FY18 Testbed Competition

This is the Round 3 of Research to Operations (R2O) Initiative that supports NOAA Testbeds. Applicants for this opportunity must work in partnership with NOAA testbeds and proving grounds (listed under www.testbeds.noaa.gov). NOAA's testbeds and proving grounds facilitate

the orderly transition of research capabilities to operational implementation through development testing in testbeds, and pre-deployment testing and operational readiness/suitability evaluation in operational proving grounds (see details in NOAA-NWS-NWSPO-2018-2005317)

Priorities under the Testbed Competition includes a) advances in forecasts for days 6-10; b) advances in forecasts for weeks 3-4; c) advances in forecasts for high-impact weather 0-3 days including storm-scale, fire weather and convective/severe weather prediction.

For the Testbed competition, 7 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	Institution
Evaluation of GFS-FV3 Vertical Profile and Thermodynamic Environment Fidelity	Clark Evans	University of Wisconsin - Milwaukee
Real Time Assimilation of GOES-16 Total Lightning into the NSSL 3DVAR Code to Improve 0-12h Forecasts of High Impact Weather Events at Cloud Resolving Scales	Alex Fierro	University of Oklahoma
Adding Tropical Cyclone Genesis Verification Capabilities to the Model Evaluation Tools –Tropical Cyclone (MET-TC) Software	Daniel Halperin	Embry-Riddle Aeronautical University
	Kathryn Newman John Halley Gotway	NCAR
Development and Evaluation of New Statistical Calibration Methods for Multi-Model Ensemble Week 3-4 Probabilistic Forecasts	Andrew Robertson Michael Tippett Nachiketa Acharya	Columbia University
Developing A Community Suite of Process-oriented Model Diagnostics for Weather-Ready Nation	Zhuo Wang	University of Illinois
	Tara Jensen	NCAR
Sea Ice Effects on Storm Surge Prediction in the Alaska Region through NEMS Coupling Infrastructure	Joannes Westerink	University of Notre Dame
	Saeed Moghimi	NOAA/CSDL
The Impact of Snowpack on NCEP Weeks 3-4 Forecasts	Xubin Zeng Michael Brunke	University of Arizona

Publications

Fierro

Dafis S., A. O. Fierro, T. M. Giannaros, V. Kotroni, K. Lagouvardos and E. Mansell, 2018: Performance evaluation of an explicit lightning forecast system. J. Geophys. Res., Atmospheres. Volume 123, 5130–5148, https://doi.org/10.1029/2017JD027930

Fierro, A. O., Wang. Y, Hu J., Gao J., and E. R. Mansell, 2021: Proof-of-concept evaluation of ensemble of 3DEnVARs assimilation (ENH3DA) of GLM-observed total lightning data for the 1 May 2018 tornado outbreak. Mon. Wea. Rev. (submitted).

Fierro, A. O., Wang. Y, Gao J., and E. R. Mansell, 2019: Variational assimilation of radar data and GLM-lightning derived water vapor for the short-term forecasts of high-impact convective events. Mon. Wea. Rev., Volume 147, 4045-4069. https://doi.org/10.1175/MWR-D-18-0421.1

Fierro, A. O., Stevenson S. and R. Rabin, 2018: Evolution of GLM-observed total lightning in Hurricane Maria (2017) during the period of maximum intensity. Mon. Wea. Rev., Volume 146, 1641–1666. https://doi.org/10.1175/MWR-D-18-0066.1

Fierro, A. O. and E. R. Mansell, 2018: Relationships between electrification and storm-scale properties based on idealized simulations of an intensifying hurricane-like vortex. J. Atmos. Sci., Volume 75, 657-574. https://doi.org/10.1175/JAS-D-17-0202.1

Fierro, A. O., Zhao G., Liu S., Wang Y., J. Gao, K. Calhoun, C. L. Ziegler, E. R. Mansell and D. R. MacGorman, 2018: Assimilation of total lightning with GSI and NEWS3DVAR to improve short-term forecasts of high impact weather events at cloud resolving scales. JCSDA Quarterly Newsletter, No. 58, Winter 2018, pp5 -12. doi: 0.7289/V5CJ8BR2.

Homeyer, C. R, A. O. Fierro, A. C Didlake, B. A Schenkel, A. V Ryzhkov, G. M MacFarquhar, J. B Basara and A. M. Murphy, 2021: Polarimetric Signatures in Landfalling Tropical Cyclones. Mon. Wea. Rev., Volume 149, 131-147.https://doi.org/10.1175/MWR-D-20-0111.1

Hu J., A. O. Fierro, Y. Wang, J. Gao, E. R. Mansell, A. J. Clark, I. Jirak and M. Hu, 2021: Assessment of storm-scale real time assimilation of GOES-16 GLM lightning-derived water vapor mass and radar data on short term precipitation forecasts during the 2020 Spring forecast experiment. J. Geophys. Res. (submitted).

Hu J., J. Gao, Y. Wang, S. Pan, A. O. Fierro, P. Skinner, K. Knopfmeier, E. R. Mansell and P. Heiselman, 2021: Evaluation of a Warn-on-Forecast 3DVAR analysis and forecast system on quasi- real time short-term forecasts of high impact weather events. Quarterly J. Royal. Metr. Soc. (submitted).

Kong R., M. Xue, C. Liu, A. O. Fierro, E. R. Mansell, and D. R. MacGorman, 2021: Assimilation of GOES-R Geostationary Lightning Mapper Flash Extent Density data in GSI 3DVar, EnKF, and Hybrid En3DVar for the Analysis and Short-Term Forecast of a Supercell Storm Case. Mon. Wea. Rev. (submitted).

Lai A., J. Gao, S. Koch, Y. Wang, S. Pan, A. O. Fierro, C. Cui and J. Min, 2019: Assimilation of Radar Radial Velocity, Reflectivity and Pseudo Water Vapor for Convective-scale NWP in a Variational Framework. Mon. Wea. Rev., Volume 147, 2877-2900. https://doi.org/10.1175/MWR-D-18-0403.1

Melnikov V., D. S. Zrnic, M. E. Weber, A. O. Fierro and D. R. MacGorman, 2019: Electrified cloud areas observed in the SHV and LDR radar mode. J. Atmos. Ocean. Tec., Volume 36, 151-159. https://doi.org/10.1175/JTECH-D-18-0022.1

Prat A. C., S. Federico, R. C. Torcasio, A. O. Fierro, Stefano Dietrich, 2020: Lightning data assimilation in the WRF-ARW model for short-term rainfall forecasts of three severe storm cases in Italy. Atmos Res. Volume 247. https://doi.org/10.1016/j.atmosres.2020.105246

Wang, H., Liu, Y., Zhao, T., Xu, M., Liu, Y., Guo F., Shen. S, Cheng W. Y. Y., Mansell E. R. and A. O. Fierro, 2018: Incorporating Geostationary Lightning Data into a Radar Reflectivity Based Hydrometeor Retrieval Method: An Observing System Simulation Experiment. Atmos. Res. Volume 209, 1-13, https://doi.org/10.1016/j.atmosres.2018.03.002

Halperin

Halperin, D. J., A. B. Penny, and R. E. Hart, 2020: A comparison of tropical cyclone genesis verification from three Global Forecast System (GFS) operational configurations. Wea. Forecasting, 35 (5), 1801-1815. https://doi.org/10.1175/WAF-D-20-0043.1

Wang

Miller, D.E., and Z. Wang, Robert J. Trapp, Daniel S. Harnos, 2020: Hybrid Prediction of Weekly Tornado Activity out to Week 3: Utilizing Weather Regimes. Geophys. Res. Lett. 47. https://doi.org/10.1029/2020GL087253.

Miller, D. E., Z. Wang, B. Li, , D. S. Harnos, and T. Ford, 2021: Skillful Subseasonal Prediction of U.S. Extreme Warm Days and Standardized Precipitation Index in Boreal Summer, J. Climate, 34, 5887-5898. https://doi.org/10.1175/JCLI-D-20-0878.1

Westerink

B.R. Joyce, W.J. Pringle, D. Wirasaet, J.J. Westerink, A. J. Van der Westhuysen, R. Grumbine, J. Feyen, 2019: High Resolution Modeling of Western Alaska Tides and Storm Surge under Varying Sea Ice Conditions, Ocean Modelling, 141, 101421. https://doi.org/10.1016/j.ocemod.2019.101421

Zeng

Arevalo, J. J. Welty, Y. Fan, and X. Zeng, 2021: Implementation of Snowpack Treatment in the CPC Water Balance Model and Its Impact on Drought Assessment. Journal of Hydrometeorology. https://doi.org/10.1175/JHM-D-20-0201.

Presentations

Evans

Blount, D. V., C. Evans, I. L. Jirak, and A. Dean, 2021: Verifying GFS short-range-forecast vertical thermodynamic profiles using an objective profile-shape classification method. Abstract, 11th Conf. on Transition of Research to Operations, New Orleans, LA, Amer. Meteor. Soc., 5A.7.

Blount, D. V., C. Evans, I. L. Jirak, and A. R. Dean, 2020: An evaluation of vertical thermodynamic profiles and derived stability parameters from parallel FV3- and spectral-model GFS forecasts. Abstract, 30th Conf. on Weather Analysis and Forecasting/26th Conf. on Numerical Weather Prediction, Boston, MA, Amer. Meteor. Soc., 146.

Blount, D. V., C. Evans, I. L. Jirak, and A. R. Dean, 2020: An evaluation of vertical thermodynamic profiles and derived stability parameters from parallel FV3- and spectral-model GFS forecasts. Abstract, UFS Users Workshop, Boulder, CO, Natl. Oceanic and Atmos. Administration.

Fierro

Fierro, A., Hu, J., Wang, Y., Gao, J., and Mansell, E.: Evaluation of the impact of assimilating spaceborne (GLM) total lightning data and radar data on short-term forecasts of convective events in the 3DVAR framework, EGU General Assembly 2021, online, 19–30 Apr 2021, EGU21-133, https://doi.org/10.5194/egusphere-egu21-133, 2020.

Halperin

Halperin, D. J., K. Newman, J. Halley Gotway, and T. Jensen, 2021: Verifying Tropical Cyclone Genesis Forecasts using TC-Gen in the Model Evaluation Tools (MET). 34th Conference on Hurricanes and Tropical Meteorology, Amer. Meteo. Soc., 13 May 2021, P135.

Halperin, D. J., K. Newman, J. Halley Gotway, and T. Jensen, 2021: Updates on “TC-Gen” for verifying TC genesis in the Model Evaluation Tools (METplus). 75th Interdepartmental Hurricane Conference, 4 March 2021, Session 4.

Halperin, D. J., K. Newman, J. Halley Gotway, and T. Jensen, 2020: Developing a new tool for verifying TC genesis forecasts in the Model Evaluation Tools (METplus). 74th Interdepartmental Hurricane Conference, Lakeland, FL, 26 February 2020, Session 9.

Halperin, D. J., K. Newman, J. Halley Gotway, and T. Jensen, 2020: Adding tropical cyclone genesis verification capabilities to the Model Evaluation Tools (MET+). 10th Conference on Transition of Research to Operations, Amer. Meteo. Soc., Boston, MA, 12-16 January 2020.

Iacono

Iacono, M.J., J.M. Henderson, L. Bernardet, E. Kalina, M. Biswas, K.M. Newman, B. Liu, and Z. Zhang, Enhancements to cloud overlap radiative effects for tropical cyclone prediction, Virtual poster presentation at the American Meteorological Society 34th Conference on Hurricanes and Tropical Meteorology, May 10-14, 2021.

Iacono, M.J., E. Mlawer, J. Henderson, and G. Thompson, Radiation enhancements for UFS global weather predictions, Virtual presentation at the NOAA Environmental Model Center (EMC) Modeling and Data Assimilation Branch (MDAB) Physics Group Bi-Weekly Meeting, October 22, 2020.

Iacono, M.J., J.M. Henderson, L. Bernardet, E. Kalina, M. Biswas, K.M. Newman, B. Liu, and Z. Zhang, Enhancements to cloud overlap radiative effects for weather forecasting and tropical cyclone prediction, Poster presentation at the Tropical Meteorology and Tropical Cyclones Symposium, 100th American Meteorological Society Annual Meeting, Boston, Massachusetts, January 12-16, 2020.

Robertson

Bohar Singh, Andrew Robertson, Michael Tippett and Nachiketa Acharya: Probabilistic multi- model sub-seasonal climate forecasts using skill-based model weighting : virtual Climate Diagnostics and Prediction Workshop (CDPW), 20–22 October 2020.

Wang

Jensen, T., G. Manikin, J. A. Otkin, I. Stajner, and Z. Wang, (2020), “A Community Effort to Unify Verification and Validation Efforts”, AMS Annual Meeting, Boston, MA.

Li, W., and Z. Wang, (2020), “Predictive Skill of African Easterly Waves in the ECMWF Subseasonal-to-Seasonal Reforecasts”, AMS Annual Meeting, Boston, MA.

Li, W., and coauthors, (2020), “Process-Oriented Diagnostics to Inform the Physics Suite of Future GFS Implementations using NOAA's Unified Forecast System”, AMS Annual Meeting, Boston, MA.

Miller, D.E., and Z. Wang, (2018), “Skillful Seasonal Prediction of Winter Blocking and Extreme Temperature Frequency”, AGU Fall Meeting, Washington DC.

Miller, D.E., and Z. Wang, (2019), “Skillful Seasonal Prediction of Winter Blocking and Extreme Temperature Frequency”, AMS Annual Meeting, Phoenix, AZ.

Miller, D.E., and Z. Wang (2019), “Subseasonal Hybrid Prediction of Severe Storm Activity: Utilizing Large-Scale Weather Regimes”, 44th Climate Diagnostics and Prediction Workshop, Duke University, Durham, NC.

Miller, D.E., and Z. Wang (2020), “Subseasonal Hybrid Prediction of Severe Storm Activity: Utilizing Large-Scale Weather Regimes”, AMS 33rd Conference on Climate Variability and Change, Boston, MA.

Miller, D., Z. Wang, B. Li, D. Harnos, and T. Ford (2021), “Skillful Week-3–4 Prediction of U.S. Extreme Warm Days and SPI in Boreal Summer”, AMS annual meeting.

Miller, D.E., Z. Wang, B. Li, D. S. Harnos, and T. Ford, (2021), “Skillful Subseasonal Prediction of United States Extreme Warm Days and Standardized Precipitation Index in Boreal Summer”. Weeks 3-4/S2S Webinar Series by the OAR and NWS.

Wang, Z., T. Jensen, D. Miller, W. Li, D. Fillmore, D. Adriaansen, and C. Kalb, (2020), “Developing a Community Suite of Process-oriented Model Diagnostics for the Unified Forecast System”, First UFS Users' Workshop.

Wang, Z., Miller, D.E., Robert J. Trapp, and Daniel S. Harnos (2020), “Hybrid Prediction of Weekly Tornado Activity out to Week 3: Utilizing Weather Regimes”, Weeks 3-4/S2S Webinar Series by the OAR and NWS.

Wang, Z., J. Ye, T. Jensen, D. Miller, W. Li, “Process-oriented Model Diagnostics for Extended-range Forecasts: A Preliminary Evaluation of the GEFSv12 Reforecasts”, International Verification Methods Workshop Online (2020-IVMW-O).

Wang, Z., J. Ye, T. Jensen, D. Miller, W. Li (2021), “Process-oriented Model Diagnostics for Extended-range Forecasts: A Preliminary Evaluation of the GEFSv12 Reforecasts”, AMS annual meeting.

Wang, Z. (2021), “Process-oriented Model Diagnostics for Extended-range Forecasts: A Preliminary Evaluation of the GEFSv12 Reforecasts”, NOAA EMC UFS Global Coupled Modeling Seminar Series.

Ye, J, Z. Wang, T. Jensen, D. Miller, W. Li (2020), “Process-oriented Model Diagnostics for Extended-range Forecasts”, AGU Fall Meeting.

Zeng

Arevalo, J., Welty, J., Fan, Y., Zeng, X., 2019: Inclusion of Snowpack in the CPC Leaky Bucket Model for Soil Moisture Monitoring, Applications in Snow Hydrology: Linking Seasonal Snow to Natural Processes and Society II (Posters) session. AGU 2019 Fall Meeting. San Francisco, CA, 9-13 December 2019.

Zeng, X., 2019: On the transition of land modeling and data assimilation to operations, Ninth Conference on Transition of R2O during the 99th AMS Annual Meeting, Phoenix, AZ, 10 January 2019.

Zeng, X., 2019: Snowpack and its impact on weather and river flow over western U.S., AMS Broadcast Meteorology Conference, San Diego, CA, June 12-14, 2019.

Zeng, X., 2019: Snowpack change and its drivers over the conterminous U.S., “Environmental Breakfast Club” Colloquium, James E.Rogers College of Law, University of Arizona, 30 August 2019 (Invited).

Zeng, X., 2020: Perspectives on the next 100 years of forecasting. Town Hall: Forecasts for the Future, Visions and Dreams for the next 100 Years, AMS Centennial Annual Meeting, Boston, MA, 15 January 2020 (Invited).

Zeng, X., 2020: Impact of snowpack on NCEP Weeks 3-4 Forecasts, NWS/OSTI 2018-2020 FFO Project Meeting, 30 July 2020.