



ANNUAL NEWSLETTER 2021

Photo courtesy of Steven Domonkos and David Warren

When Oceans Froze: An Oasis for Surface Life on Snowball Earth

By Steve Warren, Emeritus Professor in Atmospheric Sciences

“Snowball Earth” is the name given to times in Earth’s history when the oceans froze all the way to the Equator. This apparently happened several times, most recently in the Neoproterozoic, about 600 million years ago, and was most likely triggered by a failure of the natural greenhouse effect. These events each lasted a few million years, and would have been terminated by the slow buildup of atmospheric CO₂ from volcanic emissions.

The ice on the ocean would grow to a thickness of several hundred meters, limited by the geothermal heat flux of $\sim 0.1 \text{ W m}^{-2}$. It would flow in response to its thickness gradient, like the modern ice shelves fed by the Antarctic Ice Sheet. This exotic type of ice was given the name “sea glacier” by

UW grad Mel Fitzpatrick, and her term has caught on in the research community.

Snowball events would have been stressful for life in the upper ocean. Animals had not yet evolved (nor had land plants), but photosynthetic algae apparently survived the Snowball events. These algae require both sunlight and liquid water, so there must have been some ice-free “refugia”. Open water could be maintained at geothermal hot-spots in shallow coastlines around volcanic islands, but hot-spots are small and do not persist for millions of years.

The possibility of a larger and longer-lived refugium was investigated by Adam Campbell (UW-ESS) for his Ph.D. A sizeable area of open water could be safe from invasion of the sea glaciers if it was located at the end of a long narrow

bay intruding into a desert continent, such as the Gulf of Aqaba at the inland end of the Red Sea (see photo). The sides of the bay would provide friction to slow the sea glacier enough that the dry desert climate could sublimate the ice thickness down to zero before it reached the end of the bay. Adam worked out the minimum length-to-width ratio required for the bay to provide a refugium, and showed that the Red Sea qualifies. Of course, the continents were all different 600 million years ago, but plate tectonics was operating, so it is probable that similarly long and



The Red Sea (Photo courtesy of Google Earth)

narrow rift-valley seas would have existed.

Impeding the inflow of sea glaciers does not by itself guarantee a refugium. The climate at the end of the bay might still be so cold that thick sea ice would grow locally. But if the surrounding land is desert with the albedo of bare soil (0.2-0.4), much lower than that of the ice-covered ocean (0.6-0.8), maybe that would provide a cozy environment to maintain a warm swimming pool. To investigate this question requires climate modeling.

NSF funded a UW team with interdisciplinary expertise: Principal Investigators Steve Warren (snow, ice and radiation), Cecilia Bitz (general circulation modeling and sea ice), and Abby Swann

(land-surface processes in climate). Greta Shum, a graduate student in Atmospheric Sciences, has begun work on the project. Greta recently completed her Master's degree with Abby on vegetation-climate feedbacks at the forest-tundra boundary in North America at the end of the last ice age. For the Snowball work, Greta is collaborating with Marysa Laguë, a 2019 UW-Atmos grad now at the University



The Gulf of Aqaba at the North end of the Red Sea (Photo courtesy of Steve Warren)

of Saskatchewan. As part of Marysa's Ph.D. work, she developed a simplified land-surface model for the Community Earth System Model (CESM); she and Greta are using this modified version of CESM to model Snowball Earth. They will examine various configurations of continents, containing bays and lakes of various sizes, shapes, and locations, and will find out how low the albedo of the surrounding land must be to maintain open water.

Could the Earth become a Snowball in the future? It's unlikely for several reasons, particularly because the Sun brightens by one percent every 100 million years, so it is now six percent brighter than during the Neoproterozoic Snowball.

Guidance and Community In the Atmos Mentoring Program

By Ben Barr, Lily Hahn, Alli Moon and Chris Wright, graduate students in Atmospheric Sciences and Mentoring Program Coordinators

The process of science - and the human experience at large - is one of continual learning, growth, and adaptation. While many useful technical skills can be learned through reading and practice in isolation,

our most profound and useful experiences of development tend to occur through personal relationships in which knowledge is passed as lived experience. Every successful scientist (and human being) is shaped by countless mentors - parents, grandparents, advisors, colleagues, managers - whose experience hones our skills and broadens our perspectives. Learning and progress in the university setting works most effectively when the ecosystem of mentoring is active at all levels, engaging undergraduates, graduate students, faculty,

and staff. In the Atmospheric Sciences department, the Undergraduate-Graduate Mentoring Program is grateful to occupy a teaching and learning niche that connects undergraduate and graduate students and builds community within our department.

The Mentoring Program was started in 2017 by then-graduate students Casey Hilgenbrink, Isabel McCoy, and Lauren Schmeisser. It began as a Diversity and Inclusion Group initiative with the goals of helping graduate students develop

mentoring skills, providing undergraduates with resources for academic and career advice, and providing general support for undergraduates, particularly women and underrepresented minorities. Every fall, undergraduate mentees and graduate mentors are paired based on background and scientific interests, and these mentor-mentee pairs meet regularly throughout the year to foster their relationship and discuss issues relevant to the mentee. These “coffee chats” are the heart and soul of the program, and they allow mentees and mentors to discuss topics of interest within our field, course offerings and electives, graduate school applications, post-graduate job opportunities, undergraduate research, and anything else germane to the undergraduate experience.

Additionally, all mentee/mentor pairs are invited to meet roughly once each quarter for a department-sponsored group social activity, such as trivia, board games, virtual Taboo/charades (during the pandemic), or a UW women’s basketball game.

Since the first year of the program, in which there were 15 mentee/mentor pairs, participation has steadily increased, with a record-setting 33 pairs for the 2021-2022 academic year. As participation has grown, the program has organized more ambitious group activities, such as the department-wide Undergraduate Research Panel held in February 2021. During this event, our panel of undergraduates

(Christine Neumaier, Noah Asch, Rose Schoenfeld), a graduate student (Ursula Jongebloed), and faculty (Becky Alexander, Abby Swann, Rob Wood, Joel Thornton, Dargan Frierson) shared their experiences conducting and advising undergraduate research projects. Panelists discussed how to get started with research, the process of conducting research, and the rewards and benefits of doing this work, with a goal of making the process of finding and engaging in research more transparent and accessible for undergraduates. For a summary of the panelists’ thoughts, visit:

<https://atmos.uw.edu/students/undergraduate-program/research-interships-and-more/research-frequently-asked-questions>. We are planning new social and career-building activities for the future, such as panels on post-graduation job experiences (with Atmos undergraduate alumni as panelists) and applying to graduate school (with current Atmos graduate students as panelists).

Beyond the program’s career-building efforts, we are most proud of the mentoring program’s contribution to our department’s sense of community and support for individuals at all stages of their careers. The program reached a milestone last spring when the first undergraduates to participate in the mentoring program as freshmen graduated with their bachelor’s degrees. The program’s graduating seniors - Christine Neumaier, Kristan Lund, Calen Randall, and Haley Staudmyer - have been

deeply involved in the mentoring program and in our department community, and we wish them all success and happiness as they continue in their careers. Those of us still at UW continue to enjoy the community created within the mentoring program, and we are excited to further expand that community in the coming years. This year, we have extended the invitation to join the program not just to undergraduates within our major but also to undecided students investigating our field, hoping that the program can become a tool for recruiting and retaining undergraduates in the Atmospheric Sciences major.

We look forward to the program’s future as a part of the Atmospheric Science department’s continuing work towards community, inclusion, and support for scientists from all backgrounds and at all stages of their training.



Mentors and Mentees at UW women’s basketball (Photo courtesy of Ben Barr)

Justice, Equity and Diversity

By Tyler Cox, graduate student in Atmospheric Sciences

In fall of 2020 graduate students in the department, with helpful input from faculty, organized a course entitled “Justice and Equity in Academia and Beyond” that provided a space for the department to discuss topics including environmental racism, indigenous rights, and the relationship between science and social justice. This course was exciting in that it may have been

the first course in department history that offered students credit for a course focused on social and environmental justice. This fall a new course has been organized, focused on discussions of our department’s purpose, the meaning of diversity in our evolving academic discipline, and goals for the future of our department. A return to in-person classes has meant that we can once again discuss these topics without the need for Zoom.

Outside of these courses, the department’s Diversity Committee has been working to craft a Department Diversity Plan. After spend-

ing much of the last academic year creating the plan and receiving Department feedback, we hope to edit and improve the plan before shifting towards plan approval and implementation in the coming year.

As a Nature paper a few years ago entitled “No progress on diversity in 40 years” [Bernard & Cooperdock, 2018] reiterated, geoscience, and our department, still have a long way to go on issues of equity, diversity, and inclusion. We are excited for the discussions being had in our department and are hopeful for the future.

A Message from the Chair Cecilia Bitz



Cecilia enjoying a very Seattle snow storm

It is thrilling to have students back in the classroom and researchers and staff back in labs and offices. Grade school and high school students are visiting anew to learn about our science and see a major university firsthand. Coming to ATG feels nearly normal again.

Tomorrow we will host our traditional holiday party in person with singing, music, food, and drink. We’ll be safe and have fun. I can’t wait!

Faculty, postdocs, and students are going to the field again, eager for new data after a year of postponement missions. Many of us are rehearsing talks and finishing posters for hybrid AGU and AMS this year.

I’ll remember 2021 not only as the year we returned to work, but also for the extreme heat wave in June. Air conditioning in our old building couldn’t keep up, but it was better than homes and apartments for many of us. Community members and journalists contacted us for an explanation. The forecast had been accurate – a heat dome made worse by greenhouse warming.

We introduced a new undergraduate non-major class in 2021 called “Climate, Justice, and Energy Solutions”, appropriately labeled ATM S 100. Associate Professor Dargan Frierson created the class and taught it to 180 students the first time. Dargan is writing a textbook of the same title that is online and free through UW press.

We taught more student credit hours this year than ever before. Our five undergraduate non-major climate and weather classes served over 1,300 UW students. At that rate over 15% of UW undergraduates take one of our classes, even though we are considered a small department.

I’m proud of the excellent work that we do here in the department and that our alumni do in the community. Please stay in touch!

Faculty Spotlight: Kat Huybers

By Kat Huybers, faculty in Atmospheric Sciences

Starting in Autumn of 2021, I have joined the Atmospheric Sciences Department in a more permanent lecturer position. I am so glad to be part of this community! For the past several years, I have been teaching two of our larger lecture courses: Global Warming (111) and Climate Change (211). Serving students who are primarily non-majors, I really enjoy how these classes can pique the interest and passion of students who we other-

wise don't get to reach. Each quarter, I have been updating my courses with new scientific information and more active learning strategies.

In addition to teaching, I have also been a member of the College of the Environment's Teaching Sup-



port Team (formerly Online Learning Team). This group was formed to support instructors and TAs as we rapidly moved to online teaching in spring of 2020. We continue to help with pedagogical and technical issues that may arise as you teach, please reach out if you have requests/questions/concerns!

I have also partnered with EarthGen, a non-profit organization that, in part, provides professional development for K-12 teachers across Washington State. My work with them focuses on bringing climate education to the classroom.

If you find yourself back in ATG, please come by to say hello!

Staff Spotlight: David Warren

Interviewed by Aubrey Batchelor

After graduating from UW with dual degrees in Psychology and Dance, David Warren was recruited by Harry Edmon to work in Atmospheric Sciences as a research and engineering assistant. David initially built data visualization tools for Jim Holton and Dale Durran who were impressed with his design skills and ability to create user friendly models.

As he now enters his 31st year with Atmospheric Sciences, David continues to enjoy his work because there is always something interesting to do. One of David's favorite

projects was helping with the Mars Pathfinder and Viking data. Not only did he contribute to an exciting space research project, he also enjoyed visiting the Pacific Science Center and helping the NASA folks run over kids in the Pathfinder rover! Note: no kids were harmed during this educational outreach event.

David has seen many changes during his time here: a 60-megabyte disc is no longer the size of a washing machine; the old department van which had a giant hole in the floor has been replaced with a new truck that can drive on the freeway; Neil Johnson had a pour-over electric kettle, which he repaired multiple times until eventually Cliff Mass took it away so they couldn't burn down the building.

There is one thing about the department which hasn't changed during David's tenure: the hole in the roof which drains into a bucket in the hallway. When asked why the leaky roof drains into a bucket in the hallway, David said it was because someone took away the plant it was draining into. He has no idea where the plant came from or where it went.

In his spare time David loves riding his bicycle to the Rooftop Brewing Company in lower Queen Anne and sipping a delicious stout. He also recommends Métier Racing and Coffee for a delicious cup of joe. David is the proud owner of a highly intelligent border collie, he plays acoustic guitar and he is an official USA swimming referee in his free time.

In Memorium: Robert J. Charlson

By Robert Wood, faculty in Atmospheric Sciences

Emeritus Professor Robert (Bob) Charlson was a faculty member at the University of Washington since 1965, beginning his faculty career in Civil Engineering and later moving to the Department of Atmospheric Sciences. Bob received a BS and MS in chemistry from Stanford University, and a PhD from our department in 1964 under the supervision of Konrad Büttner.

It is hard to overstate the impact that Bob's research has had on the field of aerosol science in particular, and on the atmospheric sciences more broadly. He was a leader in demonstrating essential linkages in biological, geophysical and chemical phenomena. Bob was an inventor of multiple instruments to measure atmospheric aerosols, garnering him six patents. The nephelometer, which measures light scattering by aerosols, resulted in the first patent to bear royalties for the University of Washington. It is still in broad use today around the globe.

As his many colleagues and graduate students could attest (he mentored 35 PhD and 8 MS students



Robert Charlson

across his career at UW), Bob was a man of many ideas, and he generously shared these ideas with others. Bob wrote the first papers quantifying the global effects of anthropogenic aerosol pollution on the climate, both through direct interaction with sunlight, and through the effect of aerosol particles on clouds.

He conducted foundational work on the impacts of aerosol composition on the ability of particles to serve as cloud condensation nuclei. Bob's most well-known paper focused on the potential for climate stabilization through a natural feedback loop involving the production of dimethylsulfide (DMS) by ocean phytoplankton. DMS is now recognized as the primary natural source of atmospheric sulfate aerosol. Now known as the CLAW hypothesis (after the last names of

the contributing authors, Charlson, Jim Lovelock, Andi Andreae, and Steve Warren), CLAW hypothesized that DMS would increase the sunlight reflected by clouds and serve as a negative (stabilizing) feedback on climate warming. This work, as did many of Bob's other papers, generated a wealth of new understanding about the importance of aerosol cloud interactions in the climate system.

Bob retired in 1999 and accepted an appointment by the King of Sweden to be his Professor of Environmental Science for the year 1999-2000. He was a contributing author on the 4th Assessment of the Intergovernmental Panel on Climate Change (IPCC) that won the 2007 Nobel Peace Prize, and continued to work with collaborators in the department, and around the world until this year. Bob began his career with instrumentation to make local, limited measurements, steadily broadening his interests and contributions over the years to focus on global biogeochemical systems, a unique trajectory.

Bob is survived by his wife, Pat, his children Daniel and Amanda, Dan's wife Maureen, nieces Kathryn and Erika in California and eight grandchildren. Bob will be missed by the many students he mentored, his colleagues, friends and family.

Faculty Awards

Professor Shuyi Chen won the American Meteorological Society's Sverdrup Gold Medal for outstanding contributions to scientific knowledge of interactions between the oceans and the atmosphere and cryosphere. Chen's current research focuses on mathematical modeling of interactions between tropical storms and the atmosphere and ocean.

Professor and Chair Cecilia Bitz won the American Meteorological Society's Syukuro Manabe Climate Research Award for outstanding contributions and expertise in understanding the Earth's climate system. Her current research focuses on improving predictability of arctic sea ice and sea ice data assimilation and investigating wave-ice and coupled air-sea-ice interactions that control large-scale climate. She is using artificial intelligence to model sea ice.

Professor David Battisti was elected as a 2021 fellow of the American Academy of Arts & Sciences. Founded in 1780, the Academy recognizes extraordinary individuals for their commitment and dedication toward advancing knowledge and learning for the public good. Battisti currently holds the Tamaki Endowed Chair. His research focuses on climate variability, global food production, and interactions between ocean, air, land and sea ice.

Alumni Awards

Elizabeth Barnes (2012, Ph.D.) was selected to receive the 2021 James B. Macelwane Medal and became a Fellow of the American Geophysical Union. This annual award recognizes early career scientists for their significant contributions, impacts, and service in the geological and planetary fields. Elizabeth is an Associate Professor at Colorado State University researching the impacts of climate variability, sub-seasonal to seasonal predictions, and new analytical and statistical approaches in data science.

Clara Deser (1989, Ph.D.) was elected as a member of the National Academy of Sciences in 2021 as one of 120 new members. Clara is a senior scientist at the National Center for Atmospheric Research studying climate variability, anthropogenic climate change and modeling of interactions among the atmosphere, ocean and sea ice.

Richard Johnson (1975, Ph.D.) Professor Emeritus at Colorado State will be recognized with a named symposium at the 2022 AMS meeting: The Richard H. Johnson Symposium. He is receiving this honor for his outstanding contributions to research and education. Richard's contributions to international field campaigns created new standards for analyzing unique observations, and while currently retired he still maintains active research from his home in Oregon with a focus on tropical atmospheric convection and mesoscale dynamical processes.

Marysa Laguë (2019, Ph.D.) won the American Geophysical Union's 2021 James R. Holton Award. This annual award recognizes outstanding scientific research and exceptional contributions from early-

stage PhD scientists. Marysa is a James S. McDonnell Foundation Postdoctoral Fellow working at the Coldwater Lab & Center for Hydrology at the University of Saskatchewan. She is currently researching the role of land surface in modulating fluxes of water and energy within both the local atmosphere and the large-scale climate system.

Steven Rutledge (1983, Ph.D.) was selected by the American Meteorological Society for the 2022 Verner E. Suomi Technology Medal for his contributions and innovations in radar meteorology and atmospheric electricity. Steven previously served as the Department Head for Atmospheric Science at Colorado State and currently leads the Radar Meteorology Group researching convection and remote sensing. He maintains an active research program serving as the Principal Investigator for the PISTON field project: the Propagation of Intra-Seasonal Tropical Oscillations in the tropical west Pacific.

Alumni Updates

Buzz Bernard (1963, B.S.) was awarded a gold medal by the Military Writers Society of America for the first novel in his WWII historical fiction series, *When Heroes Flew*. The third novel in the series, *When Heroes Flew: The Roof of the World*, will come out in June, and will highlight, among other topics, the significant role weather played in military flights over the Himalayan mountains between India and China in 1943.

www.buzzbernard.com

Scott Braun (1995, PhD) is serving as the Project Scientist for the new NASA Earth System Observatory/Atmosphere Observing System (AOS), which is currently in its mission concept phase. AOS will address science related to aerosol-cloud-precipitation-radiation interactions with a constellation of satellites. In addition, he continues to serve as Project Scientist for the GPM and TROPICS satellite missions.

Bonnie Brown (2008, B.S., 2011 M.S., 2014 Ph.D.) started a civil service position as Numerical Weather Modeling Requirements Manager for Air Force Weather through Air Combat Command at Joint Base Langley Eustis in Hampton, VA, in May 2021 after moving to the Norfolk area with her husband James and dog Ripley. She will be identifying and prioritizing gaps in Air Force weather's modeling capabilities and coordinating with engineers and airmen to fill them.

Mindy Brugman (1979, B.S.) will be presenting at AMS 2022 on her ARkSuperstorm Project developing a rating scale for extra tropical cyclones and atmospheric rivers for Canada, as an impacts-based rating to trigger EMO communications and to assess global warming impacts. This is in collaboration with the efforts for AR by Ralph et al (from BAMS 2019). She welcomes collaboration on this project and plans to have it fully operational for use next fall. Mindy currently works as a senior R&D Meteorologist for Environment Canada.

Kyle Fitch (2006, B.S.) was recently appointed Assistant Professor of Atmospheric Science, Department of Engineering Physics, Air Force Institute of Technology in Dayton, Ohio. Kyle completed his Atmospheric Sciences Ph.D. in 2000 at the University of Utah, where his advisor was fellow UW alum, Tim Garrett. His defense-focused research consists primarily of the physics and remote sensing of Arctic clouds and precipitation.

Dylan Flynn (2014, B.S.) served for five years as a Meteorology and Oceanography Officer in the United States Navy, and recently accepted a marine meteorologist position within the Tropical Analysis and Forecast Branch of the National Hurricane Center starting next month.

Cliff Glantz (1982, M.S.) is a Senior Staff Scientist and Project Manager at Pacific Northwest National Laboratory. Working remotely from his Olympia home, he manages the

development of cybersecurity and critical infrastructure protection assessment models, coordinates international nuclear and chemical security engagements, and leads atmospheric dispersion modeling projects (www.pnnl.gov/pnnl-maturity-models). In his spare time, Cliff hikes and skis, enjoys activities with his wife and sons, and plays with his four grandchildren.

Ian Kraucunas (2005, Ph.D.) was recently promoted to Chief Science and Technology Officer for the Earth and Biological Sciences Directorate at Pacific Northwest National Laboratory, and he and his wife Katie and their three sons (12, 9, 6) have moved back to Seattle, where Ian will be working out of PNNL's Seattle Research Center in South Lake Union.

Ashly McFarlane (2017, M.S.) and **Brian Smoliak** (2013, PhD) co-founded Two Degrees Adapt, a startup research and consulting firm based in Minnesota. Their team combines climate science and technology to make climate resilience actionable for clients in the public and private sectors.
www.twodegreesadapt.com

David Mechem (2003, Ph.D.) is in his second year serving as Chair of the Department of Geography and Atmospheric Science at the University of Kansas. He is maintaining a small but active research group exploring dynamics and microphysics of boundary-layer clouds.

Jack Paris (1963, B.S.) served as a USAF Weather Officer until 1966.

After receiving his Ph.D. in meteorology from Texas A&M he has worked as a Remote-Sensing Scientist in various roles with Lockheed, University of Houston, NASA's Jet Propulsion Lab, and Cal State University. He currently serves as President of ParisLab, Datum Geospa-

tial, a startup focused on satellite, aircraft and drone mapping.

Mark Williams (1985, M.S.) after returning home to Australia worked mostly in Melbourne, training weather forecasters and then managed the Victorian State

office of the Bureau of Meteorology. He gave evidence to a commission of enquiry into some very bad bushfires which occurred in 2009 in southern Australia. Mark is currently retired and is leading a relatively quiet life with his family in Melbourne, Australia.

Awards & Scholarships

Undergraduate Awards & Scholarships

Bruce Caldwell Memorial Scholarship Fund: **Noah Asch**

College of the Environment Scholarship: **Abigail King**

Genevieve & Drew Hamilton, Sally Schoenberg and Randy Poteet, and Atmospheric Sciences Undergraduate Scholarships: **Ryan Boyd**

Mary Gates Scholars: **Surabhi Biyani** (Bitz), **Christine Neumaier** (Thornton), **Rose Schoenfeld** (Swann) and **Linh Vu** (Fudge)

Mindlin Endowed Fund for Undergraduate Student Support: **Rose Schoenfeld**

Nancy Wilcox Endowed Scholarship: **Raphael Bakin** and **Ella Coleman**

Phil Church Award: **Christine Neumaier**

Richard and Joan Reed Undergraduate Endowed Scholarship: **Zhuri He**

Graduate Fellowships & Awards

ARCS: **Nelly Emlaw** and **Zac Espinosa**

Joost A. Businger Endowed Fellowship, and Fulbright Scholarship: **Piero Rivas**

GO-MAP Graduate Excellence Award: **Terrell Wade**

Lorraine and Dennis Hartmann Endowed Fellowship: **Spencer Ressel** and **Terrell Wade**

William and Carol Lau Fellowship: **Celeste Tong**

Provost's Fellowship Award: **Nelly Emlaw**

National Defense NDSEG: **Vince Cooper**

NASA FINESST: **Andrew DeLaFrance** and **Yakelyn Jauregui**

Stephen G. Warren Endowed Graduate Fund: **Racine Nassau**

Undergraduate Research Symposium

Noah Asch (Alex Anderson-Frey)
Poster: Tornadoic Environments in the United States: An Exploratory Analysis

Surabhi Biyani (Cecilia Bitz)
Poster: Quantifying U.S. Extreme Precipitation Risks Using the GFDL SPEAR Large Ensemble

Anthony Edwards (Joe Finlon and Lynn McMurdie)
Poster: Atmospheric Instability and its Role on Precipitation Structures within an East Coast Mid-Latitude Cyclone

Rachel Fewkes (Shuyi Chen)
Poster: Toward Better Understanding Flooding from Hurricane Harvey (2017): Uncertainty in Rainfall Estimates

August Mikkelsen (Rob Wood)

Poster: Analysis of Mixed-Phase Clouds via Surface Raman Lidar and Spaceborne Lidar Feature Extinction Profiles

Christine Neumaier (Joel Thornton and Michael Diamond)

Poster: Human Activity and the Electrification of Storms: Leveraging Natural Experiments Related to COVID-19 and Policy Changes

Calen Randall (Cliff Mass)

Poster: The 'Blob' and Beyond: An

Analysis of the Climate Signal Between Northeastern Pacific Sea Surface Temperatures and Washington State Minimum Temperatures

Sara Salimi (Ursula Jongebloed, Becky Alexander and Ed Blanchard-Wrigglesworth)
Poster: Variability of Biogenic

Source of Sulfate from 1200 C.E. to Present in a Greenland Ice Core

Rose Schoenfeld (Abby Swann)
Poster: Identifying the Effect of Forest Loss on Climate

Mika Vogt (Rob Wood)
Poster: Changes in Aerosol Affects Regional and Global Precipitation Patterns: An Atmospheric Energy Budget Perspective

Linh Vu (TJ Fudge - ESS)
Poster: Detection and Change of Volcanic Signals at Depth in Antarctic Ice Core Data

Alanna Wedum (Yuk Chun Chan and Becky Alexander)
Poster: Production of Perchlorate in Planetary Atmospheres: Relating Perchlorate Ice Core Records to Polar Stratospheric Ozone

Congratulations to Our Graduates!

Bachelor of Science

Surabhi Biyani
Matthew Charchenko
Adam Collins
Quinn Damon
Preston Fiedler
Jesus Gallegos
Yu-Chi Kuo
Runjing Li
Tyler Liu
Ryan Lowery
Kristan Lund
August Mikkelsen
Christine Neumaier
Benjamin Ramsay
Calen Randall
Sara Salimi
Haley Staudmyer
Sang Tran
Zipei Zhang

Master of Science

Travis Aeronson, When Will MISR Detect Rising High Clouds? (Marchand)

Yuk Chun Chan, Heterogeneous nitrate production mechanisms in intense haze events (Alexander)

Andrew DeLaFrance, Orographically Modified Ice-Phase Precipitation Processes During the Olympic Mountains Experiment (McMurdie)

Carley Fredrickson, Evolution of Secondary Organic Aerosol Composition, Volatility, and Absorption During Oxidation of Phenolic Compounds Under Conditions Relevant to Biomass Burning (Thornton)

Daniel Lloveras, Atmospheric predictability is insensitive to the slope of the background kinetic energy spectrum (Durrán)

Jacqueline Nugent, Assessment of Convectively Generated Tropical Cirrus in Global Storm-Resolving Models (Bretherton)

Philip Rund, Source Apportionment of Organic Aerosol Mass: Evaluating Molecular Composition-Based Methods (Thornton)

Clayton Sasaki, New Insights into the South American Low Level Jet from RELAMPAGO Observations (McMurdie)

Greta Shum, Beautiful Days in the Neighborhood: Modeling Self-Perpetuated Climate and Forest Expansion during the Mid-Holocene (Swann)

Lindsey Taylor, Skillful Coupled Atmosphere-Ocean Forecasts on Interannual to Decadal Timescales Using a Linear Inverse Model (Hakim)

Samantha Turbeville, The Life Cycle of TTL Cirrus: A Model Evaluation using the DYAMOND Simulations (Ackerman)

Doctor of Philosophy

Kelly Balmes, The Aerosol Direct Radiative Effect at the ARM SGP and TWP Sites (Fu)

Robert Conrick, A study of the fidelity of simulated warm rain microphysics over the coastal terrain of the Pacific Northwest (Mass)

Michael Diamond, On the role of natural laboratories and natural experiments in elucidating cloud aerosol-climate interactions: A story of ships, smoke, and shut-downs (Wood)

Ryan Eastman, On the Evolution of Stratocumulus in the Subtropical Oceans: Modeling Challenges

and Transitions in Cellular Organization from a Lagrangian Framework (Wood)

Callie McNicholas, Characterizing Mesoscale Pressure Features with Bias Corrected Smartphone Pressures (Mass)

Jonathan Metz, Local and Upscale Impacts of Airflow over Mountains: Finite-Amplitude Dynamics and Downslope Windstorm Predictability (Durran)

Samuel Pennypacker, Exploring the Interface of Land-Atmosphere

Interactions and Boundary Layer Cloud Physics (Wood)

Wei-Yi Cheng, Lightning Parameterization and Prediction: Conventional and Data-Driven Approaches (Kim)

Welcome New Graduate Students 2021-2022

Nikhil Dadheech (Turner, Thornton)
Nelly Emlaw (Kim)

Zac Espinosa (Bitz)
Ariel Jacobs (Chen)
Amy Liu (Swann)
Alli Moon (Alexander)
Racine Nassau (Jaegle)
Spencer Ressel (Kim)
Piero Rivas (McMurdie, Anderson)

Ejha Siadari (Chen)
Becca Stout (Roe)
Morgan Tatum (Wood)
Celeste Tong (Wood)
Terrell Wade (Hakim)
Chris Wright (Lyatt)

Our Gratitude to our Donors & How to Make a Gift

We thank all who have generously supported us throughout the year. Your gifts strengthen the core of the UW through recruitment and retention of world-class students and faculty. Your support of undergraduate and graduate students helps to create the next generation of scientific leaders.

Please consider supporting the activities of the Department of Atmospheric Sciences next year to help ensure the department continues to be a leader in weather, climate, and air quality.

Your support can be directed to the department and students in specific areas of studies both for undergraduate and graduate students at <https://atmos.uw.edu/alumni-and-community/giving>.

To make your gift by phone, please call 1-877-UW-GIFTS (1-877-894-4387) or send a check to the address listed on the last page. Please indicate the fund you would like to support:

Friends of Atmospheric Sciences Fund – targeting high priority opportunities advancing faculty research and student learning.

Atmospheric Sciences Graduate Education Fund

Atmospheric Sciences Undergraduate Student Support Fund

Or one of many others at <https://atmos.uw.edu/alumni-and-community/giving>

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Please send alumni news, comments, questions, corrections, and address updates to atmos@uw.edu or call 206-543-4250.

Giving questions can also be referred to:
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