FY18 HFIP Competition

This is the Round 3 of Research to Operations (R2O) Initiative that supports the Hurricane Forecast Improvement Project (HFIP) (see details in NOAA-NWS-NWSPO-2018-2005325).

The priorities for the HFIP competition include a) advances in data assimilation techniques for hurricane NWP; b) advances in the hurricane and tropical storm prediction subsystem; c) development of high resolution ensembles to improve hurricane forecast track and/or intensity guidance; d) development of post-processing techniques that increase hurricane forecaster utility of tropical cyclone forecast guidance.

For the HFIP competition, 6 proposals were awarded with individual award amounts ranging from $100,000 to $200,000 per year for up to two years. Project start date is September 1, 2018. Details of the projects are summarized in the table below.

Project Title	PI/co-PIs	Affiliation
New Frameworks for Predicting Extreme Rapid Intensification	Kerry Emanuel	Massachusetts Institution of Technology
	Jonathan Vigh Christopher Rozoff David John Gagne Eric Hendricks	NCAR
Advanced DA Techniques for Satellite-Derived Atmos. Motion Vectors from GOES 16/17 in the HWRF	Agnes Lim	University of Wisconsin - Madison
Using Dynamically-Based Probabilistic Forecast Systems to Improve the NHC Wind Speed Speed Products	Andrea Schumacher	Colorado State University
Evaluating Initial Condition Perturbation Methods in the HWRF Ensemble Prediction System	Ryan Torn	University at Albany, SUNY
Enabling Cloud Condensate Cycling for All-Sky Radiance Assimilation in HWRF	Ting-Chi Wu Milija Zupanski Lewis Grasso	Colorado State University
RI Changes: Improving Sub-Grid Scale Model Parameterization and Microphysical-Dynamical Interaction	Ping Zhu	Florida International University

Publications

Emanuel

Lin, J., K. Emanuel, and J. L. Vigh, 2020: Forecasts of Hurricanes Using Large-Ensemble Outputs. Wea. Forecasting, 35, 1713–1731. https://doi.org/10.1175/WAF-D-19-0255.1

Vigh, J. L., N. M. Dorst, C. L. Williams, D. P. Stern, E. W. Uhlhorn, B. W. Klotz, J. Martinez, H. E. Willoughby, F. D. Marks, Jr., D. R. Chavas, 2020: FLIGHT+: The Extended Flight Level Dataset for Tropical Cyclones (Version v1.3). Tropical Cyclone Data Project, National Center for Atmospheric Research, Research Applications Laboratory, Boulder, Colorado. http://dx.doi.org/10.5065/D6WS8R93.

Torn

Bachmann, K. A. and R. D. Torn, 2021: Validation of HWRF-based Probabilistic TC Wind and Precipitation Forecasts. Wea. Forecasting (Submitted).

Torn, R.D.; DeMaria, M., 2021: Validation of Ensemble-Based Probabilistic Tropical Cyclone Intensity Change, Atmosphere, 12, 373. https://doi.org/10.3390/atmos12030373.

Ping Zhu

Li, Y. B., Zhu, P., Gao, Z. Q., Cheung, K. (2021). Sensitivity of Large Eddy Simulations of Tropical Cyclone to Sub-Grid Scale Mixing Parameterization. Atmos. Res. (submitted).

Zhu, P., Hazelton, A., Zhang, Z., Marks, D. F., Tallapragada, V. (2021). The Role of Eyewall Turbulent Transport in the Pathway to Intensification of Tropical Cyclones. J. Geophy. Res. - Atmospheres (submitted).

Presentations

Emanuel

Emanuel, K. E., J. L. Vigh, J. Lin, D. J. Gagne, C. M. Rozoff, E. A. Hendricks, M. Biswas, I. MacDaniel, M. DeMaria, J. A. Knaff, C. Sampson, 2019: New Frameworks for Predicting Extreme Rapid Intensification. HFIP Annual Meeting, Miami, FL, NOAA HFIP Program, presented 06 Nov 2019.

Emanuel K., J. Vigh, C. Rozoff, D. J. Gagne, E. Hendricks, and M. Biswas, 2020: New Frameworks for Predicting Extreme Rapid Intensification. HFIP Annual Meeting. 19 November 2020.

Gagne, D. J., C. M. Rozoff, J. L. Vigh, 2020: Probabilistic rapid intensification prediction with convolutional neural networks and HWRF. Abstract, 19th Conference on Artificial Intelligence for Environmental Science, Joint Session 43 Tropical Cyclone Analysis and Prediction with Machine Learning I, Boston, MA, Amer. Meteor. Soc. Annual Meeting, Paper J43.2. [Recorded presentation given 15 January 2020.]

Hendricks, E. A., J. L. Vigh, 2020: Forced Shallow-Water Model for the Maximum Potential Intensification Rate of Tropical Cyclones. Poster, Wayne Schubert Symposium, Poster Session 5 Tropical Cyclones, Boston, MA, Amer. Meteor. Soc. Annual Meeting, Poster 1026. 15 January 2020.

Lin, J., K. A. Emanuel, J. L. Vigh, 2020: A Probabilistic, Large-Ensemble Approach to Tropical Cyclone Forecasting. Abstract, Tropical Meteorology and Tropical Cyclones Symposium, Session 1 Tropical Cyclone Research and Forecasting. Part I: Prediction, Boston, MA, Amer. Meteor. Soc. Annual Meeting, Paper 1.6. [Recorded presentation given 13 January 2020.]

Lin, J., K. Emanuel, and J. Vigh, 2021: Pointwise Probabilistic Forecasts Using Very Large Ensembles, HFIP Special Seminar. 17 March 2021.

Lin, J., D. J. Gagne, C. Rozoff, M. Biswas, K. Emanuel, E. Hendricks, and J. Vigh, 2020: Results from FHLO and the HWRF CNN. HFIP Annual Meeting. 19 November 2020.

McDaniels, I., C. M. Rozoff, J. L. Vigh, 2020: Application of Statistical Methods to Improving Model Predictions of Rapid Intensification in Tropical Cyclones. Poster, Tropical Meteorology and Tropical Cyclones Symposium, Poster Session 2 Tropical Cyclones Research and Forecasting: Poster Session I, Boston, MA, Amer. Meteor. Soc. Annual Meeting, Poster 861. 14 January 2020.

Lim

Lim A., S. Nebuda, J. A. Jung, J. Daniels, W. Bresky and A. Mehra, 2021: Assimilation of the GOES-16/17 Atmospheric Motion Vectors in the Hurricane Weather Forecasting (HWRF) model, IWW15, 12 April - 16 April, 2021, Virtual Meeting hosted by KNMI

Lim A., S. Nebuda, J. A. Jung, J. Daniels, W. Bresky and A. Mehra, 2021: Assimilation of the GOES-16/17 Atmospheric Motion Vectors in the Hurricane Weather Forecasting (HWRF) model, Boston, MA, American Meteorological Society Annual Meeting, 2021

Lim A., S. Nebuda, J. A. Jung, J. Daniels, W. Bresky and A. Mehra, 2020: Assimilation of the GOES-16/17 Atmospheric Motion Vectors in the Hurricane Weather Forecasting (HWRF) model, Boston, MA, American Meteorological SocietyAnnual Meeting , 2020

Schumacher

Brammer, A., 2020: Using dynamically-based probabilistic forecast systems to improve the National Hurricane Center wind speed probability products. HFIP Annual Meeting (Virtual), 11/19/2020.

Torn

Bachmann, K., and R. D., Torn ,2021: Verification of Probabilistic Hazard Forecasts for the Hurricane Seasons of 2017 and 2018. AMS Annual Meeting, Virtual (https://ams.confex.com/ams/101ANNUAL/meetingapp.cgi/Paper/380965)

Zhu

Zhu P. Updates on Improvement of HAFS Turbulent Mixing Schemes and Understanding of the Pathway to Rapid Intensification. HAFS Coordination meeting on February 3, 2021.

Zhu P. Rapid Intensification Changes: Improving Sub-Grid Scale Model Parameterization and Microphysical-Dynamical **Interaction. HFIP Annual Meeting. November 19, 2020.**