

Software Updates and Plans



UPDATE!

Dave Gill

OpenMP Parallelism is Pretty Good

January 2000 Benchmark

Radiation Day

Core Count		SM Efficiency	DM Efficiency
1	74x61	100	100
2	74x31	97	100
4	37x31	93	97
8	37x16	91	96
16	19x16	65	85

Avg 5.76 s

Std 0.019 s

n = 17

Radiation Night

Core Count		SM Efficiency	DM Efficiency
1	74x61	100	100
2	74x31	97	100
4	37x31	93	95
8	37x16	88	92
16	19x16	59	83

Avg 2.16 s

Std 0.005 s

n = 24

Not Radiation Timestep

Core Count		SM Efficiency	DM Efficiency
1	74x61	100	100
2	74x31	94	97
4	37x31	84	80
8	37x16	68	71
16	19x16	43	52

Avg 0.39 s

Std 0.012 s

n = 432

OpenMP Parallelism is Pretty Good

- Mods to v3.9 fix “oops” in tile computations
- On NCAR supercomputer cheyenne, use **omplace** to pin threads to the same core
- Google “NCAR cheyenne OpenMP” for example batch scripts

MPAS -> WRF (v3.9 WPS)

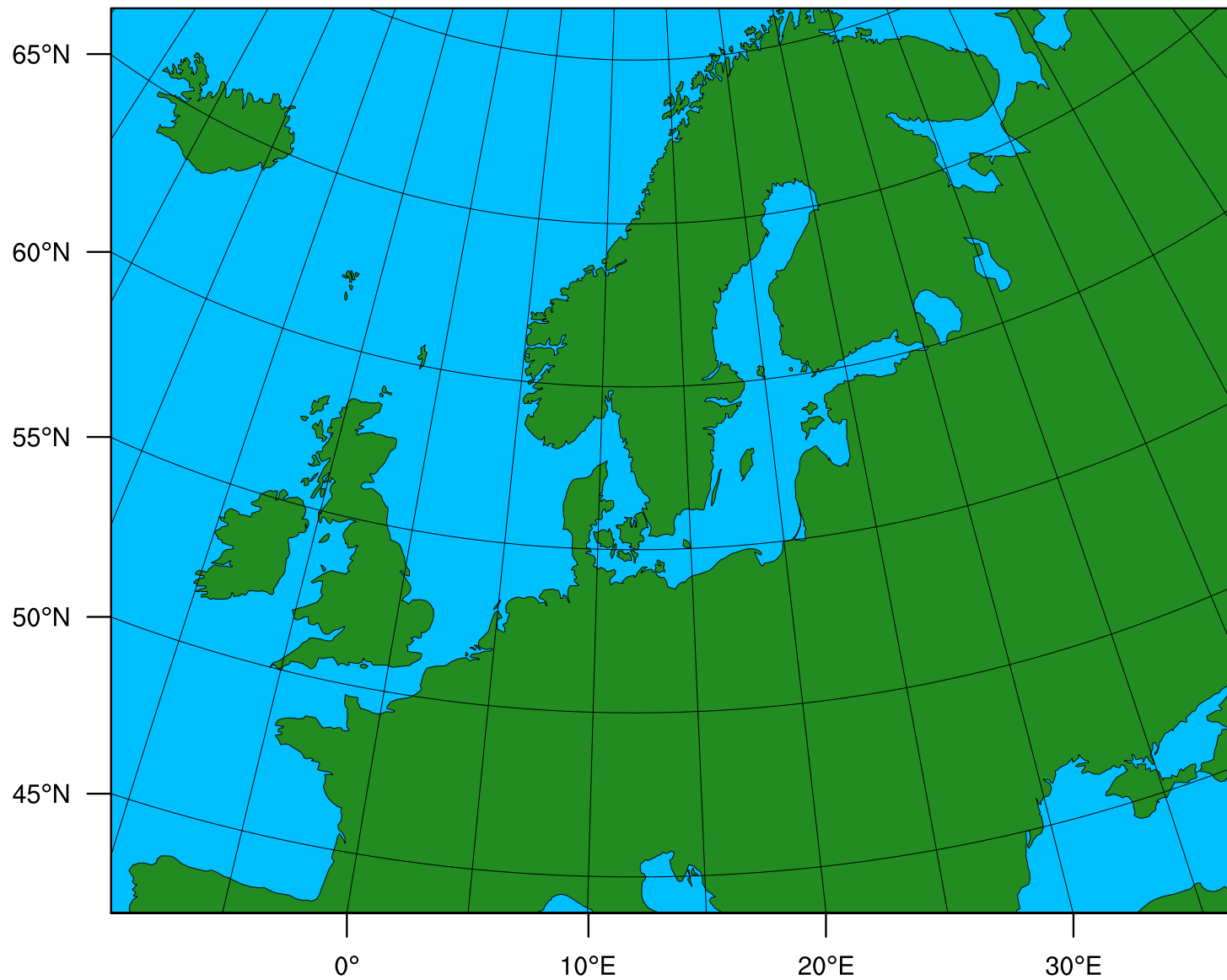
- Metgrid package directly ingests MPAS model output
- No interim re-projection

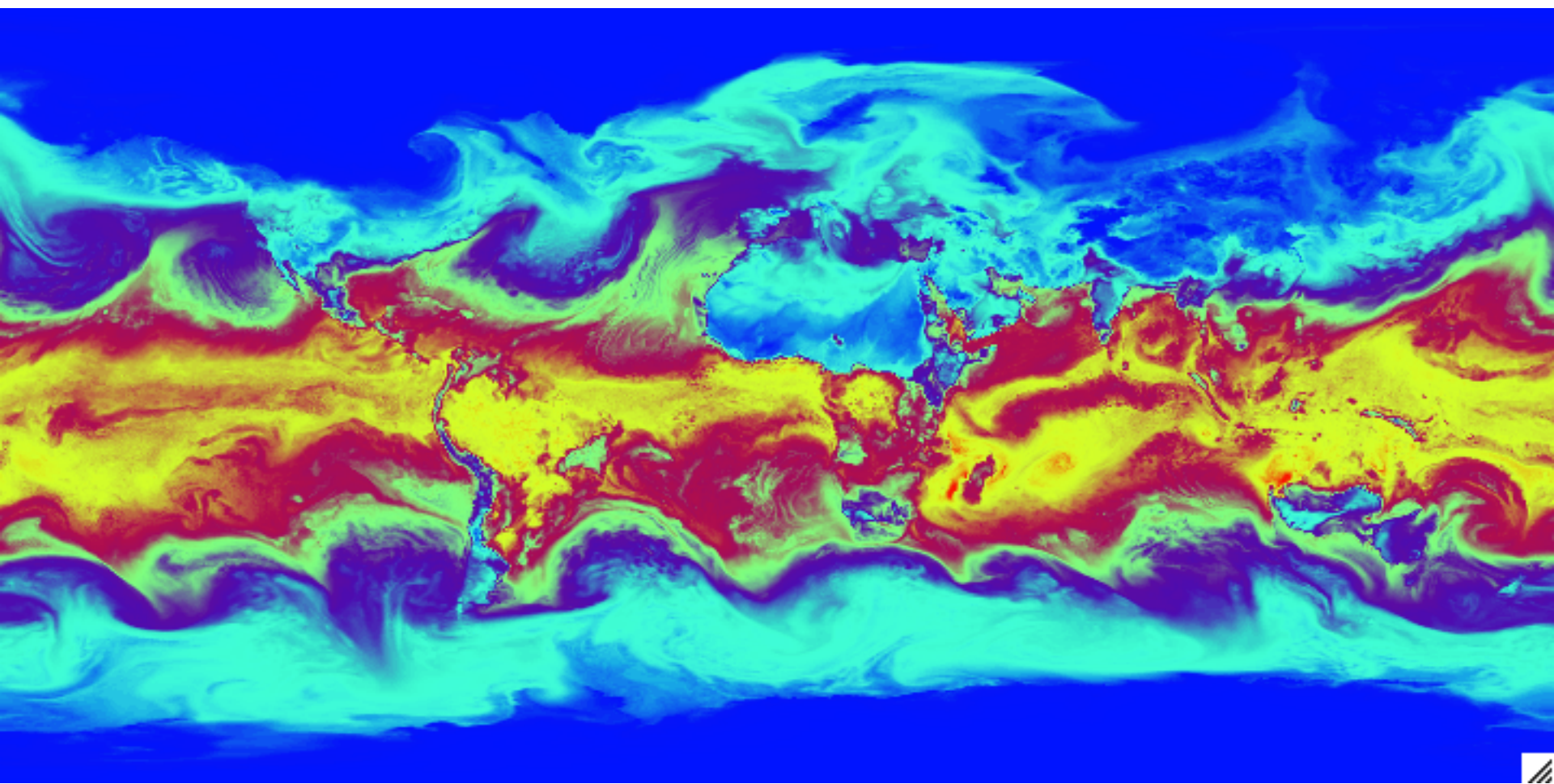
```
&metgrid
```

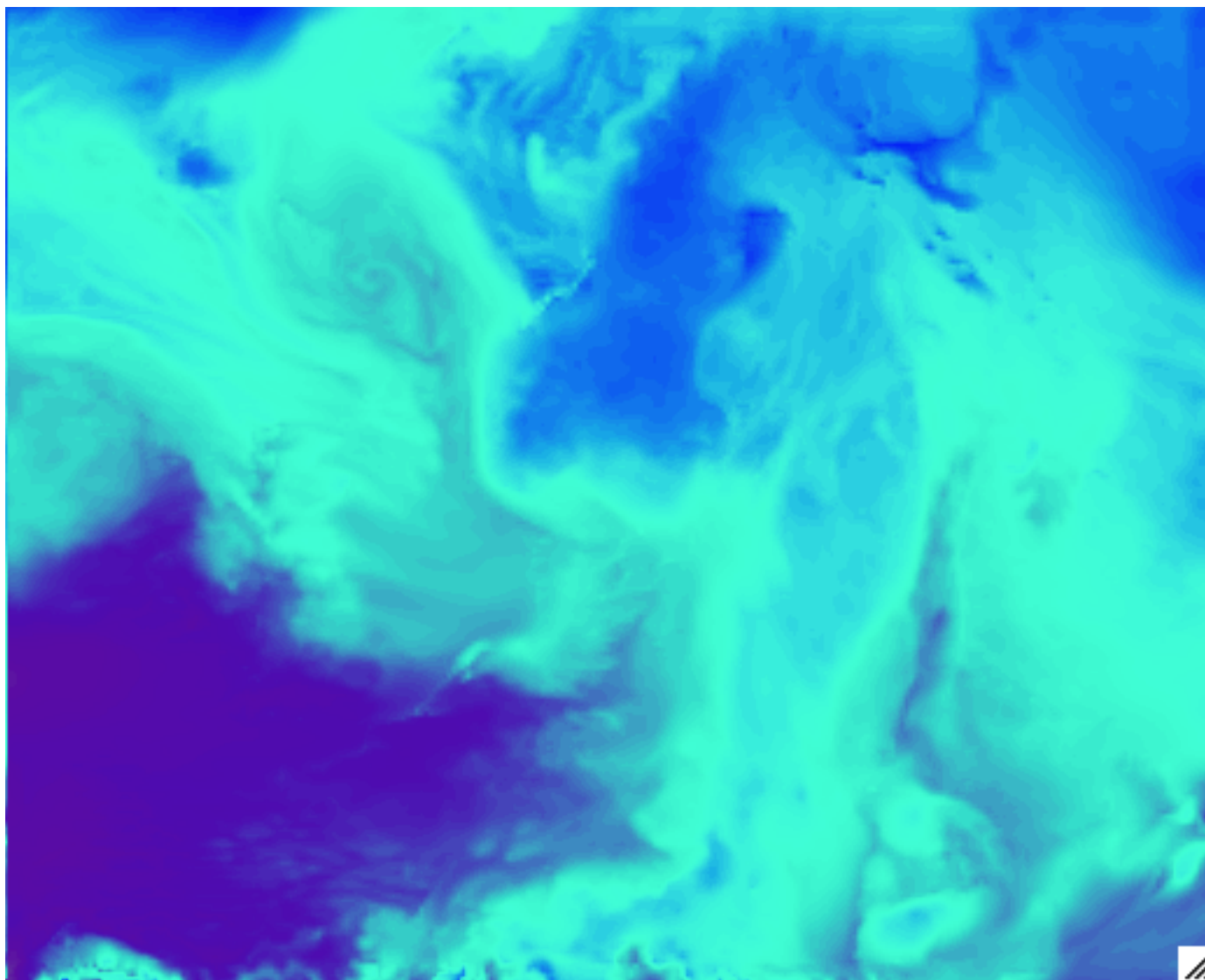
```
constants_name = 'mpas:120km.grid1.nc'
```

```
fg_name = 'mpas.120km'
```

WPS Domain Configuration







WRF&MPAS Share RIP!

AMPS 10-km WRF -- Ross-Beardmore Window

Fcst: 30 h

Wind Gust (HRRR Method)

Horizontal wind vectors

Init: 00 UTC Mon 12 Jun 17

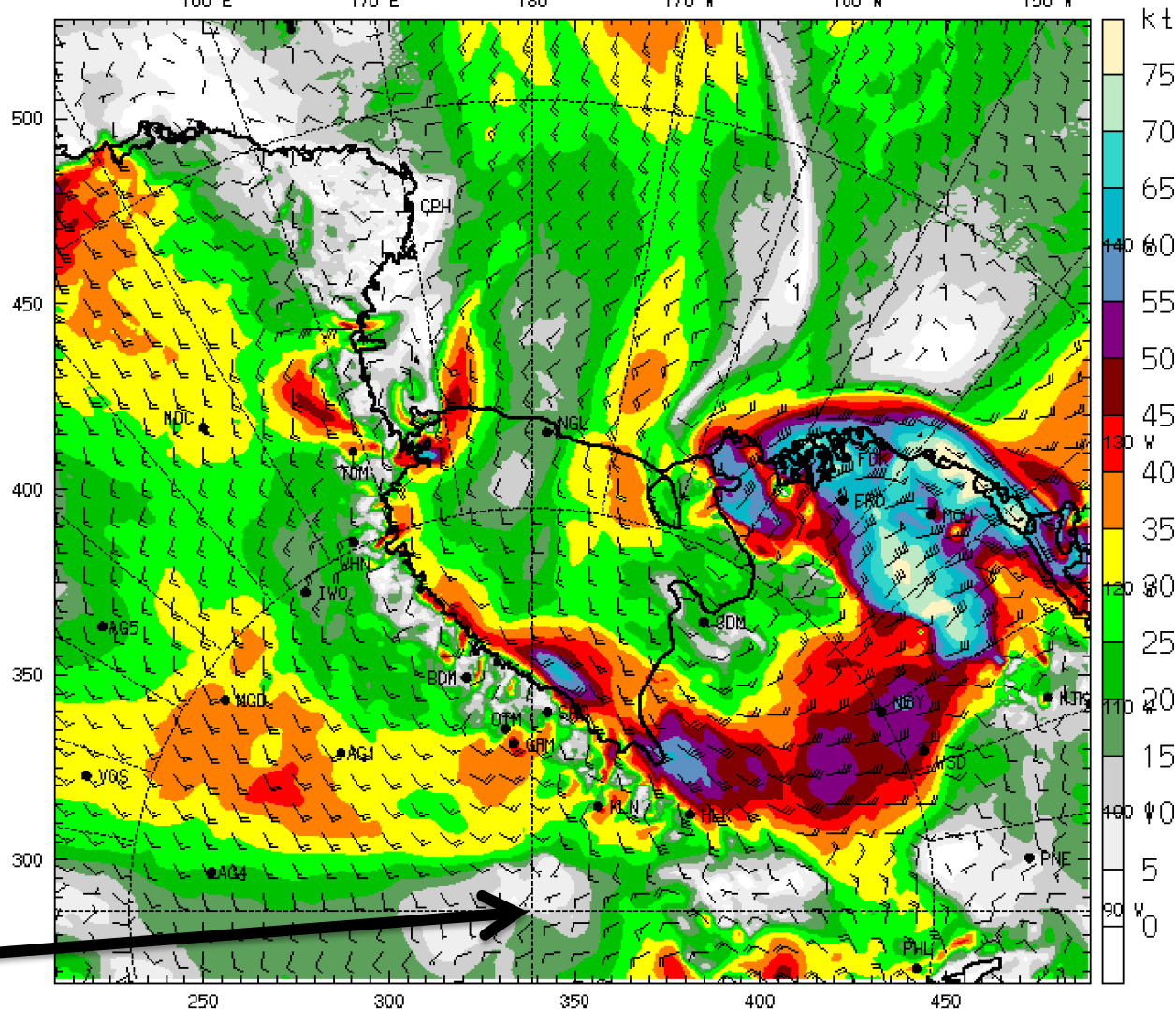
Valid: 06 UTC Tue 13 Jun 17

sm= 1

at k-index = 60

160 E 170 E 180 170 W 160 W 150 W

WRF
Wind gust



South Pole

WRF&MPAS Share RIP!

AMPS MPAS Ross-Beardmore Window

Fcst: 30 h

Wind Gust (HRRR Method)

Horizontal wind vectors

Init: 00 UTC Mon 12 Jun 17

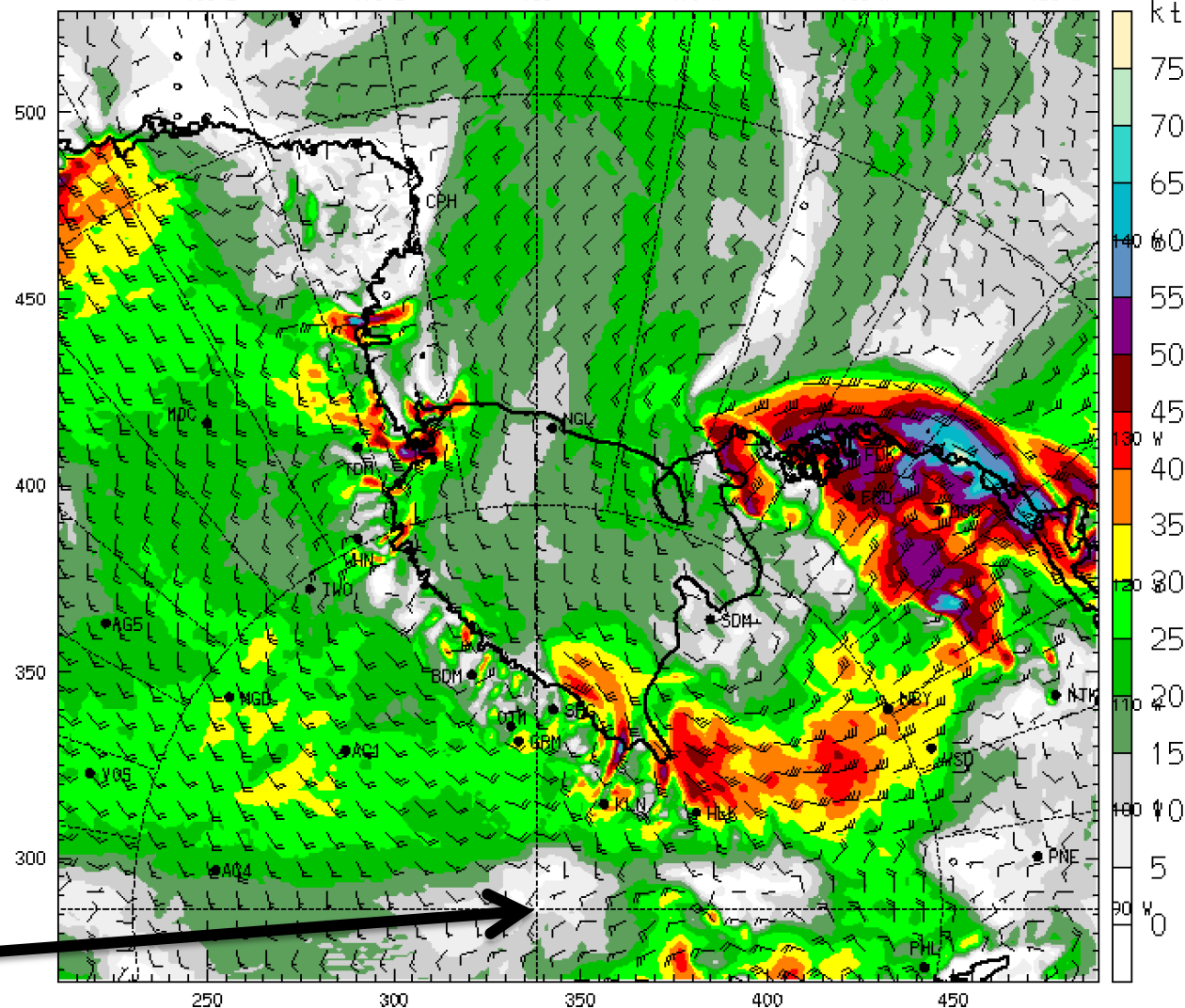
Valid: 06 UTC Tue 13 Jun 17

sm= 1

at k-index = 61

160 E 170 E 180 170 W 160 W 150 W

MPAS
Wind gust

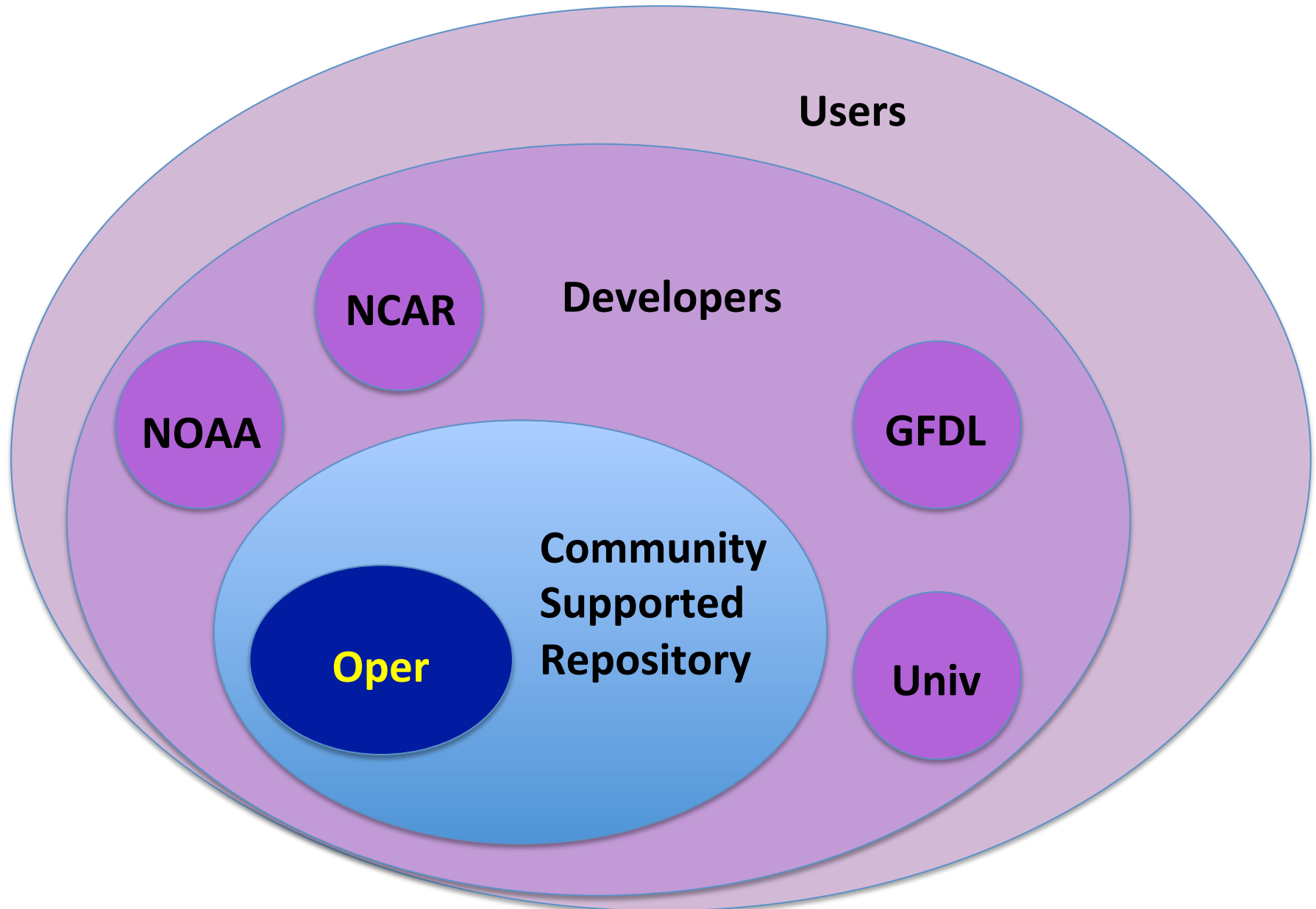


South Pole

WRF&MPAS Share RIP!

- Priscilla Mooney and Kevin Manning
 - Developers and image manufacturers
- RIP
 - Diagnostically rich
- Currently:
 - Intermediate lat-lon domain
 - Direct mapping?? We'll see
- Available next major release

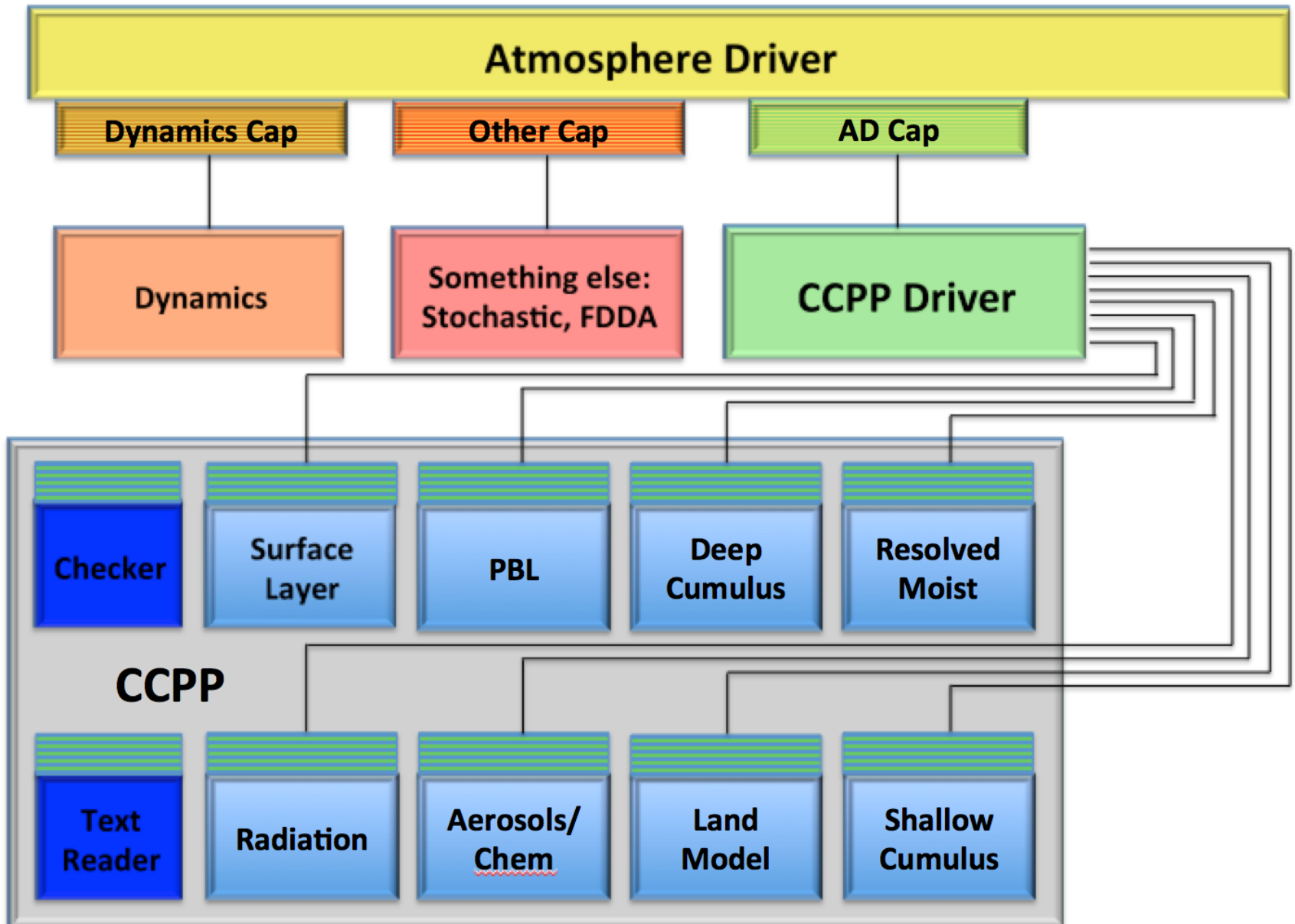
Shared Physics and Driver



Shared Physics and Driver

- Common Community Physics Packages (CCPPs)
- Shared physical parameterization schemes
- Ecosystem assumes git infrastructure
- NCAR: CESM, MPAS, WRF participating
- P1 *The Common Community Physics Package*, Bernardet, et al., DETAILS
- Interoperable Physics Driver: Need a way to call these various physics packages

Shared Physics and Driver



Shared Physics and Driver

```
<?xml version="1.0" encoding="UTF-8"?>
<suite name="RAP">
  <ipd part="1">    <subcycle loop="1">
    <scheme>RRTMGLW</scheme>
    <scheme>RRTMGSW</scheme>
    <scheme>MYNNSFC</scheme>
    <scheme>RUCLSM</scheme>
    <scheme>MYNNPBL</scheme>
    <scheme>GF</scheme>
  </subcycle>    </ipd>
  <ipd part="2">    <subcycle loop="1">
    <scheme>THOMPSONAERO</scheme>
  </subcycle>    </ipd>
</suite>
```

- Suite Definition File: SDF
- Text file of individual schemes which compose a “suite”

WRF+WPS on github

wrf-model / WRF Private

Unwatch 40

Star 2

Fork 27

Code

Issues 2

Pull requests 5

Projects 1

Wiki

Insights

Filters

is:pr is:open

Labels

Milestones

New pull request

☐	5 Open	✓ 259 Closed	Author	Labels	Projects	Milestones	Reviews	Assignee	Sort
☐	Make lanczos eigenpair filename a namelist option	#267 opened 4 days ago by mkavulich • Review required							1
☐	Diffusion swap wrong map factor Proposed for release branch	#266 opened 11 days ago by davegill • Review required 0 of 1							2
☐	Fixes a bug so that KF-CuP scheme clouds impacts radiation Add to "known problems"	Approved for release branch #257 opened on May 2 by singhbalwinder • Approved							4
☐	wrf_io.F90, index 0 invalid	#248 opened on Apr 6 by davegill • Review required							
☐	Restrict input streams that unnecessarily consider metadata	#221 opened on Mar 29 by davegill • Review required 3 of 5							4

- WRFv3.9 transitioned from NCAR based *svn* repository to *git*
- Using github hosting services

WRF+WPS on github

- Access is EASY: send your github User ID to Mike Kavulich kavulich@ucar.edu
- ALL DEVELOPERS: contribute code via github pull requests



WRF Suites – Two So Far

```
IF ( model_config_rec % cu_physics(i)           == -1 ) &  
    model_config_rec % cu_physics(i)           = TIEDTKEScheme  
  
IF ( model_config_rec % mp_physics(i)           == -1 ) &  
    model_config_rec % mp_physics(i)           = THOMPSON  
  
IF ( model_config_rec % ra_lw_physics(i)        == -1 ) &  
    model_config_rec % ra_lw_physics(i)        = RRTMG_LWScheme  
  
IF ( model_config_rec % ra_sw_physics(i)        == -1 ) &  
    model_config_rec % ra_sw_physics(i)        = RRTMG_SWScheme  
  
IF ( model_config_rec % bl_pbl_physics(i)       == -1 ) &  
    model_config_rec % bl_pbl_physics(i)       = MYJPBLScheme  
  
IF ( model_config_rec % sf_sfclay_physics(i)    == -1 ) &  
    model_config_rec % sf_sfclay_physics(i)    = MYJSFCScheme  
  
IF ( model_config_rec % sf_surface_physics(i)   == -1 ) &  
    model_config_rec % sf_surface_physics(i)   = LSMScheme
```

WRF Suites: Tropical

- Implemented by Michael Duda
- Currently inside `check_a_mundo.F`
- Available: conus and tropical
- Users can modify defaults
- Info: `WRFV3/test/em_real/examples.namelist`

WRF Suites: Conus

```
&physics
```

```
physics_suite = 'tropical'
```

```
cu_physics = -1, -1, 0,
```

- -1 = use what the physics_suite variable says



Plans

- WRF v4.0 coming up in the Spring
 - Not tied to backward compatibility
 - LBC – maybe not coupled
 - Moist theta default: changes to all of the ideals + real + DA + post-procs
 - Shared physics
 - Shared infrastructure for physics – maybe
 - HVC:
 - Un-cpp-ize
 - All the ideals

Plans - Physics

- Required of physics developers:
 - Args commented:
 - type, dim, in/out, char name, units
- Physics Requirements (not exhaustive)
 - Args simple Fortran types
 - Routines: run, init, fini??, update??, restart??
 - Nothing is “module USEd”, args or file input
 - 1d assumption
 - Schemes do not call each other (or their subs)