Samar Minallah

Scientist
Climate & Global Dynamics Laboratory (CGD)
NSF National Center for Atmospheric Research (NCAR)
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Research areas and interests

Earth system sciences:

- Atmosphere – Cryosphere – Hydrosphere interactions
- Regional hydroclimates
- Energy and water budgets

Climate sciences:

- Climate variability and predictability
- Climate extremes

Hydrological sciences:

- Terrestrial hydrology
- River systems and inland water bodies

High-altitude climates:

- Glacier dynamics and glacio-hydrology
- Mountain water resources
- Snow processes
- Geomorphological hazards

Education

2018 – 2022 **Ph.D. Climate and Space Sciences**, University of Michigan Ann Arbor (UMich), US
Dissertation: *A Study on the Atmospheric, Cryospheric, and Hydrologic Processes Governing the Evolution of Regional Hydroclimates*. 10.7302/6223

2014 – 2016 **M.S.E. Civil Engineering** (Hydrology & Hydraulics), UMich
Research project: *Precipitation Systems in the Himalaya-Karakoram Region*. 10.1175/JHM-D-18-0084.1

2008 – 2012 **B.E. Civil Engineering** (Geotechnical Engineering elective),
National University of Sciences & Technology (NUST), Islamabad, Pakistan
Engineering project: *Design of Small Dam for Water Resources Development and Irrigation in the Potohar Plateau*.

Employment

2024 – present **Project Scientist**, NCAR

- Researcher/lead on projects related to climate modeling, analysis, and predictability; hydroclimatic variability; terrestrial hydrology; and mountain glaciology.

2022 – 2024 **Advanced Study Program (ASP) Postdoctoral Fellow**, NCAR

- Lead on project "Assessing the present state and future evolution of coupled glacier and hydrological processes in High Mountain Asia".

2016 – 2018 **Focal Person Water Program**, Leadership for Environment and Development, Pakistan

- Project manager for USAID-Partnerships for Enhanced Engagement in Research (PEER) project on the transboundary Kabul River Basin.
- Researcher and deputy manager for project on "Understanding the Effects of Water Insecurity in Faisalabad, Pakistan".
- GIS Analyst for project on "Disaster Risk Management Operational Plans for Sindh and Punjab, Pakistan", funded by the Food and Agriculture Organization of the United Nations (FAO).

2013 **Infrastructure Engineer**, Mott MacDonald Pakistan

- Engineer and GIS analyst for project on "Satpara Development Project: Preparing Irrigation Master Plan for Satpara Dam Command Area in Skardu, Pakistan".

Graduate research and teaching experience

2018 – 2022 **Graduate researcher**, Dept. of Climate & Space Sciences and Engineering, UMich
Research topics: (1) Atmospheric moisture budget and precipitation over North America; (2) Lake-atmosphere interactions; (3) Terrestrial hydrology in the Laurentian Great Lakes basin; and (4) Karakoram glaciers

2021 **Graduate instructor**, UMich
Course: Our Changing Atmosphere (100-level undergraduate course; ~280 students)

2016 – 2018 **Research associate** (telework), Dept. of Civil & Environmental Engineering (CEE), UMich
Research topic: Monsoons and precipitation systems in high mountain Asia

2015 **Visiting researcher**, Dept. of CEE, Colorado State University
Research topic: Coupled Model Intercomparison Project (CMIP) assessments for hydrology over CONUS

Peer-reviewed publications

Tang, W., and **co-authors** (in review). Unlocking the Potential of Collaborative Research on Africa's Environmental Challenges: Perspectives from the UCAR Africa Initiative on Air Quality and Health, Weather and Climate, Land and Water, and Society. *Bulletin of the American Meteorological Society*.

Minallah, S.*, Lipscomb, W. H.*, Leguy, G. and Zekollari, H. (2025). A framework for three-dimensional dynamic modeling of mountain glaciers in the Community Ice Sheet Model (CISM v2.2). *Geoscientific Model Development*. 10.5194/egusphere-2024-4152

Zekollari, H.*, Schuster, L.*, and **co-authors** (2025). Glacier preservation doubled by limiting warming to 1.5˚C versus 2.7˚C. *Science*. 10.1126/science.adu4675

Minallah, S., Steiner, A. L., Ivanov, V. Y., and Wood, A. W. (2023). Controls of Variability in the Laurentian Great Lakes Terrestrial Water Budget. *Water Resources Research*. 10.1029/2022WR033759

Fry L. M. and **co-authors** (2022). Navigating Great Lakes Hydroclimate Data. *Frontiers in Water*. 10.3389/frwa.2022.803869

Minallah, S. and Steiner, A. L. (2021): The Effects of Lake Representation on the Regional Hydroclimate in the ECMWF Reanalyses, *Monthly Weather Review*. 10.1175/MWR-D-20-0421.1

Minallah, S. and Steiner, A. L. (2021): Analysis of the Atmospheric Water Cycle for the Laurentian Great Lakes Region Using CMIP6 Models, *Journal of Climate*. 10.1175/JCLI-D-20-0751.1

Minallah, S. and Steiner, A. L. (2020): Role of the Atmospheric Moisture Budget in Defining the Precipitation Seasonality of the Great Lakes Region, *Journal of Climate*. 10.1175/JCLI-D-19-0952.1

Minallah, S. and Ivanov, V. Y. (2019): Interannual Variability and Seasonality of Precipitation in the Indus River Basin, *Journal of Hydrometeorology*. 10.1175/JHM-D-18-0084.1

Research grants

2025 Co-I, UCAR President's Strategic Initiative Fund: "Advancing Global Scientific Collaborations across the West Asia – North Africa region through Strategic Partnerships and Sustainable Initiatives". PI M. Abdi-Oskouei (UCAR)

2019 Rackham Graduate Student Research Grant, University of Michigan Ann Arbor

Awards and fellowships

- Advanced Study Program (ASP) Postdoctoral Fellowship (2022 – 2024), NSF NCAR
- Rackham Predoctoral Fellowship in Physical Sciences and Engineering (2021 – 2022), UMich
- Next Generation Fellowship in Earth System Sciences (2020 – 2022), University Corporation for Atmospheric Research (UCAR)
- Outstanding Student Paper Award, American Geophysical Union Fall Meeting (2019)
- Michigan Institute for Computational Discovery and Engineering Fellowship (2018 – 2019), UMich
- Fulbright Scholarship (2014 – 2016), U.S. Department of State
- Undergraduate Merit Scholarship (2010 – 2012), National University of Sciences & Technology (NUST), Pakistan

Service

International committees:

2025 – 2029 WCRP Working Group on Observations for Researching Climate (WGORC)
2025 – 2028 WCRP working group on Impacts of Changes in the Mountain Cryosphere (IC-MontC)
2025 – 2026 AGU Cryosphere Executive Committee
2024 – 2025 CMIP7 Data Request Land and Land Ice author team

Proposal reviews/panels:

- Natural Sciences and Engineering Research Council of Canada (NSERC)
- Swiss National Science Foundation
- Future Investigators in NASA Earth and Space Science and Technology (FINESST)

Journal reviews:

Geophysical Research Letters, Monthly Weather Review, The Cryosphere, Climate Dynamics, Journal of Hydrometeorology, Journal of Hydrology, Scientific Data, Earth System Dynamics

Award committees and selection panels:

UCAR Next Generation Fellowship (2024); ASP postdoctoral fellowship (2024); NCAR Earth System Science Internship (2023); Global Undergraduate Exchange Program, Pakistan (2017, 2018); Fulbright Program, Pakistan (2017); Commonwealth Youth Awards, Asia region (2012, 2013)

Primary convener and chair:

Session on *Lakes and Inland Water Bodies* at the AGU Fall Meeting (2020 – 2025)

Institutional committees:

- West Asia and North Africa (WANA) Affinity Group member (2023 – present)
- NCAR ASP research review committee (2022 – 2024)
- NCAR ASP seminar series committee (2023 – 2024)

Mentorship:

- NSF NCAR Earth System Science Internship (NESSI) mentor (summer 2025)
- AGU Outstanding Student Presentation Awards liaison and reviewer (2021 – 2025)
- Graduate student instructor (2021)
- Informal mentoring and career guidance for graduate students and postdoctoral fellows (e.g., review and feedback on application material and career advisory panels)

Modeling experience

- Community Earth System Model (CESM)
- Weather Research & Forecasting Model (WRF)
- WRF-Hydro Modeling System
- Open Global Glacier Model (OGGM)
- Noah-Multiparameterization Land Surface Model (NOAH-MP)

Lectures and oral presentations (select)

06/2025 "Mountain Glaciers in CISM: Current Capabilities and Future Directions". 30th Annual Community Earth System Model (CESM) Workshop

09/2024 "Mountain Hydroclimates: Glaciers, Snowpack, and Hydrology in Earth System Models" (Invited). Guest Lecturer Series, Department of Earth, Geographic, and Climate Sciences, University of Massachusetts Amherst.

06/2024 "Mountain glacier mass balance and dynamics in the Community Ice Sheet Model". 29th Annual Community Earth System Model (CESM) Workshop

06/2024 "Terrestrial Hydrology in the Great Lakes Watershed". 2024 Noah-MP International Annual Users' Workshop

04/2024 "Mountain Glaciers in the Community Earth System Model". Third Annual Colorado Glaciology Workshop, Boulder, CO.

04/2024 "Simulating Mass Balance and Dynamics of Mountain Glaciers within an Earth System Modeling Framework". 2024 EGU General Assembly

02/2024 "Energy and water balance of glaciated watersheds using CLM-Hillslope Hydrology". 2024 CESM Land Model Working Group Meeting.

07/2023 "Simulating mountain glacier dynamics with the Community Ice Sheet Model". 28th General Assembly of the International Union of Geodesy and Geophysics (IUGG), Berlin, Germany.

02/2023 "2022 Floods in Pakistan" and "The High-Mountain Asia Glaciology" (Invited). Climate & Global Dynamics Seminar, NCAR

06/2022 "Modeling the Land Surface Water Balance for the Laurentian Great Lakes Watershed". AGU Frontiers in Hydrology Meeting 2022, Puerto Rico.

03/2022 “Modeling the Evolution of Himalaya-Karakoram-Hindukush Glaciers” (Invited). 2022 CESM Land Ice Working Group Meeting.

03/2021 “Impact of the Atmospheric Moisture Budget on the Seasonality of Great Lakes Precipitation” (Invited). 2021 Great Lakes Climate Modeling Workshop.

12/2020 “Understanding the Hydroclimatic Drivers of Harmful Algal Blooms in the Laurentian Great Lakes Region” (Invited). 2020 AGU Fall Meeting, San Francisco, Calif.