On the Multiple Intensity Changes of Hurricane Earl (2010)

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Introduction
- Hurricane track forecast has improved considerably over the past several decades
- Intensity forecast has been slower to progress
- Rapid Intensification is a large focus of current research

Rapid Intensification (RI) – an increase in the maximum sustained surface wind of at least 30 knots (15.4 m/s) in a 24-hour period (Kaplan and DeMaria 2003)

Objectives
- Evaluate the performance of the model simulation relative to observations
- Examine the intensity and structural changes of Earl, especially the secondary eyewall formation, in relation to RI
- Plan for future studies on hurricane energetics during RI and the secondary eyewall formation

Methodology
- Utilized Weather Research and Forecasting (WRF) Model (ARW Core)
- Initial and boundary conditions obtained from 1° x 1° reanalyses from the National Centers for Environmental Prediction (NCEP)
- Sea-surface temperatures (SSTs) also retrieved from NCEP reanalyses at the model initial time
- SSTs set constant throughout simulation

Results

Intensity
- Simulation is accurate in reproducing the onset of RI, which occurs around 0500 UTC 29 August
- End of RI occurs about 12 hours later in the model than in observations

Storm Track
- Model is very accurate in capturing the track between 27 and 30 August
- After 29 August, the simulated path deviates to the east-northeast of the observed track

Structure
- Simulated storm is able to reproduce the secondary eyewall formation, which begins around 0000 UTC 31 August in the model simulation
- Model is several hours late in forming the double eyewall and about 12 hours late in producing the inner eyewall collapse

Conclusions
- Simulation is skilled in reproducing the intensity, track, and structural changes of Earl, including the secondary eyewall formation
- Timing of RI onset in the simulation is fairly accurate, although it was late in producing the end of RI

Limitations
- Although the secondary eyewall formation is well reproduced, the low-reflectivity “moat” region between the inner and outer eyewalls is absent
- While this simulation will be used for future studies on energetics associated with RI, the limitations of the simulation should be kept in mind when interpreting results

References

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