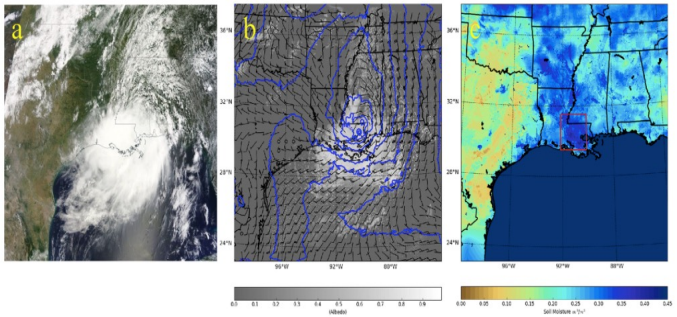
NASA Award Number, 80NSSC17K0264 entitled, THE IMPACT OF SOIL AND SURFACE MOISTURE ON TROPICAL CYCLONE REINTENSIFICATION OVER LAND

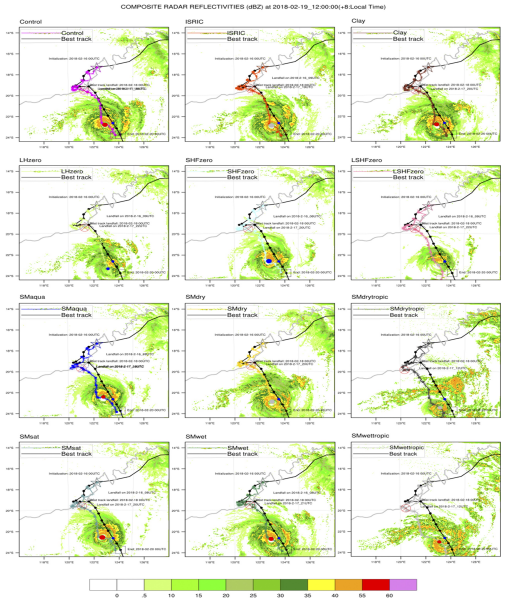
Dr. Marshall Shepherd (University of Georgia), and Dr. Joe Santanello (NASA/GSFC)

Nair., U., Rappin, E., Foshee, E., Smith, W., Pielke Sr., R., Mahmood, R., Case, J., Blankenship, C., **Shepherd, J.M., Santanello, J.**, and D. Niyogi, 2019: **Influence of Land Cover and Soil Moisture based Brown Ocean Effect on an Extreme Rainfall Event from a Louisiana Gulf Coast Tropical System**, Scientific Reports. 9, Article number: 17136, https://www.nature.com/articles/s41598-019-53031-6

- **Significance:** Published in **Nature Scientific Reports**, this was a high impact paper and one of the 1st published modeling studies confirming the influence of the Brown Ocean Effect on a tropical event, a significant extreme hydrometeorological event that affected Baton Rouge, Louisiana and surrounding areas.
- The original research by Dr. Theresa Andersen at the University of Georgia was also funded by **NASA**. This paper confirmed using a coupled land-atmosphere modeling system that wet landscapes likely modulated the intensity of the flood-producing storm (right). This research also provided valuable guidance for our forthcoming work.



Yoo, J., J. A. Santanello, M. Shepherd, S. Kumar, P. Lawston, and A. M. Thomas, (2020). **Quantification of the Land Surface and Brown Ocean Influence on Tropical Cyclone Intensification Over Land. Journal of Hydrometeorology**, JHM-D-19-0214.1. https://doi.org/10.1175/JHM-D-19-0214.1



- **Significance:** An investigation of Tropical Cyclone (TC) Kelvin in February 2018 over northeast Australia was conducted to understand the mechanisms of the brown ocean effect (BOE) and to develop a comprehensive analysis framework for landfalling TCs in the process. **NASA's Land Information System (LIS) coupled to the NASA Unified WRF (NU-WRF) system** was employed as the numerical model framework for 12 land/soil moisture perturbation experiments.
- The results suggest that there were recognized differentiations among the sensitivity simulations as a result of land surface (e.g., soil moisture and texture) conditions. However, the intensification of TC Kelvin over land was more strongly related to atmospheric moisture advection and the diurnal cycle of solar radiation (i.e., radiative cooling) than to overall soil moisture conditions or surface fluxes (left).
- The analysis framework employed here for TC Kelvin can serve as a foundation to specifically quantify the factors governing the BOE, which likely operates in a continuum from largely to minimally influential such that it could be utilized to help improve prediction of inland effects for all landfalling TCs.
- This work also set the stage for better understanding of LIS and NU-WRF land surface model and microphysics efficacy and sensitivities

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