Ashraf Rateb

Professional Summary

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Business address:	The University of Texas at Austin
	Bureau of Economic Geology
	10100 Burnet Rd., Bldg. 130
	Austin, TX 78758
Telephone:	(512) 475-9528
E-mail address:	ashraf.rateb@beg.utexas.edu

Professional Preparation

Academic Background

Ph.D., Geodetic Sciences, Department of Geomatics, National Cheng Kung University, Taiwan, July 2017

M.S., Applied Geophysics, Faculty of Sciences, Al-Azhar University, Cairo, Egypt, July 2011

B.S., Faculty of Sciences, Al-Azhar University, Cairo, Egypt, June 2007

Professional Appointments

Postdoctoral Researcher, Bureau of Economic Geology, The University of Texas at Austin (February 2018-Present)

Researcher, National Authority for Remote Sensing and Space Sciences, Egypt (June-August 2018)

Research Assistant, National Authority for Remote Sensing and Space Sciences, Egypt (July 2017-June 2018)

Research Assistant, Department of Geomatics, National Cheng Kung University (October 2012-July 2017)

Research Assistant, National Authority for Remote Sensing and Space Sciences, Egypt (August 2009-October 2012)

Professional Registrations and Certificates

Critical Thinking and Decision Making: Massachusetts Institute of Technology (MIT xPRO)

Data Science and Big Data Analytics: Making Data-Driven Decisions (MIT xPRO)

Datacamp Data Literacy Fundamentals Track (Four Courses: Data Science, Data Engineering, Machine Learning, and Data Visualization)

HarvardX's Data Science (Mini Master's)

Theses

Studies of crustal deformation and hydrological problems using geodetic observations, Department of Geomatics, National Cheng Kung University, Taiwan, 2017, 111 p.

Areas of Expertise

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Crustal deformation (land subsidence, load deformation)

Hydrology (hydrological extremes, climate and human impacts, groundwater, hydrological models)

Space geodesy--remote sensing (GRACE, GRACE-FO, SMAP, CYGNSS, InSAR, GPS, altimetry)

Statistical learning--machine learning

Awards

Awards and Honorary Societies

Postdoctoral Fellowship, Jackson School of Geosciences, The University of Texas Austin, 2020-2021

Postdoctoral Fellowship, John Wesley Powell Center for Analysis and Synthesis, U.S. Geological Survey and the National Science Foundation, 2019-2020

Doctoral Fellowship, Distinguished International Student Fellowship, National Cheng Kung University, Taiwan, 2012-2017

Presentations

Presentations

Novel Five-Day GRACE/GRACE-FO Satellite Solutions for Improved Flood Detection and Predictability, AGU23: presented to AGU, presented at AGU Annual Meeting, San Francisco, Calif., December 11-15, 2023.

Dependency of GRACE Total Water Storage Flood Detectability on Antecedent Soil Moisture Conditions: presented at AGU Fall Meeting, New Orleans, La., December 9-13, 2021.

Inferencing the GRACE/GRACE-Follow On Data Gap Using Bayesian Modeling: presented at AGU Fall Meeting, New Orleans, La., December 9-13, 2021.

How Severe is Water Stress in the Middle East and North Africa Region?: presented to European Geosciences Union, virtual, April 19-31, 2021.

Combining Physics-Based Modeling and Machine Learning for GRACE Satellite Data Fusion and Reconstruction: presented at American Geophysical Union meeting, December 1-17, 2020.

Global Analysis of Daily and Monthly GRACE Data for Flood Prediction: presented at American Geophysical Union meeting, online, December 1-17, 2020.

Opportunities to Invest in Groundwater-Fed Irrigation Sub-Saharan Africa--A Regional Assessment Under Alternative Energy Solutions: presented at American Geophysical Union meeting, virtual, December 1-17, 2020.

Preliminary Results from GRACE/GRACE-FO 5-Day Mascon Solutions from CSR: presented at American Geophysical Union meeting, virtual, December 1-17, 2020.

Reconstruction of GRACE Total Water Storage Through Automated Machine Learning (AutoML).: presented at American Geophysical Union meeting, virtual, December 1-17, 2020.

Relative Impacts of Climate Extremes and Irrigation Water Use on Water Storage in Major Aquifers Based on GRACE Satellite Data: presented at American Geophysical Union meeting, virtual, December 1-17, 2020.

Assessing Impacts of Climate Extremes and Human Water Use on GRACE Total Water Storage Trends in Major US Aquifers.: presented at GRACE/GRACE-FO Science Team Meeting, virtual, October 26-29, 2020.

Reconstruction of GRACE Total Water Storage Through Automated Machine Learning: presented at GRACE/GRACE-FO Science Team Meeting, October 26-29, 2020.

Assessing Detectability of Global Flood Occurrences using Daily and Monthly GRACE/GRACE-FO: presented at GRACE/GRACE-FO Science Team Meeting 2020, virtual, October 2020.

Insignificant GRACE Total Water Storage Seasonal Cycle in North Africa between 1980 and 2014 Based on an Association of Hydrological Variables and Climate Teleconnections: presented at Geological Society of America meeting, virtual, October 2020.

Assessing the Reliability of GRACE-Derived Groundwater Storage Using Ground-Based Monitoring and Regional and Global Modeling in Major U.S. Aquifers: presented at American Geophysical Union meeting, San Francisco, Calif., December 9-13, 2019.

Multi-Decadal Assessment of Water Storage Changes in the Tigris-Euphrates Basin Using Remote Sensing, Hydrological Models, and Monitoring Data: presented to American Geophysical Union (AGU), presented at AGU conference, San Francisco, Calif., December 9-13, 2019.

How Reliable is GRACE-Derived Groundwater Storage Changes?: presented to GRACE science team, presented at GRACE/GRACE-FO Science Team Meeting 2019, Pasadena, Calif., October 8-10, 2019.

Update on Powell Research Group Study Integrating GRACE Satellite Data, Regional Groundwater Models, and In-Situ Data to Assess Water Storage Changes in Major Aquifers in the US, AGUFM H51M-1477: presented at American Geophysical Union meeting, Washington, D.C., December 10-14, 2018.

Declining Water Storage in the Middle East as Observed by GRACE, Altimetry, Hydrological Models, and In-Situ Data: presented at Geological Society of America meeting, Indianapolis, Ind., November 4-7, 2018.

Spatio-Spectral Resolution of Crustal Deformations in Taiwan: presented at 34th Symposium on Surveying and Geospatial Information, Yilan, Taiwan, June 2015.

Funding

Research Support

Postdoctoral Researcher: Development of a GRACE-enhanced flood monitoring and forecasting tool using a five-day GRACE product and physics-based data analytics, NASA Research Opportunities in Space and Earth Sciences (January 2020-December 2024; $600,000).

Co-PI: Assessing the Causes and Predictability of Extreme High Rainfall and Linkages to Flooding in Texas, Texas Water Development Board (March 2021-February 2022; $100,000).

Postdoctoral Researcher, Principal Investigator: Integrating GRACE satellite and ground-based estimates of groundwater storage changes, U.S. Geological Survey and National Science Foundation (February-December 2020; $165,000).

Publications

Peer Reviewed Journal Articles

Bibi, S., Zhu, T., Rateb, A., Scanlon, B. R., Kamran, M. A., Elnashar, A., Bennour, A., and Li, C., 2024, Benchmarking multimodel terrestrial water storage seasonal cycle against Gravity Recovery and Climate Experiment (GRACE) observations over major global river basins: Hydrology and Earth System Sciences, v. 28, no. 7, p. 1725-1750, http://doi.org/10.5194/hess-28-1725-2024.

Dashtian, H., Young, M. H., Young, B. E., McKinney, T., Rateb, A. M., Niyogi, D., and Kumar, S. V., 2024, A framework to nowcast soil moisture with NASA SMAP level 4 data using in-situ measurements and deep learning: Journal of Hydrology: Regional Studies, v. 56, no. 102020, 16 p., http://doi.org/10.1016/j.ejrh.2024.102020.

Rateb, A., Save, H., Sun, A. Y., and Scanlon, B. R., 2024, Rapid mapping of global flood precursors and impacts using novel five-day GRACE solutions: Scientific Reports, v. 14, no. 13841, 15 p., http://doi.org/10.1038/s41598-024-64491-w.

Sun, A. Y., Save, H., Rateb, A., Jiang, P., and Scanlon, B. R., 2024, Deciphering the role of total water storage anomalies in mediating regional flooding: Geophysical Research Letters, v. 51, no. 16, article no. e2023GL108126, http://doi.org/10.1029/2023GL108126.

Zheng, S., Zhang, Z., Scanlon, B. R., Yan, H., Sun, A. Y., Rateb, A., and Li, Y., 2024, High spatial resolution in total water storage variations inferred from GPS: case study in the Great Lakes Watershed, US: Water Resources Research, v. 60, no. e2023WR035213, 17 p., http://doi.org/10.1029/2023WR035213.

Scanlon, B. R., Fakhreddine, S., Rateb, A., de Graaf, I., Famiglietti, J., Gleeson, T., Grafton, R. Q., Jobbagy, E., Kebede, S., Kolusu, S. R., Konikow, L. F., Long, D., Mekonnen, M., Schmied, H. M., Mukherjee, A., MacDonald, A., Reedy, R. C., Shamsudduha, M., Simmons, C. T., Sun, A., Taylor, R. G., Villholth, K. G., Vörösmarty, C. J., and Zheng, C., 2023, Global water resources and the role of groundwater in a resilient water future: Nature Reviews: Earth & Environment, v. 4, p. 87-101, http://doi.org/10.1038/s43017-022-00378-6.

Rateb, A., Sun, A., Scanlon, B. R., Save, H., and Hasan, E., 2022, Reconstruction of GRACE mass change time series using a Bayesian framework: Earth and Space Science, v. 9, no. e2021EA002162, 13 p., http://doi.org/10.1029/2021EA002162.

Rueda, V., Young, M. H., Faust, K., Rateb, A., and Leibowicz, B. D., 2022, System dynamics modeling in local water management: assessing strategies for the city of Boerne, Texas: Water, v. 14, no. 3682, 19 p., http://doi.org/10.3390/w14223682.

Scanlon, B. R., Rateb, A., Anyamba, A., Kebede, S., MacDonald, A. M., Shamsudduha, M., Small, J., Sun, A., Taylor, R. G., and Xie, H., 2022, Linkages between GRACE water storage, hydrologic extremes, and climate teleconnections in major African aquifers: Environmental Research Letters, v. 17, no. 1, article no. 014046, 15 p., http://doi.org/10.1088/1748-9326/ac3bfc.

Mehrnegar, N., Jones, O., Singer, M. B., Maike Schumacher, Jagdhuber, T., Scanlon, B. R., Rateb, A., and Forootan, E., 2021, Exploring groundwater and soil water storage changes across the CONUS at 12.5 km resolution by a Bayesian integration of GRACE data into W3RA: Science of The Total Environment, v. 758, no. 143579, 16 p., http://doi.org/10.1016/j.scitotenv.2020.143579.

Rateb, A., Scanlon, B. R., and Kuo, C.-Y., 2021, Multi-decadal assessment of water budget and hydrological extremes in the Tigris-Euphrates Basin using satellites, modeling, and in-situ data: Science of The Total Environment, v. 76, no. 144337, 11 p., http://doi.org/10.1016/j.scitotenv.2020.144337.

Scanlon, B. R., Rateb, A., Pool, D. R., Sanford, W., Save, H., Sun, A., Long, D., and Fuchs, B., 2021, Effects of climate and irrigation on GRACE-based estimates of water storage changes in major US aquifers: Environmental Research Letters, v. 16, no. 9, 14 p., http://doi.org/10.1088/1748-9326/ac16ff.

Sun, A. Y., Scanlon, B. R., Save, H., and Rateb, A., 2021, Reconstruction of GRACE total water storage through automated machine learning: Water Resources Research, v. 57, no. 2, article no. e2020WR028666, 20 p., http://doi.org/10.1029/2020WR028666.

Rateb, A., and Abotalib, A. Z., 2020, Inferencing the land subsidence in the Nile Delta using Sentinel-1 satellites and GPS between 2015 and 2019: Science of the Total Environment, v. 729, no. 138868, 11 p., http://doi.org/10.1016/j.scitotenv.2020.138868.

Rateb, A., and Hermas, E., 2020, The 2018 long rainy season in Kenya: hydrological changes and correlated land subsidence: Remote Sensing, v. 12, no. 1390, 16 p., http://doi.org/10.3390/rs12091390.

Rateb, A., Scanlon, B. R., Pool, D. R., Sun, A., Zhang, Z., Chen, J., Clark, B., Faunt, C. C., Haugh, C. J., Hill, M., and nine others, 2020, Comparison of groundwater storage changes from GRACE satellites with monitoring and modeling of major U.S. aquifers: Water Resources

Research, v. 56, no. 12, article no. e2020WR027556, 19 p., http://doi.org/10.1029/2020WR027556.

Rateb, A., and Kuo, C.-Y., 2019, Quantifying vertical deformation in the Tigris-Euphrates basin due to the groundwater abstraction: insights from GRACE and Sentinel-1 satellites: Water, v. 11, no. 8, article no. 1658, 12 p., http://doi.org/10.3390/w11081658.

Scanlon, B. R., Zhang, Z., Rateb, A., Sun, A. Y., Wiese, D., Save, H., Beaudoing, H., Lo, M. H., Muller-Schmied, H., Doll, P., van Beek, R., Swenson, S., Lawrence, D., Croteau, M., and Reedy, R. C., 2019, Tracking seasonal fluctuations in land water storage using global models and GRACE satellites: Geophysical Research Letters, v. 46, p. 5254-5264, http://doi.org/10.1029/2018GL081836.

Imani, M., Chen, Y.-C., You, R.-J., Lan, W.-H., Kuo, C.-Y., Chang, J.-C., and Rateb, A., 2017, Spatiotemporal prediction of satellite altimetry sea level anomalies in the tropical Pacific Ocean: Institute for Electrical and Electronics Engineers Geoscience and Remote Sensing Letters, v. 14, no. 7, p. 1126-1130, http://doi.org/10.1109/LGRS.2017.2699668.

Rateb, A., Ching, K.-E., Kuo, C.-Y., Rau, R.-J., and Chen, C.-L., 2017, Kinematics of the tectonic blocks and active faults at the post-orogenic stage: northern Taiwan: Journal of Asian Earth Sciences, v. 149, p. 29-40, http://doi.org/10.1016/j.jseaes.2017.07.055.

Rateb, A., Kuo, C.-Y., Imani, M., Tseng, K.-H., Lan, W.-H., Ching, K.-E., and Tseng, T.-P., 2017, Terrestrial water storage in African hydrological regimes derived from GRACE mission data: intercomparison of spherical harmonics, mass concentration, and scalar Slepian methods: Sensors, v. 17, no. 3, article no. 566, 15 p., http://doi.org/10.3390/s17030566.

Chang, C.-H., Kuo, C.-Y., Shum, C. K., Yi, Y., and Rateb, A., 2016, Global surface and subsurface geostrophic currents from multi-mission satellite altimetry and hydrographic data, 1996-2011: Journal of Marine Science and Technology (National Taiwan Ocean University), v. 24, no. 6, p. 1181-1193, http://doi.org/10.6119/JMST-016-1026-7.

Peer Reviewed Book Chapters

Rateb, A., Scanlon, B. R., and Fakhreddine, S., 2022, How severe is water stress in the MENA region? insights from GRACE and GRACE-FO satellites and global hydrological modeling, in Al Saud, M. M., ed., Applications of space techniques on the natural hazards in the MENA region (ch. 4): Cham, Switzerland, Springer Nature Switzerland, p. 51-65, http://doi.org/10.1007/978-3-030-88874-9_4.

Contract Reports

Rateb, A., Fernando, N., and Scanlon, B. R., 2023, Characteristics of Atmospheric Rivers over Texas and their Contributions to Extreme Precipitation: Texas Water Development Board, Contract prepared for Texas Water Development Board, under contract no. 2101792540, 46 p.

Published Abstracts

Scanlon, B. R., Rateb, A., and Sun, A. Y., 2022, Using GRACE Satellites to Estimate Impacts of Climate and Irrigation on Water Storage Changes in Major U.S. Aquifers (abs.): EGU May 27, 2022, http://doi.org/10.5194/egusphere-egu22-8939.

Scanlon, B. R., Rateb, A., Reedy, R. C., and Malito, J., 2022, Assessing the Impacts of Agrohydrology on Water Resources in the High Plains Aquifer (abs.): AGU Fall Meeting Abstract H15Q-0992, Invited.

Rateb, A., Scanlon, B. R., Müller Schmied, H., and Hasan, E., 2021, How severe is water stress in the Middle East and North Africa region? (abs.): European Geophysical Union General Assembly 2021, 2 p., http://doi.org/10.5194/egusphere-egu21-13724.

Scanlon, B. R., Rateb, A., and Xie, H., 2021, Assessing water availability for development in Africa using GRACE satellites (abs.): European Geosciences Union General Assembly 2021, 1

p., http://doi.org/10.5194/egusphere-egu21-16344.

Scanlon, B. R., Rateb, A., Pool, D. R., and Sun, A. Y., 2020, Relative impacts of climate extremes and irrigation water use on water storage in major aquifers based on GRACE satellite data (abs.): AGU Fall Meeting 2020, no. h079-08.