NWS/OSTI 2020 FFO PI Presentation
Enabling Cloud Condensate Cycling for All-Sky Radiance Assimilation in HWRF
Project Status as of October, 2020

Enabling Cloud Condensate Cycling for All-Sky Radiance Assimilation in HWRF
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HFIP Remote Annual Meeting
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Preamble

Leads: Ting-Chi Wu, Louie Grasso, Milija Zupanski

Collaborators: Jason Sipple (HRD/EMC), Henry Winterbottom (EMC), Evan Kalina (NOAA/NCAR/DTC)

Jason and Henry: Provide HWRF version 19Brun; code modifications to the VI, hybrid GSI, and MG procedures.

Evan Kalina: Ting-Chi worked with Dr. Kalina to facilitate the testing, evaluation, and verification of the added capability contained in the icda_dev_cira branch with a version of HWRF maintained by Dr. Kalina on Cheyenne. Cheyenne? Why Cheyenne?

Harm to Project:
- **Longest Government shut down:** Prevented collaboration with Jason and Henry
- **Ting-Chi's access to NOAA machines revoked:** Project dead in the water. I understand security; however, when security measures harm funded project, fund managers at NOAA should speak up. I mailed Frank Marks (HRD) about the issue.
- **Louie applies for access to NOAA machines:** Took about 10 months.
- **Louie acquires HWRF:** Ting-Chi sits next to me to help me begin HWRF runs as she has no access.
- **Ting-Chi resigned her position at CIRA:** That's why I'm giving this presentation.

Milestones

Acquire accounts on a NOAA machine

Accounts on NOAA Jet and Theia have been obtained for a few team members. Also, a project allocation has been established and is called "cloudda" on Jet. However, user access to "cloudda" is in the process of being approved.

- Obtain the latest version of HWRF

HWRF version 19Brun has been obtained from our NOAA collaborator Jason Sippel who is with HRD/EMC.

- Setup the system to conduct baseline HWRF experiment

HWRF version 19Brun has been successfully compiled on Theia. Compilation instructions were provided by Jason Sippel.

Code modifications to the VI, hybrid GSI, and MG procedures

After the current proposal was approved, subsequent conversations with Jason Sippel and Henry Winterbottom (EMC) indicated that the vortex initialization (VI) portion of HWRF is going to be changed. As a result, our original milestone related to VI must also change to be consistent with Jason and Henry's plan to alter VI code.

-Include cloud condensate variables in the VI procedure

This milestone will be changed. Due to the unforeseen and extensive six week Federal Government shutdown and the amount of time needed by our operational collaborators to adjust to the shutdown, alteration of the VI milestone is delayed.

-Allow cloud condensate update during the hybrid GSI

This milestone leverages from the development of ATMS all-sky capability in HWRF. Details are found in Wu et al. (2019); see slide 6.

-Include cloud condensate interpolation and merging in the MG procedure

Similar to the alteration of the VI milestone, cloud condensate interpolation and merging in the MerGing (MG) procedure will be redefined to be consistent with our operational collaborators vision of this portion of HWRF.

Deliverables

Modified HWRF VI and MG procedures for cloud condensate cycling

This particular deliverable is pending new VI code from operational collaborators.

Modified hybrid GSI for ATMS all-sky radiance assimilation for HWRF

Modification to the hybrid GSI for ATMS all-sky assimilation in HWRF is complete and is reported in Wu et al. (2019). This deliverable is beyond the scope of the current project.

Telecon or possible on-site visit to EMC/HWRF

An on-site visit took place at the 2018 HFIP annual review, which was held in November 2018, Miami, Florida. Team members met with Jason Sippel and Henry Winterbottom; there a discussion took place to learn of Jason and Henry's plans to alter the VI portion of HWRF. Further, results from Wu et al. (2019) were presented to participants of the HFIP annual review (see Fig. 14 on slide 4).

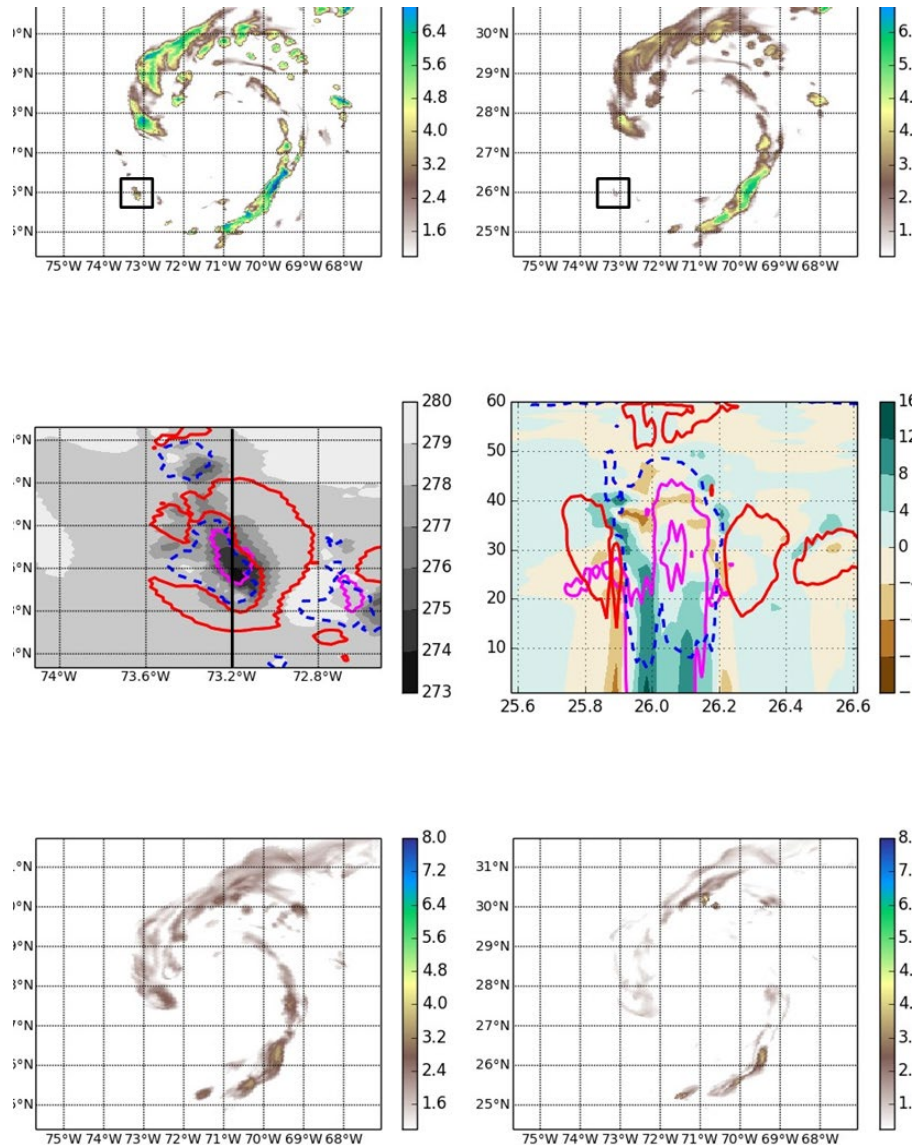# Key results/figures with potentials of being used in the Annual report

Figure 14: a) CWM (g kg-1, color) at model level 35 of 0 h forecast initialized from the AddATMS_CLRSKY analysis that is valid at 1800 UTC 26 August 2014 (cycle 10). b) is the same as a), except for 5 min forecast. c) is an enlarged view of the black box in b) near 73ºW, 26ºN. Temperature (K) is plotted in gray shades, CWM with value of 1.0 g/kg is denoted by magenta contours, and vertical winds with value of 0.5 m/s are denoted by red contours and vertical winds with value of -0.5 m/s are denoted by dashed blue contours. d) is a north-south vertical cross-section along the black solid line at 73.2ºW in c). CWM and vertical winds are plotted using the same conventions as in c), while horizontal divergence (10-4 s-1) is plotted in color shading. e)-f) are the same as b), except for 15 min and 30 min forecast respectively.

Path forward/suggested priorities and plans for ongoing work

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(G) **Project Information and Highlights**

(Y) **Deliverables**

Leads: Ting-Chi Wu, Lewis Grasso, Milija Zupanski

Scope: Enable cloud condensation cycling in the icda_dev_cira branch of the GSI to make sure it syncs with the HWRF branch of GSI, which is the branch of GSI that is used by the operational HWRF.

Expected Benefits:
- Readiness Level: Technology Maturation, R4
- Potential impacts on operational systems: None
- Publication: Wu, Ting-Chi, M. Zupanski, L. Grasso, C. D. Kummerow, S.-A. Boukabara, 2019: All-Sky Radiance Assimilation of ATMS in HWRF: A Demonstration Study. *Mon. Wea. Rev.*, **147**(1), 85-106, DOI: 10.1175/MWR-D-17-0337.1

Implementation Date:
- Your assessment when the method or scheme can be implemented operationally: Unsure as Ting-Chi has left CIRA.

Challenges/Problems:
1) Government shut down prevented communication with NOAA collaborators, Henry Winterbottom and Jason Sipple: Project negatively impacted.
2) Ting-Chi's access to the NOAA machines was revoked: Project dead in the water. Her mitigation was to seek access to other computing systems.
3) Almost one year was needed to Louie to acquire access to NOAA machines. Mitigation: Mailed Frank Marks, Director HRD, to inform him of the injury to the project.
5) Pandemic

Milestones	Completion Quarter	Status
Unable to complete		Completed
		Completed
		Completed
		On track
		On track
		On track
		Delayed
		Delayed
		Delayed

R Program Attention Required	**Y** Potential Program Attention Needed	**G** On Target