Maryam Abdi-Oskouei

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Education

- **Ph.D. Civil & Environmental Engineering**, *University of Iowa* **2018**
  Dissertation: Improving air quality prediction through characterizing the model errors using data from comprehensive field experiments
- **M.Sc. Mining Engineering**, *Missouri University of Science & Technology* **2013**
  Thesis: Methods for evaluating the effect of operators' performance on dragline energy efficiency

Experience

NASA Global Modeling and Assimilation Office (GMAO) **Boulder, CO (remote)**
GESTAR II Research Scientist, Morgan State University *2025 – Present*

- Developing a JEDI-based data assimilation and forecasting capability for NASA's GEOS-CF system, using the Swell workflow.
- Contributing to the transition of NASA's weather and aerosol forecasting and reanalysis systems (GEOS, MERRA) to a JEDI-based architecture, including developing JEDI 3D-EnVar assimilation of aerosol optical depth to replace the legacy PSAS system.
- Contributing to the integration of the GOCART2G aerosol scheme into the MPAS global model in collaboration with NSF-NCAR MMM scientists, extending NASA's aerosol modeling capability to a new dynamical core.
- Integrating diverse weather and air quality observations (satellite, airborne, and ground-based) into the JEDI-based forecasting system, including TEMPO and TROPESS trace gas retrievals.
- Evaluating emerging methods to accelerate forecasting systems in both computational cost and accuracy, including AI-based weather models (NeuralGCM, GenCast, AIFS) and an auto-differentiable dynamical core for prototyping 4D assimilation methods.
- Serving as technical lead and mentor across communities: developing shared workflow infrastructure and authoring tutorials and documentation.

Joint Center for Satellite Data Assimilation (JCSDA), UCAR **Boulder, CO**
Computational Research Scientist *2022 – 2025*

- Developed the first JEDI-based assimilation system for TEMPO NO_2 observations, with GEOS-CF.
- Extended the JEDI framework to atmospheric composition assimilation, testing the transferability of weather DA approaches (4DVar, H-TLM, 4DEnVar) to air quality prediction.
- Built and maintained end-to-end data assimilation workflows (observation ingest, variational and ensemble analyses, and forecast scorecards) for operational atmospheric prediction.
- Core developer of JEDI's observation components (IODA and UFO), including observation operators and data converters for satellite atmospheric composition retrievals.
- Authored technical documentation and training materials supporting community adoption of the JEDI framework.

JCSDA and Mesoscale and Microscale Meteorology (MMM) Laboratory, UCAR **Boulder, CO**
Software Engineer *2019 – 2022*

- Developed and maintained cloud-based CI/CD pipelines for automated testing and deployment of operational data assimilation components using AWS.
- Containerized complex scientific workflows using Docker, Singularity, and Spack to support reproducible and portable builds across HPC and cloud environments.
- Co-authored and taught remote and in-person technical workshops and tutorials for international audiences, helping accelerate community onboarding for the JEDI system.

Center for Global and Regional Environmental Research (CGRER), University of Iowa **Iowa City, IA**
Graduate Research Assistant *2013 – 2019*

- Developed mesoscale weather and air quality prediction workflows for flight path planning and briefed the flight team daily during field campaigns.
- Optimized WRF-Chem performance in predicting weather and air quality using measurements from multiple field campaigns.
- Developed an inverse modeling framework to constrain ethane emissions from the oil & gas sector using WRF-Chem.

NSF National Center for Atmospheric Research (NSF-NCAR) **Boulder, CO**
Visiting Graduate Assistant *2017 & 2018*

- Evaluated the sensitivity of the boundary layer and ethane concentrations in WRF-Chem to physical parameterizations.
- Performed comprehensive model validation using FRAPPÉ and DISCOVER-AQ field campaign measurements.

Geophysical Fluid Dynamics Laboratory (GFDL), NOAA **Princeton, NJ**
CICS Summer Intern *2016*

- Evaluated the representation of methane in the GFDL climate chemistry model.

Missouri University of Science & Technology **Rolla, MO**
Graduate Research Assistant *2011 – 2013*

- Developed a data-driven method for evaluating the effect of operators' skills on energy efficiency of mining equipment.

Selected Peer-Reviewed Publications

- **Abdi-Oskouei M.**; Barré J.; Wei S.-W.; et al.; "Capability demonstration of a JEDI-based system for TEMPO assimilation: System description and evaluation". Journal of Advances in Modeling Earth Systems 18 (2026): e2025MS005482. doi: 10.1029/2025MS005482
- Dang C.; Ha S.; Lu C.-H.; Liu Q.; Stegmann P.; Ma Y.; Wei S.-W.; Reid J. S.; Shi Y.; Sayer A. M.; Xian P.; Lee J.; Barré J.; **Abdi-Oskouei M.**; Johnson B. T.; "Aerosol optical properties in the Community Radiative Transfer Model for data assimilation". Journal of Geophysical Research: Atmospheres 131.20 (2026): e2026JD047177. doi: 10.1029/2026JD047177
- Wei S.-W.; Barré J.; Ha S.; **Abdi-Oskouei M.**; Ménétrier B.; Dang C.; Lu C.-H.; "Leveraging JEDI for atmospheric composition: A unified framework for evaluating observations and model forecasts". Geoscientific Model Development 19 (2026): 8367–8384. doi: 10.5194/gmd-19-8367-2026
- **Abdi-Oskouei M.**; Roozitalab B.; Stanier C. O.; Christiansen M.; Pfister G.; Pierce R. B.; McDonald B. C.; Adelman Z.; Janssen M.; Dickens A. F.; Carmichael G. R.; "The impact of volatile chemical products, other VOCs, and NO_x on peak ozone in the Lake Michigan region". Journal of Geophysical Research: Atmospheres 127.22 (2022): e2022JD037042. doi: 10.1029/2022JD037042
- Roozitalab B.; Carmichael G. R.; Guttikunda S. K.; **Abdi-Oskouei M.**; "Elucidating the impacts of COVID-19 lockdown on air quality and ozone chemical characteristics in India". Environmental Science: Atmospheres 2.5 (2022): 1183–1207. doi: 10.1039/D2EA00023G
- Stanier C. O.; Pierce R. B.; **Abdi-Oskouei M.**; Adelman Z. E.; Al-Saadi J.; Bertram T. H.; Carmichael G. R.; Christiansen M. B.; Cleary P. A.; Czarnetzki A. C.; Dickens A. F.; Fuoco M. A.; Hughes D. D.; Hupy J. P.; Judd L. M.; Kenski D.; Millet D. B.; Roozitalab B.; Shaw S. L.; Stone E. A.; Wagner T. J.; "Overview of the Lake Michigan Ozone Study 2017". Bulletin of the American Meteorological Society (2021). doi: 10.1175/BAMS-D-20-0061.1
- **Abdi-Oskouei M.**; Carmichael G.; Christiansen M.; Ferrada G.; Roozitalab B.; Sobhani N.; Wade K.; Czarnetzki A.; Pierce R. B.; Wagner T.; Stanier C.; "Sensitivity of meteorological skill to selection of WRF-Chem physical parameterizations and impact on ozone prediction during the Lake Michigan Ozone Study (LMOS)". Journal of Geophysical Research: Atmospheres (2020). doi: 10.1029/2019JD031971
- **Abdi-Oskouei M.**; Pfister G.; Flocke F.; Sobhani N.; Saide P.; Fried A.; Richter D.; Weibring P.; Walega J.; Carmichael G.; "Impacts of physical parameterization on prediction of ethane concentrations for oil and gas emissions". Atmospheric Chemistry and Physics (2018). doi: 10.5194/acp-18-16863-2018

- **Abdi-Oskouei M.**; Awuah-Offei K.; "Role of the operator in dragline energy efficiency". In: Energy Efficiency in the Mineral Industry – Best Practices and Research Direction, Chapter 10 (2018).
- **Abdi Oskouei M.**; Awuah-Offei K.; "A method for data-driven evaluation of operator impacts on energy efficiency of digging machines". Energy Efficiency (2016): 1–12.
- **Abdi Oskouei M.**; Awuah-Offei K.; "Statistical methods for evaluating the effect of operators on energy efficiency of mining machines". Mining Technology 123.4 (2014): 175–182.

Selected Presentations

- *Advancing TEMPO NO_2 Applications in GEOS-CF/JEDI: Data Assimilation, Emission Constraints, and Forecast Monitoring*, GMAO Seminar, GSFC, 2026
- *4DEnVar assimilation of TEMPO NO_2, emission inversion, and near-real-time monitoring with JEDI/GEOS-CF*, TEMPO Science Team Meeting, Iowa City, IA, 2026
- *Assimilation of NASA TEMPO instrument with JEDI/GEOS-CF system*, NASA Earth Sciences Directorate Seminar, remote, 2025
- *Towards an end-to-end data assimilation system for atmospheric composition with the JEDI framework*, American Geophysical Union (AGU) Fall Meeting, San Francisco, CA, 2023
- *Hybrid tangent-linear modeling for atmospheric chemistry and physics using the JEDI framework*, AGU Fall Meeting, San Francisco, CA, 2023
- Invited talk: *WRF-Chem modeling of Lake Michigan summertime ozone air quality*, ACOM Seminar, NSF-NCAR, remote, 2020
- *Testing framework in JEDI*, American Meteorological Society (AMS) Annual Meeting, Boston, MA, 2020
- *WRF-Chem modeling of Lake Michigan summertime ozone air quality: Optimization of meteorology and its impact on air quality forecasts*, AMS Annual Meeting, Boston, MA, 2020
- Invited talk: *Meteorological and air quality forecasting using the WRF-Chem model during the Lake Michigan Ozone Study (LMOS 2017) field campaign*, Space Science and Engineering Center Seminar, University of Wisconsin–Madison, Madison, WI, 2018
- *Meteorological and air quality forecasting using the WRF-Chem model during the LMOS 2017 field campaign*, Meteorology and Climate – Modeling for Air Quality (MAC-MAQ) Conference, Davis, CA, 2017
- *Impact of oil and natural gas activities on regional air quality in the Northern Front Range (NFR) area*, FRAPPÉ Science Meeting, Boulder, CO, 2017
- *Understanding the impact of oil and gas extraction activities on air quality in the Northern Front Range Metropolitan Area (NFRMA)*, AMS Annual Meeting, Seattle, WA, 2017
- *Methane in the GFDL climate chemistry model*, Geophysical Fluid Dynamics Laboratory (GFDL), Princeton, NJ, 2016

Selected Awards

- UCAR President's Strategic Initiative Fund Award (PI) – 2025
- UCAR UINNOVATE competition winner, "Weather forecast for your road trip" – 2021
- Ballard Seashore Dissertation Fellowship, University of Iowa – 2018
- Full tuition award, University of Iowa – 2013 to 2018

Service

- Reviewer for NASA proposal review panels
- Journal reviewer: ACP, JGR, EST, Remote Sensing of Environment, and Elementa
- Program committee member, MAC-MAQ 2023 Conference
- Founding member, UCAR WANA (West Asia and North Africa) affinity group