**Dunion, J. P., C. D. Thorncroft, and C. S. Velden, 2014: The Tropical Cyclone Diurnal Cycle of Mature Hurricanes. *Mon. Wea. Rev.*, 142, 3900–3919, doi:10.1175/MWR-D-13-00191.1.**

This work describes a new technique that uses infrared satellite imagery to examine the evolution of the tropical cyclone (TC) diurnal cycle for all North Atlantic major hurricanes from 2001-2010. The imagery reveals cyclical pulses in the infrared cloud field that regularly propagate outward from the storm each day.  These diurnal pulses begin forming in the storm’s inner core near the time of sunset and continue to move away from the storm overnight, reaching areas several hundred kilometers from the circulation center by the following afternoon.  Findings indicate that there can be significant changes in storm structure as TC diurnal pulses evolve and that they may also impact storm intensity estimates and the actual size of the wind field.  The repeatability of the TC diurnal cycle in time and space suggests that it may be an unrealized, yet fundamental process of tropical cyclones.

**Rogers, R. F., P. D. Reasor, and J. A. Zhang, 2015: Multiscale Structure and Evolution of Hurricane Earl (2010) during Rapid Intensification. *Mon. Wea. Rev.*, 143, 536–562, doi:10.1175/MWR-D-14-00175.1.**

This paper presents airborne Doppler radar and dropsonde observations of Hurricane Earl (2010) prior to and during a period when it strengthened very quickly, termed rapid intensification (RI).  With missions occurring every 12 h over a 3-day period, these flights comprise the most intensive sampling of the inner-core structure and evolution of a tropical cyclone undergoing RI on record.  The observations presented here show how strong thunderstorms played a role in Earl’s circulation center becoming vertically stacked with height, coincident with the onset of RI, and how the location of these thunderstorms inside Earl's radius of maximum wind was associated with the continuation of Earl's RI.  Mechanisms underlying this radial distribution of thunderstorms were explored to better understand what processes govern this distribution and associated rapid intensification.

**Chen, H., and S. G. Gopalakrishnan, 2015: A study on the asymmetric rapid intensification of**

**Hurricane Earl (2010) using the HWRF system. *J. Atmos. Sci.*, 72, 531–550.**

Hurricanes sometimes change intensity very quickly, and if this happens when they approach land, it can suddenly cause a lot of damage or kill many people. This so-called Rapid Intensification (RI) is very hard to forecast. For the first time, the Hurricane Weather Research and Forecast (HWRF) model that NOAA uses to forecast where a hurricane will go and how strong it will be, was used to help understand RI. During RI, the HWRF forecasts matched information from aircraft in hurricanes.

Two key conclusions from this paper are: 1) Sometimes, the position of the hurricane eye changes with height. It was thought that this change needed to disappear before RI began, but, in this case, it does not disappear until a few hours after RI begins; 2) Hurricane eyes are warm in the middle and upper parts of the atmosphere, and the amount of warmth is tied to intensity. The eyewall is the ring of strong thunderstorms surrounding the eye that fuel the hurricane winds. When the thunderstorms get especially strong in a special part of the eyewall, they can help to transfer more warm air into the eye and lead to further intensification.

**Atlas, R, L. Bucci, B. Annane, R. Hoffman, and S. Murillo, 2015: Observing System Simulation Experiments to Assess the Potential Impact of New Observing Systems on Hurricane Forecasting, Marine Technology Society Journal, 49(6),140-148, doi: 10.4031/MTSJ.49.6.3.**

This paper demonstrates how correctly performed Observing Systems Simulation Experiments (OSSEs) can provide guidance to instrument designers, forecasters, and even the ordinary citizen.  Using a simulated atmosphere, the designer of an OSSE can investigate how observations from a proposed observing platform potentially can improve high-impact weather forecasts.  Demonstrated findings show how the location and resolution of wind profiles from a hypothetical space-based lidar could positively impact the track forecasts of land-falling hurricanes in global forecast systems. New, higher resolution regional forecast systems are being used to conduct OSSEs to improve the intensity and structural forecasts of hurricanes. These advancements help fulfill the ultimate goal of improving hurricane track and intensity forecasts to keep the lives and livelihood of citizens protected.