

Update and plans for HAFS physics tests

- Code changes
- Test plans

EMC hurricane team
2019/07/10

- FV3 physics code changes

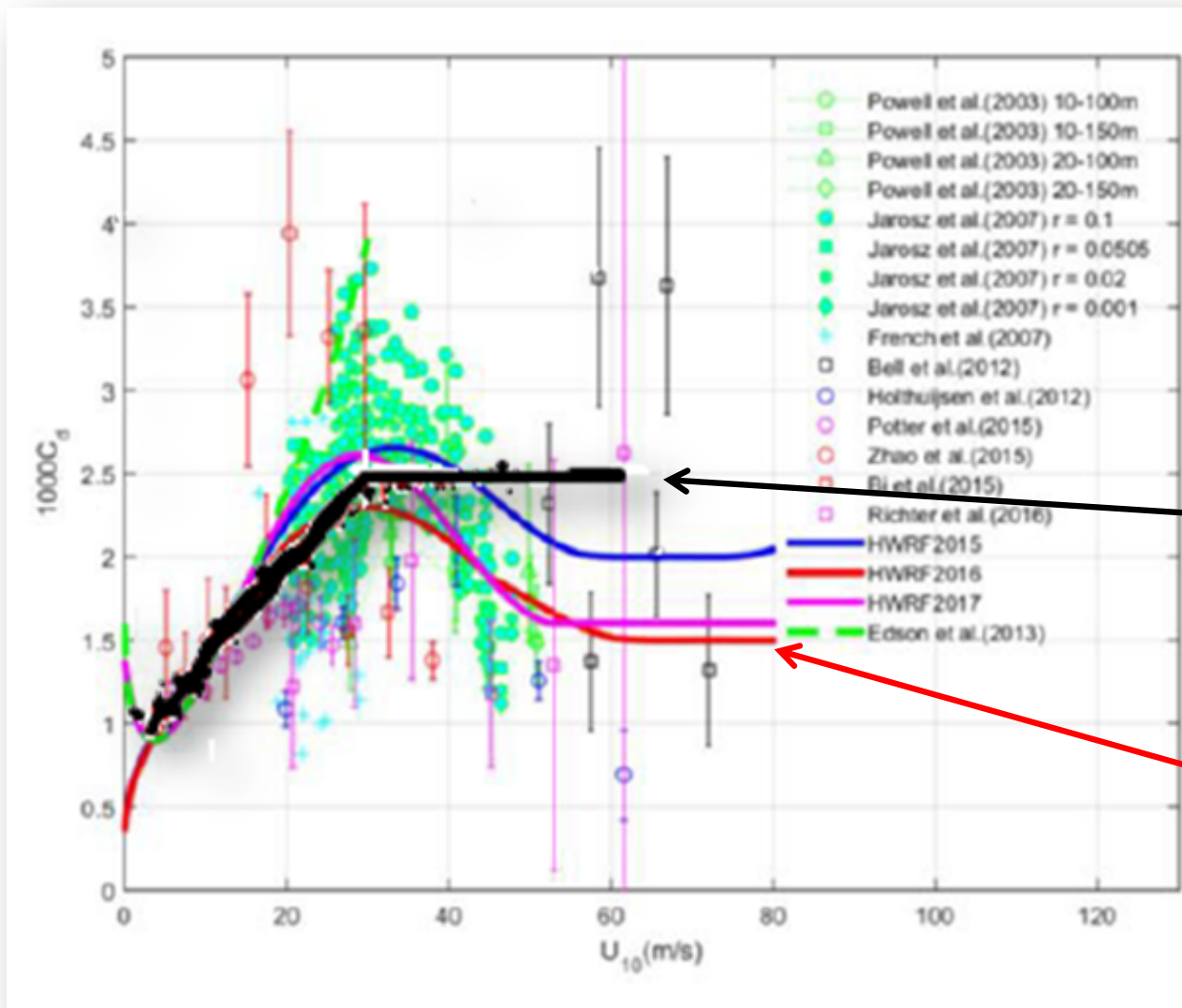
Observation-based surface drag coefficients over ocean through introducing roughness length formulations (sfc_diff.f)

Observation-based K adjustment under strong wind conditions over ocean (moninedmf.f)

Namelist control (sfc_z0_type = 6, moninq_fac = -1.0, recommend to use together)

- Commit to FV3 master on 2019/07/19 after regression tests

C_d vs wind at 10 m



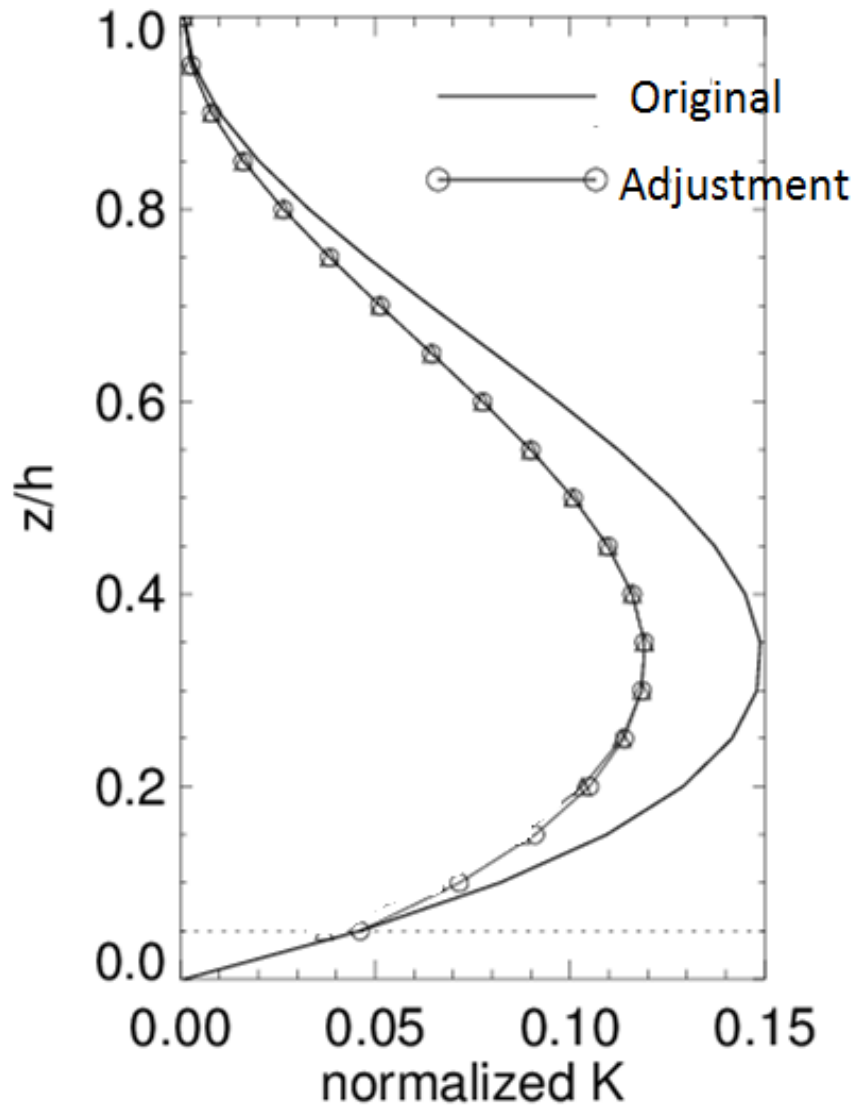
At 10 m

$$C_d = f(u, z_0, L)$$

Symbols: obs

Black line:
Fv3gfs

Blue/red/pink
lines:
HWRf/HMON

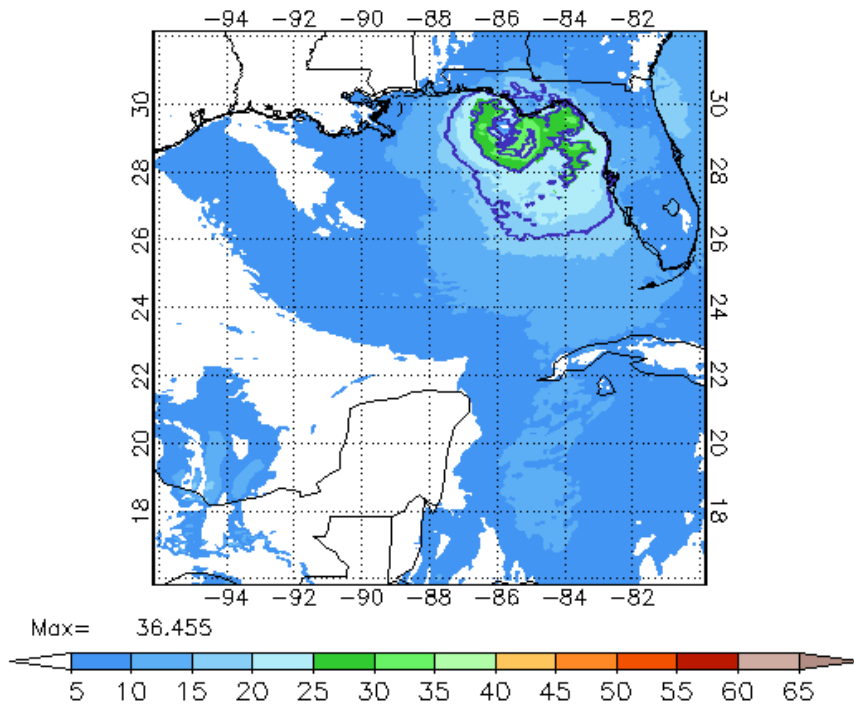


- ❑ Only over ocean
- ❑ Maximum K @500m capped by $wind/0.6$
- ❑ Adjustment mostly under strong wind conditions

Surface Wind at 72 hr (just before Michael landfall) Initialized at 2018100712

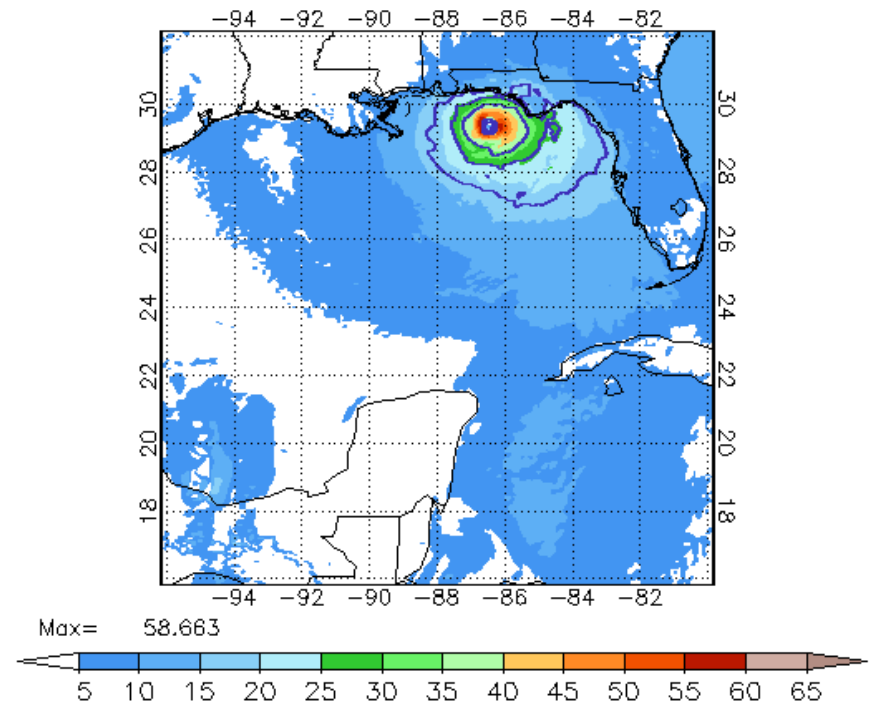
Default FV3

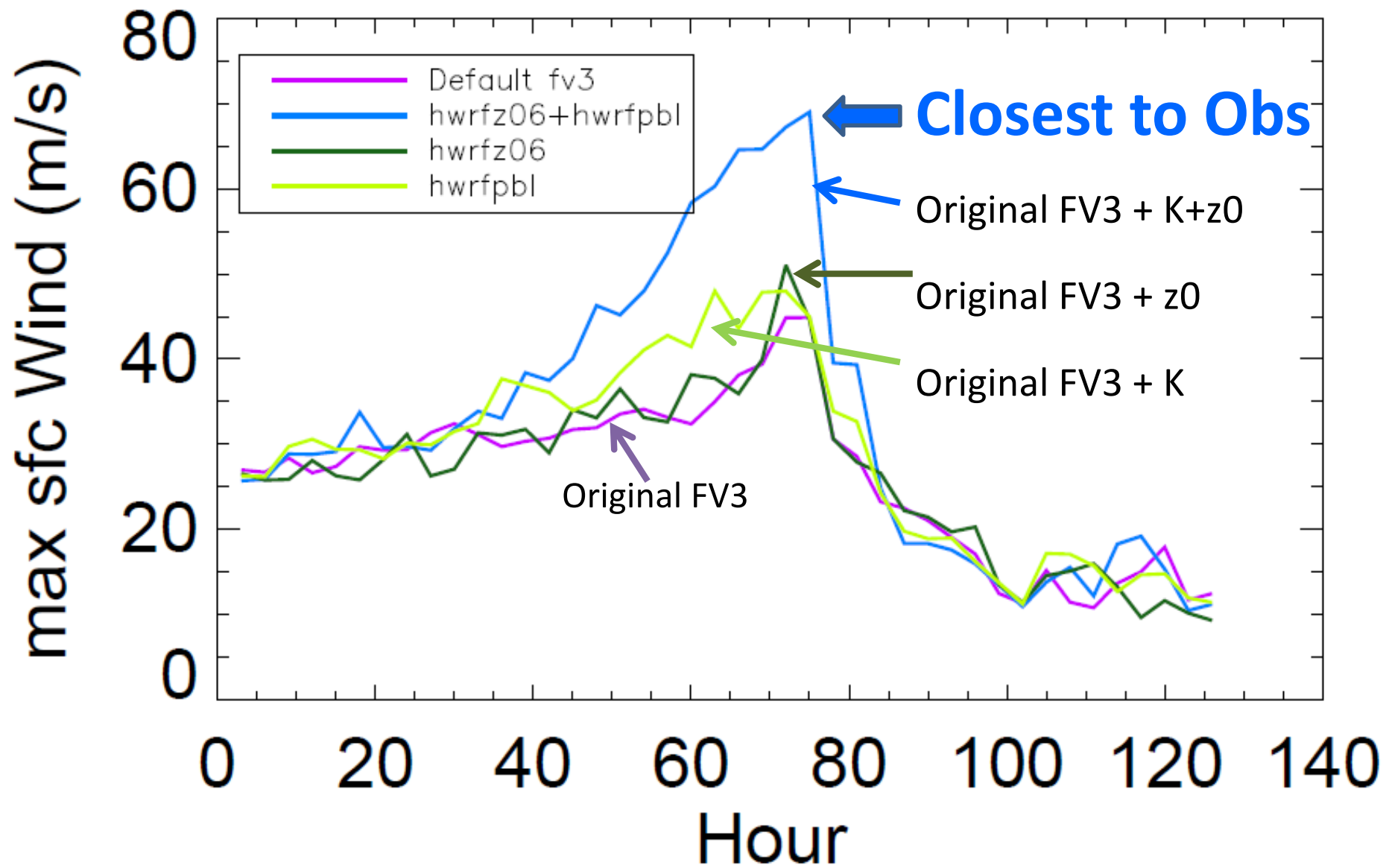
10m wind test00 Forecast hr=072



FV3 with modified PBL/Z0

10m wind test00 Forecast hr=072





HAFS Phys test plan

Goal: build a suite (under CCpp) best to FV3-hurricane.

1. Short term (June, 2019 to Dec, 2019, Jet and Wcross)

Test schemes (4 configurations):

Control: GFS modified-sfc, modified-HEDMF, GFDL-MP, saSAS, NOAH, RRTMG

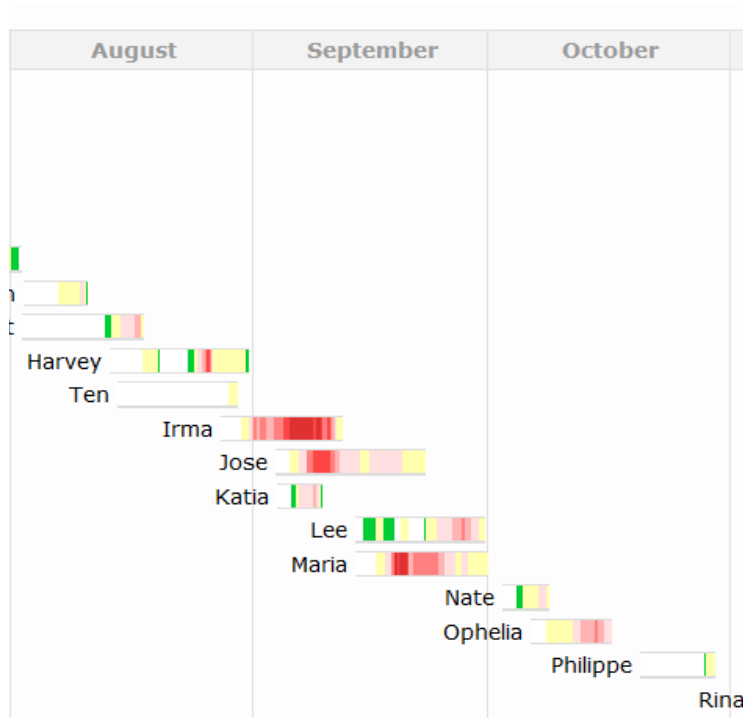
PBL test: Control + YSU PBL (possibly with YSU-sfc)
Control + SATEDMF

CU test: Control + global: on, regional off

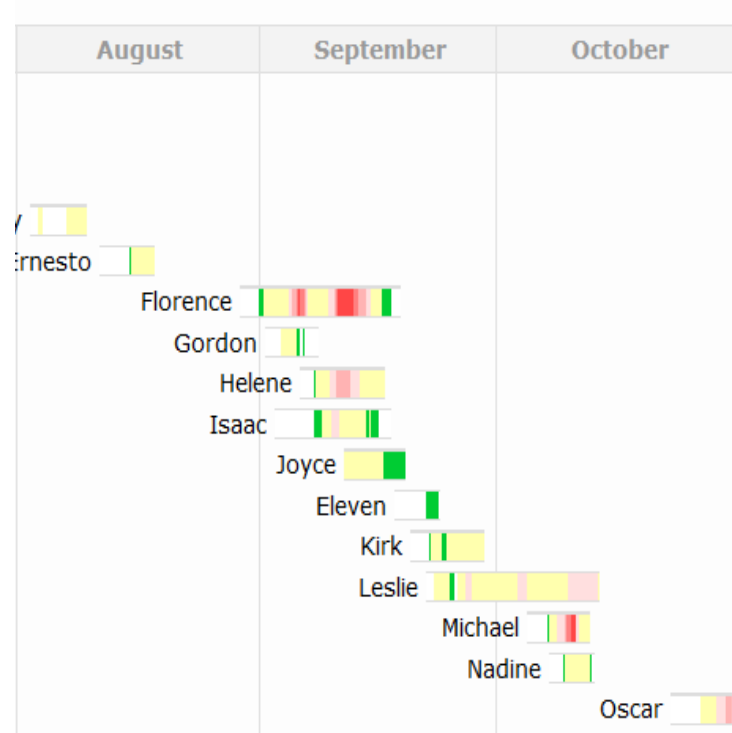
MP test: Control + Thompson
Control + wsm6

Test Periods

2017



2018



2. Long term (2020)

2.1 Test existing CCPP suites

There are five physics suites available for TC forecasts in FV3

Scheme/Suites	GFS_v15	GFS_v15+	CPT_v0	GSD_v0	HWRF_v0
Microphysics	GFDL-MP	GFDL-MP	M-G3	Thompson	Ferrier-Aligo
PBL	HEDMF	SATEDMF	HEDMF	saMYNN	HEDMF+a
Surface Layer	GFS	GFS	GFS	GFS	GFDL-SF
Deep conv	saSAS	saSAS	CS	Grell-Freitas	saSAS
Shallow conv	saSAS	saSAS	saSAS	saMYNN	saSAS
Land Surface	NOAH	NOAH	NOAH	NOAH	NOAH
Radiation	RRTMG	RRTMG	RRTMG	RRTMG	RRTMG

2.2 Test one optimized suite

If none of the above five suites are satisfactory, we will build a new suite which combines different schemes based on all tests.