Introduction

Motivation

- TC landfalls over the Mid-Atlantic are very rare (Fig. 1).
- When these events do occur, the resulting consequences could be devastating. A recent example is Hurricane Sandy (2012).
- We have utilized Minerva hindcasts as "extensions" of the observational record to compile statistics of these rare events.
- Are Mid-Atlantic TC landfalls predictable in Minerva? Does predictability depend on model resolution?

MINERVA PROJECT

Modeling System

<table>
<thead>
<tr>
<th>System</th>
<th>Atmosphere model cycle</th>
<th>Ocean model</th>
<th>Ocean resolution</th>
<th>Ocean vertical levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minerva</td>
<td>IFS cy 38r1</td>
<td>T319 (64km)</td>
<td>NEMO v3.0.3.1</td>
<td>91 levels, top = 1 Pa</td>
</tr>
<tr>
<td></td>
<td>T639 (32km)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>T1279 (16km)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Persistence of SST anomalies leading to Mid-Atlantic TC landfalls

Composite extratropical sea surface temperature (SST) anomalies (stat. sig. T1279)

(No significant SST anomalies for the T319 model)

Statistical modeling of Mid-Atlantic TC landfalls

LWA Index (LWA) = \( -1.0 *(N-LWA, + N-LWA, + S-LWA) \)

- N-LWA anomalies averaged over Region 1 (see Fig 8), etc.
- SST Index (SSTI): SSTAs averaged over the equatorial Atlantic (see Fig. 9).

All North Atlantic TCs (1980-2011)

Landfall ~ \( 0.58 \) p95/p5, Jul.-Oct.

Climatology and predictability of Mid-Atlantic tropical cyclone landfalls in high-atmospheric-resolution seasonal prediction system

Julia V. Manganello, Ben Cash & Erik Swenson

George Mason University and Center for Ocean-Land-Atmosphere Studies (COLA), Fairfax, VA

Summary & Conclusions

- Minerva hindcasts exhibit skill in reproducing climatological characteristics of Mid-Atlantic TC landfalls particularly at the highest T1279 resolution (16-km grid spacing).
- There are large-amplitude quasi-stationary features in the LWA and SST anomaly distributions that persist up to a week leading to these landfalling events.
- A statistical model utilizing indices based on the LWA and SST anomalies as predictors is developed. It shows skill in predicting Mid-Atlantic TC landfalls one day (and possibly two days) in advance only when applied to T1279 data.
- Using the LWA Index as a metric may have potential for assessing statistics of Mid-Atlantic TC landfalls in longer timescale predictions including climate change projections.