12TH ANNUAL GREAT LAKES ATMOSPHERIC SCIENCE SYMPOSIUM

Conference Agenda

State University of New York at Oswego

November 5, 2022

Oswego State Student Chapter of the American Meteorological Society and National Weather Association

President Kaitlyn Jesmonth | E: osscams@oswego.edu

Dear Colleagues,

On behalf of the Oswego State Student Chapter of the American Meteorological Society and National Weather Association, it is my pleasure to welcome you to the 12th Annual Great Lakes Atmospheric Science Symposium (GLASS).

This symposium is truly a unique opportunity where we are able to bring together individuals from numerous sectors across the field of meteorology. Collaboration at its best is a way to help advance our science. The GLASS aims to promote the sharing of research among several different facets of meteorology while encouraging the next generation of scientists. Students will be exposed to a wide breadth of topics and gain valuable insight through this event. Our afternoon panel featuring representatives from academia, the private sector, broadcasting, and the government promotes discussion and direct interactions between students and professionals alike. It also gives students an opportunity to explore a variety of career paths.

Our keynote speaker this year, Tom Niziol, is a 1977 graduate of the SUNY Oswego meteorology program. He is a former on-air winter weather expert at The Weather Channel and has previously served as a Meteorologist-in-Charge at NWS Buffalo. Currently, he is semi-retired as a meteorological consultant for weather analysis in litigation, forensics, and science specials on several television networks. We are so thankful for his continued support of our program and are very fortunate to have him joining us.

I would like to thank our entire Oswego State AMS & NWA club along with our advisor, Dr. Katelyn Barber, for their hard work in organizing this symposium. It takes an immense amount of effort to put on such an event and I am forever grateful for their dedication toward making this year's GLASS a success. The club also would like to extend a special thank you to the SUNY Oswego Student Association which provides a portion of the funding to host GLASS. Lastly, I would like to personally thank all of the presenters, panelists, and attendees for making this year's symposium the biggest we have ever had! We hope you find this year's GLASS to be a meaningful experience and that you will return again in 2023 for the 13th Annual Great Lakes Atmospheric Science Symposium!

Sincerely,

Kaitlyn Jesmonth

Kaitlyn Jesmonth
OSSCAMS President

The 12th Annual Great Lakes Atmospheric Science Symposium is hosted by:

Kaitlyn Jesmonth	President
Dan Hummel	Vice President
Tommy Cerra	Treasurer
Aidan Alwang	Secretary
Kayla Lewis	Public Relations
Jake Rumowicz	Community Outreach
Michael Pagnanelli	Reservations Coordinator
Elijah Sumner	Webmaster
Evan Biedron	Webmaster-in-Training
Dr. Katelyn Barber	Faculty Advisor

A Special Thank You…

Mr. Tom Niziol

SUNY Oswego Box Office

SUNY Oswego Student Association

SUNY Oswego Department of Atmospheric and Geological Sciences

All presenters and attendees for making this conference possible!

Great Lakes Atmospheric Science Symposium

Conference Agenda

Saturday, November 5th, 2022

Location: Shineman Center Auditorium (Shineman 122)

8:00-8:30 Check-in

8:30-8:40 Opening Remarks
Kaitlyn Jesmonth and Dan Hummel; SUNY Oswego

8:40-9:00 Forecast Discussion
Dan Hummel and Michael Pagnanelli; SUNY Oswego

Session I: Climate and Observations

9:00-9:15 *Seasonal, Interannual, and Decadal Variability and Long-Term Trend of Ice Cover in Two Regions of Lake Superior, 1973-2022*
Shaun Laurinaitis, SUNY Oswego

9:15-9:30 *Evaluation of the National Water Model in the East River Watershed*
Rachel Palladino, Northern Vermont University-Lyndon

9:30-9:45 *Trends in Cold Season Tornadoes in the Contiguous United States, 1950-2021*
Garrett Statum, SUNY Oswego

9:45-10:00 *What is the NYS Mesonet?*
Sam Cherubin, New York State Mesonet

10:00-10:20 Break

Session II: Severe Weather

10:20-10:35 *Wake Depression of 7 September 2020 in Western NY*
Jon Hitchcock, NOAA National Weather Service, Buffalo, NY

10:35-10:50 *A local verification study of convection-allowing model performance during convective events in eastern New York and western New England*
Michael Evans, NOAA National Weather Service, Albany, NY

10:50-11:05 *2021 NOAA/NWS SPC Day 1 Fire Weather Outlook Verification*
Evan Belkin, SUNY Albany

11:05-11:20 *Ten Years of Wireless Emergency Alerts*
Judy Levan, NOAA National Weather Service, Buffalo, NY

11:20-11:35 *Aftermath of the September 25 Walton Tornado*
Ben Lott, NOAA National Weather Service, Binghamton, NY

Lunch Break

11:35-1:00 *No organized functions during this time*

Session III: Tropical Weather

1:00-1:15 *Analysis of Environmental Factors Contributing to the Eyewall Replacement Cycle of Hurricanes*
Martha Christino, Pennsylvania State University

1:15-1:30 *A Structural Analysis of Hurricane Dorian (2019) During Rapid Intensification*
Bruno Rojas, Pennsylvania State University

1:30-1:45 *An Analysis of Several Subtropical Cyclones in the Southeastern Pacific Ocean*
Cameron Wunderlin, University of Nebraska-Lincoln

1:45-1:55 Break

Session IV: Career Panel

1:55-2:35 *Question and Answer Panel Discussion*
Liam Healy, Robert Reale, Dr. Katelyn Barber, Michael Evans

2:35-2:45 Break

Session V: Lightning

2:45-3:00 *Increases of fecal indicator bacteria in coastal regions following the CZU Lightning Complex and Thomas wildfires in California*
Madison Roy, Northern Vermont University-Lyndon

3:00-3:15 *Geostationary Lightning Mapper (GLM) Trends Prior to Tornadoes Associated with Landfalling Tropical Cyclones in the U.S.*
Gabrielle Brown, Northern Vermont University-Lyndon

3:15-3:30 *Overview and initial results from the 2022-23 Lake-Effect Electrification (LEE) study in the Lake Ontario region*
Dr. Scott Steiger, SUNY Oswego

3:30-3:45 *Probing the microphysics of electrification in lake effect snow with Project LEE*
Dr. Eric Bruning, Texas Tech University

Session VI: Project LEE

3:45-4:15 NSF Project LEE Open House
Dr. Scott Steiger, Dr. Yonggang Wang, Dr. Eric Bruning

Dinner & Keynote Speaker

Oswego Country Club
610 West First Street, Oswego, NY

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5:00-7:00 *The United States - A Natural Weather Laboratory*
Mr. Tom Niziol

Doors open at 4:30 pm.

Keynote Speaker

Tom Niziol

Tom Niziol has been fascinated with snow since his childhood days in Buffalo, NY. He holds a B.S. in meteorology from SUNY Oswego. Most recently, Tom was the national on-air Winter Weather Expert at The Weather Channel from 2012 through 2019. He spent much of his career with the National Oceanic and Atmospheric Administration (NOAA) at the National Weather Service for over 30 years as a forecaster, Science Officer and Meteorologist-In-Charge at Buffalo, NY. Previous to that Tom was an Associate Atmospheric Scientist for Calspan Corporation where his research took him to Iceland, Alaska, the Pacific Ocean and Gulf of Mexico. He has authored several publications in atmospheric science journals on winter weather topics, especially in regards to lake-effect snow. Tom was a guest lecturer on winter weather forecast techniques for several years with UCAR's COMET Program in Boulder, Colorado. He contributed to numerous science documentaries on networks including the BBC, History Channel, Discovery Channel and Dateline NBC. Tom was the recipient of several awards from NOAA, the National Weather Association (NWA), and the American Meteorological Society including the Francis W. Reichelderfer Award for research leading to substantial improvement in the prediction of snowstorms influenced by the Great Lakes. He is currently semi-retired and is a meteorological consultant for weather analysis in litigation, forensics and science specials on various television and cable networks. You can learn more about Tom's weather passions at his blog itsallweather.blogspot.com.

Liam Healy

Liam Healy is currently a broadcast meteorologist and multimedia journalist at News 8 WROC in Rochester, NY. His career in broadcast meteorology began at SUNY Oswego when he joined WTOP-10, the on campus television station in Fall of 2017. Prior to graduating from SUNY Oswego in 2020 with his degree in Meteorology, he freelanced with Spectrum News Syracuse over the winter of 2019-20. After graduation, Liam moved to southern West Virginia where he served as the morning meteorologist at WVNS-TV for two years up until May of 2022 before moving back to New York to work in the Rochester television market.

Robert Reale

Rob is the Director of Meteorological Services at a private weather consulting firm, WeatherWorks, located in northwest New Jersey. Rob began his journey at WeatherWorks as an intern while attending Rutgers University. Upon graduation in 2010, he began working full time, initially as an associate meteorologist. Since then, he's been involved in social media, forensics and snowfall verification, but has taken on an expanded role within forecasting and operations. His main responsibilities include leading the team of over 30 meteorologists while providing training and mentoring of the staff. He is also in charge of recruiting and hiring, and has developed a relationship with many Oswego students over the years. Outside of work, Rob enjoys keeping busy with various activities, most recently pickleball. Otherwise, you'll likely find him spending time with his family, especially his dog, Fallon!

Dr. Katelyn Barber

Katelyn Barber received her B.S. Degree in Meteorology from the State University of New York at Oswego in 2013 and her Master's and PhD in Atmospheric Sciences from the University of North Dakota in 2015 and 2019, respectively. Following her PhD, Barber was a postdoctoral research associate at the Pacific Northwest National Laboratory in the Atmospheric Sciences and Global Change division. During this time, she studied the influence of modernized boundary layer parameterizations on transitioning cloud populations in the Amazon and environmental conditions that favor convective initiation in model ensembles. Her research interests also include convectively induced turbulence prediction using high-resolution numerical simulations for aviation avoidance. Barber joined the meteorology faculty at SUNY Oswego in spring of 2022 as a tenure-track faculty member.

Michael Evans

Mike grew up in northern New Jersey hoping for snow storms but watching many storms change to rain as he was often just a little too close to the coastline. He attended Penn State in the early 80s, getting his B.S. degree in meteorology in 1985. He then worked for 3 years at AccuWeather before returning to graduate school and getting an M.S. from SUNY Albany in 1991. Mike started his NWS career in March, 1992 as a meteorologist intern in Charleston WV, then worked as a forecaster and lead forecaster at offices near Detroit and in State College, Pa. from 1994-2001. Mike became the Science and Operations Officer at the NWS office in Binghamton, NY in 2002, and has had the same position at the Albany office since 2017. During his career, Mike has forecasted for a wide range of storms, including winter storms, severe storms and flooding.

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Seasonal, Interannual, and Decadal Variability and Long-Term Trend of Ice Cover in Two Regions of Lake Superior, 1973-2022

Shaun Laurinaitis
State University of New York at Oswego / CIGLR

Dr. Jia Wang
NOAA Great Lakes Environmental Research Lab (GLERL)

Dr. David Cannon
CIGLR

In the Laurentian Great Lakes, annual ice cover has significant impacts on local weather, ecology, and shipping infrastructure, motivating studies of long-term trends and interannual variability of ice climatology. This study updates the current ice climatology for two regions in Lake Superior: Whitefish Bay and the Apostle Islands National Lakeshore. This work's data is essential to stakeholders in both regions as the ice cover data is used in both policy making and management support. The long-term trend in ice cover also provides a look at possible climate forcings and changes due to climate warming.

Daily ice cover data between 1973 and 2022 was analyzed using ice charts created by the National Ice Center (NIC). Data for each region was examined separately to look for trends in annual average ice cover (AAIC), annual maximum ice cover (AMIC), and the duration of ice cover. The 50-year ice cover climatology for each region was also created. From the 50-year dataset, it was found that a significant negative trend in AAIC and the duration of ice cover existed in both regions. Missing ice cover values in earlier years of the dataset were also discovered, which impacts our results. When these missing values were filled in with representative climatology values, the magnitude of the negative trends increased in both regions. This indicates that the trends estimated from our initial analysis, as well as other similar studies, may be underpredicting the "true" ice cover trends in the nearshore waters of the Laurentian Great Lakes.

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Evaluation of the National Water Model in the East River Watershed

Rachel Palladino
Northern Vermont University at Lyndon

Dr. William R. Currier and Dr. Mimi Hughes
NOAA Office of Oceanic and Atmospheric Research

The East River Watershed (ERW) lies within the Colorado River Basin, where accurately modeling snowmelt is an essential part of water resource management. This study evaluates the accuracy of the National Water Model (NWM) in the ERW by comparing historical model reanalysis and operational analysis cycles to observations. Both the retrospective and operational analysis datasets from the NWM version 2.1 are compared to observations of snow water equivalent (SWE) and streamflow. Observations for SWE were obtained from the two Snow Telemetry (SNOTEL) sites located in the ERW and from Airborne Snow Observatory (ASO) flights. Streamflow data were obtained from the United States Geological Survey (USGS) gauge in Almont, CO. SWE from the NWM v2.1 is biased low overall, especially in the operational model runs. The underestimation from the NWM's SWE in the watershed is consistent with an underestimation of NWM streamflow. This study investigates why the NWM simulations of both SWE and streamflow in the ERW are biased low, and assesses whether forcing data can be improved, as well as where further study is needed.

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What is the New York State Mesonet?

Sam Cherubin
NYS Mesonet

The NYS Mesonet (NYSM) is an advanced, state-of-the-art, weather observation network across New York State. The word 'mesonet' comes from the meteorological definition 'mesoscale', which is a scale at which weather occurs, between 10-1000 km, and 'net' for network. Established in 2014, the NYS Mesonet comprises 126 standard sites, which measure your typical variables such as temperature, humidity, and wind speed, as well as soil conditions and even snow depth. These sites are scattered relatively evenly around NYS, and usually are within 15-17 miles of each other, hence the term 'mesonet'. In addition to the 126 standard sites, the NYSM has many sub-networks, designed for more specific scientific and research use, as well as Thruway roadside network and a small-scale "micronet" in NYC in partnership with utility provider Con-Ed. The sub-networks include upper-air profiler sites (17), flux (18), snow (21), Thruway (12) and Con-Ed/NYC (17). All the data is collected and sent over a cellular network, quality-controlled and displayed in real-time, 5-min for standard obs + flux, 10-min for profiler, and twice a day for snow, on our website at: www.nysmesonet.org.

12

Trends in Cold Season Tornadoes in the Contiguous United States, 1950-2021

Garrett Statum and Dr. Yonggang Wang
State University of New York at Oswego

Tornadoes in the United States are most common in a region traditionally referred to as Tornado Alley, typically defined as an area encompassing the Great Plains from Texas to Iowa. Recent tornado climatology studies suggest contiguous United States (CONUS) tornado activity is shifting to the east, with the most notable increases occurring in the lower Mississippi Valley region. With these annual tornado climatology trends in consideration, this study focuses on the cold season (NDJF) to determine statistical trends in tornado activity, including spatial shifts in tornado reports, tornado frequency, and intraseasonal variability. Using the NOAA Storm Prediction Center's comprehensive tornado database, this study provides a climatology of cold season tornado outbreaks from 1950-2021. The results of this study are critical for a great portion of the CONUS that is routinely subject to cold season severe weather outbreaks, especially to those living in the more densely populated Southern and Midwestern U.S. Cold season tornadoes often catch residents by surprise due to existing bias about the lack of severe weather during the coldest months of the year. With favorable tornado environments spatially shifting and warmer than average winters becoming more common, this study aims to increase awareness of cold season severe weather, especially as regions previously at lesser risk are impacted by our changing climate.

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Wake Depression of 7 September 2020 in Western New York

Jonathan Hitchcock
NOAA / National Weather Service, Buffalo, NY

During the morning hours of 7 September, 2020 a decaying Mesoscale Convective System (MCS) crossed Western New York. A wake depression at the trailing edge of stratiform rain produced locally strong wind gusts of up to 27 m/s (60 mph) and numerous instances of wind damage. This presentation will examine the synoptic and mesoscale setting of the event, provide a basic review of wake depression dynamics, and show detailed observations from New York State Mesonet stations which recorded the passage of the meso-high and wake depression associated with the decaying MCS.

Ten Years of Wireless Emergency Alerts

Judith Levan
NOAA / National Weather Service, Buffalo, NY

As operational meteorologists we strive to produce the most accurate forecast. This is especially true when we are forecasting weather that threatens life and property. The most accurate forecast however is of little value if the message is not received and acted upon. The communication and dissemination of the message is just as critical as the forecast and its impacts. The first Wireless Emergency Alert (WEA) was issued in June of 2012. Since then over 60,000 WEAs have been issued. In this presentation we will look at the history of WEA messages, how they have evolved over the past ten years, and what the future may hold for these messages.

14

A local verification study of convection allowing model performance during convective events in eastern New York and western New England

Michael Evans
NOAA / National Weather Service, Albany, NY

Convection Allowing Models (CAMs) have become an increasingly utilized tool for forecasters to anticipate the development and evolution of convective weather during the past several years. During this period of time, formal and informal evaluations of CAMs during convective weather events have been performed at test beds, universities, modeling centers, and forecast offices. This presentation describes a study recently completed at the National Weather Service Forecast Office in Albany, NY (NWS ALY) on the performance of the 3 km NAM nest and the HRRR models during several convective events that occurred in eastern New York and western New England during the warm season of 2021. The study utilized subjective evaluations from forecasters with a wide range of experience levels, using a methodology similar to evaluations done at NOAA's Hazardous Weather Testbed. Participating forecaster's experience level in this project ranged from undergraduate students, to National Weather Service forecasters with over 20 years of experience.

The study evaluated CAM forecasts from 32 events that included at least one report of severe weather or one report of flash flooding in the NWS ALY county warning area (CWA) during the 2021 warm season (severe cases). In addition, 16 cases were evaluated when NOAA's Storm Prediction Center forecasted at least a marginal potential for severe storms in the NWS Albany CWA, but no reports of severe weather occurred (null cases). For each case, forecasters evaluated CAM-forecasts for the magnitude of coverage of convection across the study area, timing of convection, and forecasts of convective mode (ie. linear vs. discrete). Results from the study indicated that CAM-forecast coverage tended to be slightly underdone for severe cases, but substantially overdone for null cases. The 00 UTC HRRR model was most overdone with coverage during null events. Both the NAM nest and HRRR tended to be too slow with timing of convection during severe cases, and no timing bias was evident for null cases. Finally, the NAM nest and HRRR model forecasts appeared to be of similar quality regarding storm evolution during severe cases. There did appear to be a tendency for the HRRR model's forecasts of convective evolution to improve from the 00 UTC to the 12 UTC run times, while no such improvement was noted with the NAM nest.

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2021 NOAA/NWS SPC Day 1 Fire Weather Outlook Verification

Evan Belkin
SUNY Albany

The NOAA/NWS Storm Prediction Center (SPC) is responsible for forecasting meteorological conditions that, when combined with antecedent dry fuels, result in a significant threat for the rapid growth and spread of wildfires across the contiguous United States (CONUS). The SPC issues three categorical risk areas in the Day 1 and 2 (defined as 12-12 UTC) Fire Weather Outlook Products: "elevated", "critical", or "extremely critical" for dry and windy conditions. The risk category depends on both the severity of the forecast weather and the fuel conditions relative to a given geographic region. A "critical" outlook will be issued when, in the judgment of the forecaster, sustained winds of 20 mph or greater (15 mph in Florida) are forecast, the minimum relative humidity is at or below the regional threshold, temperatures are above 50-60ºF (depending on the season), and the fuels are dry, all for a duration of at least three consecutive hours. This study aims to quantify and document the performance characteristics of the SPC Day 1 Fire Weather Outlook during the entirety of 2021.

Using surface data from the SPC's operational surface objective analysis system (sfcOA) archive and Energy Release Component (ERC) climatological percentile data from the Gridded Surface Meteorological (gridMET) dataset, the SPC "critical" fire definition was evaluated across the CONUS. Since "extremely critical" delineations are reserved for significant deviations from climatological normal, this study did not verify "extremely critical" conditions any differently from "critical" conditions. The Probability of Detection (POD), False Alarm Rate (FAR), and Critical Success Index (CSI) were calculated for each individual day in 2021 as well as the year as a whole. Performance diagrams were then created using these data and these results will be shown and discussed.

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Aftermath of the September 25 Walton Tornado

Ben Lott
NOAA / National Weather Service, Binghamton, NY

On September 25th, 2022, a surface low pressure system moved through New York. Co-located with this low, a cold front and warm front swept through Central New York. Storms developed ahead of the cold front in a marginally severe environment. While much of the convection associated with this system tracked through southeastern Pennsylvania, and New Jersey, one storm became severe in southern Broome County producing sub-severe wind gusts and one inch hail. This supercell underwent a cycling process where it weakened but then strengthened again once it entered Delaware County and approached the warm front and produced an EF-1 tornado near the town of Walton, NY. A review of this storm will look at the storm environment, radar data, the warning decisions that were made on assessments of the radar and near storm environment, and how operational forecasters cope with missed events.

Forecasters often hear comments from the public about being paid to be wrong when unpredicted events occur. Even with years of training and experience there will be events that may not be well forecasted or may not meet the warning decision thresholds that were covered in training. We will specifically highlight how this event affected the warning forecaster and how missed events can impact forecasters emotionally and mentally. Coping strategies and shared advice learned through the years will also be discussed.

17

Analysis of Environmental Factors Contributing to the Eyewall Replacement Cycle of Hurricanes

Martha Christino
Pennsylvania State University

Even the most advanced hurricane forecast models have difficulty predicting eyewall replacement cycles (ERCs) in tropical cyclones. Most research has attempted to solve this problem by working to understand the dynamic and kinematic drivers of an ERC. This project proposes an alternative approach focused on analyzing the changes in measurable environmental factors and utilizing a machine learning algorithm to predict the ERC. The aim of the first phase of this project is to establish which environmental factors are linked to the initial development of a secondary eye wall. Thirty-seven occurrences of secondary eyewall formation (SEF) in hurricanes between 1984 and 2018 were selected based on the criteria used in Sitkowski, et al. (2011). Each SEF event was matched with a similarly intensifying hurricane that did not experience a subsequent SEF event based on the year and storm intensity. Using environmental data from the Statistical Hurricane Intensity Prediction Scheme (SHIPS) predictor files, the change in each environmental variable at six-hour intervals for twenty-four hours before the start of SEF was analyzed. The environmental variables that experience the most significant change prior to SEF will determine which variables should be used as predictors in a machine learning program designed to predict SEF onset. The goal of this research is to create an algorithm capable of predicting a SEF event twenty-four hours in advance. This algorithm will be compared to existing statistical SEF prediction schemes. Predicting ERC events will allow hurricane track and intensity models to produce more accurate forecasts and emergency response centers to accordingly alter evacuation zones, resulting in decreased economic loss and fatalities.

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A Structural Analysis of Hurricane Dorian (2019) During Rapid Intensification

Bruno S. Rojas
Pennsylvania State University

Dr. Sim D. Aberson
NOAA / AOML / Hurricane Research Division

Hurricane Dorian (2019) was an Atlantic hurricane that underwent rapid intensification (RI) preceding the most damaging landfall to the northern Bahamas in recent memory. Part of the difficulty in understanding and predicting RI are structural changes to the hurricane. Two structural aspects are analyzed in this study: the alignment of a tilted vortex, and an early period of secondary eyewall formation.

This analysis was conducted using the Hurricane Ensemble Data Assimilation System (HEDAS), based on the Hurricane Weather Research and Forecasting model (HWRF). Depending on data availability, HEDAS is capable of assimilation of satellite derived atmospheric motion vectors, land based doppler radar winds, and data obtained from aircraft reconnaissance missions which includes flight level data, dropsonde data, and winds derived from the tail doppler radar (TDR).

Our findings show that during the period of vortex alignment, the vertical wind shear through two layers was opposite in direction, indicating this configuration may be favorable for vortex alignment. At the end of the RI period, an eyewall replacement cycle (ERC) took place, and HEDAS analyses are available. The analysis shows a secondary wind maximum and a mesoscale descending inflow feature in the rainband region. This demonstrates that HEDAS is capable of resolving these complex features.

19

An Analysis of Several Subtropical Cyclones in the Southeastern Pacific Ocean

Cameron Wunderlin
University of Nebraska-Lincoln

The southeastern Pacific Ocean is the oceanic region of the Southern Hemisphere located between the west coast of South America and 120°W. In recent years, several subtropical cyclones (SCs) have been observed in this region of the world, which is unprecedented. The scientific literature has not identified the southeastern Pacific as an ocean basin which is able to produce SCs and has in fact shown the region to be devoid of tropical cyclone (TC) activity. SCs are known to be precursors to TCs and are often an intermediate stage of the tropical transition (TT) process. Phase space analysis was carried out on three separate cases involving SC occurrence within the basin. Additional analysis was conducted on the environmental conditions which allowed for SC formation such as sea surface temperatures (SSTs), thermodynamic instability, and wind shear. The implications of these SC cases are substantial as the potential exists for new avenues of research to be pursued.

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Increases of fecal indicator bacteria in coastal regions following the CZU Lightning Complex and Thomas wildfires in California

Madison Roy
Northern Vermont University at Lyndon

Dr. Raphael Kudela and Mariam Ayad
University of California at Santa Cruz

Warming due to climate change is creating more extreme and catastrophic wildfires, especially in California. The CZU Lightning Complex (2020) and Thomas (2017) fires are in the top twenty largest wildfires in the state's history. The California Department of Environmental Health recommends avoiding water-related activities for 72 hours after heavy rainfall due to increased levels of potentially dangerous bacteria, which are tracked using fecal indicator bacteria (FIB). With California's dry climate, heavy rainfalls flood streams and rivers, transporting bacteria built up over time and leaving little water to soak up into the ground. When fires burn, the intense heat changes the chemistry of the soil and creates a hydrophobic layer at or just below the surface, meaning the soil is no longer able to absorb any water. Previous research evaluated the levels of FIB following a rain event after the 2018 Woolsey fire (Southern California) was contained to determine if there was a correlation between the wildfire and increased FIB, total coliform, Enterococcus, and turbidity levels. In this research we analyzed the CZU and Thomas fire impacts by collecting Community Collaborative Rain, Hail, and Snow Network (CoCoRaHS) data, California Environmental Data Exchange Network (CEDEN) water quality data, and Sentinel-2 imagery for four impacted counties. Student t-tests were performed on the water quality data before, during, and after the fire to identify any significant differences between the different periods of the fires. The results show a significant increase in bacteria and turbidity for a longer duration of time after the fires in comparison to normal, consistent with the findings from the Woolsey fire. Due to the hydrophobicity of the soil, 72 hours after rain events is not sufficient time for bacteria levels to return to normal in coastal regions.

21

Geostationary Lightning Mapper (GLM) Trends Prior to Tornadoes Associated with Landfalling Tropical Cyclones in the U.S.

Gabrielle Brown
Northern Vermont University at Lyndon
Class of 2021 Hollings Scholar

Frank Alsheimer and Chris Rohrbach
NOAA National Weather Service, Columbia, SC

The GLM is an instrument on the GOES-R series satellites used to detect lightning by observing transitory optical changes from cloud tops during the day and night. The GLM has been investigated in previous research and used in current operational strategies when it comes to warning in severe weather situations. However, it has not yet been looked at with the challenge of warning on tornadoes that spawn from landfalling tropical systems. Due to tropical tornadoes being short lived and having a weaker signature and smaller vertical structure, they are more difficult to warn on using current radar interrogation techniques.

In this work, we found 21 tropical systems from 2019-2021 that impacted the U.S. using the National Hurricane Center's (NHC) Atlantic Tropical Cyclone Archive. 265 tornadoes were identified as being associated with the tropical systems through the National Center for Environmental Information's (NCEI) Storm Event Database. The flash extent density (FED) and minimum flash area (MFA) of each minute 30 minutes prior to the touchdown of all tornadoes were compiled and investigated. We gathered our data using NOAA's Weather and Climate Toolkit. Our analysis showed that lightning trends varied depending on the geography, time of occurrence, individual named tropical cyclone, and tropical system status at the time of the tornado. Through this work, we found that not all products of the GLM analyzed are as effective in a warning situation for forecasters.

22

Overview of and initial results from the 2022-23 Lake-Effect Electrification (LEE) study in the Lake Ontario region

Dr. Scott Steiger
State University of New York at Oswego

Dr. Eric Bruning
Texas Tech University

Dr. Vanna Chmielewski
University of Oklahoma / CIWRO

Dr. Geoffrey Stano
University of Alabama at Huntsville

John Trostel
Georgia Tech Research Institute

The Lake-Effect Electrification (LEE) Project field campaign between September and March 2022-23 is focused on Lake Ontario and the region of upstate New York to its *lee* (east of the lake). Project LEE's goals include to document, for the first time, the total lightning and electrical charge structures of lake-effect storms and the associated storm environment using a lightning mapping array (LMA), a dual-polarization X-band radar (Doppler on Wheels/DOW), and balloon-based soundings that measure vertical profiles of temperature, humidity, wind, electric field, and hydrometeor types. During another recent NSF-funded project, the Ontario Winter Lake-effect Systems (OWLeS) field campaign during the 2013-14 winter season, all observed lake-effect lightning occurred inland and many flashes were associated with the Maple Ridge Wind Farm, composed of approximately 200 turbines over 100 m tall. Lightning is a significant cause of wind turbine damage (e.g., to the blades), increasing wind energy generation costs. The study region is therefore an ideal natural laboratory within which basic understanding of the electrical structure of clouds can be advanced while also improving forecasts of such events and understanding their impacts on energy infrastructure. Project LEE also affords the opportunity to improve observations of convective-to-stratiform electrical development due to the shallowness of lake-effect storms (cloud depth ~ 3-4 km) and the proximity of these processes to the ground. This project involves many undergraduate (> 20) and graduate students in the collection and analysis of data, developing measurement, instrumentation and data analysis skills while inspiring their further education and interest in research careers. The proximity in space and time will also lead to multi-project coordination with the NASA-sponsored IMPACTS field campaign during January 2023. Lastly, we plan to show some initial results from the LEE Project.

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Probing the microphysics of electrification in lake effect snow with Project LEE

Dr. Eric Bruning
Texas Tech University

In collaboration with 14 other authors.

Project LEE (Lake Effect Electrification) will take the first-ever measurements of storm electricity in lake-effect snow events, in this case downwind of Lake Ontario during intensive observations from November 2022 through January 2023. Large balloons will carry an electric field meter and make video observations of precipitation. The combination of these measurements with a VHF lightning mapping array and the X-band Doppler On Wheels (DOW) polarimetric radar will allow us to infer the charge structure in electrified lake-effect clouds, and which particles carry the charge. This talk will describe how the experimental design will allow us to investigate the fundamental microphysics of electrification, and how the results of this experiment will allow us to better understand the electrification of all thunderstorms.

Great Lakes Atmospheric Science Symposium
Attendee List

Trinity Abraham	Colonie Central High School
Anthony Corrales	Cornell University
Jacob Feuerstein	Cornell University
Ethan Greenburg	Cornell University
Linsai Jackson	Cornell University
Jeffrey Johnson	Cornell University
Gabe Larouche	Cornell University
Everest Litchford	Cornell University
Juneau McGee	Cornell University
Benjamin Moose	Cornell University
Joshua Pan	Cornell University
Austin Ping	Cornell University
Henning Schade	Cornell University
Kaidan Sookdar	Cornell University
Mark Wysocki	Cornell University
Packie Young	Cornell University
Meghan Hamlin	New Hartford Senior High School
Michael Evans	NOAA / NWS Albany, NY
Ben Lott	NOAA / NWS Binghamton, NY
Jonathan Hitchcock	NOAA / NWS Buffalo, NY
Judith Levan	NOAA / NWS Buffalo, NY
Brandon Adams	Northern Vermont University-Lyndon
Chase Abbott	Northern Vermont University-Lyndon

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Attendee List

Gabrielle Brown	Northern Vermont University-Lyndon
Hannah Cavender	Northern Vermont University-Lyndon
Jonathan Chambers	Northern Vermont University-Lyndon
Benjamin Cohen-Tyler	Northern Vermont University-Lyndon
Jacob Cole	Northern Vermont University-Lyndon
Matthew Condon	Northern Vermont University-Lyndon
Richard Dialessi	Northern Vermont University-Lyndon
Michael Ferragamo	Northern Vermont University-Lyndon
Andrew Grautski	Northern Vermont University-Lyndon
Shea Harrington	Northern Vermont University-Lyndon
Duncan Hurd	Northern Vermont University-Lyndon
Nathan Moore	Northern Vermont University-Lyndon
Luke Morin	Northern Vermont University-Lyndon
Patrick Osborn	Northern Vermont University-Lyndon
Rachel Palladino	Northern Vermont University-Lyndon
Teagan Reeves	Northern Vermont University-Lyndon
Madison Roy	Northern Vermont University-Lyndon
Zander Sahlia	Northern Vermont University-Lyndon
Alexander Salerno	Northern Vermont University-Lyndon
Michael Spencer	Northern Vermont University-Lyndon
Lara Lee Thomlinson	Northern Vermont University-Lyndon
Brett Violett	Northern Vermont University-Lyndon
Brennen Webb	Northern Vermont University-Lyndon

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Attendee List

Sara Wichrowski	Northern Vermont University-Lyndon
Sam Cherubin	NYS Mesonet
Allyson Bruns	Oswego High School
Sean Metcalf	Oswego High School
David Pearson	Oswego High School
Isabella Richmond	Oswego High School
Martha Christino	Pennsylvania State University
Bruno Rojas	Pennsylvania State University
Nicholas Rodick	Spire Global Weather
Evan Belkin	SUNY Albany
Matthew Lynne	SUNY Albany
Patrick Miller	SUNY Albany
David Zywiczynski	SUNY Albany
Charles Clottin	SUNY Brockport
Douglas Bell Freitag	SUNY Brockport
Alyce Frisa	SUNY Brockport
Casey Griffin	SUNY Brockport
Jaclyn Hendry	SUNY Brockport
Nathan Himpsi	SUNY Brockport
Patricia Hutton	SUNY Brockport
Logan Jewell	SUNY Brockport
Angel Lopez	SUNY Brockport
Andrea Patterson	SUNY Brockport

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Attendee List

Matthew Quinn	SUNY Brockport
Scott Rochette	SUNY Brockport
Ashley Stanley	SUNY Brockport
Lukas Walters	SUNY Brockport
Aidan Alwang	SUNY Oswego
Katelyn Barber	SUNY Oswego
Evan Biedron	SUNY Oswego
Zoe Bush	SUNY Oswego
Ezekiel Caldon	SUNY Oswego
Kyle Camille	SUNY Oswego
Thomas Cerra	SUNY Oswego
Nicholas Cusano	SUNY Oswego
Vincent DiBattista	SUNY Oswego
Maxwell Gallo	SUNY Oswego
Lena Greene	SUNY Oswego
Sarah Gryskiewicz	SUNY Oswego
Daniel Hummel	SUNY Oswego
Joshua Intini	SUNY Oswego
Kaitlyn Jesmonth	SUNY Oswego
Daniel Kelly	SUNY Oswego
Benjamin Lamsma	SUNY Oswego
Shaun Laurinaitis	SUNY Oswego
Kayla Lewis	SUNY Oswego

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Attendee List

Tyler Lucia	SUNY Oswego
Michael Pagnanelli	SUNY Oswego
Josephine Ragland	SUNY Oswego
Brendan Rice	SUNY Oswego
David Rienzo	SUNY Oswego
Jacob Rumowicz	SUNY Oswego
Brianna Saunders	SUNY Oswego
Garrett Statum	SUNY Oswego
Scott Steiger	SUNY Oswego
Elijah Sumner	SUNY Oswego
Yonggang Wang	SUNY Oswego
Thomas Weist	SUNY Oswego
Lily Zent	SUNY Oswego
Christa Gilkey	SUNY Oswego Alumna
Eric Bruning	Texas Tech University
Cameron Wunderlin	University of Nebraska-Lincoln
Matthew Rolph	Weather Routing, Inc.
Robert Reale	WeatherWorks, LLC.
Avery Reina	West Genesee High School
Liam Healy	WROC-TV Rochester, NY
John DiPasquale	WSYR-TV Syracuse, NY

and Keynote Speaker

Tom Niziol