The second HFIP–Biweekly teleconference in May 2017 was held 2:00 PM – 3:00 PM ET Wednesday May 31st *online* from the NWS Headquarters OSTI, Silver Spring, MD. Following roll call (see back for list of participants), Shane Forsythe-Newell (HFIP/PO) welcomed about 33 members onboard (many members were busy with this active hurricane season), and along with Gopalakrishnan Sundararaman (HRD/HWRF) shared opening remarks noting the purpose of the meeting.

**Introduction and Announcements:**

The first part of this meeting consisted of announcements from the HFIP Program Office for all Project PI's and POCs.

**Presentation by James Doyle on:**

*Recent COAMPS-TC development and future plans*[1] was shown via Go-To-Meeting, and also made available to all participants via HFIP's anonymous FTP temporary link for those who might have had a problem using Go-To-Meeting.

The speaker, Dr. James Doyle (Naval Research Laboratory, Monterey, CA), initially thanked his peers, contributors, supporters, and began a 28-slide presentation of COAMPS-TC (CTCX) recent developments. The speaker began with an overview that outlined five major areas: (1) Analysis, (2) Atmosphere, (3) Ocean, (4) Operations, and (5) Ensemble. Analysis was described as no cycling or cycling: 3D-Var (NAVDAS), 4D-Var, and EnKF DART. Atmospherics consisted of non-hydrostatic moving nests and TC-physics. The ocean area consisted of 3D-Var (NCODA), ocean (NCOM), and wave options (SWAN, WWIII). Operations was described as 45-15-5 km (2016); 36-12-4 km (2017) COTC (NAVGEM) and CTCX (GFS). The ensemble area consisted of 45-15-5 km (2016); 36-12-4 km (2017) 11-member CTCX ensemble. The performance of COAMPS-TC began with describing significant

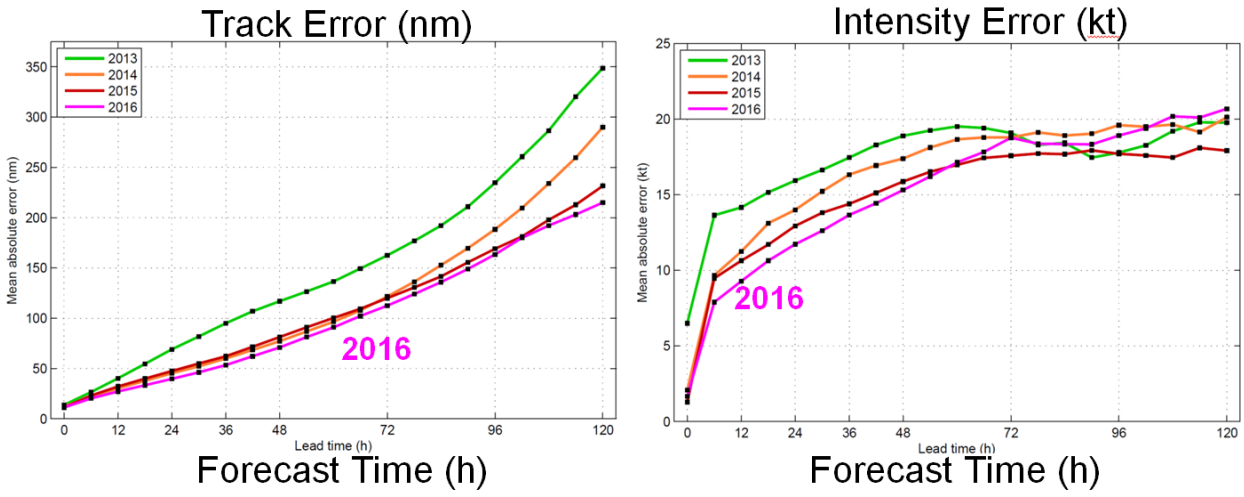


Figure 1. COAMPS-TC (CTCX) Track and Intensity Error 2013-2016.

[1] Doyle, J., Moskaitus, J., Hodur, R., Chen, S., Jin, H., Jin, Y. Komaromi, W., Reinecke, A., Ryglicki, D., Stern, D., and Wang, S. (2017). *Recent COAMPS-TC development and future plans.* Presentation by Dr. Doyle, Naval Research Laboratory, Monterey, CA. at the Hurricane Forecast Improvement Project HFIP-Biweekly Teleconference, 31 May 2017, National Weather Service HQ, Silver Spring, MD.

improvements during the 2015/2016 timeframe occurred for both track and intensity errors of COAMPS-TC CTCX (Fig. 1). COAMPS-TC had lower track error than most models (GFDL, GFDN) from 2015-2016 with HWRF only slightly outperforming from 12-h to 106-h time frames. COAMPS outperformed all model mentioned after 106-h timeframes. This was followed by slides depicting improved performance in the pressure-wind relationship from 3013-2016 attributed to the new formulation of the surface drag coefficient and coupled air-ocean interaction.

Major efforts using case studies were made in the area of developing more accurate forecasts involving atmospheric-ocean coupling i.e., sea surface temperature (SST) and 10-m winds (e.g., Gaston (07L), 2016. Improvements were observed in intensity forecasts using coupled modeling that were very similar to observed data. It was noted that for slow moving TCs such as Leslie (Fig. 2), the coupled model substantially outperforms the uncoupled model for all lead times with intensity errors and bias as well as track forecasts.

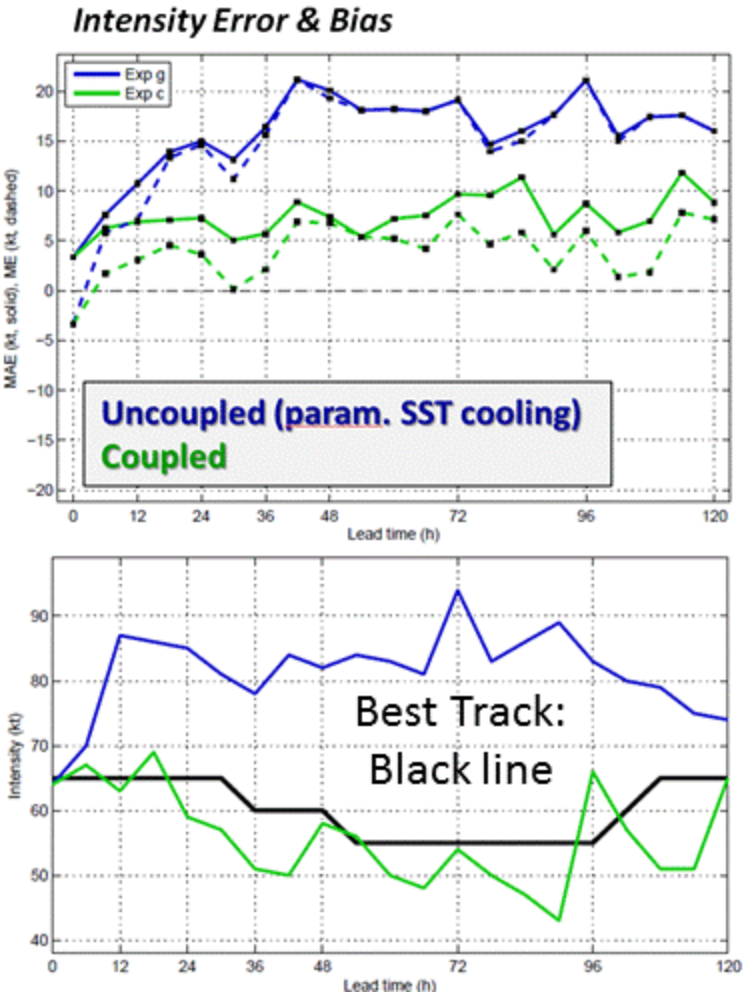


Figure 2. COAMPS-TC (CTCX) Atmosphere-Ocean coupling using Hurricane Leslie (2012).

Ocean interaction was determined to be of *first-order importance* during the initial 48-hours of Hurricane Leslie's slow movement. Track forecasts showed equally significant improvement in accuracy with the coupled model especially through the 96-h point.

Rapid intensification (RI) challenges were noted by the speaker to pose a continuing challenge as exemplified by RI storms Meranti (16W) and Chaba (21W) in 2016, and Patricia (20E) in 2015 where all models struggled to spin up and spin down in concert with observed values.

An example of what a new 24-h forecast intensity change product (colored vertical-bar graph) would look like was shown in slide-26. In subsequent slides it was noted that COAMPS-TC (3km) and HWRF (3km) controlled consensus in the Atlantic basin using Hurricane Joaquin (11L) as a case-study. Another product example, Basin-scale COAMPS-TC was shown for 36-h forecasts of 10-m winds that depicted triple nested applications (45-15-5 km) as *progress toward* producing high-resolution global forecast products.

## Summary:

COAMPS-TC was much improved for track and intensity from 2015-2016. Intensity error detailed improvements were in ocean coupling, new vortex initialization; and new $C_D$ parameter). Track error detailed improvements were new initialization and physics. The multi-model high-resolution ensemble (NOAA/Navy) and air-ocean coupling look promising. Challenges are RI, TC physics, and inner core DA. In 2017, development of the 4 km resolution deterministic model will look for a 10% to 20% improvement in intensity/RI CTCX running worldwide. Also, the 4 km, 11-member ensemble for initial and boundary condition perturbations will be developed with CTCX running in W. Atlantic, E. pacific, and W. Pacific basins. Priorities for COAMPS-TC are TC-physics (PBL, cloud microphysics), Analysis (4-D-Var in 2018, emphasis on satellite DA), Ensemble (10-20 members, stochastic physics), coupling (Ocean, waves, coupled DA), and resolution (4 km in 2017, 2 km in 2019, and about 4 km basin-scale in 2021 and beyond.

## Closing Remarks:

It was noted by Dr. Gopal Sundararaman the presentation and participation were very good. Dr. Shane Forsythe-Newell followed up by announcing the next meeting date time, thanked everyone, and adjourned the meeting.

## Next Meeting time: 2-3 PM ET Wednesday, 14 June 2017

- Shane to send out a reminder. Following roll-call and any announcements from the HFIP Program Office, a round table discussion with Team Leads is planned with project updates.

## Participants (33):

Alex Reinecke (NRLMRY), Andrew Penny (NHC), Avichal Mehra (NCWCP), Bin Liu (EMC), Bryce Tyner (FIU), Chanh Kieu (Indiana Univ.), Daniel Stern (UCAR), David Ryglicki (NRLMRY), Edward Mifflin (HFIP/PO), Evan Kalina (GSD), Frank Marks (AOML), Gopal Sundararaman (AOML/HRD), Hao Jin (NRLMRY), Yi Jin (NRLMRY), Jian-Wen Bao (NWS), Jon Moskaitis (NRLMRY), Jun Zhang (RSMAS), Kate Musgrave (CO State Univ.), Kathryn Newman (DTC), Mark Boothe (NPS), Morris Bender (OAR), Nicole Kurkowski (OAR), Nysheema Lett (HFIP/PO), Ping Zhu (FIU), Richard M. Hodur (NRLMRY/SAIC), Ryan Torn (SUNY), Shane Forsythe-Newell (HFIP/PO), Sue Chen (NRLMRY), Tim Marchok (GFDL), Will Komaromi (NRLMRY), Xu Lu, Xuejin Zhang (Univ. of Miami), and Zhan Zhang (NCEP).