Dr. Bijan Fallah

Senior Climate Scientist & AI Training Specialist

Potsdam Institute for Climate Impact Research
14473 Potsdam, Germany
E info@bijan-fallah.com
in bijanfallah
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Climate scientist (PhD, Meteorology) with 15+ years in atmospheric dynamics and 55 peer-reviewed publications (574 citations, h-index 13). Trains and evaluates AI for the geosciences: CNN-based climate downscaling (GMD 2025) and LLM tooling for scientific reasoning over climate data.

Profile

Earth-system scientist combining deep atmospheric-science expertise with hands-on AI training. Designed and trained convolutional neural networks for high-resolution regional climate downscaling, and contributed to the **FrevaGPT** team at DKRZ on an LLM interface for climate-data evaluation. Strong commitment to scientific rigor: 55 peer-reviewed publications, COP28 contributor, active reviewer for international climate-science journals. Currently focused on paleoclimate data assimilation (Particle Filter, AMOC reconstruction) at PIK.

Atmospheric & Climate Expertise

Dynamics	Atmospheric circulation, westerly jet streams, Asian summer monsoon, AMOC and orographic forcing of the Tibetan Plateau, extreme-event attribution.
Modeling	Regional climate models (**COSMO-CLM / CCLM**), GCMs (**MPI-ESM**, ECHAM), CMIP6 multi-model analysis, SSP-scenario projections at 0.22–0.25° resolution.
Data Assimilation	Ensemble Kalman Filter and Particle Filter for paleoclimate reconstruction; pseudo-tree-ring-width assimilation with process-based forward operators; satellite-data assimilation in chemistry transport models.
Geospatial	ERA5/ERA-Interim, NetCDF/Zarr workflows, Xarray, remote-sensing retrieval pipelines, downscaling evaluation over mountainous terrain.

AI Training & Scientific Reasoning

Model Training	Trained **CNN architectures** (convolutional, transposed-convolutional, residual blocks) to emulate dynamical downscaling of CCLM driven by MPI-ESM1-2-HR. Compared hard, soft, and unconstrained variants for mass-conservation in extreme-precipitation regimes — published in *Geoscientific Model Development* (2025).
LLMs for Science	Worked with the **FrevaGPT** team at DKRZ on an LLM interface for climate-data evaluation; expert prompt engineering with **Claude Code** and **Gemini** for scientific code generation, review, and reasoning evaluation.
Evaluation	15+ years of peer-reviewing scientific manuscripts — directly transferable to evaluating AI-generated reasoning for accuracy, depth, and methodological soundness. Comfortable designing rigorous, nuanced problem statements with real-world climate relevance.

Academic & Professional Positions

2025–Present **Senior Staff Scientist**, *Potsdam Institute for Climate Impact Research (PIK)*, Potsdam
- Lead researcher in Earth System Analysis on Paleo-Data Assimilation; AI-assisted (**Claude**, **Gemini**) Particle Filter implementation for AMOC reconstruction.

2024–2025 **Climate Software Developer**, *German Climate Computing Centre (DKRZ)*, Hamburg
- Lead developer of the **Freva Databrowser** (Apache Solr-based metadata search across petabyte-scale climate archives).
- Collaborated with the **FrevaGPT** team on an LLM interface for climate-data evaluation on DKRZ HPC.
- Implemented CI/CD pipelines and automated testing for climate evaluation frameworks.

2020–2024 **Senior Staff Scientist**, *PIK*, Potsdam

- Trained **CNN downscaling** models for Central Asia and Tibetan Plateau (0.22–0.25°).
- Open-access **BASD** bias-adjusted datasets via reproducible Python/GitHub pipelines.
- Invited speaker, **COP28** (Green Central Asia) and Tashkent Water Security Lectures.

2015–2020 **Postdoctoral Researcher**, *Freie Universität Berlin*, Berlin

- Paleo-data assimilation: assimilation of pseudo-tree-ring-width observations into atmospheric GCMs using Ensemble Kalman Filter and a process-based tree-growth forward model.
- Satellite-data assimilation in chemistry transport models; scientific code for retrieval pipelines.

Selected Publications

2025 **Fallah, B.** et al. *Climate model downscaling in central Asia: a dynamical and a neural network approach.* Geosci. Model Dev., 18, 161. doi:10.5194/gmd-18-161-2025

2024 **Fallah, B.**, Didovets, I., Rostami, M., Hamidi, M. *Climate change impacts on Central Asia: trends, extremes and future projections.* Int. J. Climatol.

2023 **Fallah, B.** et al. *Anthropogenic influence on extreme temperature and precipitation in Central Asia.* Sci. Rep. 13, 6854.

2018 **Fallah, B.** et al. *Towards high-resolution climate reconstruction using off-line data assimilation and COSMO-CLM 5.00.* Clim. Past, 14, 1345.

2017 **Fallah, B.** et al. *Assimilation of pseudo-tree-ring-width observations into an atmospheric GCM.* Clim. Past, 13, 545.

2016 **Fallah, B.**, Cubasch, U., Prömmel, K., Sodoudi, S. *Asian summer monsoon and AMOC under Tibetan Plateau orographic forcing.* Clim. Dyn.

Metrics 55 peer-reviewed publications, **574 citations, h-index 13, i10-index 17** (Google Scholar).

Technical Skills

Programming **Python (Expert)**, Bash (Expert), R, Fortran, SQL.

ML / AI TensorFlow, PyTorch, CNNs for geoscience, LLM prompt engineering (Claude, Gemini), AI evaluation workflows.

Climate Stack COSMO-CLM, MPI-ESM, NetCDF, Zarr, Xarray, Apache Solr, ERA5 / ERA-Interim, CMIP6.

DevOps & HPC Docker, GitHub Actions (CI/CD), HPC Levante (DKRZ), HLRN, JupyterHub.

Education

2011–2015 **PhD in Meteorology (Dr. rer. nat.)**, *Freie Universität Berlin*, Germany
Thesis: *Modelling the Asian Paleo-hydroclimatic Variability*.

2017 **Deep Learning Nanodegree**, *Udacity*, Online
Neural-network architectures for scientific applications.

Languages

English Fluent (professional / academic writing and peer review)

German Fluent (C1)

Persian Native