

# HFIP Annual Meeting Agenda

## Day 4 (Nov 18, 2021)

### Meeting Notes

#### 12:00 pm - 1:15 pm: HFIP Real-time Experiment

##### 12:00 pm Results from HAFS v0.2A (Bin Liu)

- Configuration is finalized in June. Sub-components synced with the authoritative branches on 05/12/2021.
- Based on HAFSv0.1A. Some changes in physics. Coupling using CMEPS.
- Improvements in both track and intensity than v0.1A. Modification to the SFC layer mixing length improves inflow angle.
- 3 Basin average: HAFS-A better than HWRF in track almost at all lead times. For intensity, HAFS-A is better after 24 hours.
- Ocean heat content - HAFS was able to capture a small area of high heat content.

##### 12:15 pm Results from HAFS v0.2B (Andy Hazelton)

- Expanded the nest domain to the East. Coupled the nest to HYCOM.
- Bias was well calibrated on Days 1-3, slightly high bias at Days 4-5, especially for Larry.
- Global skill is a little bit better than GFS in track, lower intensity errors than GFS in the EPAC.
- Ida case: RI was well predicted. Wind structure was consistent with obs.
- Sensitivity experiments: diffusive tracer advection and PBL (mixing length)
- Tracer advection didn't alter the results much. Mixing length has a bigger impact.
- Q: Any plan for switching to MOM6? - A: That's a long-term goal.

##### 12:30 pm Results from HAFS v0.2D (Li Bi)

- HYCOM coupled regional FV3. 6-hourly hybrid 3DEnVar using GDAS ensemble. 3-hourly FGAT. CRTM2.3.0.
- Motel top is 10 hPa, lower than GFS, making it difficult to use high-peaking channels.
- No self-cycled DA yet.
- Some additional observations to global DA.
- Continuous cycling: HAFS-D was able to control error growth
- HAFS-D track error is similar or slightly better than HAFS-A.

- GFS: bias does not change much with time. HAFS-A and HAFS-D bias increase with time. May have an issue with mass conservation.
- Important future work is to configure a potential regional basin scale cycled HAFS DA.
- Comment: review high-level satellite DA.

12:45 pm Results from HAFS v0.2E (Zhan Zhang)

- Based on HAFS-A configuration. Lower resolution in both horizontal (6 km) and vertical (L64). using NSST without ocean coupling. 21 ensemble members.
- HAFS-A is more skillful than the control member in both track and intensity forecast at all lead times.
- HFMN is better than the control member.
- HAFS ensemble mena track forecast outperformed GEFS in the short lead times.
- HFMN has smaller error in the storm size than HAFA and HF00.
- Intensity spread is still underdispersive but improved than 2020.
- HAFS-E and HAFS-A have better track forecasts than HAFS-D and HAFS-B before Day 3. Not doing well for longer lead time for both track and intensity.
- For RI events, using a threshold of 20 % of ensemble members led to better success rate while maintaining relatively lower false alarms.
- Produced probabilistic forecasts - wind radii, wind, and precip.
- Q: Any gain with 3 km? - A: 5- 10% gain. Hugh intensity gain.

1:00 pm Results from T-SHiELD (Morris Bender/Tim Marchok)

- T-SHiELD upgrade: EDMF-TKE, 100 m mixing length cap, ice/radiation interaction, modified sfc exchange coeff, retuned 1-D mixed-layer ocean, retuned detrainment.
- Improvements in Gale wind radii compared to 2020 T-SHiELD.
- 13 km SHiELD outperformed GFS (11-17 %).
- 3-year comparison: Atlantic SHiELD track error is 10 % less than the GFSv16 in 3-4 days.
- Big improvement in the central and easter Atlantic. Better in along-track error. Some improvement in the Caribbean. Moist physics is important in track error.
- Ida: T-SHiELD is doing very well with Intensity, RI.
- T-SHiELD also has a small bias in precip.
- Simple 1D ocean coupling in T-SHiELD was a major contributor to large intensity bias in Larry.

1:15 pm Results from GSL FV3 Experiments (Georg Grell)

- 3 experiments: THMP, GF, MYNN runs
- THMP: serious issue with radiation. Radiation balances very sensitive to physics changes.
- Warm bias in GF run.
- Slowing bias for GF.
- The GF run moves Sam too fast.
- All runs produced more precip. THMP run produced an extra 25% more precip. A lot of precip is due to SAS.
- Clipping of large negative mixing ratios causes an issue.

### **1:30 pm - 2:15 pm: Observations for HAFS**

#### 1:30 pm      Advancing Prediction of Hurricanes Experiment (APHEX) (Jason Dunion)

- Motivated by goals/metrics of 5-year HFIP strategic plan
- Goal is to focus on improving understanding all stages of TC life cycle
- Bold experiments were run in 2021
- COVID limited Bermuda/Barbados this year, hoping to add Cabo Verde 2022
- Had a few RI flights, mainly TS/Cat 1, no pre-TC
- Doppler wind radar tested this year
- Had 75-80% success rate on expendables
- Ida: Majority of data assimilated was from P3
- Major upgrade on WSRA this year, reduced spikes
- MicroDop has potential, did not fly into hurricanes
- Continuing ONR collaboration for 2022
- Starting WPAC/Cabo Verde operations
- Continued sUAS/satellite validation
- Jiayi: 3D structure needed for both HWRF/HAFS model evaluation, 3DVAR TDR data was presented in this talk

#### 1:45 pm      2021 Ocean observing collaboration (Gustavo Goni)

- Data collected on the ocean for Opal, since then ocean essential features on the map have been linked to hurricane intensification
- Objective is to monitor water mass properties from surface to a few hundred meters deep
- Saildrones are new this year

- Observations for Henri this year are colored according to type (box outline)
- Glider is size/weight of average person, piloted from the ground, and has many capabilities, provide training opportunities
- Argo floats are similar to gliders but not piloted
- Collected more than 100,000 profiles via floats/gliders
- RTOFS has a cool bias in the Caribbean
- Conducted 5 saildrone missions in Caribbean and tropical Atlantic
- Integrated field plan (saildrone, sUAS, and gliders) for 2022 to observe full air-sea transition zone
- D. Melendez: are you leveraging HF Radar? Gustavo: No, aware of it's ocean current importance.
- What is the data policy for external research? Gustavo: All of the data is public, institutions also provide QC data.

2:00 pm Extreme Events Ocean Observing Task Team (EEOOTT) (Cheyenne Stienbarger)

- EEOOTT, centralized working group for modeling and observations, started in 2020
- Priority recommendations from 2021 workshop, will require continued coordination across line offices and with academic partners
- Working groups formed 2021 to address priorities (getting obs to forecasters, etc.)
- Integrated field campaign planned for 2022, two modes of observations to focus on storms (collocated, repeated obs for studies)
- Bridging gap between observing and modeling communities and creating a coordinated implementation plan are key tasks for the team
- Frank: How can HFIP advance this collaboration effort? Meetings are open to HFIP collaborators, reach out to Cheyenne for an invitation.
- Maria: Comment--used glider/saildrone observations for coupling in HAFS systems, will continue collaborating.

**2:30 pm - 5:00 pm: Discussion on HAFS Development**

2:30 pm HAFS configurations strategies and IOC (Zhan Zhang)

- HAFS IOC and goals
  - Collaborative project in UFS, targeting for FY23 implementation
  - HWRF and HMON is providing track and intensity forecast
  - Functionality before May 1, 2022

- Proposed HAFS domain configuration
  - 4 realtime config with HWRF baseline: improved results over HWRF for 36 hr
  - Two config is proposed for testing for IOC to replace HWRF and NHON
    - First config: Storm centric with one moving nest parent, 6 x 2 km res., storm inner core DA cycling, two-way HYCOM coupled and one way WW3 coupled, CCPP physics
    - Second config will only run for NHC AOR, NATL and EPAC, GFS based for parent domain, DA cycling for nest domain, GDAS or HAFS ensemble for error BG covariance
- Physics strategy and plan
  - Close to the one in GFS
  - Make use of CCPP/UFS framework
  - Focus on PBL, cumulus convection and microphysics schemes
  - Address current issues in physics (slide 8)
- HPC resources
- Timeline: started code development for IOC on Nov 1, 2021, will deliver to NCO on Mar-May 2023 for implementation on June 2023 (slide 10)
- Potential HAFS v2/3 storm focussed config targeted for FY24-25
  - 5 storm following
  - Replace hycom with mom6
  - ESG grid
  - High resolution nest

#### 2:50 pm Grid and Nesting Developments (Xuejin Zhang)

- Provide inner-core analyses and global and regional forecast guidance of the Tropical Cyclone (TC) track, intensity, structure, and ambient flows to operational communities, Extend forecast guidance up to seven days, target on the scientific and forecast priorities under HFIP and UFS
- Available capabilities in HAFS (slide 3)
- Grid development: global grid with static nest feature is used because it is more uniform globally, widest clee is underscore 2, that makes the time step smaller, for flux can use c-grid by doing this, right now using approx of c-grid

- Grid development for regional ESG grid, making the domain more uniform, making it more efficient with timesteps
- FV3 nesting: parent and nest can be integrated concurrently, nested grids aligned with coarse grid
- Moving nest implementation progress - current - single moving nest in 6 tile, storm tracking algorithm; moving forward workflow for moving nest, physics optimization
- Moving nest design ongoing work for innercore DA and moving nest coupling
- Storm following internal tracker to scan the certain area to determine where the center of the moving nest should be located and multiple storm tracking
- Gopal: when will this code be available? Will follow the IOC timeline.

#### 3:10 pm Physics Development (Andy Hazelton/Chunxi Zhang)

- Estimation of vertical mixing length
- MEDMF-TKE v KEDMF shows RI closer to reality with MEDMF TKE
- HAFL (91 vertical levels ) produced better results for track and intensity
- Future plans how to improve LES
- Physics suite in HAFS mostly based on GFS, SAS scheme
- PBL Based on eddy diffusivity and mass flux
- TKE EDMF improved results in HAFS-A
- EEPS PBL schemes shows worse track error but 30 kt track error is better
- When tested without Dorian, EEPS scheme shows good results
- Three major elements for cumulus schemes
- EDMF-GFS produces the works forecast
- What are the plans on focusing on physics alone? Two different physics suite will be developed for different configurations.

#### 3:30 pm DA Advancements and Use of observations (Jason Sippel/Zhan Zhang)

- HAFS DA issues - initialization during RI, large negative intensity bias, track worse than HAFSA, not target for IOC, more of physics issue on negative bias
- HAFSD performance: improved by 10%, intensity skill more or less neutral
- OU results on HAFS DA condos vs. HAFS A, 4DnVAR, online bias correction
- From UMD: when online bias correction evaluated against HAFSA, the online BC config produces similar track errors

- From UM: HAFS ensemble covariance res. with 5km and 9 km cycled ensembles, downscaling produces better results at 6km in intensity error
- Need to tune ENkf, obs. Need further analysis and optimization to address underdispersion
- Plan moving forward towards IOC target, with config for larger domain and online bias correction, work out bugs with cycled EnKF, move towards GDAS/HAFS.

#### 3:50 pm Coupling Strategies for HAFS (Avichal Mehra/Dan Rosen)

- Focus on current and future ocean and DA coupled HAFS configuration
- HAFSA and HAFSD was run coupled, HAFSB was also coupled with hycom, in future will be replaced with MOM6
- RTOFS at NCEP - eddy resolving ocean model, using for initial conditions, also used at GFS, NWPS
- Implemented RTOFS DA last year, RTOFS is based on HYCOM
- Challenge with ocean data, there are areas not covered, so looking at gliders
- HAFS coupling infrastructure - FV3ATM component and HYCOM component
- UFS transitioned to Community mediator at earth prediction system, CMEPD advantages are community development, modular design, configurable for fields
- HYCOM-WW3-ATM filed exchange is available, three way coupled ongoing, may switch to mom6 in future
- Future plan - 3-way coupling, Replace MOM6 in regional, global coupling with nest, and moving nest, introduce fractional mask
- CDEPS available in UFS
- HSUP-2 contributing to developed ocean DA, adopted common strategies for coupled DA
- Ongoing SOCA based 3D var test results show DA results reduce errors
- Just looking at LETKF

#### 4:10 pm CAM FV3 testing (Curtis Alexander)

- In context to operational timeline, RRFSv1 implementation target for end of FYFY23
- Looking more into DA components this year
- Strategy for first year bringing in GFS data in 6h cycle, 3km, 60hr forecast, full time a day
- Testing of sensitivities of vertical level config,
- physics similar to HRRR system
- Connecting ensemble with DA, two way coupled analysis
- Use of high res. Ensemble

- Constrains of HPC for running ensemble simulations
- Planning on Bringing in large scale global information into RRFS
- Overlapping windows to avoid simulating same obs, showing promise
- Exp hourly tcvitals closer to obs
- Jedi transition planning for RRFS
- FV3 LAM evaluation
- RRFS producing high ppt, still understanding why for south eastern US, consistent cold bias
- FV3 forecast instantaneous precip forecast
- Implementing verif tiers n SRW app workflow

4:30 pm HAFS Code Management and Community Engagement (Evan Kalina/ Bin Liu)

- The goals of code management strategy is to ensure HAFS development are available to the community, developed guidelines
- Detected and fix bugs by series of regression tests
- Used poll to get feedback from the HAFS community
- HAFS code is freely available in github, HAFS structure based on the branching rationale
- Realtime codes can be accessed
- Public release with me managed by the release branch
- There are number of submodules in HAFS
- HAFS A and B workflow is supported well, has the capacity to change to storm focus, one-storm or multiple, can be run in multiple res.
- Coupling to ocean is also supported also for wave
- Vortex initialization is not fully implemented yet
- The governance policy provides the guidelines on how to use the HAFS repository for development purpose

**4:50 pm Meeting Summary, Next Steps and Concluding Remarks (Frank Marks)**

- Will be briefing SAB on HFIP in December
- Great successes in all the key strategies (slide 3)
- Significant RI improvements
- Why is the HAFS version doing better than HWRF/HMON? Ryan's tool to identify biases.
- Also need to look further into ocean DA and ocean obs, need more sensitivities studies.
- Larry and Sam intensity issue, longest lived storm; weak system track and intensity issues

- Evaluation of observation impact is needed
- HAFS Development within UFS, POCs are X. Zhang and Z. Zhang
- Continue HREx, only some Jet is used because other jet can't run HAFS, need to find a solution for this
- Need Data Display capability for HFIP products on AWIPS, SBES may help with product development
- Working hard to increase funding HFIP

### Chat Messages:

Andrew Hazelton - NOAA Affiliate 12:13 PM

Nice analysis of the shear, Bin. I remember HWRF was generating a ton of diabatic PV and unrealistically eroding the TUTT. Kept trying to hit Miami with a hurricane as a result haha

Frank Marks - NOAA Federal 12:16 PM

@Vijay Should I do the last 3 talks?

JungHoon Shin - NOAA Affiliate 12:16 PM

@Andy, there were two troughs to the north of Fred, and the trough of HWRF's was weaker than that of GFS analysis. Maybe they could be associated with weaker VWS of HWRF (just my guess..)

Vijay Tallapragada - NOAA Federal 12:16 PM

Yes Frank

Frank Marks - NOAA Federal 12:18 PM

@Bin I think we need to look more closely at the cases where HAFS-A outperformed HWRF to identify what was better.

and why?

Bin Liu - NOAA Affiliate 12:20 PM

@Frank, agreed. Thanks for the suggestions! We are still looking into the HAFS-A performance and focusing on the issues (cold biases, etc. mentioned earlier in Zhan's presentation on Tuesday).

Bin Liu - NOAA Affiliate 12:21 PM

And we will definitely conduct some more analyses on HAFS-A comparing against HWRF/HMON and other HAFS real-time experiments.

Jiayi Peng - NOAA Affiliate 12:24 PM

What about the global skill for Atlantic basin?

Evan Kalina - NOAA Affiliate 12:24 PM

Is it easier to beat HWRF in the EPAC because there generally aren't TDR/inner-core data for HWRF to assimilate there?

Frank Marks - NOAA Federal 12:25 PM

@Andy are the global improvements due to the feedback of the ATL high-res nest on the global forecast through teleconnections from feedback?

Frank Marks - NOAA Federal 12:26 PM

Did it also impact the track forecasts?

Ghassan Alaka - NOAA Federal 12:28 PM

@Evan, definitely for HAFS-B, which didn't have DA this year.

JungHoon Shin - NOAA Affiliate 12:29 PM

@Andy, Did the HAFS-B model capture the ERC (i.e., secondary eyewall) events of Larry?

Stanley Goldenberg - NOAA Federal 12:29 PM

Saying it's hard to get RI and weakening both working well says it all!

Zhan Zhang - NOAA Federal 12:29 PM

@Andy in your 91L experiment, did you keep the same model top? HAFS-B has 2hPa model top, right?

Andrew Hazelton - NOAA Affiliate 12:31 PM

@Jiayi the track verification for the global domain will basically be the same for the Atlantic

@Evan that's a good point. I didn't show it but HAFS-A (with cold start) did quite well compared to HWRF in the EPAC

@Frank that is my working theory. Seems like the improvements in the EPAC (closer to the Atlantic feedback) compared to the WPAC are a solid piece of evidence for that

Andrew Hazelton - NOAA Affiliate 12:32 PM

@JungHoon it captured the ERCs of Sam but not so much for Larry. Maybe that's part of the reason for the bias

The eyewall was too small/robust in HAFB

@Zhan we didn't change the model top for the L91 test

Frank Marks - NOAA Federal 12:34 PM

@Andy That is a significant result, arguing for the benefit of having the nest feedback on the global forecast. Something we can not get from a regional storm following nest.

Andrew Hazelton - NOAA Affiliate 12:35 PM

@Frank indeed. I think it's a solid piece of evidence for the long-term goal of HAFS (multiple storm-following nests globally)

Frank Marks - NOAA Federal 12:36 PM

@Li can we get a plot of the location of the observations assimilated in each cycle as Zhan set up for HWRF this year?

Lew Gramer - NOAA Affiliate 12:37 PM

+1 to Frank's suggestion, @Li

Frank Marks - NOAA Federal 12:38 PM

@Lew we should also get something similar for all the ocean observations as we develop the coupled DA system as well

Yonghui Weng - NOAA Affiliate 12:38 PM

@Frank, Yes, we are working on updating the package to plot HAFS obs. Thanks.

Zhan Zhang - NOAA Federal12:39 PM

@Frank Yonghui actually worked on the HWRF DA observation plots. I think he also looked at the similar plots for HAFS-D

Frank Marks - NOAA Federal12:39 PM

@Yonghui Excellent! I think we need to figure out how to get it into AWIPS II as well so the forecasters can easily see it.

Frank Marks - NOAA Federal12:42 PM

Thanks @Zhan. I think this is a great product that could greatly benefit the forecasters situation awareness

Lew Gramer - NOAA Affiliate12:47 PM

@Frank, definitely agree. Gives an idea of the potential benefit from the ocean DA once it is ready also.

Ghassan Alaka - NOAA Federal12:49 PM

@Frank @Andy, the positive EPAC performance for HAFS-B suggests to the importance of simulating seed disturbances at high resolution (as Andy mentioned). Might be worthwhile to test the impact of that with localized static nests in these seed regions within the global model.

(Of course, we need multiple nest capability first)

Lew Gramer - NOAA Affiliate12:49 PM

@Gus, really nice idea

Andrew Hazelton - NOAA Affiliate12:51 PM

@Gus I think that multiple nests (static, not moving yet) is in the hafs nesting branch already

@Bin or someone else can correct me if I am wrong

Lew Gramer - NOAA Affiliate12:52 PM

I think you're right, @Andy, multinests?

Andrew Hazelton - NOAA Affiliate12:52 PM

Yeah

Bin Liu - NOAA Affiliate12:53 PM

@Andy and @Gus, Yes, we do have multiple static nesting capability in the featue/multi\_nest branch. But, not multiple moving-nesting yet.

Frank Marks - NOAA Federal12:53 PM

@Gus Definitely!

Ghassan Alaka - NOAA Federal12:53 PM

Thanks @Bin.

Lew Gramer - NOAA Affiliate12:54 PM

Something to chat about over the Holidays...?

Frank Marks - NOAA Federal12:56 PM

@Bin Is anyone looking at HAFS-A performance when multiple storms are in the high-res nest, as Gus did for HWRF-B in the recent BAMS paper? I think that would be a great study as well.

That might explain some differences between HWRF and HAF-A performance in particular cases.

Bin Liu - NOAA Affiliate12:58 PM

@Frank, that's a very good suggestion! @Gus, maybe we can work together on looking HAFSv0.2A results for 2021 and 2020 storms especially on the multiple storm interaction perspective.

Ghassan Alaka - NOAA Federal 12:59 PM

Great idea @Frank! @Bin, happy to collaborate on this. Let's set up a meeting once things quiet down a bit

Bin Liu - NOAA Affiliate 1:02 PM

Thanks, @Gus! Let's catch up on this.

Frank Marks - NOAA Federal 1:11 PM

@Zhan I really like the new ensemble products that you added. I think it would be great to see how we can assist NHC in using those products to inform their guidance. The plots are great for us to evaluate the uncertainty in track, intensity, structure, and rainfall, but I think our next challenge is to work closely with NHC and WPC to provide the uncertainty information they need for each product. I think we may want to set up a small group of forecasters and you to identify what would help the

Jason Sippel - NOAA Federal 1:12 PM

what I see in these figures is that the western NATL has way lower track errors than the eastern NATL... probably speaks volumes about the impacts of data

Dave Jones 1:16 PM

@Frank It could be possible to share the data with NHC-WPC on calls with GeoCollaborate. Would allow you to overlay various fields in the future and they would receive the data on their systems as a follower or dashboard user. Just an idea.

Bin Liu - NOAA Affiliate 1:19 PM

@Morris, for 2021 T-SHiELD, did you turn on the convection scheme on the 3-km nest?

Andy Hazelton 1:20 PM

I believe the shallow convection was on (re-tuned) but not deep. Morris is that correct?

Zhan Zhang - NOAA Federal 1:20 PM

@Frank Sure. thanks! It would be great if we can develop new probabilistic plots, and further improve the ensemble products so they can be used by NHC and WPC

Michael Brennan - NOAA Federal 1:25 PM

NHC would be very interested in probabilistic output on structure (RMW) and intensity. Anything we can get from a dynamical hurricane ensemble system to constrain structural variability for PSurge or WSP modeling would be very useful

Frank Marks - NOAA Federal 1:26 PM

Thanks @Mike. Who from NHC should Zhan engage with on use of the ensemble output?

Michael Brennan - NOAA Federal 1:28 PM

@Frank - he can start with me and I can engage others from there.

morris bender 1:28 PM

BIN as I pointed out in the beginning of talk we turn off deep convection but retain the shallow convection. However we change the detrainment in the shallow convection in doing so that makes a huge positive impact. You have to tune down the shallow convection with that methodology. We would be glad to share with you what we did. It was just a couple of important parameters in the namelist.....

Frank Marks - NOAA Federal 1:29 PM

@Mike would PDFs of the structure and intensity variability in the ensemble at different lead times be something that we could use?

Xuguang Wang - NOAA Affiliate 1:30 PM

@George, the negative hydrometeor mixing ratio affects our cloudy radiance DA.  
too

Bin Liu - NOAA Affiliate 1:36 PM

Thanks, @Morris and @Andy! Also, a follow-up question: Regarding the 13-km global parent in the T-SHiELD configuration, was it using the same dynamics and physics options as the 13-km SHiELD (single global domain no nesting)?

Stanley Goldenberg - NOAA Federal 1:39 PM

Great idea to add session on obs!

Zhan Zhang - NOAA Federal 1:44 PM

@Mike Thanks! I will contact you regarding the probabilistic products.

Daniel Melendez - NOAA Federal 2:02 PM

Gustavo, are you leveraging HF radar data?

Lew Gramer - NOAA Affiliate 2:03 PM

@Gustavo, are there plans to assimilate the glider T and S data in RTOFS DA?

Avichal Mehra - NOAA Federal 2:04 PM

@Lew: RTOFS ingests glider T&S which are available on GTS.

Xuguang Wang - NOAA Affiliate 2:05 PM

@Gustavo, what is the data policy? Are they all available for external research?

Lew Gramer - NOAA Affiliate 2:06 PM

+1 Xuguang's question. And thanks @Avichal. It seems interesting that those persistent glider-RTOFS biases that Gustavo mentioned still remain.

Avichal Mehra - NOAA Federal 2:10 PM

@Lew: Yes, we have noticed the differences and we are looking into them. We have a couple of parallel's running to see if we can improve results in the IAS and the Caribbean.

Frank Marks - NOAA Federal 2:11 PM

@Avichal is there a path for us to provide the RTOFS DA system to our research partners as part of HFIP? With the increased interest in ocean observing and coupled model development I think we need to get the ocean DA system to the community.

Avichal Mehra - NOAA Federal 2:12 PM

@Frank: Unfortunately RTOFS-DA is part of a MoA with US Navy which limits its use for operations.

That said, we are working on Marine JEDI as our future ODA system which is a wide community effort and a number of research groups are already engaged in its development for HAFS.

Avichal Mehra - NOAA Federal 2:14 PM

I will talk some more about use of Marine JEDI later today.

Lew Gramer - NOAA Affiliate 2:14 PM

@Avichal, is JCSDA represented in the HFIP Annual meeting this week?

Frank Marks - NOAA Federal2:14 PM

@Cheyenne How can HFIP enhance the collaboration between EEOOTT and our ongoing strategies to develop HAFS to improve forecast guidance? How can HFIP collaborator get more involved in EEOOTT and the effort to improve the impact of ocean observations on model forecast guidance?

Avichal Mehra - NOAA Federal2:16 PM

@Lew: Unsure. HFIP meeting was announced far and wide by PO's for all to attend.

Frank Marks - NOAA Federal2:16 PM

Thanks @Avichal. Should we be encouraging the EEOOTT team to work with the ocean JEDI effort?

Avichal Mehra - NOAA Federal2:16 PM

@Frank: Absolutely. NOS, JCSDA and NESDIS are already engaged.

Frank Marks - NOAA Federal2:17 PM

Is Hyun-Sook a good POC for that team?

Avichal Mehra - NOAA Federal2:18 PM

Yes. She is already active!

Hyun-Sook Kim - NOAA Federal2:21 PM

@Bob, we are about to start to work in OSSE.

Gustavo Goni - NOAA Federal2:22 PM

@Bob. Following George Halliwell's paper results. the glider spatial sampling strategy of approx 1.5 deg separation among gliders has already been implemented.

Andrew Hazelton - NOAA Affiliate2:38 PM

@Zhan (and others): one question I have is whether a large 6-km domain with a much smaller 2-km moving nest will come close to reproducing the skill that we have generated with the larger 3-km domains Given 6-km is much more in the "gray zone" of cumulus convection and such

Lew Gramer - NOAA Affiliate2:39 PM

@Zhan, I was curious why the HYCOM domain for the primary configuration will not provide more coverage for the EPAC domain, similar to that for the outer atmospheric domain?

Xuguang Wang - NOAA Affiliate2:43 PM

@Zhan, the self cycled hybrid DA capabilities developed can be used/tested for the inner core DA as well.

Bin Liu - NOAA Affiliate2:45 PM

@Andy, I believe the nesting resolution configuration of  $\sim 6/2$  are just estimation, whether or not that might be the HAFSv1.0 configuration will definitely depend upon model performance as well as the affordable computation cost.

Ghassan Alaka - NOAA Federal2:46 PM

@Zhan, just so I understand, the plan is to not cycle the parent domain in the primary HAFS IOC? What is the justification for this?

Andrew Hazelton - NOAA Affiliate2:47 PM

@Bin I see. There are some DA experiments at 6-km, right? We might learn something from those results

Jason Sippel - NOAA Federal2:47 PM

i have plenty of results to show

that justify cycling a static domain over the basin

Bin Liu - NOAA Affiliate 2:49 PM

@Lew, the HYCOM ocean domain, currently for HAFS and HWRF are static for each basin, does not change cycle to cycle. We could consider expanding the HYCOM domain of course, but will need some changes from the ocean model configuration (need to consider computation cost as well).

Xuejin Zhang - NOAA Federal 2:49 PM

Can't unmute

Lew Gramer - NOAA Affiliate 2:50 PM

Thanks, @Bin, understood. Region west of northern Mexico, e.g., Baja Sur may be very useful to have coupling for.

Zhan Zhang - NOAA Federal 2:54 PM

@Andy the proposed ~2km moving nest domain is relatively large (19x19degree), we also tested similar configuration last year (HAFS-C config). We are confident we will get the same forecast skills as large 3km domain.

Zhan Zhang - NOAA Federal 2:55 PM

@Lew I see Bin has answered your question

Andrew Hazelton - NOAA Affiliate 2:56 PM

@Zhan that is true, the 2-km moving nest is fairly large compared to HWRF/HMON

Zhan Zhang - NOAA Federal 2:59 PM

@Xuguang Yes, we can test and compare the self-cycled vs gdas ensemble to determine the final DA configuration. another concern is computer resource.

Zhan Zhang - NOAA Federal 3:03 PM

@Gus we would like to focus on inner-core DA

Zhan Zhang - NOAA Federal 3:07 PM

@Gus the parent domain center in primary configuration varies from cycle to cycle

Ghassan Alaka - NOAA Federal 3:11 PM

@Zhan OK. I was under the impression that a large analysis domain was still possible for NATL storms, even with the forecast parent domain moving every cycle.

I definitely agree that inner-core DA should be a focus

Zhan Zhang - NOAA Federal 3:12 PM

@Gus Jason will talk about the static DA configuration in his DA talk

Jason Sippel - NOAA Federal 3:25 PM

@Chunxi - instead of removing a storm, it's probably better to look at median errors

Xuguang Wang - NOAA Affiliate 3:28 PM

@Chunxi, We noticed negative hydrometeors from HAFS outputs. Any comments on this (or I missed it)?

Andrew Hazelton - NOAA Affiliate 3:30 PM

When is the GFSv17 upgrade happening? Can't remember for some reason

Evan Kalina - NOAA Affiliate 3:31 PM

Looks like Q3FY24 according to the rainbow chart

chunxi zhang - NOAA Affiliate 3:32 PM

@Jason, good suggestion, I will look at median errors.

Fanglin Yang - NOAA Federal 3:34 PM

@Xuguang Negative tracers were caused by the TKE-EDMF and convection schemes. A TVD positive tracer advection scheme was recently added in the PBL and convection schemes. This update has been committed to the ufs-weather-model develop branch

Xuguang Wang - NOAA Affiliate 3:35 PM

@Fanglin, Great to hear

chunxi zhang - NOAA Affiliate 3:35 PM

@Fanglin, thank you!

Andrew Hazelton - NOAA Affiliate 3:36 PM

@Bin will those changes make it into HAFS? I wonder if that caused us any problems

Hadn't heard anything about this negative tracer issue

Bin Liu - NOAA Affiliate 3:38 PM

@Andy, yes last sync of ufs-weather-model develop branch was 11/03 (early this month).

And we regularly sync HAFS subcomponents on a monthly basis.

Andrew Hazelton - NOAA Affiliate 3:40 PM

@Bin thanks - that's what I figured. Is it possible this will fix some of the occasional instability we saw near terrain

?

Or is that a separate issue?

Fanglin Yang - NOAA Federal 3:40 PM

@Andy, if you are using Thompson MP without this positive tracer scheme global mean precip will be about 4 to 4.5 mm/day

Bin Liu - NOAA Affiliate 3:41 PM

@Andy, Definitely worse testing, and when we start the HAFSv0.3 series developments, we can look into these perspectives.

Xuguang Wang - NOAA Affiliate 3:52 PM

One thing that Jason didn't get a chance to mention: the project from the 3 institutes (UMD, UM and OU) was proposed based on the assumption that the self-cycled dual resolution EnVar for HAFS was already in place. Unfortunately there was a personnel change in EMC so that didn't happen. So we had to step up to build the self-cycled dual resolution EnVar-EnKF for HAFS almost from scratch.

Jason Sippel - NOAA Federal 3:53 PM

thanks xuguang

yes, a lot has happened in the past year - pretty phenomenal progress IMO

Lew Gramer - NOAA Affiliate 3:59 PM

@Avichal, a lot of the available ADCP data (esp. in the Gulf) is on private platforms. Any plans to implement real-time data flow for more of those platforms, for ingestion into RTOFS-DA?

Frank Marks - NOAA Federal4:15 PM

@Avichal for clarity will HAFS IOC be coupled to MOM6 or HYCOM?

Avichal Mehra - NOAA Federal4:15 PM

@Lew: Yes, we can bring them in as long as the data is made available via GTS.

Xuguang Wang - NOAA Affiliate4:15 PM

@Jason, it's been a great collaboration among the institutes and EMC in the past year, which got where we are now :)

Avichal Mehra - NOAA Federal4:15 PM

@Frank: IOC will be with HYCOM.

We plan to move to MOM6 for future upgrades of HAFS.

Frank Marks - NOAA Federal4:16 PM

I presume that if it is HYCOM we will be using RTOFS for IC/BC, whereas if it is MOM6 it will be ocean JEDI

Avichal Mehra - NOAA Federal4:17 PM

That's the plan. A lot depends upon how much progress we make with MOM6 and Marine JEDI.

Frank Marks - NOAA Federal4:19 PM

Thanks.

@Curtis what is your IC/BCs for the oceanic regions

Hyun-Sook Kim - NOAA Federal4:21 PM

@Frank and Avichal, MOM6 still needs a good IC and more importantly OBC. A candidate for the IC is needed to put some series thoughts. It is because it would take about 3-mon free-run to have the MOM6 dynamics and mixing kick in.

Frank Marks - NOAA Federal4:21 PM

Are you planning ocean coupling and coupled DA? Could this be a collaborative effort with HFIP developments that Avichal and Dan summarized?

Thanks @Hyun Sook. Would you use RTOFS global for the ICs

Hyun-Sook Kim - NOAA Federal4:23 PM

@Frank, yes. We can use global RTOFS, and I am currently using them as well.

Curtis Alexander - NOAA Federal4:35 PM

@Frank: The ICs/BCs for oceanic regions of the RRFs will come from the GFS and related SST analysis.

Curtis Alexander - NOAA Federal4:39 PM

@Frank: And to add to the coupled DA discussion, we have a funded effort from the Wx Portfolio getting underway between GSL, PSL and AOML to make progress in this arena. GSL is going to focus on

land-atmosphere coupled DA and AOML on the ocean-atmosphere side and leverage each others work there.

Curtis Alexander - NOAA Federal4:40 PM

This coupled DA would not be ready for RRFSv1, but hopefully v2 or v3 timeframe.

Frank Marks - NOAA Federal4:41 PM

@Curtis Thanks. Hyun-Sook is the AOML POC on that WPO project so she is likely the best link for collaborations.

Curtis Alexander - NOAA Federal4:42 PM

Yep, absolutely and we're having regular meetings now.

Frank Marks - NOAA Federal4:44 PM

@Curtis we also should think about collaborations to investigate land-surface coupling issues HAFS will have as we move more to looking at landfall issues and how RRRFS and HAFS interact over land

Curtis Alexander - NOAA Federal4:47 PM

@Frank: Absolutely, given the more significant overlap between the RRFS and HAFS domains we're going to need to coordinate R&D here to have a more seamless prediction of landfalling TCs.

Dan Rosen4:51 PM

@Evan et al. - Thank you for all your hard work!

Bin Liu - NOAA Affiliate4:51 PM

Thanks @Evan!

Evan Kalina - NOAA Affiliate4:51 PM

It is definitely a team effort and I deserve only a small piece of the credit, but thanks Dan!

Ghassan Alaka - NOAA Federal4:51 PM

@Evan & @Bin, Really appreciate your efforts to manage the code and keep everything organized. It's been a huge step up from HWRF

Sundararaman Gopalakrishnan - NOAA Federal4:52 PM

@Frank @Curtis - This is especially true if we need to create two diverse versions for IOC.

Evan Kalina - NOAA Affiliate4:52 PM

Thanks gus!

You4:56 PM

Jenny, Frank's file is in the Day 4 folder.

Ben Woods - NOAA Affiliate4:57 PM

Great week/HFIP Annual Meeting! Hoping to hear something soon about the FY22 Supplemental.

Michael Brennan - NOAA Federal5:04 PM

Already starting to talk with Cheyenne to improve SA of ocean ob DA

Xuguang Wang - NOAA Affiliate5:10 PM

It is a great meeting!

Andrew Hazelton - NOAA Affiliate 5:10 PM

Thanks Frank and all!

Michael Brennan - NOAA Federal 5:11 PM

Thanks everyone! Great job with all the presentations and engagement even with everyone remote.

Frank Marks - NOAA Federal 5:11 PM

Thank you Sikchya and Jennifer. We could not do this without you.

Curtis Alexander - NOAA Federal 5:11 PM

Thanks everyone including Sikchya for organizing.

Lew Gramer - NOAA Affiliate 5:11 PM

What an excellent meeting - thank you, Youngsun, Sikchya, Avichal, Gopal, Frank, NHC folks, and all the presenters.

Avichal Mehra - NOAA Federal 5:11 PM

Thanks all!

Evan Kalina - NOAA Affiliate 5:11 PM

Fantastic meeting. Thank you!

Zhan Zhang - NOAA Federal 5:11 PM

Thanks everyone!

Jun Zhang - NOAA Affiliate 5:12 PM

Thanks all!

JungHoon Shin - NOAA Affiliate 5:12 PM

Thank you all!