 10, pp. 1531-1545, Oct 1987.

[114] L. M. Camacho and S. Tjuatja, "A numerical model for microwave emission from soil with vegetation cover," in *2012 IEEE International Geoscience and Remote Sensing Symposium*, 2012, pp. 5173-5176: IEEE.

[115] C. Sung and J. J. A. P. L. Holzer, "Scattering of electromagnetic waves from a rough surface," vol. 28, no. 8, pp. 429-431, 1976.

[116] J. P. Ogilvy, "Wave scattering from rough surfaces," vol. 50, no. 12, p. 1553, 1987.

[117] B. Bhushan, "Surface roughness analysis and measurement techniques," in *Modern tribology handbook, two volume set*: CRC press, 2000, pp. 79-150.

[118] S. A. Yadav, R. Prasad, A. K. Vishwakarma, J. Sharma, B. Verma, and P. K. Srivastava, "Optimization of dual-polarized bistatic specular scatterometer for studying microwave scattering response and vegetation growth parameters retrieval of

paddy crop using a machine learning algorithm," (in English), *Computers and Electronics in Agriculture,* vol. 175, Aug 2020.

[119] P. W. Liu *et al.*, "Assessing Disaggregated SMAP Soil Moisture Products in the United States," (in English), *Ieee Journal of Selected Topics in Applied Earth Observations and Remote Sensing,* vol. 14, pp. 2577-2592, 2021.

[120] L. He, Y. Hong, X. L. Wu, N. Ye, J. P. Walker, and X. N. Chen, "Investigation of SMAP Active-Passive Downscaling Algorithms Using Combined Sentinel-1 SAR and SMAP Radiometer Data," (in English), *Ieee Transactions on Geoscience and Remote Sensing,* vol. 56, no. 8, pp. 4906-4918, Aug 2018.

[121] C. Montzka, K. Rotzer, H. R. Bogena, N. Sanchez, and H. Vereecken, "A New Soil Moisture Downscaling Approach for SMAP, SMOS, and ASCAT by Predicting Sub-Grid Variability," (in English), *Remote Sensing,* vol. 10, no. 3, Mar 2018.

[122] F. M. Hu, Z. S. Wei, W. Zhang, D. Dorjee, and L. K. Meng, "A spatial downscaling method for SMAP soil moisture through visible and shortwave-infrared remote sensing data," (in English), *Journal of Hydrology,* vol. 590, Nov 2020.

[123] D. H. Zheng *et al.*, "Assessment of the SMAP Soil Emission Model and Soil Moisture Retrieval Algorithms for a Tibetan Desert Ecosystem," (in English), *Ieee Transactions on Geoscience and Remote Sensing,* vol. 56, no. 7, pp. 3786-3799, Jul 2018.

[124] J. Chaubell, S. Chan, R. Dunbar, J. Peng, S. J. B. Yueh, Colorado USA. NASA National Snow, and I. D. C. D. A. A. Center, "SMAP enhanced L1C radiometer half-orbit 9 km EASE-grid brightness temperatures, Version 1," 2016.

[125] A. Mathew, S. Khandelwal, and N. Kaul, "Investigating spatio-temporal surface urban heat island growth over Jaipur city using geospatial techniques," (in English), *Sustainable Cities and Society,* vol. 40, pp. 484-500, Jul 2018.

[126] B. Fang, V. Lakshmi, R. Bindlish, and T. J. Jackson, "Downscaling of SMAP Soil Moisture Using Land Surface Temperature and Vegetation Data," (in English), *Vadose Zone Journal,* vol. 17, no. 1, Aug 9 2018.

[127] T. J. Zhao *et al.*, "Soil moisture experiment in the Luan River supporting new satellite mission opportunities," (in English), *Remote Sensing of Environment,* vol. 240, Apr 2020.

[128] X. Y. Ge *et al.*, "Combining UAV-based hyperspectral imagery and machine learning algorithms for soil moisture content monitoring," (in English), *Peerj,* vol. 7, May 3 2019.

[129] N. Sanchez *et al.*, "On the Synergy of Airborne GNSS-R and Landsat 8 for Soil Moisture Estimation," (in English), *Remote Sensing,* vol. 7, no. 8, pp. 9954-9974, Aug 2015.

[130] E. G. Njoku and D. Entekhabi, "Passive microwave remote sensing of soil moisture," (in English), *Journal of Hydrology,* vol. 184, no. 1-2, pp. 101-129, Oct 1 1996.

[131] J. Y. Bai, Q. Cui, W. Zhang, and L. K. Meng, "An Approach for Downscaling SMAP Soil Moisture by Combining Sentinel-1 SAR and MODIS Data," (in English), *Remote Sensing,* vol. 11, no. 23, Dec 1 2019.

[132] L. Lu, G. P. Luo, and J. Y. Wang, "Development of an ATI-NDVI method for estimation of soil moisture from MODIS data," (in English), *International Journal of Remote Sensing,* vol. 35, no. 10, pp. 3797-3815, 2014.

[133] J. Peng, A. Loew, S. Q. Zhang, J. Wang, and J. Niesel, "Spatial Downscaling of Satellite Soil Moisture Data Using a Vegetation Temperature Condition Index," (in English), *Ieee Transactions on Geoscience and Remote Sensing,* vol. 54, no. 1, pp. 558-566, Jan 2016.

[134] D. Kim, H. Moon, H. Kim, J. Im, and M. Choi, "Intercomparison of Downscaling Techniques for Satellite Soil Moisture Products," (in English), *Advances in Meteorology,* vol. 2018, 2018.

[135] J. Peng, A. Loew, O. Merlin, and N. E. C. Verhoest, "A review of spatial downscaling of satellite remotely sensed soil moisture," (in English), *Reviews of Geophysics,* vol. 55, no. 2, pp. 341-366, Jun 2017.

[136] A. A. Hossain and G. Easson, "Evaluating the potential of VI-LST triangle model for quantitative estimation of soil moisture using optical imagery," in *IGARSS 2008-2008 IEEE International Geoscience and Remote Sensing Symposium*, 2008, vol. 3, pp. III-879-III-882: IEEE.

[137] Y. Zeng, Z. Feng, and N. Xiang, "Assessment of soil moisture using Landsat ETM+ temperature/vegetation index in semiarid environment," in *IGARSS 2004. 2004 IEEE International Geoscience and Remote Sensing Symposium*, 2004, vol. 6, pp. 4306-4309: Ieee.

[138] G. C. Hulley, S. J. Hook, and C. Hughes, "MODIS MOD21 land surface temperature and emissivity algorithm theoretical basis document," Pasadena, CA: Jet Propulsion Laboratory, National Aeronautics and Space …2012.

[139] K. E. Taylor, "Summarizing multiple aspects of model performance in a single diagram.," (in English), *Journal of Geophysical Research-Atmospheres,* vol. 106, no. D7, pp. 7183-7192, Apr 16 2001.

[140] L. Wang, S. B. Fang, Z. F. Pei, Y. C. Zhu, D. N. Khoi, and W. Han, "Using FengYun-3C VSM Data and Multivariate Models to Estimate Land Surface Soil Moisture," (in English), *Remote Sensing,* vol. 12, no. 6, Mar 2020.

[141] J. Chaubell *et al.*, "Regularized Dual-Channel Algorithm for the Retrieval of Soil Moisture and Vegetation Optical Depth From SMAP Measurements," (in English), *Ieee Journal of Selected Topics in Applied Earth Observations and Remote Sensing,* vol. 15, pp. 102-114, 2022.

[142] S. K. Chan *et al.*, "Assessment of the SMAP Passive Soil Moisture Product," (in English), *Ieee Transactions on Geoscience and Remote Sensing,* vol. 54, no. 8, pp. 4994-5007, Aug 2016.

[143] J. Sharma, R. Prasad, P. K. Srivastava, S. K. Singh, S. A. Yadav, and V. P. Yadav, "Roughness characterization and disaggregation of coarse resolution SMAP soil moisture using single-channel algorithm," (in English), *Journal of Applied Remote Sensing,* vol. 15, no. 1, Mar 4 2021.

[144] J. Sharma, R. Prasad, P. K. Srivastava, S. A. Yadav, and V. P. Yadav, "Improving Spatial Representation of Soil Moisture Through the Incorporation of Single-Channel Algorithm With Different Downscaling Approaches," (in English), *Ieee Transactions on Geoscience and Remote Sensing,* vol. 60, 2022.

[145] S. A. Yadav *et al.*, "Far-field bistatic scattering simulation for rice crop biophysical parameters retrieval using modified radiative transfer model at X- and C-band," (in English), *Remote Sensing of Environment,* vol. 272, Apr 2022.

[146] Y. Kim, J. G. van Zyl, and R. Sensing, "A time-series approach to estimate soil moisture using polarimetric radar data," vol. 47, no. 8, pp. 2519-2527, 2009.

[147] M. Trudel, F. Charbonneau, and R. Leconte, "Using RADARSAT-2 polarimetric and ENVISAT-ASAR dual-polarization data for estimating soil moisture over agricultural fields," (in English), *Canadian Journal of Remote Sensing,* vol. 38, no. 4, pp. 514-527, Aug 2012.

[148] K. Harfenmeister, S. Itzerott, C. Weltzien, and D. J. R. S. Spengler, "Agricultural monitoring using polarimetric decomposition parameters of sentinel-1 data," vol. 13, no. 4, p. 575, 2021.

[149] L. Breiman, J. H. Friedman, R. A. Olshen, and C. J. Stone, *Classification and regression trees*. Routledge, 2017.

[150] B. Verma *et al.*, "Investigation of optimal vegetation indices for retrieval of leaf chlorophyll and leaf area index using enhanced learning algorithms," vol. 192, p. 106581, 2022.

[151] S. A. Yadav, R. Prasad, A. K. Vishwakarma, V. P. Yadav, Remote Sensing, and S. I. Sciences, "Random forest regression for the estimation of leaf area index of okra crop using ground based bistatic scatterometer," 2018.

[152] P. Kumar *et al.*, "Comprehensive evaluation of soil moisture retrieval models under different crop cover types using C-band synthetic aperture radar data," vol. 34, no. 9, pp. 1022-1041, 2019.

[153] H. Q. Yang, K. Z. Huang, I. King, and M. R. Lyu, "Localized support vector regression for time series prediction," (in English), *Neurocomputing,* vol. 72, no. 10-12, pp. 2659-2669, Jun 2009.

[154] S. Sharma, P. Srivastava, X. Fang, and L. J. E. S. w. A. Kalin, "Performance comparison of adoptive neuro fuzzy inference system (ANFIS) with loading simulation program C++ (LSPC) model for streamflow simulation in El Niño Southern Oscillation (ENSO)-affected watershed," vol. 42, no. 4, pp. 2213-2223, 2015.

[155] Jang, man, and cybernetics, "ANFIS: adaptive-network-based fuzzy inference system," vol. 23, no. 3, pp. 665-685, 1993.

[156] A. Konstantaras, M. R. Varley, F. Vallianatos, G. Collins, and P. Holifield, "A neuro-fuzzy approach to the reliable recognition of electric earthquake precursors," (in English), *Natural Hazards and Earth System Sciences,* vol. 4, no. 5-6, pp. 641-646, 2004.

[157] Zadeh, Man, and Cybernetics, "Outline of a new approach to the analysis of complex systems and decision processes," no. 1, pp. 28-44, 1973.

[158] G. Panda, S. Panda, and C. I. Ardil, "Hybrid neuro fuzzy approach for automatic generation control of two–area interconnected power system," vol. 5, no. 1, pp. 80-84, 2009.

[159] A. Dehnavi, I. N. Aghdam, B. Pradhan, and M. H. M. J. C. Varzandeh, "A new hybrid model using step-wise weight assessment ratio analysis (SWARA) technique and adaptive neuro-fuzzy inference system (ANFIS) for regional landslide hazard assessment in Iran," vol. 135, pp. 122-148, 2015.

[160] J. R. Mohanty, B. B. Verma, P. K. Ray, and D. R. K. Parhi, "Application of adaptive neuro-fuzzy inference system in modeling fatigue life under interspersed mixed-mode (I and II) spike overload," (in English), *Expert Systems with Applications,* vol. 38, no. 10, pp. 12302-12311, Sep 15 2011.

[161] B. Rezaie, S. Y. Nikoo, D. Rahmani, and Control, "A novel intelligent fast terminal sliding mode control for a class of nonlinear systems: application to atomic force microscope," vol. 6, no. 3, pp. 1335-1350, 2018.

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LIST OF PUBLICATIONS

Journal publication

1. **Sharma, J**., Prasad, R., Srivastava, P. K., Singh, S. K., Yadav, S. A., & Yadav, V. P. (2021). Roughness characterization and disaggregation of coarse resolution SMAP soil moisture using single-channel algorithm. ***Journal of Applied Remote Sensing***, 15(1), 014514.
2. **Sharma, J**., Prasad, R., Srivastava, P. K., Yadav, S. A., & Yadav, V. P. (2022). Improving Spatial Representation of Soil Moisture Through the Incorporation of Single-Channel Algorithm with Different Downscaling Approaches. ***IEEE Transactions on Geoscience and Remote Sensing***, 60, 5302710.
3. **Sharma, J**., Prasad, R., Srivastava, P. K., Singh, S. K., Yadav, S. A., & Panday, D. K. Microwave soil moisture retrieval with the incorporation of improved vegetation water content. (Under review in ***IEEE Transactions on Geoscience and Remote Sensing***)
4. **Sharma, J**., Prasad, R., Srivastava, P. K, & Yadav, S. A. Spatial Downscaling of Soil Moisture Data Using a newly developed Vegetation Modulated Soil Moisture Index. (Under review in ***Remote sensing***)
5. Yadav, S. A., Prasad, R., Vishwakarma, A. K., **Sharma, J.,** Verma, B., & Srivastava, P. K. **(2020**). Optimization of dual-polarized bistatic specular scatterometer for studying microwave scattering response and vegetation growth parameters retrieval of paddy crop using a machine learning algorithm. ***Computers and Electronics in Agriculture***, 175, 105592
6. Yadav, S. A., Prasad, R., Yadav, V. P., Verma, B., Singh, S. K., **Sharma**, **J**., & Srivastava, P. K. (**2022**). Far-field bistatic scattering simulation for rice crop biophysical parameters retrieval using modified radiative transfer model at X-and C-band. ***Remote Sensing of Environment***, 272, 112959.
7. Verma, B., Prasad, R., Srivastava, P. K., Singh, P., Badola, A., & **Sharma, J. (2022).** Evaluation of Simulated AVIRIS-NG Imagery Using a Spectral Reconstruction Method for the Retrieval of Leaf Chlorophyll Content. ***Remote sensing***), 14, 3560.

Conference publication

1. **Sharma, J**., Prasad, R., Mishra, V. N., Yadav, V. P., & Bala, R. (2018). Land use and land cover classification of multispectral LANDSAT-8 satellite imagery using discrete wavelet transform. ***The International Archives of Photogrammetry, Remote Sensing and Spatial Information Sciences***, 42, 703-706.

Book Chapter

1. S. K. Chaudhary, **J. Sharma,** D. K. Gupta, P. K. Srivastava, R. Prasad, & D. K. Pandey, (**2021**). Artificial neural network for the estimation of soil moisture using earth observation datasets. In Agricultural Water Management (pp. 227-239).
2. P. K. Srivastava, R. Prasad, S. Chaudhary, S. Yadav, **J. Sharma**, S. Suman, V. Pandey, R. Singh, and D. K. Gupta, (2022). Challenges in Radar remote sensing. In Book, Radar Remote Sensing, ISBN: 9780128234570. Elsevier Press, UK.
3. S. A. Yadav, D. K. Gupta, R. Prasad, **J. Sharma** and P. K. Srivastava, (2022). Theory of monostatic and bistatic radar systems. In Book, Radar Remote Sensing, ISBN: 9780128234570. Elsevier Press, UK.

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