2017 Ensemble Tiger Team Highlights

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Purpose & Objectives

• **Charge**: Develop new ensemble-based products beyond the typical mean/standard deviation that could be used by NHC forecasters to improve forecasts

• First product was ensemble-based RI probabilities, which are compare to current statistical methods (SHIPS, DTOPS)
## Configuration

<table>
<thead>
<tr>
<th>Model</th>
<th>Type</th>
<th>Real-Time Offset</th>
</tr>
</thead>
<tbody>
<tr>
<td>HWRF (HWMN)</td>
<td>Dynamical (IC + Physics)</td>
<td>12 h</td>
</tr>
<tr>
<td>HMON (HMMN)</td>
<td>Dynamical (IC + Physics)</td>
<td>12 h</td>
</tr>
<tr>
<td>COAMPS (COMN)</td>
<td>Dynamical (IC)</td>
<td>6 or 12 h</td>
</tr>
<tr>
<td>HWRF Analog (ANEN)</td>
<td>Statistical model applied to retrospective HWRF</td>
<td>6 h</td>
</tr>
<tr>
<td>DTOP (DTOP)</td>
<td>Statistical combination of dynamical forecasts</td>
<td>0 h</td>
</tr>
<tr>
<td>SHIPS (RIOD)</td>
<td>Statistical</td>
<td>0 h</td>
</tr>
</tbody>
</table>

- Probabilities derived for first four models via counting number of members where intensity change criteria is satisfied
Major Milestones

• Increased participation in the real-time intensity change probability product
• Additional models (DTOP, HMON)
• Integration of products into HFIP site
• Additional analysis of intensity change probabilities between models
• Moskaitis-style intensity change probability added to HWRF & HMON ensembles
• Use of ECMWF ensemble guidance for aircraft flight plans and extra sondes
Brier Skill Scores

• 2017 demonstration forecasts
  – Atlantic and east Pacific verified separately
  – Heterogeneous verifications with all available cases
  – Homogeneous verifications for Atlantic statistical models

• Skill baseline uses 1987-2016 climatological probability as the forecast
  • $\Delta V \geq 30$ kt in 24 hr    climo = 5.9%
  • $\Delta V \geq 55$ kt in 48 hr    climo = 3.9%
  • $\Delta V \geq 65$ kt in 72 hr    climo = 6.8%
Brier Skill Scores

Brier Skill Scores: Atlantic Basin

- 24 h, 30 kt
- 48 h, 55 kt
- 72 h, 65 kt

N cases:
- HWRF: 169
- HMON: 157
- COAMPS: 265
- HWAN: 243
- DTOPS: 303
- SHIPS: 300

N RI:
- HWRF: 145
- HMON: 132
- COAMPS: 221
- HWAN: 209
- DTOPS: 251
- SHIPS: 244

N RI:
- HWRF: 9
- HMON: 9
- COAMPS: 20
- HWAN: 16
- DTOPS: 22
- SHIPS: 22

HWRF: NCEP HWRF
HMON: NCEP HMON
COAMPS: Navy COAMPS-TC
HWAN: HWRF Analog
DTOPS: Deterministic to Probabilistic Statistical
SHIPS: SHIPS-RI
Brier Skill Scores

HWAN, DTOPS, SHIPS Brier Skill Scores: Atlantic Basin

- 24 h, 30 kt
- 48 h, 55 kt
- 72 h, 65 kt

<table>
<thead>
<tr>
<th></th>
<th>HWAN</th>
<th>DTOPS</th>
<th>SHIPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>N cases</td>
<td>219</td>
<td>219</td>
<td>219</td>
</tr>
<tr>
<td>N RI</td>
<td>27</td>
<td>27</td>
<td>27</td>
</tr>
</tbody>
</table>

HWAN: HWRF Analog
DTOPS: Deterministic to Probabilistic Statistical
SHIPS: SHIPS-RI
δl >= 30 kt (Rapid Intensification)
10 kt <= δl < 30 kt (Moderate Intensification)
-10 kt < δl < 10 kt (Steady)
-30 kt < δl <= -10 kt (Moderate Weakening)
δl <= -30 kt (Rapid Weakening)  TC Has Dissipated
Future Plans/Priorities

• Combinations of individual probabilities (i.e., multi-model probabilities)
• Generate and validate ensemble-based hazard probabilities (wind, rain)
• Expanded use of ensemble-based methods for observation targeting information
• Further use of ensembles for model diagnostics in individual cases
Summary

- Dynamical ensemble systems have shown more skill at predicting RI in 2017
- Statistical methods better for 48 and 72 hr lead times
- Models have even greater skill for non-RI intensity change categories
- Not uniform agreement between dynamical and statistical models in case-by-case basis
- Ensemble systems offer opportunities to extract other information, including forecast sensitivity and model dynamics