Rachel Wegener

rwegener@umd.edu
College Park, MD | (+1) 414.477.5606

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EDUCATION

UNIVERSITY OF MARYLAND
Atmospheric and
Oceanic Science [in progress]
2021 - present | College Park, MD
College of Computer, Natural and
Mathematical Sciences

UNIVERSITY OF DENVER
BS in Physics and
Environmental Science
2012 - 2017 | Denver, CO
College of Natural Sciences and
Mathematics
Cum Laude, with Distinction in Physics
GPA: 3.75 / 4.0

LINKS

LinkedIn:// **Rachel Wegener**
Github:// **rwegener2**
Twitter:// **@rwegener2**

COURSEWORK

UC San Diego - Extension
Sept 2019 - Mar 2019
Fundamentals of Data Science
Linear Algebra for Machine Learning

LEADERSHIP & EDUCATION

Active Learning Teaching Community
Feb 2022 - May 2022
UMD MeteoGrads
Nov 2021 - present
NASA SARP Guest Lecturer
July 2020
NASA DEVELOP Ambassador
Jan 2018 - Apr 2019
Residence Assistant (RA)
Aug 2016 - June 2017,
Aug 2014 - Jun 2015
Society of Physics Students
Outreach Coordinator, 1 year
Sept 2012 - June 2017
Environmental Sustainability Living and Learning Community
Sept 2012 - June 2013

CURRENT ROLE

UMD GRADUATE STUDENT & RESEARCH ASSISTANT
Aug 2021 - present

- *Research under the supervision of*: Dr. Veronica Lance, NOAA Coastwatch & Dr. Jacob Wenegrat, University of Maryland
- *Research focus*: I look at trends in marine heatwaves in the Chesapeake Bay, with a focus on satellite imagery as a tool. I am interested in if these trends can provide insight into physical mechanisms.
- *TA Courses*: AOSC123 Causes and Implications of Global Change (Fall 2021 & Spring 2022)
- *Supporting research activities*: Convert NOAA Geopolar SST dataset to zarr using Pangeo Forge, where it is publicly available in a cloud optimized format.

WORK EXPERIENCE

NASA SARP PROGRAM | Coding Mentor
Jun 2021 - Aug 2021 & Jun 2022 - Aug 2022

- Develop a core curriculum to teach coding and data access concepts to undergraduate students doing earth science research
- Deploy materials as a public executable Jupyter book
- Set up collaborative work environments to promote communication skills
- Work individually with students to guide code skill development based on their personal and research interests
- Coordinate with the mentor team to ensure a fulfilling program experience

DEVELOPMENT SEED | Cloud Engineer; Project Manager
Jan 2020 - May 2021

- Research, select and use the most applicable technologies to process and archive data based on the needs of each project, with a heavy emphasis on open source tools and technologies. Frequently built cloud systems for data processing
- Work with project partners on applied science projects to develop shared goals that satisfy diverse needs and constraints.
- Interface often with the NASA IMPACT team, thereby engaging with organization level data challenges such as metadata and cataloging, diverse scientific use cases, cloud costs, and strengths/weaknesses of file formats
- Manage project teams to ensure that developers have guidance and support. Consider the communities connected to each project. Ensure project deadlines are communicated to partners and met.
- Assist in business develop opportunities and project proposals for new work
- Participate in the collective ownership of the company by identifying and pursuing initiatives that better the organization

MAXAR | Geopython Developer - Emerging Technologies
July 2018 – Dec 2019

- Work in a team of 6 to prototype new geospatial analytics products built on top of DigitalGlobe high resolution satellite imagery. Integrate external public data sources
- Build scaled data processing solutions as a part of a team
- Develop algorithms for new capabilities using remote sensing and data science techniques

PREVIOUS RESEARCH EXPERIENCE

NASA DEVELOP USING CMIP5 GLOBAL CLIMATE MODELS TO PROJECT FUTURE MONSOON AND EXTREME WEATHER EVENTS IN THE PACIFIC

Working in a team of 3 under Michael Kruk,
NOAA's National Center for Environmental Information | Sept 2017 - Nov 2017

This 10-week long study provided an initial outlook at regional trends in the location of the monsoon and distribution of the extremes in wind speed and rainfall over the course of the 21st century. Select Global Climate Models (GCMs) from the Coupled Model Intercomparison Project Phase 5 (CMIP5) were verified against historic NOAA satellite data. This project used the future simulations to calculate the projected changes in magnitude for extreme values of wind speed and rainfall rate, return interval frequency for rainfall and wind speed, and distribution of monsoon events. The results include gridded maps of monsoon distribution and extreme wind and rain values, as well as return interval plots for virtual stations within the USAPI and Hawai'i Exclusive Economic Zones on a decadal basis for the years 2030-2100.

NASA STUDENT AIRBORNE RESEARCH PROGRAM (SARP) IMPACTS OF COASTAL AND CLIMATOLOGICAL PROCESSES ON PRIMARY PRODUCTIVITY IN THE COLUMBIA RIVER PLUME

Working under Dr. Raphael Kudela, UC Santa Cruz | Jun 2016 - Aug 2016

In this 6-week long research experience the impact of persistent drought on primary productivity in Columbia River Plume was examined using monthly MODerate Resolution Imaging Spectroradiometer (MODIS) imagery collected between 2003-2015. Chlorophyll concentrations are compared to several drought indices, although only correlated to the Precipitation Index (PCP), Palmer Z-Index (ZNDX), and sediment concentration (as determined by MODIS Rrs_645). The monthly chlorophyll values were then compared to VGPM primary productivity in order to confirm that chlorophyll is a good proxy for phytoplankton growth.

SENIOR THESIS ICE NUCLEATION OF PARTICLE SAMPLES FROM REUNION ISLAND

Working under Dr. J. Alex Huffman, University of Denver Department of Chemistry | Jan 2016 - Jun 2017

In order to better understand the formation and presence of clouds in the atmosphere, this study assessed the ice nucleation abilities of particulates collected off Reunion Island, an island situated off the east coast of the African continent which is exposed to the open ocean. Data collected from the micro-orifice uniform deposit impactor – droplet freezing technique (MOUDI-DFT) was used to observe ice nucleation particles (INP) as a function of size and temperature.

SOFTWARE PROJECTS
Community Programming

OPEN SOURCE CONTRIBUTOR, PANGEO FORGE | June 2021 - May 2022

Contribute to the development and communication of the Pangeo Forge project, an open source engine for converting data to cloud optimized file formats. Core contribution is to documentation, where emphasis is placed on engaging many backgrounds or skill levels and considering differing scientific motivations and barriers to open data.

OCEANHACKWEEK | August 2021

Work on a team to expand the example gallery of the cmip6_preprocessing Github repository.

AWS PUBLIC DATASETS CONTRIBUTION | June 2020

Convert 15+ years of data across 6 NASA products to Cloud Optimized Geotiff, working with a Development Seed colleague. Coordinated with the NASA Quality Assurance teams to ensure accuracy.

Engineering Roles

In these projects I employed open source software tools to build a new end product while working at a company.

SMALLSAT USER INTERFACE AND DATA PROCESSING | Jan 2020 - Jan 2021

PROCESS DATA ARCHIVE OF NASA PURCHASED COMMERCIAL SATELLITE DATA AND COORDINATE USER ACCESS

Development Seed in collaboration with the NASA CSDA Program

Technologies	Datasets	Skills
Python: FastAPI, pydantic, sqlalchemy, alembic, AWS Cloud Development Kit	Planet imagery, Spire GNSS	STAC specification

SHIP DETECTION DATABASE & API | Aug 2019 - Dec 2019

PARSE AND CATALOG AIS TRANSMISSIONS FOR QUERY

Maxar

Technologies	Datasets	Skills
Postgres Database; AWS: Lambda, API Gateway; Python: psycopg2	commercial AIS	system prototyping, ShapeUp development framework

VECTOR INFORMATION PRODUCT ENHANCER | Jan 2019 - Dec 2019
Generate building attributes based on input datasets
Maxar

Technologies	Datasets	Skills
GDAL; AWS: ECS; Python: luigi, rasterio, shapely, pyproj	stereo-derived DEM, building footprint vectors	algorithm development, geospatial processing

FLOODWATCH FLOOD DETECTION TOOL | Jul 2018 - Jan 2019
Locate flooded areas after a severe weather event
Maxar

Technologies	Datasets	Skills
TauDEM; Python: rasterio	DigitalGlobe imagery, USGS HUC boundaries	algorithm development, statistics

ANIMATED MAP VISUALIZATION OF BUILDING ENERGY USE | Jan 2018 - May 2018
Visualize building energy use over time
U.S. Department of Energy's National Renewable Energy Lab (NREL) internship

Technologies	Datasets	Skills
QGIS; Docker; bash; Python: argparse CLI	US census boundaries, ComStock building energy model	technical report, poster creation, documentation writing, development for scientific application

Project Management Roles

In these projects I coordinated the development and execution of project vision. This involved supporting developers, communicating with project partners, and facilitating actionable science. In projects with open communities, care was taken to steer the project in a direction that is community driven and set the project up for sustainable development.

LOW COST SENSORS DASHBOARD INTERFACE | Sept 2020 - Feb 2021
Integrate Low Cost Sensor data into the OpenAQ data access platform
Development Seed, in collaboration with OpenAQ and the Environmental Defense Fund

NASA AIRBORNE DATA CATALOG SEARCH INTERFACE | Mar 2020 - May 2021
Build a search interface for NASA field campaign metadata
Development Seed, in collaboration with the NASA IMPACT Team

ACADEMIC EXPERIENCES

CRITICAL LANGUAGE SCHOLARSHIP PARTICIPANT - ARABIC | Jun 2017 - Aug 2017
American Councils for International Education, U.S. Department of State

- Intensively studied Arabic with 30 other selected students while living in Tangier, Morocco.
- Integrated self into the culture through interactions with host family, connections at the local university, and through the routine of daily life.

PROJECT COORDINATOR | Jan 2016 - Jun 2017
University of Denver, Center for Sustainability

- Coordinated with other student leaders to raise awareness of environmental issues on campus and promote sustainable lifestyles.
- Projects included co-directing the Residence Hall Energy Challenge and acting as the lead researcher for the Real Food Challenge campaign, which brought local and sustainably produced food to campus.

FIELD QUARTER PARTICIPANT | Sep 2015 - Nov 2015
University of Denver Department of Natural Sciences and Mathematics

- During this field course the class spent 10 weeks working in off campus locations in three countries with 11 other students in a range of disciplines. The goal was to provide authentic hands-on experiences that challenged participants as scientists as well as provide an integrated, international view of the scientific world that extended beyond the laboratory.
- Coursework included conservation efforts in diverse ecosystems, urban geography, western U.S. geology, and desert ecology.
- Projects included digging soil pits, extracting several meters of peat cores, and independently carrying out a research project assessing the impact of ENSO on local fisheries in the Baja peninsula of Mexico.

PHYSICS TUTOR | Sep 2013 - Jun 2014, Sept 2016 - Mar 2019
University of Denver; Tutor.com

- Provided learning support to students with diverse physics backgrounds using a collaborative teaching environment while working as a University of Denver Help Desk Learning Assistant.
- Worked privately with high school students 1-2 times per week to provide homework help and concept explanation.
- Approached concepts in several ways to help better explain material and show applications to increase student interest.

AWARDS & FELLOWSHIPS

FERDINAND BAER SCHOLARSHIP AWARD
U of Maryland Dept. of Atmospheric and Oceanic Science | $2500 | June 2022
For academic performance, mentorship and leadership contributions, and positive evaluations as a teaching assistant.

AMIT AND RUCHI MEHTA GRADUATE RESEARCH AWARD
U of Maryland College of Computer, Mathematical, and Natural Sciences | $5000 | March 2022
For a desire to serve the broader intellectual community by pursuing alternative careers combining science with business or law.

DR. RICHARD PAYNE GRADUATE FELLOWSHIP
U of Maryland & the National Socio-Environmental Synthesis Center | $5000 | Nov 2021
Supports innovative and actionable graduate-level research that directly links social and environmental sciences, with a particular focus on connecting climate and policy studies.

DEAN'S FELLOWSHIP U of Maryland College of Computer, Mathematical, and Natural Sciences | Sep 2021

UNDERGRADUATE PROGRAM AWARDS | Jun 2017
Outstanding Senior in Physics   For outstanding overall performance in the physics program
Environmental Science Program Award   For outstanding overall performance in the environmental science program
Thomas M. Stephen Memorial Award   For outstanding academic achievement in the physics program

OUTSTANDING PHYSICS TUTOR AWARD | Nov 2016

PUBLICATIONS & CONFERENCE PRESENTATIONS

PUBLICATIONS

Stern, C., Abernathey, R., Hamman, J., **Wegener, R.**, Lepore, C., Harkins, S. Merose, A. Pangeo Forge: Crowdsourcing Analysis-Ready, Cloud Optimized Data Production. Frontiers in Climate, 3, https://doi.org/10.3389/fclim.2021.782909 Publ. 10 Feb. 2022

Duflot, V., Tulet, P., Flores, O., Barthe, C., Colomb, A., Deguillaume, L., Vaïtilingom, M., Perring, A., Huffman, J. A., Hernandez, M. T., Sellegri, K., Robinson, E., O'Connor, D. J., Gomez, O. M., Burnet, F., Bourrianne, T., Strasberg, D., Rocco, M., Bertram, A. K., Chazette, P., Totems, J., Fournel, J., Stamenoff, P., Metzger, J.-M., Chabasset, M., Rousseau, C., Bourrianne, E., Sancelme, M., Delort, A.-M., **Wegener, R. E.**, Chou, C., and Elizondo, P.: Preliminary results from the FARCE 2015 campaign: multidisciplinary study of the forest–gas–aerosol–cloud system on the tropical island of La Réunion, Atmos. Chem. Phys., 19, 10591–10618, https://doi.org/10.5194/acp-19-10591-2019, 2019. Publ: Aug. 21, 2019

CONFERENCE PRESENTATIONS

Wegener, R., Lama, S., Lance, V., Wenegrat, J. (2022, Dec. 16) Observing Marine Heatwave Spatial Patterns in the Chesapeake Bay using Satellite Data. American Geophysical Union, 10 minute oral session

Wegener, R. (2022, Dec. 12) Programming instruction for research: an adaptive and active approach to teaching applied programming for earth science research during an 8-week internship. American Geophysical Union, poster session

Stern, C. **Wegener, R.** (2022, April 20) Pangeo Forge: An ETL Pipeline for Cloud Optimized Analysis Ready Data. Cloud Native Geospatial Outreach Event, 1 hour oral session

Wegener, R. Stern, C. (2022, March 4) Pangeo Forge mini-Hackathon: Transforming Archival Ocean Data into Cloud-Native Formats. AGU Ocean Sciences Meeting, 2 hour innovative session

Wegener, R. (2020, July 14) STAC and Cloud-Optimized Data: Publicly Accessible COGs for Web Data Exploration. Earth Systems Information Partners (ESIP) Summer Meeting, 10 minute oral session

CONFERENCE ABSTRACTS

Stern, C., Abernathey, R., Hamman, J., Busecke, J., **Wegener, R.** (2021) Pangeo Forge: A New Integrated Platform for Analysis-Ready, Cloud Optimized Data Production. American Geophysical Union Fall Meeting

Stern, C., Abernathey, R., Hamman, J., Busecke, J., **Wegener, R.**, Sterzinger, L. (2022) Pangeo Forge: Crowdsourcing Analysis-Ready, Cloud Optimized Data for Ocean, Weather, and Climate Science. American Meteorological Society Annual Meeting

Kaulfus, A. S., Maskey, M., Freitag, B., Hall, A., Ivey, Y., Lukach, A., Pieschke, R., Smith, D. C., Foley, S., McCarty, W., Baker, B. W., **Wegener, R.**, Thomas, L., Acharya, A. (2020) Enabling Discovery and Access of Commercial Small Satellite Data. American Geophysical Union Fall Meeting