2017 Real-time COAMPS-TC EPS

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Typhoon Noru
Hurricane Norma
Hurricane Irma
COAMPS-TC EPS Configuration

- Same EPS configuration as 2015/2016 real-time ensemble
- 1 unperturbed control + 10 perturbed members
- Synoptic-scale IC, vortex scale IC, and lateral BC perturbations
- Uncoupled COAMPS-TC with simple SST-cooling parameterization
- 36/12/4 km resolution, same as 2017 ops deterministic COAMPS-TC
- GFS deterministic is “parent model” for control and perturbed members

Real-time Forecast Sample

<table>
<thead>
<tr>
<th>Atlantic</th>
<th>Cases</th>
<th>Obs RI</th>
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<tr>
<td>05L Don</td>
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<td>18L Philippe</td>
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<tr>
<th>EastPac</th>
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<td>12E Jova</td>
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<td>14E Lidia</td>
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<td>15E Otis</td>
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<td>17E Norma</td>
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<td>18E Pilar</td>
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<td>19E Ramon</td>
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<tr>
<th>WestPac</th>
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<th>Obs RI</th>
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<td>26W TD26</td>
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<td>27W Saola</td>
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</table>

Obs RI = # of observed independent RI events predicted by at least one 0-24 h COAMPS-TC EPS forecast
Storm not included here in validation sample

880 real-time forecasts of 46 different TCs, including 18 observed RI events from 16 different TCs
Track spread is very well calibrated in the COAMPS-TC EPS for a large sample of cases, consistent with results of previous years.
Can the ensemble discriminate between forecast cases with high uncertainty vs. low uncertainty? (i.e. high vs. low expected ensemble mean error)

For track, at least at later lead times, the COAMPS-TC EPS is excellent at discriminating between high and low uncertainty forecast cases.

Would like to see red dots increasing from left to right (indicating discrimination), ideally along the diagonal (indicating good spread calibration).

Plot pertains to Atlantic, EastPac & WestPac sample.
The intensity forecasts remain underdispersive. Although spread grows with time after ~24 h, the spread at 24 h is only about 80% of the initial time spread.
Can the ensemble discriminate between forecast cases with high uncertainty vs. low uncertainty? (i.e. high vs. low expected ensemble mean error)

For intensity, discrimination is good for early and middle lead times. However, the spread calibration is poor for all lead times (underdispersive)

Would like to see red dots increasing from left to right (indicating discrimination), ideally along the diagonal (indicating good spread calibration)

Plot pertains to Atlantic, EastPac & WestPac sample
The overall rel. freq. at which ensemble members predict RI (~4-5%) is lower than the observed rel. freq (~6-8%).

24 – 48 h RI forecasts are reliable for low to mid-range probabilities. 48 to 72 h RI forecasts are reliable for low probabilities. 0 – 24 h forecasts are not reliable, likely due to adjustment of the initial vortex.
### Harvey (09L)

<table>
<thead>
<tr>
<th>CTCX EPS</th>
<th>Forecast Probability of RI (%)</th>
<th>Prob of RI (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid time</td>
<td>( \tau = 0-24 ) h ( \tau = 24-48 ) h ( \tau = 48-72 ) h</td>
<td>Prob of RI (%)</td>
</tr>
<tr>
<td>22/18z</td>
<td>0</td>
<td>9</td>
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<tr>
<td>23/00z</td>
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<td>24/00z</td>
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<td>26/00z</td>
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### Noru (07W)

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<td>( \tau = 0-24 ) h ( \tau = 24-48 ) h ( \tau = 48-72 ) h</td>
<td>Prob of RI (%)</td>
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<td>21/00z</td>
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<td>21/06z</td>
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<td>36</td>
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### Nate (16L)

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<td>Valid time</td>
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<td>Prob of RI (%)</td>
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<tr>
<td>07/12z</td>
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</table>

- Three 0-24 h forecasts had high RI prob. during Harvey's RI event
- Ensemble rarely produces high prob. for beginning portion of RI event
- Example of uncertainty in RI timing. Prediction of most likely time of RI is after observed RI event in this case.
- Example of missed RI event. Almost no members predict the observed RI.
Goal for FY18: Transition COAMPS-TC EPS to FNMOC for operational implementation

- 11 members, 36/12/4 km resolution, Uncoupled COAMPS-TC (as in 2017 demo)
- Operational configuration will include: Synoptic-scale perturbations from NAVGEM deterministic + correlated noise, and possibly some members GFS deterministic + correlated noise
- Implement measures to improve intensity spread calibration, such as (1) SST perturbations, (2) initial time vortex moisture perturbations, and (3) stochastic physical parameters, e.g. surface drag coefficient

Additional objectives for FY18+:

- Continued product development (e.g. for wind radii), interfacing with JTWC and NHC
- Continued contribution to HFIP multi-model ensemble

https://www.nrlmry.navy.mil/coamps-web/web/ens