

Marcel El Hajj (*h-index* = 25)  
Nationality: French  
Age: 38 years  
Email: marcel.elhajj@kaust.edu.sa  
Tel: +966563056236  
G: <https://scholar.google.fr/citations?user=t8JvUTMAAAAJ&hl=en>

## Research interests

---

My research activities aim to use and promote remote sensing techniques for land surface applications. They consist in developing operational methods to elaborate products relevant to users and complementary to those available/expected in the Copernicus program and in other national and international programs. Linking my research activities to societal issues and adapting them to foster the link with the needs of users is one of my priorities. My research focuses on the use of satellite data (radar, optical, and Lidar) along with in situ measurements. In particular, it involves analyzing the signal as a function, on the one hand, the instrumental parameters and, on the other hand, the medium parameter, using physical or experimental approaches. General field of interest: increase the knowledge on the potential of Earth observation satellites for the characterization and monitoring of natural environments.

## Education

---

- **2013-15** Ph.D in earth and water sciences (AgroParisTech, France)
- **2010-11** Specialized master (Bac+6) in geomatics: SILAT (AgroParisTech, France)
- **2005-10** Survey/Geomatics engineer (Bac+5)

## Professional experiences

---

- **2021-present** Postdoctoral fellow at KAUST (HALO group)-KSA
  - *Develop methods for soil moisture and biomass estimation from GNSS-R signals*
  - *3D characterization of trees from LiDAR UAV-based sensor data*
  - *Explore the potential of SAR images to estimate the water use in olive orchards*
  - *Develop a method for estimating soil moisture from GPS satellites*
  - *Develop a method for crop classification using SAR images*
- **2019-21** Researcher at itk<sup>1</sup> - France
  - *Integration of remote sensing data in decision-making tools for agriculture and environment*
- **2016-19** Research engineer/postdoc at Irstea<sup>2</sup> (UMR TETIS<sup>3</sup>) - France
  - *Development of an operational algorithm for mapping soil moisture from SAR and optical data*
    - *Algorithm currently used to deliver soil moisture maps for regions in Europe, Asia, Africa via the French land data center (Theia/Geosud)*<sup>4</sup>
  - *Mapping forest biomass by coupling SAR, optical and Lidar data*
    - *Method used to deliver above ground biomass maps for Madagascar and Gabon via the French land data center (Theia/Geosud)*<sup>5</sup>
  - *Mapping irrigated plots from SAR and optical data*
  - *Drought mapping using MODIS products*
  - *Crops types mapping from SAR and optical data*
  - *Evaluate the radiometric accuracy of SAR sensors*
  - *Mapping frozen areas using SAR data*

---

<sup>1</sup> <https://www.itk.fr/>

<sup>2</sup> <https://www.irstea.fr/fr> (*As of January 1, 2020, IRSTEA and INRA were merged to become INRAE*)

<sup>3</sup> <https://www.umn-tetis.fr/index.php/fr/>

<sup>4</sup> <https://www.theia-land.fr/en/product/soil-moisture-with-very-high-spatial-resolution/>

<sup>5</sup> <https://www.theia-land.fr/en/product/gabon-biomass-map/>; <https://www.theia-land.fr/en/product/biomass-for-madagascar/>

- *Development of automated pipelines to produce thematic maps from spatial data*
- **2013-15** Ph.D at AgroParisTech university - France
  - *Monitoring and management of irrigated grasslands using optical and SAR data*
  - *Assimilation of remote sensing data into crop model*
- **2011-12** Engineer at Irstea<sup>3</sup> (UMR-TETIS<sup>4</sup>) - France
  - *Analysis/processing of Lidar data to estimate trees height*
  - *Analysis of multi-source (optics and radar) remote sensing data for temporal monitoring of forest ecosystems*

## Skills

---

- **Remote sensing and Geomatics:** Development of an operational methods based on the use of Machine Learning technics to derive biophysical indicators from remote sensing images; atmospheric & geometric correction; image processing; radar polarimetry; synergic use of optical, SAR, and Lidar data; photo-interpretation; professional user of geographic information system and image processing software; spatial analysis; segmentation; classification; ...
- **Programming:** Development of automated pipelines to extract biophysical indicators from remote sensing images (Big Data), advanced programming skills in Python, and R programming languages (good skills in Matlab programming language), ...
- **Modeling:** Modeling remote sensing physical signal (radar, lidar and optical data) as a function of soil and vegetation parameters; assimilation of remote sensing data into crop models, ...
- **Writing:** Strong writing skills in French and English → 37 scientific articles published in international journals with impact factor as well as 6 chapters and methodological guides in books. 3 papers in progress
- **Project management:** Design and conduct of research projects; supervise of trainees and Ph.D students, ...
- **Instrumentation:** Use of various surface characterization devices (LAI2000, TDR moisture probes, profile-meter, hemispherical photos processing with CanEye software to derive LAI, sap flow meters installation), Survey instruments (differential GPS, total station), ...

## Teaching activities (2013 - present)

<i>Title</i>	<i>Level</i>	<i>University</i>
• Basics remote sensing	specialized master (Bac +6)	AgroParisTech (France)
• GIS - Basics	specialized master (Bac +6)	AgroParisTech (France)
• GIS - methods and tools	specialized master (Bac +6)	AgroParisTech (France)
• Calibration of remote sensing images	Master 1	Montpellier (France)
• Vector analysis	Master 1	Montpellier (France)
• Raster analysis	Master 1	Montpellier (France)
• Land use/cover classification	-	INAT - Summer School (Tunisia)

## Doctoral and master Advisement

---

- **Committee member of four thesis in applied remote sensing:**
  - Thesis 1: Insights into the food-water-energy nexus in Saudi Arabia via a combined modeling and observation approach

- Thesis 2: Estimation of soil roughness in agricultural areas from Sentinel-1 data
- Thesis 3: Vegetation characterization using new radar satellite sensors
- Thesis 4: Crop mapping and yield estimation of wheat in the Bekaa plain of Lebanon
- **Supervision of trainees in applied remote sensing:**
  - Synergic use of optical and radar spatial data to map surface soil moisture
  - Detection of trees cuts in forest using MODIS data
  - Mapping soil moisture in grassland areas from RadarSat-2 spatial data

## Software

---

- Professional user of image processing and GIS (Geographical Information System) software
  - Image processing: ERDAS, ENVI, OrfeoToolBox, Sentinel-1/2 Toolbox, MapReady, NEST, SNAP, PlsaPro, eCognition
  - GIS: QGIS, ArcGIS, GRASSGIS, PostgresSQL/PostGIS

## In situ missions

---

- Conduct vegetation and soil sampling for carrying capacity estimation in a natural reserve in Saudi Arabia.
- Measure uptake-rate in olive orchards using sap flow meters in desert areas.
- Planning and performing campaigns of soil in situ measurements (soil moisture and roughness) and vegetation parameters (LAI, water content, water-uptake ...)
- Planning and performing a mission of forest inventory in France: trees height measurements and geolocation of plots

## Languages

---

- Arabic: mother tong
- French: fluent
- English: fluent
- Spanish: beginner

## List of publications/communications

---

### a) Paper published in international journals with impact factor

- 1 **El Hajj, M.M.**; Almashharawi, S.K.; Johansen, K.; McCabe, M.F. Plant Area Index Estimation and 3D representation of trees from LiDAR UAV Images Time-Series over Cherry Orchards. **2024, ready for submission.**
- 2 **El Hajj, M.M.**; Steele-Dunne, S.C.; Almashharawi, S.K.; Johansen, K.; Camargo, O.A.L.; Amezaga-Sarries, A.; Mas-Viñolas, A.; McCabe, M.F. Synergic Use of Ground-Based GNSS-R and Sentinel-2 images for soil moisture and vegetation parameter estimation in irrigated grassland field: An Empirical Approach. **2024. Submitted to IEEE TGRS.**
- 3 **El Hajj, M.M.**; Steele-Dunne, S.C.; Almashharawi, S.K.; Tian, X.; Johansen, K.; Camargo, O.A.L.; Amezaga-Sarries, A.; Mas-Viñolas, A.; McCabe, M.F. Ground-Based Soil Moisture Retrieval Using the Correlation Between Dual-Polarization GNSS-R Interference Patterns. *IEEE Trans. Geosci. Remote Sensing* 2024, 62, 1–10, doi:10.1109/TGRS.2023.3337841.
- 4 **El Hajj, M.M.**; Johansen, K.; Almashharawi, S.K.; McCabe, M.F. Water Uptake Rates over Olive Orchards Using Sentinel-1 Synthetic Aperture Radar Data. *Agricultural Water Management* 2023, 288, 108462, doi:10.1016/j.agwat.2023.108462.

- 5 Elfarkh, J.; Johansen, K.; **El Hajj, M.M.**; Almashharawi, S.K.; McCabe, M.F. Evapotranspiration, Gross Primary Productivity and Water Use Efficiency over a High-Density Olive Orchard Using Ground and Satellite Based Data. *Agricultural Water Management* 2023, 287, 108423, doi:10.1016/j.agwat.2023.108423.
- 6 Tu, Y.-H.; Johansen, K.; Aragon, B.; **El Hajj, M.M.**; McCabe, M.F. The Radiometric Accuracy of the 8-Band Multi-Spectral Surface Reflectance from the Planet SuperDove Constellation. *Int. J. Appl. Earth Obs. Geoinformation* **2022**, 114, 103035. <https://doi.org/10.1016/j.jag.2022.103035>
- 7 **El Hajj, M.M.**; Almashharawi, S.K.; Johansen, K.; Elfarkh, J.; McCabe, M.F. Exploring the Use of Synthetic Aperture Radar Data for Irrigation Management in Super High-Density Olive Orchards. *Int. J. Appl. Earth Obs. Geoinformation* **2022**, 112, 102878. <https://doi.org/10.1016/j.jag.2022.102878>
- 8 Reluy, N.P.; Baghdadi, N.; Simonneau, T.; Bazzi, H.; **El Hajj, M.**; Pret, V.; Amin, G.; Daret, E. Can We Detect the Damage of a Heatwave on Vineyards Using Sentinel-2 Optical Remote Sensing Data? *OENO One* 2021, 56, 145–159. <https://doi.org/10.20870/oeno-one.2022.56.1.4632>
- 9 Hamze, M.; Baghdadi, N.; **El Hajj, M.**; Zribi, M.; Bazzi, H.; Cheviron, B.; Faour, G. Integration of L-Band Derived Soil Roughness into a Bare Soil Moisture Retrieval Approach from C-Band SAR Data. *Remote Sens.* 2021, 13, 2102. <https://doi.org/10.3390/rs13112102>
- 10 Le Page, M., Jarlan, L., **El Hajj, M.**, Zribi, M., Baghdadi, N., and Boone, A. (2020). Potential for the Detection of Irrigation Events on Maize Plots Using Sentinel-1 Soil Moisture Products. *Remote Sens.* 12, 1621. <https://doi.org/10.3390/rs12101621>
- 11 **El Hajj, M.**, Baghdadi, N., Wigneron, J.-P., Zribi, M., Albergel, C., Calvet, J.-C., and Fayad, I. (2019d). First Vegetation Optical Depth Mapping from Sentinel-1 C-band SAR Data over Crop Fields. *Remote Sensing* 11, 2769. <https://doi.org/10.3390/rs11232769>
- 12 Nasrallah, A., Baghdadi, N., **El Hajj, M.**, Darwish, T., Belhoucette, H., Faour, G., Darwich, S., and Mhawej, M. (2019). Sentinel-1 Data for Winter Wheat Phenology Monitoring and Mapping. *Remote Sensing* 11, 2228. <https://doi.org/10.3390/rs11192228>
- 13 **El Hajj, M.**, Baghdadi, N., and Zribi, M. (2019b). Comparative analysis of the accuracy of surface soil moisture estimation from the C-and L-bands. *International Journal of Applied Earth Observation and Geoinformation* 82, 101888. <https://doi.org/10.1016/j.jag.2019.05.021>
- 14 **El Hajj, M.**; Baghdadi, N.; Bazzi, H.; Zribi, M. Penetration Analysis of SAR Signals in the C and L Bands for Wheat, Maize, and Grasslands. *Remote Sens.* 2019, 11, 31. doi: 10.3390/rs11010031
- 15 Bazzi, H., Baghdadi, N., Ienco, D., **El Hajj, M.**, Zribi, M., Belhoucette, H., Escorihuela, M.J., and Demarez, V. (2019). Mapping Irrigated Areas Using Sentinel-1 Time Series in Catalonia, Spain. *Remote Sensing* 11, 1836. <https://doi.org/10.3390/rs11151836>
- 16 **El Hajj, M.**, Baghdadi, N., Labrière, N., Bailly, J.-S., and Villard, L. (2019). Mapping of aboveground biomass in Gabon. *Comptes Rendus Geoscience.* <https://doi.org/10.1016/j.crte.2019.01.001>
- 17 Bazzi, H., Baghdadi, N., **El Hajj, M.**, Zribi, M., Minh, D.H.T., Ndikumana, E., Courault, D., and Belhoucette, H. (2019). Mapping Paddy Rice Using Sentinel-1 SAR Time Series in Camargue, France. *Remote Sensing* 11, 887. doi:10.3390/rs11070887
- 18 Bazzi, H., Baghdadi, N., **El Hajj, M.**, and Zribi, M. (2019). Potential of Sentinel-1 Surface Soil Moisture Product for Detecting Heavy Rainfall in the South of France. *Sensors* 19, 802. doi: 10.3390/s19040802
- 19 Bousbih, S.; Zribi, M.; **El Hajj, M.**; Baghdadi, N.; Lili-Chabaane, Z.; Gao, Q.; Fanise, P. Soil Moisture and Irrigation Mapping in A Semi-Arid Region, Based on the Synergetic Use of Sentinel-1 and Sentinel-2 Data. *Remote Sens.* 2018, 10, 1953. <https://doi.org/10.3390/rs10121953>
- 20 Baghdadi, N.; Bazzi, H.; **El Hajj, M.**; Zribi, M. Detection of Frozen Soil Using Sentinel-1 SAR Data. *Remote Sens.* 2018, 10, 1182. Doi. 10.3390/rs10040569
- 21 **El Hajj, M.**; Baghdadi, N.; Zribi, M.; Rodríguez-Fernández, N.; Wigneron, J. P.; Al-Yaari, A.; Al Bitar, A.; Albergel, C.; Calvet, J.-C. Evaluation of SMOS, SMAP, ASCAT and Sentinel-1 Soil Moisture Products at Sites in Southwestern France. *Remote Sens.* 2018, 10, 569, doi:10.3390/rs9121292.
- 22 Baghdadi N., **El Hajj M.**, Choker M., Zribi M., Bazzi H., Vaudour E., Gilliot J.M., Dav M. Ebengo, 2018. Potential of Sentinel-1 images for estimating the soil roughness over bare agricultural soils. *Water*, 10, 131, pp. 1-14, doi: 10.3390/w10020131.
- 23 **EL Hajj, M.**, Baghdadi, N., Zribi, M., and Bazzi, H., 2017. Synergic Use of Sentinel-1 and Sentinel-2 Images for Operational Soil Moisture Mapping at High Spatial Resolution over Agricultural Areas. *Remote Sens.* 2017, 9, 1292; doi:10.3390/rs9121292
- 24 Bousbih, S., Zribi, M., Lili-Chabaane, Z., Baghdadi, N., **El Hajj, M.**, Gao, Q., & Mougenot, B. **2017**. Potential of Sentinel-1 Radar Data for the Assessment of Soil and Cereal Cover Parameters. *Sensors*, 17(11), 2617. doi: 10.3390/s17112617.
- 25 Baghdadi, N.; **El Hajj, M.**; Zribi, M.; Bousbih, S. Calibration of the Water Cloud Model at C-Band for Winter Crop Fields and Grasslands. *Remote Sens.* 2017, 9, doi:10.3390/rs9090969.

- 26 **El Hajj M.**, Baghdadi N., Fayad I., Vieilledent G., Bailly J.S., Ho Tong Minh D., 2017. Interest of integrating spaceborne LiDAR data to derive accurate biomass estimates in high biomass forested areas. *Remote Sensing*, 9(3), 213, pp. 1-19, doi: 10.3390/rs9030213.
- 27 Choker M., Baghdadi N., Zribi M., **El Hajj M.**, Paloscia S., Verhoest N., Lievens H., Mattia F., 2017. Evaluation of the Oh, Dubois and IEM models using large dataset of SAR signal and experimental soil measurements. *Water*, 9(38), pp. 1-27, doi: 10.3390/w9010038.
- 28 Baghdadi N., Choker M., Zribi M., **El Hajj M.**, Paloscia S., Verhoest N., Lievens H., Baup F., Mattia F., 2016. A new empirical model for radar scattering from bare soil surfaces. *Remote Sensing*, vol. 8, Issue 11, pp. 1-14, doi: 10.3390/rs8110920.
- 29 Fatras C., Borderies P., Baghdadi N., Zribi M., **El Hajj M.**, Frappart F., and Mougin E., 2016. Radar backscattering coefficient over bare soils at Ka-band close to nadir angle. *IEEE Geoscience and Remote Sensing Letters*, vol. 13, Issue 9, pp. 1290-1294, doi: 10.1109/LGRS.2016.2582382
- 30 **El Hajj M.**, Baghdadi N., Cheviron B., Belaud G., Zribi M., 2016. Integration of remote sensing derived parameters in crop models: application to the PILOTE model for hay production. *Agricultural Water Management*, vol. 176, pp. 67-79, <http://dx.doi.org/10.1016/j.agwat.2016.05.017>
- 31 **El Hajj M.**, Baghdadi N., Cheviron B., Zribi M., Angelliaume S., 2016. Analysis of Sentinel-1 radiometric stability and quality for land surface applications. *Remote Sensing*, 8(5), 406, doi:10.3390/rs8050406
- 32 Baghdadi N., **El Hajj M.**, Zribi M., and Fayad I., 2016. Coupling SAR C-band and optical data for soil moisture and leaf area index retrieval over irrigated grasslands. *IEEE JSTARS*, vol. 9, no. 3, pp. 1229-1243. doi: 10.1109/JSTARS.2015.2464698
- 33 **El Hajj M.**, Baghdadi N., Zribi M., Belaud G., Cheviron B., Courault D., and Charron F., 2016. Soil moisture retrieval over irrigated grassland using X-band SAR data. *Remote Sensing of Environment*, vol. 176, pp. 202-218, doi: <http://dx.doi.org/10.1016/j.rse.2016.01.027>.
- 34 Baghdadi N., **El Hajj M.**, Dubois-Fernandez P., Zribi M., Belaud G., and Cheviron B., 2015. Signal level comparison between TerraSAR-X and COSMO-SkyMed SAR sensors. *IEEE Geoscience and Remote Sensing Letters*, vol. 12, no.3, pp. 448-452, doi: 10.1109/LGRS.2014.2342733.
- 35 **El Hajj M.**, Baghdadi N., Belaud G., Zribi M., Cheviron B., Courault D., and Charron F., 2014. Irrigated grassland monitoring using a time series of TerraSAR-X and COSMO-SkyMed X-band SAR data, *Remote Sensing*, vol. 6, pp. 10002-10032, doi: 10.3390/rs61010002.
- 36 Baghdadi N., **El Hajj M.**, Bailly J.S., and Fabre F., 2014. Viability statistics of GLAS/ICESat data acquired over tropical forests, *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing (JSTARS)*, vol. 7, issue 5, pp. 1658-1664, doi: 10.1109/JSTARS.2013.2273563.
- 37 Baghdadi N., Cresson R., **El Hajj M.**, Ludwig R., and La Jeunesse I., 2012. Estimation of soil parameters over bare agriculture areas from C-band polarimetric SAR data using neural networks. *Hydrology and Earth System Sciences (HESS)*, vol. 16, pp. 1607-1621, doi:10.5194/hess-16-1607-2012.

## b) Books: chapters and methodological guides in geomatics and remote sensing

- 1 **El Hajj M.**, Baghdadi N., Zribi M., 2018. Coupling radar and optical data for soil moisture retrieval over agricultural areas. Chapter book: Baghdadi N., Mallet C., and Zribi M. (eds), *QGIS and applications in Agriculture and Forest*, vol. 2, p. 1-46, 2018, ISTE-Wiley Editions, 364 pp.
- 2 **El Hajj M.**, Zribi M., Baghdadi N., Lepage M., 2018. Mapping of Drought. Chapter book: Baghdadi N., Mallet C., and Zribi M. (eds), *QGIS and applications in water and risks*, vol. 4, p. 185-214, 2018, ISTE-Wiley Editions, Wiley, 306 pp.
- 3 Kassouk Z., Lili-Chabaane Z., Deffontaines B., **El Hajj M.**, Baghdadi N., 2018. Contribution of the integrated topo-bathymetric model for coastal wetland evolution: case of geomorphologic and biologic evolution of Ichkeul Marshes (North Tunisia). Chapter book: Baghdadi N., Mallet C., and Zribi M. (eds), *QGIS and applications in water and risks*, vol. 4, p. 35-76, 2018, ISTE-Wiley Editions, 306 pp.
- 4 **El Hajj M.**, Baghdadi N., Zribi M., 2018. Estimation de l'humidité du sol par couplage d'images radar et optique. Chapitre book: Baghdadi N., Mallet C., et Zribi M. (eds), *QGIS et applications en agriculture et forêt*, vol. 2, p. 15-58, 2018, ISTE Editions, 374 pp.
- 5 **El Hajj M.**, Zribi M., Baghdadi N., Lepage M., 2018. Cartographie de la sécheresse. Chapitre book: Baghdadi N., Mallet C., et Zribi M. (eds), *QGIS et applications en eau et risques*, vol. 4, p. 209-240, 2018, ISTE Editions, 320 pp.
- 6 Kassouk Z., Lili-Chabaane Z., Deffontaines B., **El Hajj M.**, Baghdadi N., 2018. Apport des données topo-bathymétriques dans l'étude de l'évolution bio-géomorphologique du littoral: Cas des marais du lac Ichkeul en Tunisie. Chapitre book: Baghdadi N., Mallet C., et Zribi M. (eds), *QGIS et applications en eau et risques*, vol. 4, p. 49-92, 2018, ISTE Editions, 320 pp.

### c) Thematic products published in Theia/Geosud<sup>6</sup>

- Map of above-ground biomass in Madagascar and Gabon<sup>7</sup>
- Surface soil moisture maps at plot scale with revisit time of 6 days for several agriculture areas located in France, Morocco, Germany, Greece, Lebanon, Italy, and Spain<sup>8</sup>.

### d) Communications in IGARSS with publication of abstract:

- 1 **El Hajj M.**, Baghdadi N., Zribi M., Bazzi H., 2018. coupling sentinel-1 and sentinel-2 images for operational Soil moisture mapping. *International Geoscience and Remote Sensing Symposium 2018 (IGARSS 2018)*, 23 - 27 July 2018, Valencia, Spain.
- 2 Baghdadi N., **El Hajj M.**, Choker M., Zribi M., Bazzi H., Vaudour E., Gilliot J. M., Bousbih S., Ebengo Mwampongo D. E. Potential of Sentinel-1 for estimating the soil roughness over agricultural soils. *International Geoscience and Remote Sensing Symposium 2018 (IGARSS 2018)*, 23 - 27 July 2018, Valencia, Spain.
- 3 Baghdadi N., Choker M., Zribi M., **El Hajj M.**, Paloscia S., Verhoest N., Lievens H., Baup F., Mattia F., 2017. New empirical model for radar scattering from bare soils. *International Geoscience and Remote Sensing Symposium 2017 (IGARSS 2017)*, 23 - 28 July 2017, Fort Worth, Texas, USA.
- 4 **El Hajj M.**, Baghdadi N., Fayad I., Vieilledent G., Bailly J.S., Ho Tong Minh D., 2017. Integration of spaceborne lidar data to improve the forest biomass map in Madagascar. *International Geoscience and Remote Sensing Symposium 2017 (IGARSS 2017)*, 23 - 28 July 2017, Fort Worth, Texas, USA.
- 5 **El Hajj M.**, Baghdadi N., Zribi M., Angelliaume S., 2017. Assessment of Sentinel-1 radiometric stability and quality. *International Geoscience and Remote Sensing Symposium 2017 (IGARSS 2017)*, 23 - 28 July 2017, Fort Worth, Texas, USA.
- 6 Baghdadi N., **El Hajj M.**, Zribi M., 2016. Coupling SAR C-band and optical data for soil moisture and leaf area index retrieval over irrigated grasslands. *International Geoscience and Remote Sensing Symposium 2016 (IGARSS 2016)*, 10 - 15 July 2016, Beijing, Chine.
- 7 **El Hajj M.**, Baghdadi N., Cheviron B., Belaud G., Zribi M., 2016. Integration of remote sensing derived parameters in a crop model : case of hay. *International Geoscience and Remote Sensing Symposium 2016 (IGARSS 2016)*, 10 - 15 July 2016, Beijing, Chine.
- 8 **El Hajj M.**, Baghdadi N., Zribi M., Belaud G., Cheviron B., Courault D., and Charron F., 2015. Soil moisture retrieval over irrigated grassland using X-band SAR data combined with optical data acquired at high resolution. *International Geoscience and Remote Sensing Symposium 2015 (IGARSS 2015)*, 26 - 31 July 2015, Milan, Italie.
- 9 **El Hajj M.**, Baghdadi N., Belaud G., Zribi M., Cheviron B., Courault D., and Charron F., 2014. Soil moisture retrieval over Grassland using X-band SAR data. *International Geoscience and Remote Sensing Symposium 2014 (IGARSS 2014)*, 13 - 18 July 2014, Quebec, Canada.

### e) Scientific communications

- 1 **El Hajj, M.M.**; Steele-Dunne, S.C.; Almashharawi, S.K.; Tian, X.; Johansen, K.; Camargo, O.A.L.; Amezaaga-Sarries, A.; Mas-Viñolas, A.; McCabe, M.F. Ground-Based Soil Moisture Retrieval Using the Correlation between Dual-Polarization GNSS-R Interference Patterns. EGU, 14-19 April 2024, Vienna, Austria
- 2 **El Hajj, M.M.**; Johansen, K.; Almashharawi, S.K.; McCabe, M.F. Water Uptake Rates over Olive Orchards Using Sentinel-1 Synthetic Aperture Radar Data. EGU, 23–28 April 2023, Vienna, Austria.
- 3 **El Hajj, M.M.**; Almashharawi, S.K.; Johansen, K.; Elfarkh, J.; McCabe, M.F. Exploring the Use of Synthetic Aperture Radar Data for Irrigation Management in Super High-Density Olive Orchards. ESA Living Planet Symposium, 23–27 May 2022, Bonn, Germany.
- 4 Baghdadi N., **El Hajj, M.**, Zribi M., 2017. Vers une cartographie opérationnelle haute résolution spatiale de l'humidité du sol des surfaces agricoles à partir d'images radar et optique (Sentinel-1/2), *Atelier Télédétection Radar*, 29 mai - 02 juin 2017, Organisé par la Société Française de Photogrammétrie et de Télédétection, ENSG, Champs sur Marne, France.
- 5 Agrawal S., Zribi M., Muddu S., Albitar A., Ferrant S., Baghdadi N., **El Hajj, M.**, 2017. Potential of synergy between Sentinel-1 and TerraSAR-X radar sensors to retrieve physical soil properties. *5th International Symposium on Recent Advances in Quantitative Remote Sensing (RAQRS'V)*, 18-22 September 2017, Torrent, Valencia, Spain.

<sup>6</sup> <https://www.theia-land.fr/en/data-and-services-for-the-land/>, <http://ids.equipex-geosud.fr/>

<sup>7</sup> <https://www.theia-land.fr/en/product/soil-moisture-with-very-high-spatial-resolution/>

<sup>8</sup> <https://www.theia-land.fr/en/product/soil-moisture-with-very-high-spatial-resolution/>

- 6 **El Hajj, M.**, Baghdadi N., Cheviron B., Belaud G., Zribi M., 2016. Use of remote sensing derived parameters in a crop model for biomass prediction of hay crop. *EGU General Assembly 2016*, Geophysical Research Abstracts, 17-22 April, 2016, Vienna-Austria.
- 7 Baghdadi N., **El Hajj, M.**, Fayad I., and Zribi M., 2015. Coupling SAR C-band and optical data for soil moisture and leaf area index retrieval over irrigated grasslands. *10th ASAR workshop*, October 20-22, 2015, Québec, Canada.
- 8 **El Hajj, M.**, Baghdadi N., Zribi M., Belaud G., Cheviron B., Courault D., Hagolle O., and Charron F., Estimation of soil moisture using radar and optical images over Grassland areas. *EGU General Assembly 2015*, Geophysical Research Abstracts, vol. 17, 12 -17 April 2015, Vienna-Austria.

#### f) Activity report

- Durrieu S, Allouis T., **El Hajj M.**, Debise H., 2013. Dynamique d'un signal Lidar en forêt : Approches simplifiées pour estimer le taux de pénétration du signal lidar dans la végétation. compte rendu d'activité projet CNES – DAR n°4800000604 - TS3 et étude lidar, *UMR TETIS-Irstea*