

Hamada S. Badr

Department of Earth and Planetary Sciences (EPS), Johns Hopkins University (JHU)
3400 N. Charles Street, Baltimore, MD 21218, USA
• Phone: 410-404-6354 • Email: badr@jhu.edu • Website: pages.jh.edu/~hbadr1

Research Interests

- Data Science and Machine Learning
- High Performance Computing (HPC)
- Computational Fluid Dynamics (CFD)
- Numerical Weather Modeling and Prediction
- Remote Sensing and Data Assimilation
- Climate Dynamics, Modeling, and Regionalization
- Hydrology and Seasonal Forecasting
- Applications to environmental related problems

Academic Background

2016 Ph.D. Earth & Planetary Sciences

Department of Earth and Planetary Sciences (EPS), Johns Hopkins University (JHU),
Baltimore, Maryland, USA

Advisor(s): Benjamin F. Zaitchik

Thesis: Applications of Climate Regionalization: Statistical Prediction and Patterns of
Precipitation Variability in Observations and Global Climate Models

2013 M.A. Earth & Planetary Sciences

Department of Earth and Planetary Sciences (EPS), Johns Hopkins University (JHU),
Baltimore, Maryland, USA

Advisor(s): Benjamin F. Zaitchik

2011 M.Sc. Aerospace Engineering

Department of Aerospace Engineering (AE), Cairo University (CU)
Giza, Egypt

Advisor(s): Atef O. Sherif, Basman M. N. Elhadidi, & Hamdy A. Kandil

Thesis: Ensemble Forecasting & Data Assimilation

2003 B.Sc. Aerospace Engineering

Department of Aerospace Engineering (AE), Cairo University (CU)
Giza, Egypt

Advisor(s): Atef O. Sherif

Graduation Project: Terrain Aerodynamics

Honors & Awards

2016 Assistant Research Scientist

Department of Earth and Planetary Sciences (EPS), Johns Hopkins University (JHU),
Baltimore, Maryland, USA

2016 Postdoctoral Fellowship

Department of Earth and Planetary Sciences (EPS), Johns Hopkins University (JHU),
Baltimore, Maryland, USA

2013 Honorable Mention Award

American Meteorological Society (AMS)
Boston, Massachusetts, USA

2012 Research Assistantship

Department of Earth and Planetary Sciences (EPS), Johns Hopkins University (JHU),
Baltimore, Maryland, USA

2011 Morton K. Blaustein Fellowship

Department of Earth and Planetary Sciences (EPS), Johns Hopkins University (JHU),
Baltimore, Maryland, USA

2011 Research Assistantship

National Authority for Remote Sensing and Space Sciences (NARSS)
Cairo, Egypt

Research Experience

2017 – 2020 Environmental Determinants of Enteric Infectious Disease

Department of Earth and Planetary Sciences (EPS), Johns Hopkins University (JHU),
Baltimore, Maryland, USA

Determinants of Enteric Infectious Disease: a GEO Platform for Analysis and Risk Assessment is a 3-year project to develop an environmentally informed risk monitoring and early warning application that will inform decision makers for appropriate interventions and investments needed to reduce enteric infectious (EID) diseases.

2017 – 2017 Advanced Seminar in Remote Sensing

Department of Earth and Planetary Sciences (EPS), Johns Hopkins University (JHU),
Baltimore, Maryland, USA

The fall 2017 iteration of Advanced Seminar in Remote Sensing focused on the application, interpretation, and visualization of Land Data Assimilation Systems (LDAS). Through lectures, exercises, and a semester project, students learnt the theory behind LDAS, run LDAS simulations using the NASA Land Information System (LIS), and built web apps for LDAS output using the open-source Tethys scientific visualization platform.

2015 – 2016 The NASA Land Information System (LIS)

Department of Earth and Planetary Sciences (EPS), Johns Hopkins University (JHU),
Baltimore, Maryland, USA

Contributions to the development and training workshops of the NASA Land Information System (LIS). For example, a workshop for Egyptian applications was held at the National Authority for Remote Sensing and Space Sciences (NARSS) in Cairo, Egypt, in August 2017.

2015 – 2016 Porting NU-WRF to HHPC & MARCC

Department of Earth and Planetary Sciences (EPS), Johns Hopkins University (JHU),
Baltimore, Maryland, USA
Porting NASA-Unified Weather Research and Forecasting (NU-WRF) Model to JHU
Homewood High Performance Compute Cluster (HHPC) and Maryland Advanced Research
Computing Center (MARCC).

2015 – 2016 Climate Regionalization of Africa

Department of Earth and Planetary Sciences (EPS), Johns Hopkins University (JHU),
Baltimore, Maryland, USA
Regionalizing Africa based on interannual variability of precipitation: spatial patterns of
precipitation variability in observations and global climate models (GCMs) at different times
from geological periods to historical simulations and future climate projections.

2013 – 2015 Objective Climate Regionalization

Department of Earth and Planetary Sciences (EPS), Johns Hopkins University (JHU),
Baltimore, Maryland, USA
Development of an open-source R package for **H**ierarchical **C**limate **R**egionalization
(HiClimR) to facilitate the application of rigorous regionalization for climate studies.
HiClimR is applicable to any correlation-based clustering.

2011 – 2013 Seasonal Precipitation Predictions

Department of Earth and Planetary Sciences (EPS), Johns Hopkins University (JHU),
Baltimore, Maryland, USA
Application of different statistical models to understand and predict seasonal rainfall
anomalies as a function of large-scale indices of surface air temperature anomalies (SATA),
sea surface temperature (SST), surface pressure, and other variables.

2010 – 2011 Prediction of Dust/Sand Storms

National Authority for Remote Sensing and Space Sciences (NARSS)
Cairo, Egypt
Development of a framework for dust/sand storms prediction using numerical weather
prediction and remote sensing technology.

2010 – 2010 Porting WRF to EUMEDGRID

Africa 4 2010 - Joint EUMEDGRID-Support / EPIKH School for Application Porting
Cairo, Egypt
Porting the Weather Research and Forecasting (WRF) model to EUMEDGRID.

2010 – 2010 High Performance Computing (HPC)

IBM-Egypt and National Authority for Remote Sensing and Space Sciences (NARSS)
Cairo, Egypt
IBM AIX 5L system administration and running Code_Saturne Computational Fluid
Dynamics (CFD) Solver on NARSS Blue-Gene/L.

2008 – 2010 Ensemble Forecasting

National Authority for Remote Sensing and Space Sciences (NARSS)
Cairo, Egypt
Development of a preliminary ensemble forecasting system for Egypt, which can be
developed for operational use.

2008 – 2008 Estimation of Evaporative Rates

National Authority for Remote Sensing and Space Sciences (NARSS)

Cairo, Egypt

Evaluation of Lake Nasser water loss by evaporation using numerical weather prediction and remote sensing technology.

2006 – 2008 Data Assimilation

National Authority for Remote Sensing and Space Sciences (NARSS)

Cairo, Egypt

Implementation of the conventional and remotely-sensed observational data into the numerical weather modeling system for Egypt using Four-Dimensional Data Assimilation.

2005 – 2006 ATOVS Data Processing and Visualization

National Authority for Remote Sensing and Space Sciences (NARSS)

Cairo, Egypt

Development of an automatic framework for the processing and visualization of NOAA/ATOVS satellite data.

2001 – 2003 Terrain Aerodynamics

Department of Aerospace Engineering (AE), Cairo University (CU)

Giza, Egypt

Generation of a surface grid for Cairo area from Raster maps, measuring flow over prototypes in a wind tunnel, and comparing the numerical and experimental results.

Computer Skills

Some of my computer skills are listed at: pages.jh.edu/~hbadr1/#Skills.

Publications & Preprints

Satti, S., B. F. Zaitchik, **H. S. Badr**, and S. Tadesse, **2017**: Understanding and Enhancing Dynamical Seasonal Predictions through Objective Regionalization. *Journal of Applied Meteorology and Climatology (JAMC)*, **56**, 1432–1442.

DOI: 10.1175/JAMC-D-16-0192.1

Dezfuli, A. K., B. F. Zaitchik, **H. S. Badr**, E. Jason, and C. D. Peters-Lidard, **2017**: The role of low-level terrain-induced jets in rainfall variability in Tigris-Euphrates Headwaters. *Journal of Hydrometeorology (JHM)*. *Journal of Hydrometeorology (JHM)*, **18**, 819–835.

DOI: 10.1175/JHM-D-16-0165.1

Badr, H. S., B. F. Zaitchik, A. K. Dezfuli, and C. D. Peters-Lidard, **2016**: Regionalizing Africa: Patterns of Precipitation Variability in Observations and Global Climate Models. *Journal of Climate (JCLI)*, **29**, 9027–9043.

DOI: 10.1175/JCLI-D-16-0182.1

Regonda, S. K., B. F. Zaitchik, **H. S. Badr**, and M. Rodell, **2016**: Using Climate Regionalization to Understand Climate Forecast System Version 2 (CFSv2) Precipitation Performance for the Conterminous United States (CONUS). *Geophysical Research Letters (GRL)*, **43**, 6485–6492.

DOI: 10.1002/2016GL069150

F. Berhane, B. F. Zaitchik, and **H. S. Badr**, 2015: The Madden-Julian Oscillation's influence on Spring Rainy Season Precipitation over Equatorial West Africa, *Journal of Climate (JCLI)*, **28**, 8653–8672.

DOI: 10.1175/JCLI-D-14-00510.1

Badr, H. S., B. F. Zaitchik, and A. K. Dezfuli, 2015: A Tool for Hierarchical Climate Regionalization. *Earth Science Informatics (ESIN)*, **8**, 949–958.

DOI: 10.1007/s12145-015-0221-7

Badr, H. S., B. F. Zaitchik, and A. K. Dezfuli, 2014: Hierarchical Climate Regionalization. *CRAN*, <http://cran.r-project.org/package=HiClimR>.

URL: <https://github.com/hsbadr/HiClimR>

Badr, H. S., B. F. Zaitchik, and S. D. Guikema, 2014: Application of Statistical Models to the Prediction of Seasonal Rainfall Anomalies over the Sahel. *Journal of Applied Meteorology and Climatology (JAMC)*, **53**, 614–636.

DOI: 10.1175/JAMC-D-13-0181.1

Nasr, A. H., B. M. El Leithy, and **H. S. Badr**, 2012: Estimation of Radiometric Calibration Coefficients of Egyptsat-1 Sensor. The XXII Congress of the International Society for Photogrammetry and Remote Sensing, Melbourne, Australia, **XXXIX-B1**, 139-143.

DOI: 10.5194/isprsarchives-XXXIX-B1-139-2012

Badr, H. S., H. A. Kandil, B. M. N. Elhadidi, and A. O. Sherif, 2011: Evaluating the Physics Options of Regional Weather Models for Areas with Complex Land-Use Characteristics. *Proceedings of IEEE 2011 International Geoscience and Remote Sensing Symposium (IGARSS)*, Vancouver, Canada, 3257-3260.

DOI: 10.1109/IGARSS.2011.6049914

Badr, H. S., 2011: Ensemble Forecasting and Data Assimilation in Numerical Weather Modeling for Egypt. *M.Sc. Thesis, Department of Aerospace Engineering (AE), Cairo University (CU)*, Giza, Egypt.

Badr, H. S., B. M. N. Elhadidi, and A. O. Sherif, 2010: Evaluation of Data Assimilation on Numerical Weather Prediction for Egypt. *Proceedings of IEEE 2010 International Geoscience and Remote Sensing Symposium (IGARSS)*, Honolulu, Hawaii, USA, 3526-3529.

DOI: 10.1109/IGARSS.2010.5652441

Presentations & Invited Talks

Badr, H. S., and B. F. Zaitchik, 2018: On the Coherence of Sahel Region under Different Emissions Scenarios. *31st Conference on Climate Variability and Change, 98th American Meteorological Society (AMS) Annual Meeting*, Austin, Texas, USA.

Badr, H. S., B. F. Zaitchik, K. R. Arsenault, and S. V. Kumar, 2017: Evaluation of Spatio-Temporal Variability in Land Surface Models using Objective Regionalization. *31st Conference on Hydrology, 97th American Meteorological Society (AMS) Annual Meeting*, Seattle, WA, USA.

Badr, H. S., 2016: NASA-Unified Weather Research and Forecasting (NU-WRF) Model. *Training Workshop, Department of Earth and Planetary Sciences (EPS), Johns Hopkins University (JHU)*, Baltimore, Maryland, USA.

Badr, H. S., 2016: Applications of Climate Regionalization: Statistical Prediction and Patterns of Precipitation Variability in Observations and Global Climate Models. *Thesis Presentation, Department of Earth and Planetary Sciences (EPS), Johns Hopkins University (JHU), Baltimore, Maryland, USA.*

Badr, H. S., N. M. Deluca, N. E. Levin, and B. F. Zaitchik, **2015:** On The Regionalization of African Precipitation for Paleoclimate Studies. *Geological Society of America (GSA) Annual Meeting 2015, Baltimore, Maryland, USA.*

Badr, H. S., B. F. Zaitchik, and A. K. Dezfuli, **2014:** Climate Regionalization through Hierarchical Clustering: Options and Recommendations for Africa. *American Geophysical Union (AGU) Fall Meeting 2014, San Francisco, California, USA.*

A.K. Dezfuli, B.F. Zaitchik, **Badr, H. S.,** K. Bergaoui, R. Zaaboul, and P. Bhattacharjee, **2014:** Dynamical downscaling with WRF for the Middle-East and North Africa. *American Geophysical Union (AGU) Fall Meeting 2014, San Francisco, California, USA.*

Badr, H. S., B. F. Zaitchik, and A. K. Dezfuli, **2014:** Statistical and Dynamical Prediction of Seasonal Rainfall over Tropical Africa. *Graduate Board Oral (GBO) Exam, Department of Earth and Planetary Sciences (EPS), Johns Hopkins University (JHU), Baltimore, Maryland, USA.*

Badr, H. S., B. F. Zaitchik, and A. K. Dezfuli, **2014:** Statistical and Dynamical Prediction of Seasonal Rainfall over Tropical Africa. *Regional Climate Modeling (RCM) Group Meeting, Department of Earth and Planetary Sciences (EPS), Johns Hopkins University (JHU), Baltimore, Maryland, USA.*

Badr, H. S., B. F. Zaitchik, and A. K. Dezfuli, **2013:** Regionalization of Africa based on Interannual Variability of Precipitation: An Improved Approach and A New Software Package. *American Geophysical Union (AGU) Fall Meeting 2013, San Francisco, California, USA.*

Badr, H. S., B. F. Zaitchik, and A. K. Dezfuli, **2013:** Regionalization of Africa based on Interannual Variability of Precipitation: An Improved Approach and A New Software Package. *Journal Club, Department of Earth and Planetary Sciences (EPS), Johns Hopkins University (JHU), Baltimore, Maryland, USA.*

Badr, H. S., B. F. Zaitchik, and S. D. Guikema, **2013:** Statistical Predictive Models for Seasonal Rainfall Anomalies over Sahel. *Journal Club, Department of Earth and Planetary Sciences (EPS), Johns Hopkins University (JHU), Baltimore, Maryland, USA.*

Badr, H. S., B. F. Zaitchik, and S. D. Guikema, **2013:** Spatiotemporal Variability of Precipitation over Africa. *25th Conference on Climate Variability and Change, 93rd American Meteorological Society (AMS) Annual Meeting, Austin, Texas, USA.*

Badr, H. S., B. F. Zaitchik, and S. D. Guikema, **2012:** Statistical Predictive Models for Seasonal Rainfall Anomalies over Sahel. *11th Conference on Artificial and Computational Intelligence and its Applications to the Environmental Sciences, 93rd American Meteorological Society (AMS) Annual Meeting, Austin, Texas, USA.*

Badr, H. S., B. F. Zaitchik, and S. D. Guikema, **2012:** Statistical Predictive Models for Seasonal Rainfall Anomalies over Sahel. *Climate Dynamics of Tropical Africa: Present*

Understanding and Future Directions, Department of Earth and Planetary Sciences (EPS), Johns Hopkins University (JHU), Baltimore, Maryland, USA.

Nasr, A. H. , B. M. El Leithy, and **H. S. Badr, 2012:** Estimation of Radiometric Calibration Coefficients of Egyptsat-1 Sensor. The XXII Congress of the International Society for Photogrammetry and Remote Sensing, Melbourne, Australia.

Badr, H. S., 2012: PCA-based Regionalization of Precipitation over Africa. *Journal Club, Department of Earth and Planetary Sciences (EPS), Johns Hopkins University (JHU), Baltimore, Maryland, USA.*

Badr, H. S., 2011: Soil Moisture Response and Memory. *African Climate Group Meeting, Department of Earth and Planetary Sciences (EPS), Johns Hopkins University (JHU), Baltimore, Maryland, USA.*

Badr, H. S., 2011: The Atlantic multidecadal oscillation and its relation to rainfall and river flows in the continental US. 270.644: *Physics of Climate Variability, Department of Earth and Planetary Sciences (EPS), Johns Hopkins University (JHU), Baltimore, Maryland, USA.*

Badr, H. S., H. A. Kandil, B. M. N. Elhadidi, and A. O. Sherif, 2011: Evaluating the Physics Options of Regional Weather Models for Areas with Complex Land-Use Characteristics. *IEEE 2011 International Geoscience and Remote Sensing Symposium (IGARSS), Vancouver, Canada.*

Badr, H. S., B. M. N. Elhadidi, and A. O. Sherif, 2010: Evaluation of Data Assimilation on Numerical Weather Prediction for Egypt. *IEEE 2010 International Geoscience and Remote Sensing Symposium (IGARSS), Honolulu, Hawaii, USA.*

Badr, H. S., B. M. N. Elhadidi, and A. O. Sherif, 2007: FDDA Enhancement of the Meso-scale Meteorological Modeling System for Egypt. *Cairo 10th International Conference on Energy and Environment (EE10), Luxor, Egypt.*

Professional Memberships & Services

- Session Chair, Geological Society of America (GSA) Annual Meeting 2015
- Peer-review, Journal of Climate (JCLI)
- Peer-review, Theoretical and Applied Climatology (TAAC)
- Member, American Meteorological Society (AMS)
- Member, American Geophysical Union (AGU)

References

Benjamin F. Zaitchik

Department of Earth and Planetary Sciences (EPS)
Johns Hopkins University (JHU)
3400 N. Charles Street, Baltimore, MD 21218, USA
Office: 222 Olin Hall
Phone: 410-516-4223
Email: zaitchik@jhu.edu

Anand Gnanadesikan

Department of Earth and Planetary Sciences (EPS)
Johns Hopkins University (JHU)
3400 N. Charles Street, Baltimore, MD 21218, USA
Office: 327 Olin Hall
Phone: 410-516-0722
Email: gnanades@jhu.edu

Darryn Waugh

Department of Earth and Planetary Sciences (EPS)
Johns Hopkins University (JHU)
3400 N. Charles Street, Baltimore, MD 21218, USA
Office: 327 Olin Hall
Phone: 410-516-0722
Email: waugh@jhu.edu

Thomas W. N. Haine

Department of Earth and Planetary Sciences (EPS)
Johns Hopkins University (JHU)
3400 N. Charles Street, Baltimore, MD 21218, USA
Office: 329 Olin Hall
Phone: 410-516-7048
Email: Thomas.Haine@jhu.edu