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UNIVERSITY OF WISCONSIN-MADISON

MAKING WAVES

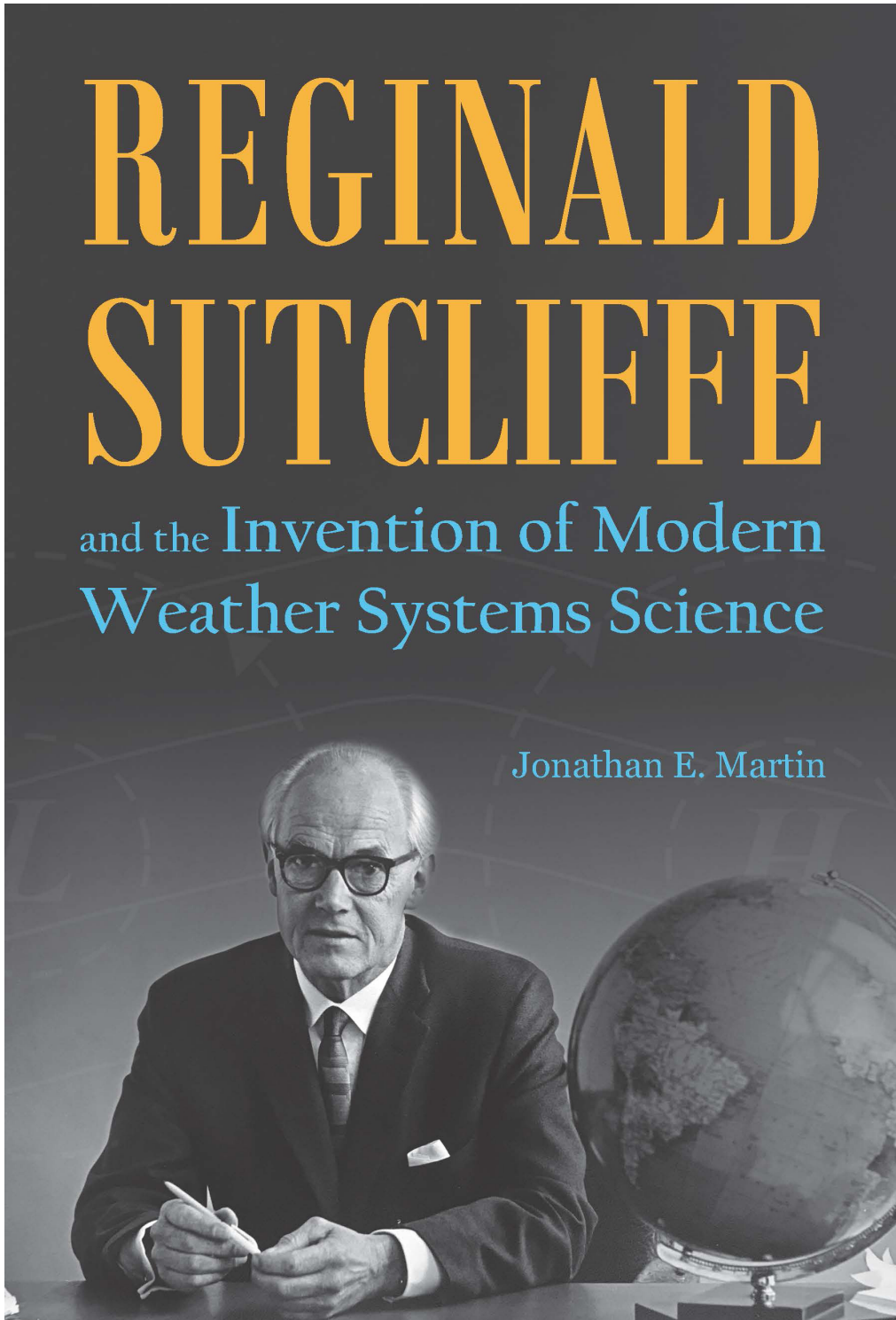
News for Alumni and Friends of the Department of Atmospheric and Oceanic Sciences

Fall 2020

REGINALD SUTCLIFFE

and the Invention of Modern
Weather Systems Science

Jonathan E. Martin



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CHAIR'S LETTER



This has been a year like no other. The Covid-19 pandemic turned the

academic world all over the nation upside-down, beginning last March. All of our classes at the UW, research, and other activities went 100% on-line following Spring break. Over the summer break, all AOS and most SSEC activities remained online. University supported travel was halted and for the most part, has not been restarted as I write this. Although we will continue teaching 50% of classes online through the spring 2021 semester, we expect to return to normal face to face classes in Fall 2021.

As a consequence of Professor Vimont winning University approval of a "Polar Cluster" hire initiative based in AOS and focusing on the polar oceans, we have made an accepted faculty offer to Dr. Hannah Zanowski and a pending faculty offer to another candidate that we will name in the near future. We have also brought on a 5th new faculty, Professor Angel Adames-Corraliza, formally at the University of Michigan, specializing in global telecommunication of weather and climate with the Madden-Julian Oscillation. The number of faculty in our Department has now recovered back to 17 or 18, depending on the final

faculty (Polar Cluster) hire now in progress.

We welcome Ms. Kaitlyn Heinlein to the AOS staff as the Program Manager for our new Professional Masters program that kicked off last December. Although it was too late to bring in a full class of new PM candidates last Fall, we do have our first PM class in residence this year.

Over the summer, our Department Manager, Ms. Chelsea Dahmen was promoted to an administrative position in SSEC and was replaced by Ms. Christi Balas Levenson, formerly our AOS financial specialist. Finally, I am stepping down as Department Chair on January 1 at which time Professor Michael Morgan will take over the chair position. It has been a rewarding 4 1/2 year term as Department Chair and I look forward to resuming my full research and teaching activities in the Spring.

On, Wisconsin!

Gregory Tripoli, Professor and Chair

Design: Sarah Morton, College of Letters & Science
ON THE COVER Book cover written by Jonathan E. Martin

Save the date

The best social gathering at the annual American Meteorological Society meeting is scheduled for

**Wednesday, January 13th
from 7-9pm(CT),**

Although this year will be a virtual reception, the tradition of great conversation will continue as we share memories and catch up on the news in each other's lives. We hope you will join us!

Join the Zoom Meeting
<https://go.wisc.edu/60srzx>
Meeting ID: 935 6653 2804
Passcode: 265550

New Graduate Program Update

By Kaitlyn Heinlein, Professional Master's Program Coordinator

We are finally underway! Despite the pandemic, the inaugural cohort of the new Professional Master of Science (M.S.) Program commenced this fall with three strong students. They are currently working through the program's intensive course sequence, with all three specializing in the Meteorological Forecasting and Modeling pathway. As the New Year approaches, the students are looking forward to finding internships for summer 2021. Please reach out to us (profms@aos.wisc.edu) if you can offer one, in-person or even remote-based. We would love for our students to make great connections and learn from our amazing alumni. Recruiting for next year's class is ongoing. We recently hosted an informational webinar internally

for UW-Madison students, and now we are hoping to host another for students everywhere. Admissions are open, and applications are quickly flowing in. If you know anyone who may be interested in the program, please encourage them to check out our website (<https://www.aos.wisc.edu/academics/profms/>) and apply! Professor Jonathan Martin, the program faculty director, and I have enjoyed getting the Professional M.S. off the ground this year, and we are very excited to keep moving forward. It is wonderful how seamlessly the program fits into the department, and more broadly, how it fills a niche in our discipline. We hope to see it continue to flourish in the many years to come!



Alumni Engagement Board

Greetings! The UWAOS Alumni Engagement Board continues its work to foster relationships between students, department, and alumni, despite the ongoing pandemic. Brian Miretzky was able to attend the annual AMS meeting and UWAOS reception on behalf of the board, registering additional alumni and reaching out to current students to let them know we are here to help. Virtually, co-chair Kris Craven presented to the capstone seminar, and Brian Miretzky spoke remotely to the graduates on graduation day. We also started a twitter feed, to post job opportunities, internships, or other information keeping students and alumni connected - follow us at @UWAOS_AEB! While the fall open house at homecoming was cancelled, the board would like to keep this as an annual event as a way to gather alumni back to the department, and build relationships that take this program into the future. If you have job opportunities, internships, fundraising ideas, or other information you like to see passed between alumni and students, please let us know! Current members: Kris Craven (co-chair), Jennifer Zeltwanger (co-chair), Brian Miretzky, Pete Pokrandt, Alan Robock, Daniel Knuth, Kaitlyn Krzyzaniak, Brett Hoover, Skylar Williams, James Simkins, Joshua Weber

Reginald Sutcliffe and the Invention of Modern Weather Systems Science

By Jonathan E. Martin

Less than a century ago, a forecast of the weather for tomorrow or the next day was generally considered a practical impossibility. During the intervening decades a remarkable revolution has taken place such that today a weather forecast out to 5 or so days is so routinely accurate in its broad contours as to be taken for granted. This revolution is partly the result of the pursuit of deeper theoretical understanding of the atmosphere. Just after receiving the news that I would be joining the faculty in AOS, I began to put my notes together for my first AOS 452 to be taught in Fall 1994. As I did so, I gradually became aware of the fact that Reginald Sutcliffe had almost singlehandedly developed modern dynamical meteorology as it pertains to the study of synoptic-scale weather systems. Sure, there were others of great note – Sawyer, Eliassen, Petterssen etc - but no other single individual seemed to have made more fundamental contributions on the dynamics of weather systems than Sutcliffe. Despite this apparent truth, it seemed that his reputation was of substantially lower profile than his contributions. In the rush of starting a career I had to place this incongruity to

the side and get on with the business of preparing a course.

Nearly 20 years later, after a prolonged term as Chair of AOS, I was finally able to consider a sabbatical leave. For a variety of reasons I had not taken one before and so began to wonder what I would do with the time away from teaching. My mind went back nearly immediately to Sutcliffe. I eventually decided that I wanted to spend the year researching and writing a cradle-to-grave biography of this underappreciated luminary in our science. Thus, in Fall 2014 I began what would eventually be a 6 year project by making my first trip to England on the trail of this giant. The first trip brought me to the University of Reading at which Sutcliffe established the now internationally renowned Department of Meteorology. From that initial trip I ended up making 5 others -over a period of 4 years - to conduct interviews, spend hundreds of hours in libraries and archives, and get to know Sutcliffe's two daughters and their respective families. The project has been life changing for me and has resulted in the forthcoming book *Reginald Sutcliffe and the Invention of Modern Weather Systems Science* (Purdue University

Press) which will be available on March 15. The book details Sutcliffe's life and his ideas, but also illuminates the impact of social movements, and the larger forces that compel them, on shaping his consequential life.

The book makes the case that three important advances guided the development of the modern dynamic meteorology that led directly to the astounding progress in weather forecasting and that Sutcliffe was the pioneer in all three of these foundational developments. In an age where nearly everyone can cast a quick glance at a mobile phone to acquire accurate weather forecast information, where responsible governments seek scientific answers regarding the likely ramifications of global warming, and where an enormous fraction of the global economy depends on the current and future weather, Sutcliffe's story is timely. It my hope that shining a light on Sutcliffe's life and work will, in some way, inspire a renewed appreciation for the human dimension in progress and the rich legacy bequeathed to societies wise enough to fully embrace investments in education and basic research.

AMS 2021 UW-AOS Alumni Reception

The 2021 AMS UW-AOS Alumni virtual reception will take place from 7:00-9:00 PM CST on Wednesday, January 13, 2021. Join us to hear what's going on in the department, meet up with old friends and meet new friends! You do NOT need to be registered for the AMS Annual Meeting to attend this event.

Please take a moment to register for the event if you plan to attend, so we have some idea on how many to expect - although you are still welcome to attend even if you don't register!

The registration link and additional details including the event link when available can be found at <https://www.aos.wisc.edu/alumni/reception2021>

AOS Hiring in Polar Climate!

By Dan Vimont

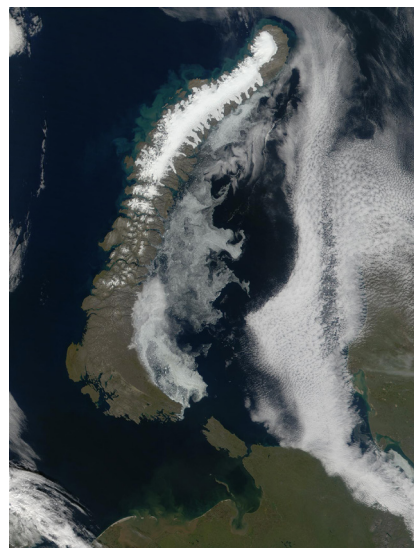
We at AOS are excited to participate in a recent cluster hire aimed at advancing our understanding of polar climate, and are thrilled to announce that Dr. Hannah Zanowski will be joining this effort!

Earth's polar regions are at the frontier of profound global change. As our planet continues to warm, the polar cryosphere (land and sea ice), ocean and atmosphere, and ecosystems face accelerated changes that are unprecedented in human, and even geologic history. The processes that determine the future of the polar cryosphere, ocean, atmosphere, and

ecosystems, are intricately coupled, and as such require novel approaches to advance our understanding.

The Emerging Polar Regions" cluster hire joins a diverse landscape of existing and historical strengths in diverse aspects of polar research here in Atmospheric and Oceanic Sciences, the Center for Climatic Research, and at UW-Madison. As part of the cluster hire, UW-Madison will be hiring a new group of scientists focused on polar ecology, ice sheet modeling, and polar climate modeling. AOS is happy to partner with the Center for Climatic Research to

welcome these new hires, and we look forward to providing our students with new educational and research opportunities.



Alumni Awards

Please notify the AOS Department if you or one of our other alum receive an award at: aos@aos.wisc.edu

Faculty Awards

Tracey Holloway and Tristan L'Ecuyer, AGU's Atmospheric Sciences Ascent

Award for their excellence in research and leadership in the atmospheric and climate sciences.

Student Awards

Horn Scholarship Award: Grant Gilcrease

Sunkel Award: Cassidy Johnson

Johnson Scholarship Award: Jack

Richter

Lettau-Wahl Scholarship Award: James Mineau

Lettau Award: Austin Dixon

Schwerdtfeger Award: Andi Muttaqin

Wahl Award: Julia Shates

Department Student Service Award:

Megan Caldwell and Anne Sledd



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THANK YOU!

Ed Hopkins' Historical Corner

The Peshtigo Fire of 1871

National attention this past summer was directed to record wildfires in California and Colorado due to heat and drought. While Wisconsin in the relatively humid Midwest was not under fire danger, it has not always escaped major wildfires. In fact, the deadliest wildfire in America's history occurred in northeastern Wisconsin and adjoining counties of Michigan's Upper Peninsula on 8-10 October 1871, when between 1200 and 2500 people lost their lives and made 7500 were made homeless. Sixteen towns were burned in Brown, Oconto and Marinette Counties along the western side of the bay of Green Bay and in Door and Kewaunee Counties east of the bay. Up to 1.28 million acres were burned, an area larger than California's record August fire of 2020. The thriving village of Peshtigo (then Oconto, now Marinette County) was demolished, with as many as 800 of its 1750 residents dying on Sunday night, 8 October 1871, when a fire storm consumed the town. Although four other large fires burned simultaneously across Michigan, this conflagration now is known as the Peshtigo Fire. However, the famous Chicago Fire that occurred that same night originally took the limelight as telegraphic communications were disrupted by these two fires.



Image courtesy of the Print Collector, Getty images

The Peshtigo Fire and the other wildfires across Michigan were the result of several factors. Between

July and September, a persistent ridge of high pressure extended from the central Plains into the Midwest, leading to relatively warm and dry conditions across this region that extended into fall. Some Midwest locations saw little rain resulting in lower water levels and mild drought conditions. Furthermore, the forests of northeastern Wisconsin were being logged for timber, while settlers were clearing the land for agriculture and local industry. Wasteful land use practices meant that some of the discarded timber became fuel. Fires had been set to help clear this debris. Very low relative humidity was reported during the week prior to the fire, reducing the moisture content of dead logs, branches and duff on the forest floor. Smoke from several ongoing local fires was reported by the Smithsonian Institution volunteer weather observer at Embarrass in Waupaca County, 60 miles southwest of Peshtigo.

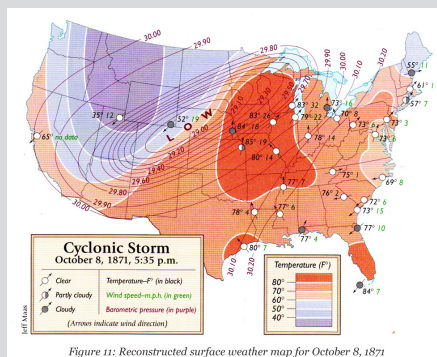


Figure 11: Reconstructed surface weather map for October 8, 1871
Tom Hultquist, SOO at NWS Twin Cities wrote in an article "The Great Midwest Wildfires of 1871" in the Nov 2015 issue of the Midwest Regional Climate Center's "The Climate Observer."
https://mrcc.illinois.edu/cliwatch/eNews/observer_201511_full.html

Ultimately, a strong autumn low pressure system helped create conditions that triggered a blowup or rapid widespread of the wildfire on 8 October 1871. A fire storm was created that generated its own weather. According to U.S. Signal Service's daily surface weather maps, a low-pressure system was deepening

over Minnesota on the evening of the 8th, while a high-pressure system was centered over the Southeast. The pressure gradient between the high and the low tightened, strengthening the southwest winds over most of Wisconsin and Michigan. A cold front was developing. The Signal Service weather observer in Milwaukee reported winds from the south and southwest on Sunday afternoon at 32 mph. At Embarrass the temperature on Sunday afternoon reached 75 degrees ahead of the cold front. By evening, strong winds possibly associated with a low-level nocturnal jet fanned the smoldering fires, creating a firestorm along a swath 40 miles long and 10 miles wide across Oconto County. Peshtigo was consumed in less than two hours by a wall of fire. Embers were carried great distances by firestorm winds across Green Bay to Door County, where the community of Williamsonville was consumed by a fire whirl, or a whirlwind vortex generated by the fire. Tornado Memorial County Park, where 60 fire fatalities are memorialized, now stands near the site of Williamsonville. The fires also created hot volatile gases that were lethal.



Map showing the burnt area of the Peshtigo fire.

Image courtesy of www.exploringoffthebeatenpath.com

Japan 2020

By Matthew Hitchman

I visited Japan during January - March 2020, as part of my sabbatical for spring semester. It was an honor to be invited to teach the very first geophysical science course in English at Kyoto University. My goals for the semester included completing a textbook on global change and completing research collaborations on the effects of the stratospheric quasi-biennial oscillation (QBO) on the tropical and subtropical tropopause upper troposphere and lower stratosphere (UTLS). Over the past 25 years in teaching AOS/NIES 171 at the UW-Madison, I developed a global change textbook. It was good to have the opportunity in January to finalize the last few chapters. In considering quantitative updates to the text over the past decade, it is particularly striking how anthropogenic global carbon emissions have increased from 6 Gt/yr to 12 Gt/yr. Another striking change is the transformation from the U.S. importing almost all of its fossil fuels to becoming a net exporter.

Recently Kyoto University was asked by the central Japanese government to explore transitioning toward teaching classes in English. As part of their two-year experiment, I was given the opportunity to teach an intensive lecture course on global change in English to Japanese undergraduate and graduate students. During the eleven-day period February 10-20, I gave two 90-minute lectures per day, covering an entire semester of course material. Their range in English-speaking ability was broad. I learned a lot about differences in the educational culture between Japan and the U.S. In late February, I participated in the SATIO-TCS (Stratospheric and Tropospheric Influences on Tropical Convective Systems) SPARC (Stratospheric Processes and their Role in Climate) workshop in Kyoto, as part of the steering committee. I gave a presentation on the effect of the stratospheric QBO on tropical deep convection. I had submitted a paper on this topic in 2000. The reviewers recommended publication, but the Editor took the remarkable step of rejecting the paper because he did not believe in such a thing. I am glad to say that the community has finally “come around”. Through collaboration with colleagues from Japan, India, the U.K., and Canada, whose updated global analyses validated my original findings and revealed new aspects, I completed an invited review paper on the observational history of the influence of the QBO on the tropical and subtropical UTLS. The publication process

had many novel components. I am happy to say that it will be published in the April 2021 volume of JMSJ.

I also prepared two lectures for the Asian International Spring School for graduate students and Post-docs, which was supposed to occur during March 9-11. These lectures, intended for young researchers throughout Asia, were on the topics of “Volcanic Eruptions and the General Circulation” and “On the Cause of Millennial-scale Climate Variations”. However, the Spring School was cancelled due to the COVID virus. I distributed the lectures electronically to the students that would have participated. During the week approaching my departure on March 13, it was interesting to be in a hotel with no other guests and to hear that the U.S. may not allow re-entry.

The early spring snow showers that tumbled over the western mountains into the valley were wonderful. Sometimes on the banks of the Kawagama river, it could be quite warm in the afternoon sun. Perhaps you might enjoy an egg salad sandwich from Lawson Station - I can relate to Anthony Bourdain’s rapturous descriptions of them. My commute took me through the Imperial Palace Gardens on the way to and from Kyoto University. Sheltered somewhat behind the stone walls, the plum, cherry, and peach trees started blooming in early February, frequently visited by appealing white-eyed green vireos (mejiro). If you do get to Kyoto and are a competent, yet prudent cyclist, don’t listen to what anyone says – get a bicycle! It is some of the most fun I’ve ever had riding in a city.

No samurai swords?
Bicycles slicing quickly
Through Hyakumanben

There is a large “okii” symbol on the hill to the east – the Daimonji – which I liked to climb and enjoy the view of Kyoto. One evening coming down

Two doves flew between
Venus and the crescent moon
Sunset Daimonji

I hope to be able to visit there again someday.



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C V P E L L E T S Q W I H J U
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|--------------|-------------|------------|----------|
| condensation | diamonddust | snowflakes | humidity |
| moisture | drizzle | pellets | sleet |
| vapor | water | rain | graupel |
| fog | ice | hail | |