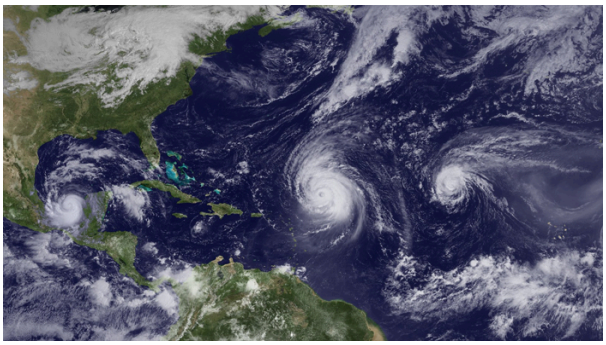
FLORIDA STATE UNIVERSITY
Center for Ocean-Atmospheric Prediction Studies

Fall 2018 Newsletter

How meteorologists predict the next big hurricane

(Source: The Conversation, posted online September 12, 2018)



Hurricane forecasts have traditionally focused on predicting a storm's track and intensity. The track and size of the storm determine which areas may be hit. To do so, forecasters use models - essentially software programs, often run on large computers.

Unfortunately, no single forecast model is consistently better than other models at making these predictions. Sometimes these forecasts show dramatically different paths, diverging by hundreds of miles. Other times, the models are in close agreement. In some cases, even when models are in close agreement, the small differences in track have very large differences in storm surge, winds and other factors that impact damage and evacuations. What's more, several empirical factors in the forecast models are either determined under laboratory conditions or in isolated field experiments. That means that they may not necessarily fully represent the current weather event.

So, forecasters use a collection of models to determine a likely range of tracks and intensities. Such models include the NOAA's Global Forecast System and European Centre for Medium-Range Weather Forecasts global models.

Over the past decade, track forecasts have steadily improved. A plethora of observations -- from satellites, buoys and aircraft flown into the developing storm -- allow scientists to better understand the environment around a storm, and in turn improve their models. Some models have improved by as much as 40% for some storms. However, forecasts of intensity have improved little over the last several decades. Read more.

A buoy collecting weather data. (Source: U.S. National Oceanic and Atmospheric Administration)

Read full article by Mark Bourassa and Vasu Misra at https://theconversation.com/how-meteorologists-predict-the-next-big-hurricane-102827

COAPS hurricane hunter studies storms where they happen - 10,000 feet up!

(Source: FSU News)

When powerful hurricanes emerge from the churn of ocean and atmospheric flux to menace coastal communities, officials will often urge vulnerable populations to gather their valuables and take flight. But for some daring scientists, the idea of "taking flight" in

the face of a looming hurricane means something entirely different. **Heather Holbach**, a postdoctoral researcher in FSU's Center for Ocean and Atmospheric Prediction Studies, is one such scientist. When a hurricane thrashes its way through the warm waters of the Atlantic or Caribbean, she and her colleagues at the National Oceanic and Atmospheric Administration collect their sophisticated storm monitoring tools, board a Lockheed WP-3D research plane and knife their way through the storm and into the eye, making high-resolution observations along the way that provide critical information to storm forecasters.Holbach has been hurricane hunting for five years, including a recent flight through the devastating Hurricane Florence. She spoke to news.fsu.edu about her experiences studying these mighty storms up close.

FSU postdoctoral researcher Heather Holbach poses in front of a NOAA WP-3D research plane, which is specially outfitted for hurricane hunting.

Read full article by Zachary Boehm, FSU News at https://news.fsu.edu/news/science-technology/2018/10/01/fsu-hurricane-hunter-students-storms-where-they-happen-10000-feet-up/

News and Activities

Helping the public understand why hurricane forecasting is so difficult

Hurricane Florence was one of the topics discussed on BYUradio's Top of Mind show on September 13. At least a million people evacuated coastal areas in the storm's path, because officials are never sure exactly where the brunt of a hurricane will be felt. To understand why hurricane forecasting is so difficult, show host Julie Rose spoke with COAPS associate director and meteorologist **Mark Bourassa** from the department of Earth, Ocean & Atmospheric Science at FSU. Listen to the interview.

New book: "New Frontiers in Operational Oceanography"

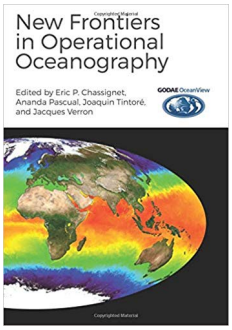
The implementation of operational oceanography in the past 15 years has provided many societal benefits and has led to many countries adopting a formal roadmap for providing ocean forecasts. Continuing the tradition of two very successful international summer schools

Steve Morey now at the NOAA Center for Coastal and Marine Ecosystems at Florida A&M Univ.

Steve Morey, COAPS research faculty member since 2000 and a COAPS alum, left COAPS in August to become the Distinguished Research Scientist for the NOAA Center for Coastal and Marine Ecosystems (CCME) at Florida A&M University. Morey is now also a professor in the FAMU School of the Environment. CCME is a six-institution (Florida A&M University, Bethune-Cookman University, Jackson State University, University of Texas - Rio Grande Valley, Texas A&M Corpus Christi, and California State University - Monterrey Bay) Cooperative Science Center funded by the NOAA Educational Partnership Program. CCME's mission is to educate and train a new generation of scientists, particularly from underrepresented minority communities, in NOAA-relevant STEM disciplines and social sciences, equipped to utilize interdisciplinary approaches to address issues confronting marine and coastal communities. Morey remains involved with COAPS students and faculty through collaborative projects and holds a courtesy appointment at FSU.

COAPS welcomes "Girls Can Do Anything!" campers

held in France in 2004 and in Australia in 2010, a third international school that focused on frontier research in operational oceanography was held in Majorca in 2017. The latter school brought together senior experts and young researchers (pre- and post-doctorate) from across the world and exposed them to the latest research in oceanography, specifically how it will impact operational oceanography. This newly-published book is a compilation of the lectures presented at the school and presents a summary of the current state-of-the-art in operational oceanography research. Chapter authors include **Eric Chassignet and Mark Bourassa**.



Project to further knowledge of the response of fish populations to environmental variability

A new collaboration between NOAA Southeast Fisheries Science Center and FSU, has been funded to develop a methodology using coupled hydrodynamic/biogeochemical/individual-based models with fisheries-independent data and analysis techniques to understand the environmental drivers of age-0 abundance for coastal pelagic fish species in the Gulf of Mexico. In addition to furthering the knowledge of the response of fish populations to environmental variability, this project -- l ed by **Steve Morey** (PI) and **Mike Stukel** (co-PI) -- will provide indices for application to stock assessments.

COAPS was excited to welcome more than two dozen campers from The Oasis Center for Women & Girls "Girls Can Do Anything" camp. Activity stations designed to introduce the girls to weather and climate were set up and manned by COAPS research scientists and students. Through hands-on demonstrations, the campers learned about working with wind, keeping an eye on hurricanes, and all about clouds. They also had the opportunity to be an on-camera weather broadcaster thanks to the FSU Weather Team, a student-produced weather station. And finally, campers learned about pseudo-coding and what it takes to program computers using COAPS' Lego EV3 robot, Ada. We hope the campers had as much fun as we did! Watch the video.

Catching up with COAPS Alum... KYLE HILBURN

Kyle Hilburn grew-up in Fairmont, Minnesota where he was inspired to study the weather from his experiences with Minnesota's extreme weather. After obtaining a B.S. in Atmospheric Science from the University of North Dakota in 2000, Dr. James O'Brien convinced Hilburn that COAPS at FSU was the right place to continue his education. At the time, Hilburn had a strong interest in dynamic meteorology, and this led him to work closely with **Mark Bourassa** to study the use of ocean surface vector winds measured by QuikSCAT to derive surface pressure fields. This experience cultivated Hilburn's interest in both satellite meteorology and data assimilation.


Kyle Hilburn is now at the Cooperative Institute for

After completing a M.S. in Meteorology at FSU in 2002, Hilburn's interest in satellite meteorology led him to the

Research in the Atmosphere at Colorado State University in Fort Collins, Colorado

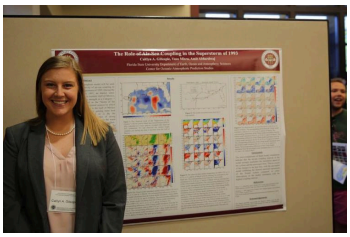
private company, Remote Sensing Systems in Santa Rosa, California, where he worked from 2002-2015 as a Scientist and later also as the Lead Software Developer. His work initially focused on improving QuikSCAT wind retrievals in raining scenes, but this evolved into a broader interest in precipitation retrievals from passive microwave imagers. In addition to focusing on satellite retrievals, Hilburn also studied the use of microwave satellite data to better constrain the global water cycle.

In 2016, his interest in precipitation led him to The Cooperative Institute for Research in the Atmosphere (CIRA/CSU) where he works as a research associate with Chris Kummerow and Steve Miller. This move provided Hilburn the opportunity to analyze data from the new GOES-16 satellite that carries both the Advanced Baseline Imager (ABI) and the Geostationary Lightning Mapper (GLM). His focus has been on using the data from these sensors to better initialize convection in the High Resolution Rapid Refresh (HRRR) model, collaborating with scientists at NOAA's Earth System Research Laboratory in Boulder, Colorado. Thus, his work at CIRA/CSU has brought him full circle to the use of satellite data for data assimilation in numerical weather prediction models. Near real-time imagery from the GOES-16 satellite, including lightning overlays that Hilburn developed can be viewed at: http://rammb-slider.cira.colostate.edu. When not working, Hilburn's hobbies include playing folk music on the violin, watching the weather in Colorado, and riding his road bicycle in the foothills around Fort Collins.

Student Activities and Achievements

John Steffen, PhD candidate in meteorology, has accepted a post-doc position at Woods Hole Oceanographic Institution, working with Dr. Hyodae Seo. The project will focus on the influence of coupled, air-sea interactions on the variability/ predictability of the Madden-Julian oscillation over the Maritime Continent. Steffen has been working with **Mark Bourassa** to quantify barrier layer development during tropical cyclone passage using Argo float observations of temperature and salinity.

Taylor Shropshire, PhD candidate in oceanography, presented at the NOAA General Modeling Meeting and Fair on "Estimates of food limation experienced by coastal-pelagic fish larvae in the Gulf of Mexico: An interdisciplinary model application between three-dimensional ocean models and fishery assessment models." The goal of the work, a NOAA FATE project being led by **Steve Morey** and **Mike Stukel**, is to investigate how ocean models can be used in fisheries management; primarily estimating susceptibility to mortality through starvation by modeling their food source (zooplankton) in the Gulf of Mexico.



Meteorology student, **Caitlyn Gillespie**, participated in the 2018 President's Showcase of Undergraduate Research Excellence where she shared her poster entitled "The Role of Air-Sea Coupling on the Superstorm of 1993." Gillespie is an undergraduate honors student working with **Vasu Misra**. She is looking at the impact of air-sea interaction on the superstorm that passed over Tallahassee and produced some snow in March 1993.

Recent Publications

*COAPS authors are in **bold**.*

Ali, M., Singh, N., Kumar, M., **Zheng, Y.**, **Bourassa, M.**, Kishtawal, C., et al. (2018). Dominant Modes of Upper Ocean Heat Content in the North Indian Ocean. *Climate*, 6(3), 71.

Bourassa, M. A., & Hughes, P.J. (2018). Surface Heat Fluxes and Wind Remote Sensing. In New Frontiers in Operational Oceanography. **Chassignet, E. P.**, A. Pascual, J. Tintoré, and J. Verron (Eds.). (pp. 245-270). Tallahassee, FL: GODAE OceanView.

815pp, https://doi.org/10.17125/gov2018

Deng, J., **Wu, Z.**, Zhang, M., Huang, N. E., Wang, S., & Qiao, F. (2018). Using Holo-Hilbert spectral analysis to quantify the modulation of Dansgaard-Oeschger events by obliquity. *Quaternary Science Reviews*, 192, 282-299.

Groenen, D. (2018). The Effects of Climate Change on the Pests and Diseases of Coffee Crops in Mesoamerica. *Climatol Weather Forecasting,* 6: 239. doi:10.4172/2332-2594.1000239

Holbach, H.M., Uhlhorn, E.W., **& Bourassa, M.A.** (2018). Off-Nadir SFMR Brightness Temperature Measurements in High-Wind Conditions. *J. Atmos. Oceanic Technol.*, 35,1865-1879, https://doi.org/10.1175/JTECH-D-18-0005.1

Kelly, T. B. (2018). Spatial and interannual variability in export efficiency and the biological pump in an eastern boundary current upwelling system with substantial lateral advection. Master's thesis, Florida State University, Tallahassee, FL.

Kelly, T. B., Goericke, R., Kahru, M., Song, H., & **Stukel, M.R.** (2018). CCE II: Spatial and interannual variability in export efficiency and the biological pump in an eastern boundary current upwelling system with substantial lateral advection. *Deep-Sea Research I.* doi: 10.1016/j.dsr.2018.08.007

Le Sommer, J., **Chassignet, E. P.**, & **Wallcraft, A. J.** (2018). Ocean Circulation Modeling for Operational Oceanography: Current Status and Future Challenges. In New Frontiers in Operational Oceanography. Chassignet, E. P., A. Pascual, J. Tintoré, and J. Verron (Eds.), (pp. 289-305). Tallahassee, FL: GODAE OceanView. 815pp, https://doi.org/10.17125/gov2018

Liu, M., Lin, J., Wang, Y., Sun, Y., Zheng, B., Shao, J., ... & **Wu, Z**. (2018). Spatiotemporal variability of NO2 and PM2.5 over Eastern China: observational and model analyses with a novel statistical method. *Atmos. Chem. Phys.*, 18(17), 12933-12952.

Misra, V., Bhardwaj, A., & **Mishra, A.** (2018). Local onset and demise of the Indian summer monsoon. *Clim Dyn,* 51(5-6), 1609-1622.

Morey, S., Weinders, N., **Dukhovskoy, D.**, & **Bourassa, M.** (2018). Measurement Characteristics of Near-Surface Currents from Ultra-Thin Drifters, Drogued Drifters, and HF Radar. Remote Sensing, 10(10), 1633. doi: 10.3390/rs10101633

Morrow, R. M., Ohman, M.D., Goericke, R., **Kelly. T.B.**, Stephens, B.M., & **Stukel, M.R.** (2018). CCE V: Primary production, mesozooplankton grazing, and the biological pump in the California Current Ecosystem: Variability and response to El Nino. *Deep-Sea Research I*. doi: 10.1016/j.dsr.2018.07.012

Stauffer, C. L. (2018). Air-sea coupling dependency on sea surface temperature fronts as observed by research vessel data. Bachelor's thesis, Florida State University, Tallahassee, FL.

Steffen, J. & **M. Bourassa.** (2018). Barrier Layer Development Local to Tropical Cyclones based on Argo Float Observations. *J. Phys. Oceanogr.*, 48, 1951-1968,https://doi.org/10.1175/JPO-D-17-0262.1

Stukel, M. R., Biard, T., Krause, J.W., & Ohman, M. (2018). Large Phaeodaria in the twilight zone: Their role in the carbon cycle. *Limnology and Oceanography*. doi: 10.1002/lno.10961

Venugopal, T., **Ali, M. M., Bourassa, M. A., Zheng, Y.**, Goni, G. J., Folz, G. R., et al. (2018). Statistical Evidence for the Role of Southwestern Indian Ocean Heat Content in the Indian Summer Monsoon Rainfall. Scientific Reports, 8(12092).

Xu, X., Bower, A., Furey, H., & **E. P. Chassignet**. (2018). Variability of the Iceland-Scotland overflow water transport through the Charlie-Gibbs Fracture Zone: Results from an eddying simulation and observations, *J. Geophys. Res. Oceans*, 123, 5808-5823, doi:10.1029/2018JC013895

Xu, X., Rhines, P.B., & **Chassignet, E.P**. (2018). On mapping the diapycnal water mass transformation of the upper North Atlantic Ocean, *J. Phys. Oceanogr.*, 48, 2233-2258, doi:10.1175/JPO-D-17-0223.1.

Zhang, M., **Wu, Z.,** & Qiao, F. (2018). Deep Atlantic Ocean Warming Facilitated by the Deep Western Boundary Current and Equatorial Kelvin Waves. *J. Climate,* 31(20), 8541-8555.

http://coaps.fsu.edu
contact@coaps.fsu.edu