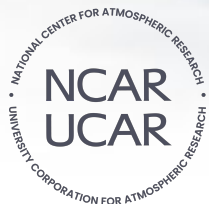


Implementing CCPP in CAM-SIMA

A tale of two (x2) repos

Jesse Nusbaumer,
Software Engineer, NCAR CGD-AMP

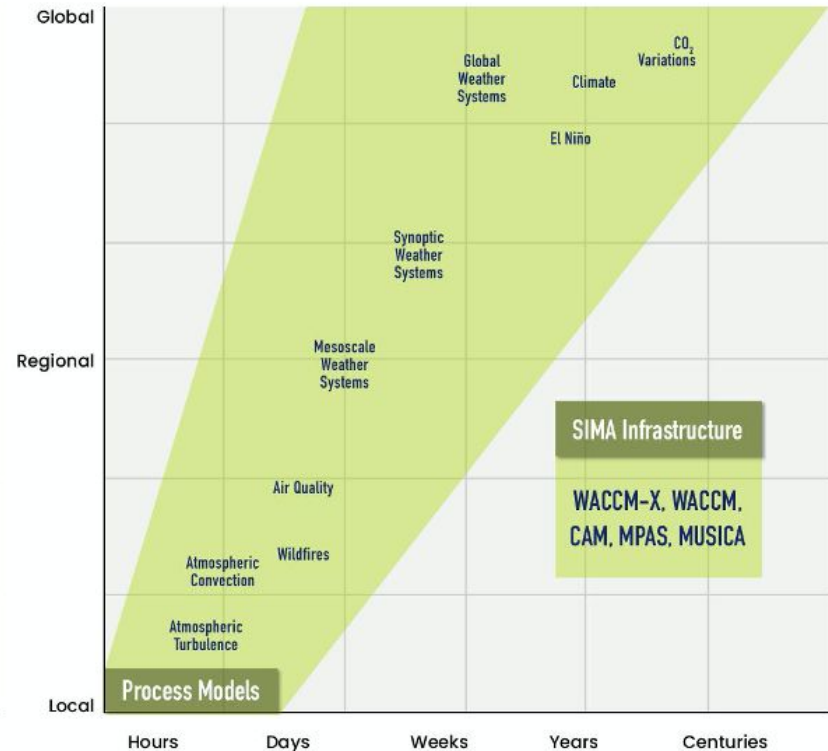
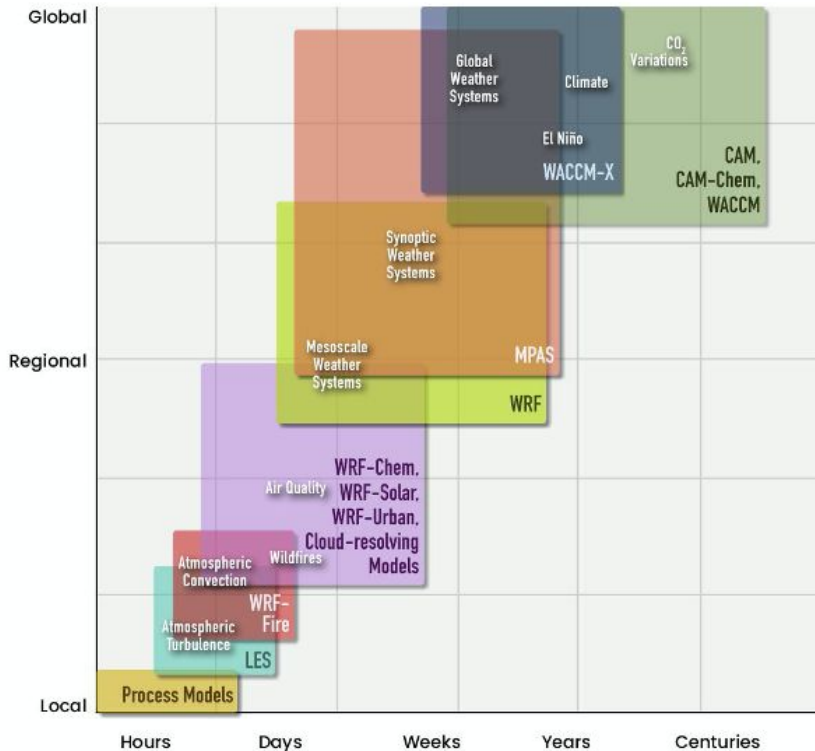
June 14th , 2023



System for Integrated Modeling of the Atmosphere (SIMA)

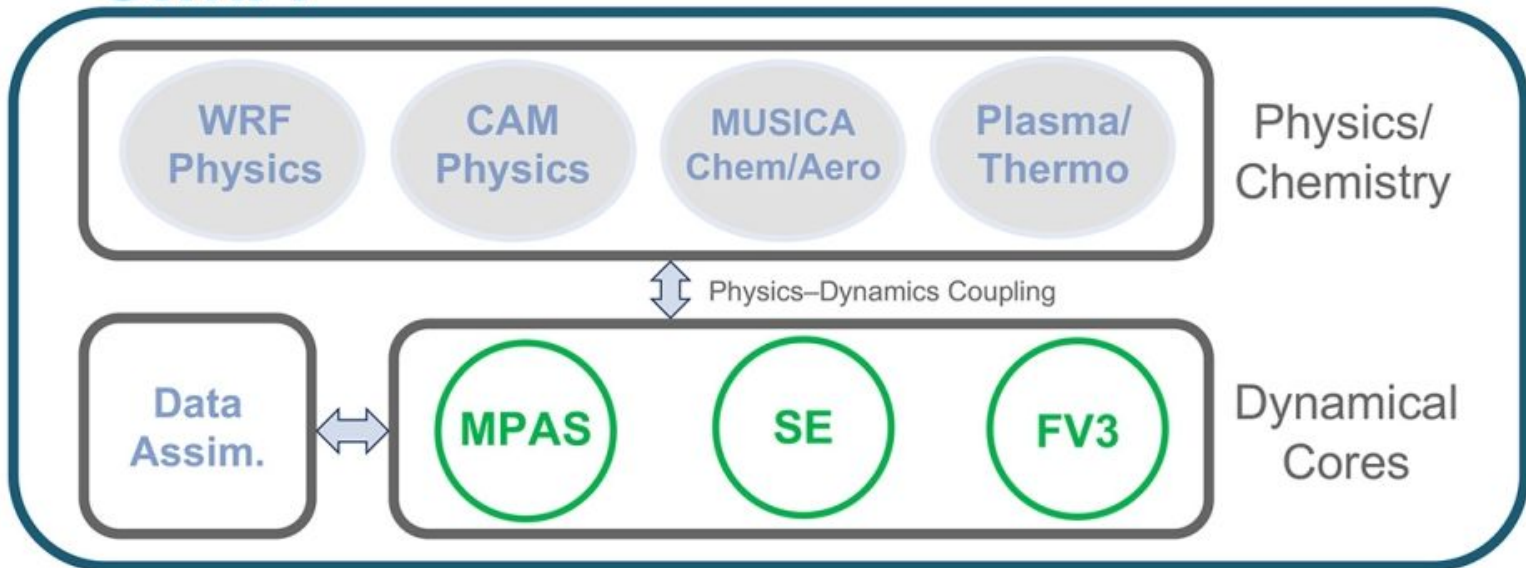
Atmospheric Modeling Ecosystem in Mid-2010s

SIMA-based Atmospheric Modeling System in Mid-2020s



SIMA is a unified community atmospheric modeling framework, for use in an Earth System Model (ESM). SIMA enables diverse configurations of an atmosphere model inside of an ESM for applications spanning minutes to centuries and cloud to global scales, including atmospheric forecasts and projections of the atmospheric state and composition from the surface into the thermosphere.

SIMA



All of this is already in CAM in some form...

CAM-SIMA repo (repo #1)

ESCOMP / CAM-SIMA Public

<> Code Issues 65 Pull requests 1 Discussions Actions Projects 2 Wiki Security Insights Settings

main 3 branches 0 tags Go to file Add file <> Code

nusbaume Merge pull request #220 from nusbaume/update_issue_templates 974b64c 2 hours ago 7 commits

- .github/ISSUE_TEMPLATE Update issue template to reference CAM-SIMA. 3 days ago
- README.md Update README.md 3 days ago

README.md

CAM-SIMA

Community Atmosphere Model - System for Integrated Modeling of the Atmosphere

NOTE: Only developmental code exists at the moment. This README will be updated once production code becomes available.

Current code status:

Python Unit Tests passing

About
Community Atmosphere Model - System for Integrated Modeling of the Atmosphere

- Readme
- Activity
- 0 stars
- 7 watching
- 2 forks

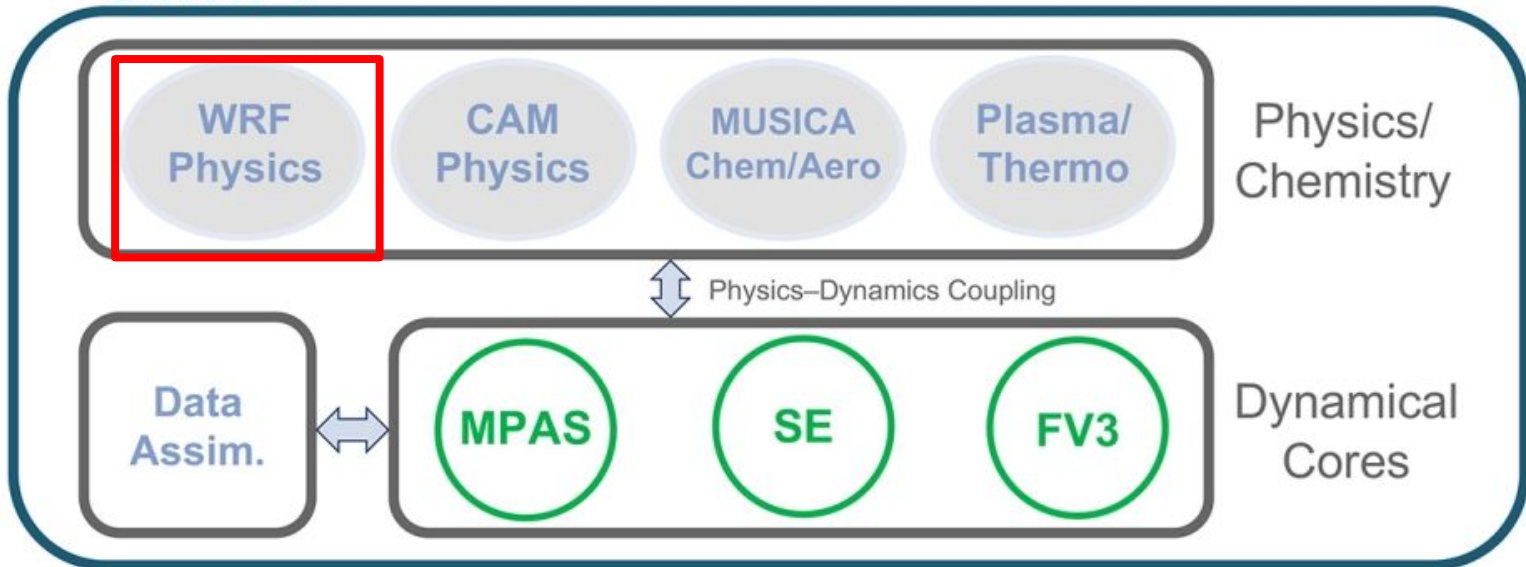
Report repository

Releases
No releases published
[Create a new release](#)

Packages
No packages published

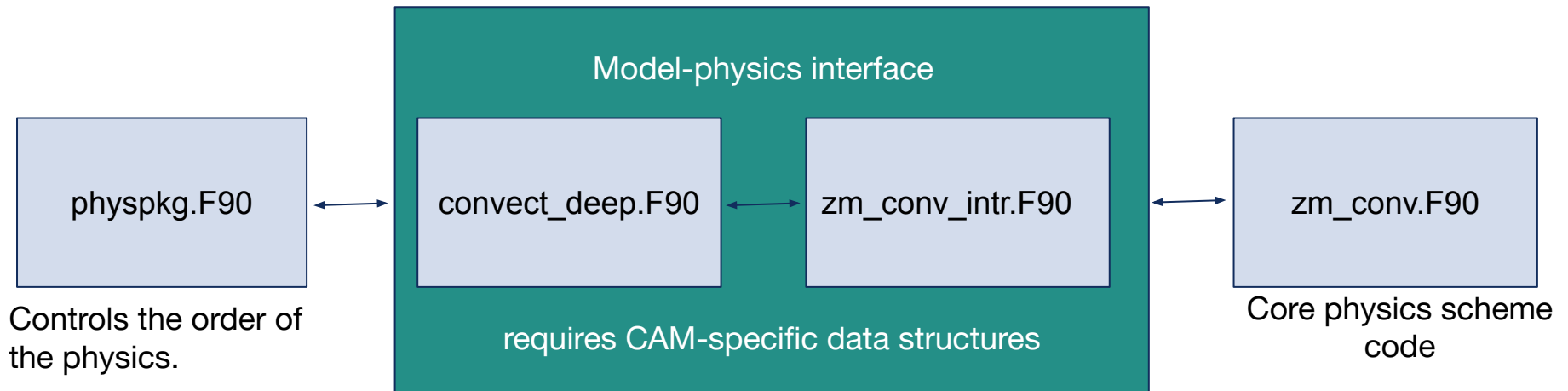
This code base used to be referred to as “CAMDEN”, or “new” CAM. Unlike the previous repo, this one is fully **public**.

SIMA



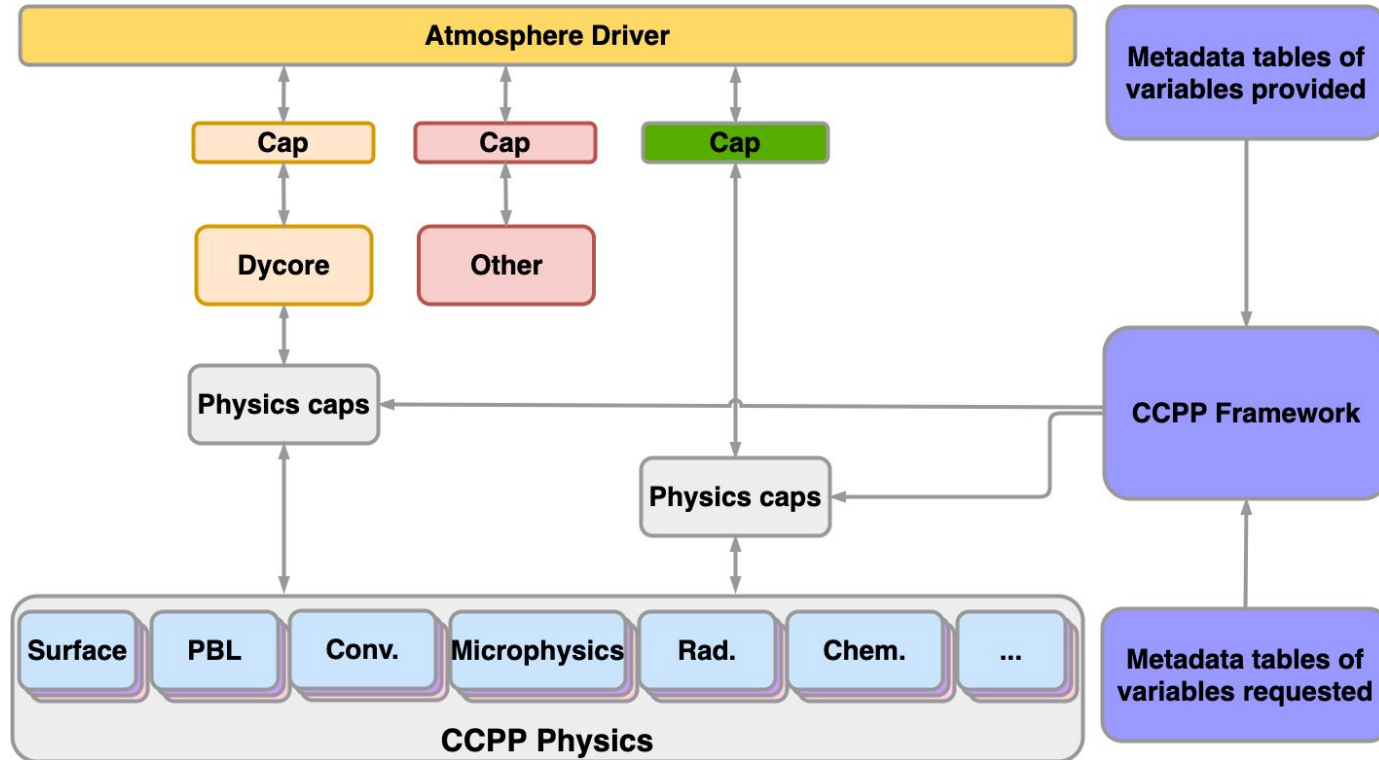
All of this is already in CAM in some form...*except* WRF Physics. How can we bring in entirely new sets of physics into what will eventually be SIMA?

Describe current CAM physics interface



The files in the “Model-physics interface” would need to be created or modified, by hand, for every new WRF or NOAA physics scheme being brought into SIMA. Also different versions of “physpkg.F90” would need to be created

Common Community Physics Package (CCPP)



The CCPP is a software framework that automatically generates the Fortran interface (cap) layer for a physics parameterization (scheme).

The CCPP-Framework (Repo #2)

NCAR / **ccpp-framework** Public Unwatch 23

<> Code Issues 49 Pull requests 2 Discussions Actions Projects 2 Wiki Security Insights

main 9 branches 15 tags Go to file Add file Code

mkavulich and **gold2718** Add more unit tests for routines in common.py (#465) 625a456 on Apr 10 1,397 commits

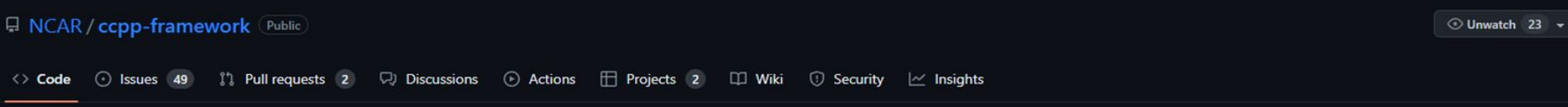
| | | |
|----------------|--|--------------|
| .github | Add new runtime info routine, ccpp_physics_suite_schemes | 2 years ago |
| doc | Change unit of errmsg from '1' to 'none' | 2 years ago |
| logging | First pass at working ccpp_capgen using version 2 metadata | 4 years ago |
| schema | Removed standard names dictionary, moved to ESCOMP/CCPPStandard... | 3 years ago |
| scripts | Fix error message for unit conversions involving unit "1" (#462) | 3 months ago |
| src | Remove legacy src/ccpp_api.F90 | last year |
| stub | Update CCPP error code variable in stub/stub.meta | last year |
| test | Add more unit tests for routines in common.py (#465) | 2 months ago |
| tests | Fix CI test failures in tests/test_metadata_parser.py | 2 years ago |
| .codecov.yml | Adding coverage information/badges. | 6 years ago |
| .gitignore | Add .pyc (compiled Python modules) to list of files ignored by git | 6 years ago |
| .travis.yml | Remove Julie from email notifications in .travis.yml | 2 years ago |
| CMakeLists.txt | Update CMakeLists.txt: update authors, remove custom 'Bitforbit' buil... | last year |
| CODEOWNERS | Remove Laurie from CODEOWNERS | 2 years ago |

About
Common Community Physics Package (CCPP)
www.dtcenter.org/community-code/com...
Readme
View license
Activity
19 stars
23 watching
55 forks
Report repository

Releases 8
v6.0.0 Latest
on Aug 4, 2022
[+ 7 releases](#)

Packages
No packages published

The CCPP-Framework (Repo #2)



Currently NOAA and NCAR use two different versions of the Framework, pre-build (NOAA) and capgen (NCAR)

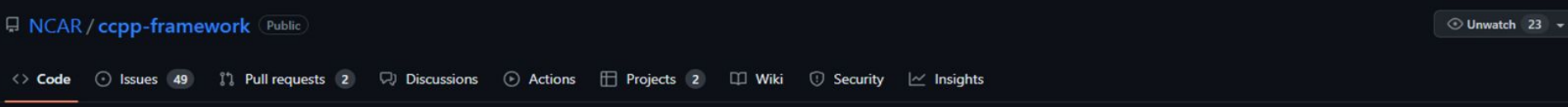
| Issue # | Description | Number | Labels | Assignee | Created |
|---------|--|--------|------------------|-----------------|---------|
| 22 | Tasks below require the variable action class to be implemented in capgen (#403) | | | | |
| 23 | | | | | |
| 24 | capgen must implement the unit conversion module | #329 | * | 55 Steve | |
| 25 | capgen needs to be able handle blocked data | #314 | * | 90 Dom | |
| 26 | Add debug switch to capgen | #325 | * | 35 Steve or Dom | |
| 27 | capgen must implement active metadata keyword | #328 | | 25 Steve | |
| 28 | Create unit tests for unit conversion | #430 | PR created: #434 | 3 Dom | |
| 29 | Create unit tests for block data | #431 | | | |
| 30 | Create unit tests for active metadata keyword | #432 | | | |
| 31 | Create unit tests for debug switch | #433 | | | |

| File | Description | Created |
|----------------|---|-------------|
| tests | Fix CI test failures in tests/test_metadata_parser.py | 2 years ago |
| .codecov.yml | Adding coverage information/badges. | 6 years ago |
| .gitignore | Add .pyc (compiled Python modules) to list of files ignored by git | 6 years ago |
| .travis.yml | Remove Julie from email notifications in .travis.yml | 2 years ago |
| CMakeLists.txt | Update CMakeLists.txt: update authors, remove custom 'Bitforbit' build... | last year |
| CODEOWNERS | Remove Laurie from CODEOWNERS | 2 years ago |

| Release | Version | Label | Date |
|---------|---------|-------|----------------|
| v6.0.0 | Latest | | on Aug 4, 2022 |

| Package | Status |
|-----------------------|--------|
| No packages published | |

The CCPP-Framework (Repo #2)



Currently NOAA and NCAR use two different versions of the Framework, pre-build (NOAA) and capgen (NCAR)

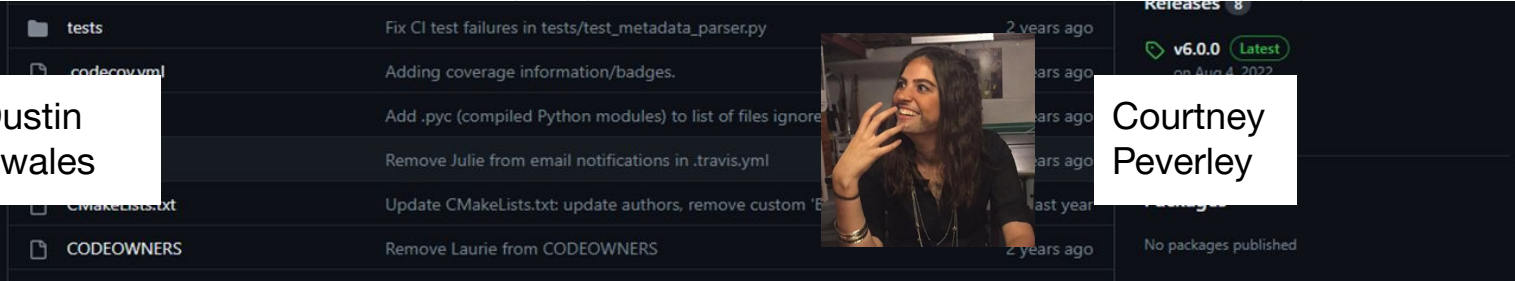
| Issue # | Description | Number | Priority | Assignee |
|---------|--|--------|------------------|-----------------|
| 22 | Tasks below require the variable action class to be implemented in capgen (#403) | | | |
| 23 | | | | |
| 24 | capgen must implement the unit conversion module | #329 | * | 55 Steve |
| 25 | capgen needs to be able handle blocked data | #314 | * | 90 Dom |
| 26 | Add debug switch to capgen | #325 | * | 35 Steve or Dom |
| 27 | capgen must implement active metadata keyword | #328 | | 25 Steve |
| 28 | Create unit tests for unit conversion | #430 | PR created: #434 | 3 Dom |
| 29 | Create unit tests for block data | #431 | | |
| 30 | Create unit tests for active metadata keyword | #432 | | |
| 31 | Create unit tests for debug switch | #433 | | |



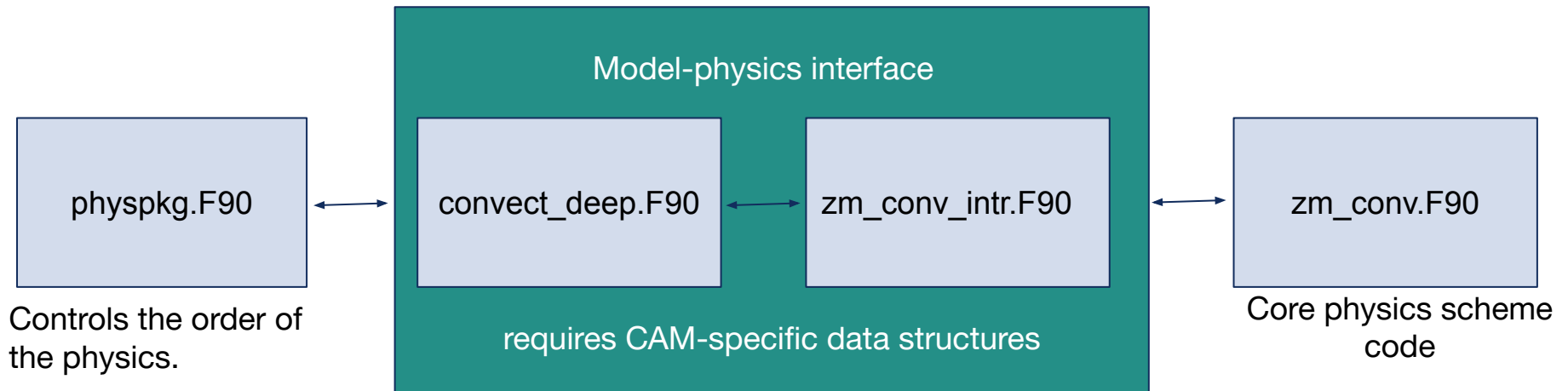
Dustin Swales



Courtney Peverley



Describe current CAM physics interface



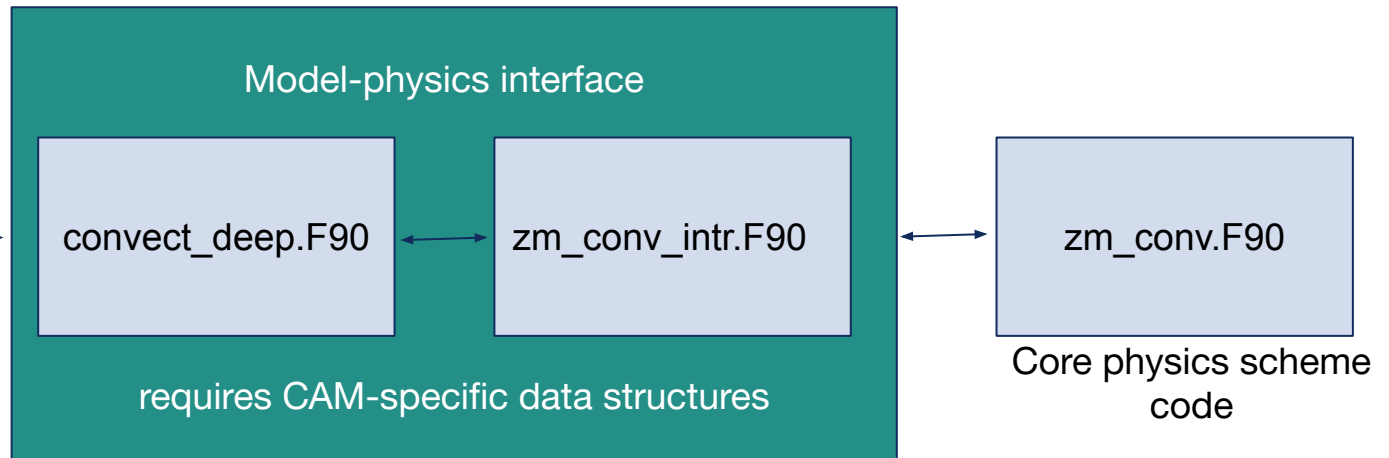
The files in the “Model-physics interface” would need to be created or modified, by hand, for every new WRF or NOAA physics scheme being brought into SIMA. Also different versions of “physpkg.F90” would need to be created

Describe current CAM physics interface

What's the CCPP's method to control physics order?

physpkg.F90

Controls the order of the physics.



The files in the “Model-physics interface” would need to be created or modified, by hand, for every new WRF or NOAA physics scheme being brought into SIMA. Also different versions of “physpkg.F90” would need to be created

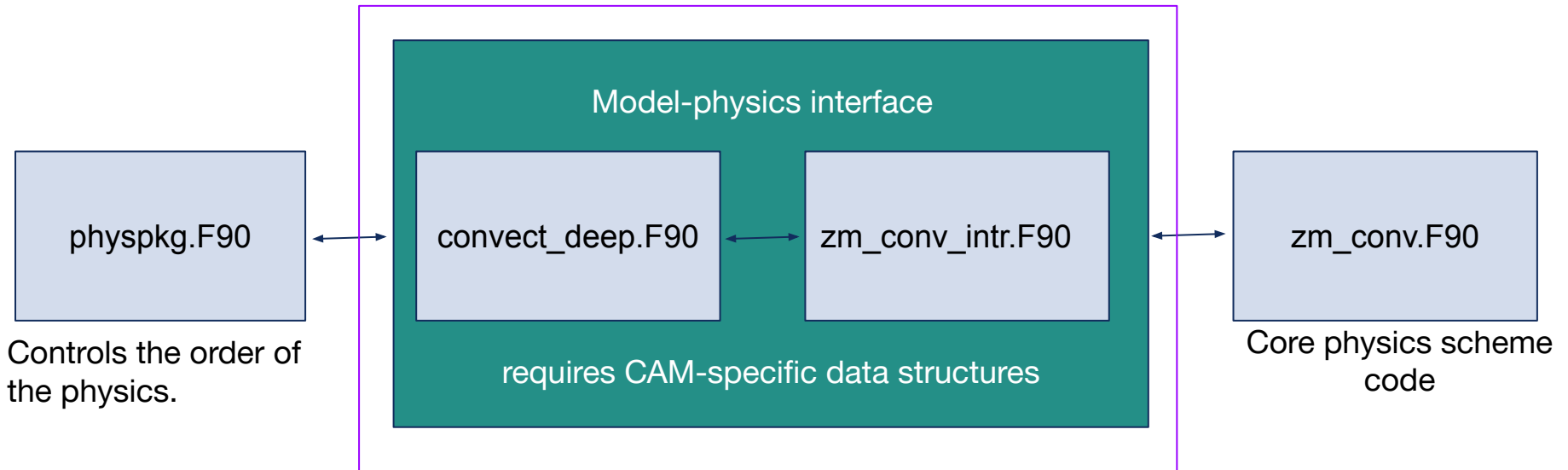
CCPP Suite Definition File

The list and order of physics schemes is controlled by a Suite Definition File (SDF), which allows for much easier re-ordering of physics routines, and removes the need to have a “physpkg.F90” source file.

```
1  <?xml version="1.0" encoding="UTF-8"?>
2
3  <suite name="held_suarez_1994" version="1.0">
4    <group name="physics">
5      <scheme>held_suarez_1994</scheme>
6      <scheme>apply_tendency_of_x_wind</scheme>
7      <scheme>apply_tendency_of_y_wind</scheme>
8      <scheme>apply_heating_rate</scheme>
9      <scheme>qneg</scheme>
10   </group>
11 </suite>
```

Describe current CAM physics interface

What is needed for the CCPP to generate the interface?



The files in the “Model-physics interface” would need to be created or modified, by hand, for every new WRF or NOAA physics scheme being brought into SIMA. Also different versions of “physpkg.F90” would need to be created

CCPP Physics Scheme

Metadata (*.meta) file,
which lists metadata for all interface variables

```
[ccpp-arg-table]
name = apply_tendency_of_x_wind_run
type = scheme
[nz]
standard_name = vertical_layer_dimension
long_name = Number of vertical layers
units = count
type = integer
dimensions = ()
intent = in
[dudt]
standard_name = tendency_of_x_wind
units = m s-2
type = real | kind = kind_phys
dimensions = (horizontal_loop_extent, vertical_layer_dimension)
intent = in
[u]
standard_name = x_wind
units = m s-1
type = real | kind = kind_phys
dimensions = (horizontal_loop_extent, vertical_layer_dimension)
intent = inout
state_variable = True
[dudt_total]
standard_name = tendency_of_x_wind_due_to_model_physics
units = m s-2
type = real | kind = kind_phys
dimensions = (horizontal_loop_extent, vertical_layer_dimension)
intent = inout
```

Source code (*.F90) file,
which contains the actual parameterization code

```
!> \section arg_table_apply_tendency_of_x_wind_run Argument Table
! \htmlinclude apply_tendency_of_x_wind_run.html
subroutine apply_tendency_of_x_wind_run(nz, dudt, u, dudt_total, dt, &
                                         errcode, errmsg)

! Dummy arguments
integer,          intent(in)    :: nz           ! Num vertical layers
real(kind_phys), intent(in)    :: dudt(:, :)   ! tendency of x wind
real(kind_phys), intent(inout) :: u(:, :)     ! x wind
real(kind_phys), intent(inout) :: dudt_total(:, :) ! total tendency of x wind
real(kind_phys), intent(in)    :: dt           ! physics time step
integer,          intent(out)   :: errcode
character(len=512), intent(out) :: errmsg

! Local variable
integer :: klev

errcode = 0
errmsg = ''

do klev = 1, nz
    u(:, klev) = u(:, klev) + (dudt(:, klev) * dt)
    dudt_total(:, klev) = dudt_total(:, klev) + dudt(:, klev)
end do

end subroutine apply_tendency_of_x_wind_run
```

With these two files and a host model metadata file,
the model/scheme interface can be auto-generated

atmospheric_physics (repo #3)

NCAR / atmospheric_physics Public

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Code Issues 17 Pull requests 1 Discussions Actions Projects 1 Wiki Security Insights Settings

main 1 branch 18 tags

Go to file Add file Code

About

CCPP-enabled Atmo

- Readme
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- 2 stars
- 8 watching
- 9 forks

Report repository

Releases

18 tags

Create a new release

Packages

No packages published

| | | |
|---|--|--------------|
| nusbaume Merge pull request #10 from nusbaume/cam4_suite_file ... | d7b98fc 2 days ago | 130 commits |
| held_suarez | Update metadata, remove optional, add constituent info | last year |
| kessler | Add modifications needed to build and run with CAMDEN. | 6 months ago |
| utilities | Add modifications needed to build and run with CAMDEN. | 6 months ago |
| LICENSE.txt | Test run of new repository with simple Kessler suite | 4 years ago |
| README.md | updates based on code review | 4 years ago |
| suite_cam4.xml | Rename potential temperature scheme, and clean-up CAM4 SDF co... | 3 years ago |
| suite_cam6.xml | change qneg4 to qneg_surface | 2 years ago |
| suite_cam6_silhs.xml | Modify suite name in cam6_silhs SDF to avoid naming conflict. | 2 years ago |
| suite_held_suarez_1994.xml | Add modifications needed to build and run with CAMDEN. | 6 months ago |
| suite_kessler.xml | Add modifications needed to build and run with CAMDEN. | 6 months ago |

README.md

CCPP Standard Names

[ccpp-arg-table]

name = apply_tendency_of_x_wind_run
type = scheme

[nz]

standard_name = vertical_layer_dimension
long_name = Number of vertical layers
units = count
type = integer
dimensions = ()
intent = in

[dudt]

standard_name = tendency_of_x_wind
units = m s⁻²
type = real | kind = kind_phys
dimensions = (horizontal_loop_extent, vertical_layer_dimension)
intent = in

[u]

standard_name = x_wind
units = m s⁻¹
type = real | kind = kind_phys
dimensions = (horizontal_loop_extent, vertical_layer_dimension)
intent = inout
state_variable = True

[dudt_total]

standard_name = tendency_of_x_wind_due_to_model_physics
units = m s⁻²
type = real | kind = kind_phys
dimensions = (horizontal_loop_extent, vertical_layer_dimension)
intent = inout

CCPP “standard names” are the official name of a particular variable, and are what the CCPP-framework uses to determine what host model or physics scheme variable should be passed to another physics scheme.

Standard Name example discussion

- Q

Standard Name example discussion

- Q
- Q -> specific_humidity

Standard Name example discussion

- Q
- Q -> specific_humidity
- Q -> water_vapor_mixing_ratio_wrt_moist_air

Standard Name example discussion

- Q
- Q -> specific_humidity
- Q -> water_vapor_mixing_ratio_wrt_moist_air
- Q -> water_vapor_mixing_ratio_wrt_total_mass

Standard Name example discussion

- Q
- Q -> specific_humidity
- Q -> water_vapor_mixing_ratio_wrt_moist_air
- Q -> water_vapor_mixing_ratio_wrt_total_mass
- Q ->
water_vapor_mixing_ratio_wrt_moist_air_and_condensed
_water

CCPP Standard Names

| 1 | Snapshot Variable Name | Snapshot Longname | Longname Location | Snapshot Units | CCPP Standard Name | Accepted |
|-----|------------------------|---|--------------------------------|----------------|--|----------|
| 400 | ptend_taux_top | net zonal stress at top of model | physics_types.F90: line 163 | Pa | N/A | |
| 401 | ptend_tauy_srf | net meridional stress at surface | physics_types.F90: line 164 | Pa | N/A | |
| 402 | ptend_tauy_top | net meridional stress at top of model | physics_types.F90: line 165 | Pa | N/A | |
| 403 | | | | | TPHYSAC VARIABLES | |
| 404 | tphysac_cmfmfc | convective mass flux (m sub c) | physpkg.F90: line 2072 | | atmosphere_convective_mass_flux_due_to_all_convection | X |
| 405 | tphysac_det_ice | vertical integral of detrained ice | physpkg.F90: line 2141 | | vertically_integrated_detrainment_of_ice_due_to_all_convection | X |
| 406 | tphysac_det_s | vertical integral of detrained static energy from ice | physpkg.F90: line 2140 | | vertically_integrated_heating_from_freezing_of_detrained_liquid_due_to_all_convection | X |
| 407 | tphysac_dif | detraining cld H2O from shallow + deep convections | physpkg.F90: line 2076 | | detrainment_of_water_due_to_all_convection | X |
| 408 | tphysac_dif2 | detraining cld H2O from shallow convections | physpkg.F90: line 2077 | | detrainment_of_water_due_to_shallow_convection | X |
| 409 | tphysac_fh2o | h2o flux to balance source from methane chemistry | physpkg.F90: line 1433 | | vertically_integrated_water_flux_due_to_chemistry | X |
| 410 | tphysac_fix_heat | heat flux for check_energy_chng | physpkg.F90: line 1434 | | | |
| 411 | tphysac_net_fix | | physpkg.F90: line 2069 | | net_radiative_fluxes_through_top_and_bottom_of_atmosphere_column | X |
| 412 | tphysac_obklen | Obukhov length | physpkg.F90: line 1432 | | obukhov_length | X |
| 413 | tphysac_rliq | vertical integral of liquid not yet in q (ixcldliq) | physpkg.F90: line 2137 | kg m-2 s-1 | vertically_integrated_cloud_liquid_tendency_due_to_all_convection_to_be_applied_later_in_time_loop | X |
| 414 | tphysac_rliq2 | vertical integral of liquid from shallow scheme | physpkg.F90: line 2139 | | vertically_integrated_cloud_liquid_tendency_due_to_shallow_convection_to_be_applied_later_in_time_loop | X |
| 415 | tphysac_surfric | surface friction velocity | physpkg.F90: line 1431 | | surface_layer_friction_velocity | X |
| 416 | tphysac_zdu | detraining mass flux from deep convection | physpkg.F90: line 2071 | | detrainment_mass_flux_due_to_deep_convection | X |
| 417 | | | | | TPHYSBC VARIABLES | |
| 418 | tphysbc_cmfcme | cmf condensation - evaporation | physpkg.F90: line 2074 | | condensation_minus_evaporation_due_to_deep_convection | X |
| 419 | tphysbc_cmfmfc | convective mass flux (m sub c) | physpkg.F90: line 2072 | | atmosphere_convective_mass_flux_due_to_all_convection | X |
| 420 | tphysbc_dif | detraining cld H2O from shallow + deep convections | physpkg.F90: line 2076 | | detrainment_of_water_due_to_all_convection | X |
| 421 | tphysbc_dif2 | detraining cld H2O from shallow convections | physpkg.F90: line 2077 | | detrainment_of_water_due_to_shallow_convection | X |
| 422 | tphysbc_fix_heat | heat flux for check_energy_chng | physpkg.F90: line 1434 | | surface_upward_heat_flux_in_air_surfa | |
| 423 | tphysbc_net_fix | | physpkg.F90: line 2069 | | net_radiative_fluxes_through_top_and_bottom_of_atmosphere_column | X |
| 424 | tphysbc_pflx | conv rain flux throughout bottom of lev | physpkg.F90: line 2078 | | precipitation_flux_at_interface_due_to_deep_convection | X |
| 425 | tphysbc_riice | vertical integral of ice not yet in q (ixcldice) | physpkg.F90: line 2138 | | vertically_integrated_cloud_ice_tendency_due_to_all_convection_to_be_applied_later_in_time_loop | X |
| 426 | tphysbc_rliq | vertical integral of liquid not yet in q (ixcldliq) | physpkg.F90: line 2137 | | vertically_integrated_cloud_liquid_tendency_due_to_all_convection_to_be_applied_later_in_time_loop | X |
| 427 | tphysbc_rliq2 | vertical integral of liquid from shallow scheme | physpkg.F90: line 2139 | | vertically_integrated_cloud_liquid_tendency_due_to_shallow_convection_to_be_applied_later_in_time_loop | X |
| 428 | tphysbc_zdu | detraining mass flux from deep convection | physpkg.F90: line 2071 | | detrainment_mass_flux_due_to_deep_convection | X |
| 429 | | | | | | |
| 430 | | | | | NCAR/ATMOSPHERIC_PHYSICS | |
| 431 | Variable Name | CAM equivalent variable | Meta File | | CCPP Standard Name | |
| 432 | rho | No CAM equivalent | kessler.meta | | density_of_dry_air | X |
| 433 | qr | state%q(:,,:ixrain) | kessler.meta | | rain_mixing_ratio_wrt_dry_air | X |
| 434 | scheme_name | No CAM equivalent | kessler.meta | | scheme_name | X |
| 435 | rair | rairv | geopotential_t.meta | | composition_dependent_gas_constant_of_dry_air | X |
| 436 | zvir | zvirv | geopotential_t.meta | | ratio_of_water_vapor_gas_constant_to_composition_dependent_dry_air_gas_constant_minus_one | X |
| 437 | zi | state%zi | geopotential_t.meta | | geopotential_height_wrt_surface_at_interface | X |
| 438 | dudt | ptend%u | physics_tendency_updaters.meta | | tendency_of_eastward_wind | |
| 439 | dudt_total | tend%u | physics_tendency_updaters.meta | | tendency_of_eastward_wind_due_to_model_physics | |
| 440 | dvdv | ptend%v | physics_tendency_updaters.meta | | tendency_of_northward_wind | |

CCPP Standard Names

| 1 | Snapshot Variable Name | Snapshot Longname | Longname Location | Snapshot Units | CCPP Standard Name | Accepted |
|-----|---------------------------------|---|--------------------------------|----------------|--|----------|
| 400 | plend_taux_top | net zonal stress at top of model | physics_types.F90: line 163 | Pa | N/A | |
| 401 | plend_tauy_srf | net meridional stress at surface | physics_types.F90: line 164 | Pa | N/A | |
| 402 | plend_tauy_top | net meridional stress at top of model | physics_types.F90: line 165 | Pa | N/A | |
| 403 | TPHYSAC VARIABLES | | | | | |
| 404 | tphysac_cmfmfc | convective mass flux (m sub c) | physpkg.F90: line 2072 | | atmosphere_convective_mass_flux_due_to_all_convection | X |
| 405 | tphysac_det_ice | vertical integral of detrained ice | physpkg.F90: line 2141 | | vertically_integrated_detrainment_of_ice_due_to_all_convection | X |
| 406 | tphysac_det_s | vertical integral of detrained static energy from ice | physpkg.F90: line 2140 | | vertically_integrated_heating_from_freezing_of_detrained_liquid_due_to_all_convection | X |
| 407 | tphysac_dif | detraining cld H2O from shallow + deep convections | physpkg.F90: line 2076 | | detrainment_of_water_due_to_all_convection | X |
| 408 | tphysac_dif2 | detraining cld H2O from shallow convections | physpkg.F90: line 2077 | | detrainment_of_water_due_to_shallow_convection | X |
| 409 | tphysac_fh2o | h2o flux to balance source from methane chemistry | physpkg.F90: line 1433 | | vertically_integrated_water_flux_due_to_chemistry | X |
| 410 | tphysac_fix_heat | heat flux for check_energy_chng | physpkg.F90: line 1434 | | | |
| 411 | tphysac_net_flux | | physpkg.F90: line 2069 | | net_radiative_fluxes_through_top_and_bottom_of_atmosphere_column | X |
| 412 | tphysac_obklen | Oblique length | physpkg.F90: line 1422 | | oblique_length | X |
| 413 | tphysac_rliq | vert | | | loop | X |
| 414 | tphysac_rliq2 | vert | | | time_loop | X |
| 415 | tphysac_surfric | surf | | | | X |
| 416 | tphysac_zdu | detr | | | | X |
| 417 | | | | | | |
| 418 | tphysbc_cmfcme | cmf | | | | X |
| 419 | tphysbc_cmfmfc | con | | | | X |
| 420 | tphysbc_dif | detr | | | | X |
| 421 | tphysbc_dif2 | detr | | | | X |
| 422 | tphysbc_fix_heat | hea | | | ice_upward_heat_flux_in_air_surfa | X |
| 423 | tphysbc_net_flux | | | | | X |
| 424 | tphysbc_pflx | conv rain flux throughout bottom of lev | physpkg.F90: line 2078 | | precipitation_flux_at_interface_due_to_deep_convection | X |
| 425 | tphysbc_riice | vertical integral of ice not yet in q (ixcldice) | physpkg.F90: line 2138 | | vertically_integrated_cloud_ice_tendency_due_to_all_convection_to_be_applied_later_in_time_loop | X |
| 426 | tphysbc_rliq | vertical integral of liquid not yet in q (ixcldliq) | physpkg.F90: line 2137 | | vertically_integrated_cloud_liquid_tendency_due_to_all_convection_to_be_applied_later_in_time_loop | X |
| 427 | tphysbc_rliq2 | vertical integral of liquid from shallow scheme | physpkg.F90: line 2139 | | vertically_integrated_cloud_liquid_tendency_due_to_shallow_convection_to_be_applied_later_in_time_loop | X |
| 428 | tphysbc_zdu | detraining mass flux from deep convection | physpkg.F90: line 2071 | | detrainment_mass_flux_due_to_deep_convection | X |
| 429 | | | | | | |
| 430 | NCAR/ATMOSPHERIC_PHYSICS | | | | | |
| 431 | Variable Name | CAM equivalent variable | Meta File | | CCPP Standard Name | |
| 432 | rho | No CAM equivalent | kessler.meta | | density_of_dry_air | X |
| 433 | qr | state%q(:,,:ixrain) | kessler.meta | | rain_mixing_ratio_wrt_dry_air | X |
| 434 | scheme_name | No CAM equivalent | kessler.meta | | scheme_name | X |
| 435 | rair | rairv | geopotential_t.meta | | composition_dependent_gas_constant_of_dry_air | X |
| 436 | zvir | zvirv | geopotential_t.meta | | ratio_of_water_vapor_gas_constant_to_composition_dependent_dry_air_gas_constant_minus_one | X |
| 437 | zi | state%zi | geopotential_t.meta | | geopotential_height_wrt_surface_at_interface | X |
| 438 | dudt | plend%u | physics_tendency_updaters.meta | | tendency_of_eastward_wind | |
| 439 | dudt_total | tend%u | physics_tendency_updaters.meta | | tendency_of_eastward_wind_due_to_model_physics | |
| 440 | dvd | plend%v | physics_tendency_updaters.meta | | tendency_of_northward_wind | |

It is slow, tedious work, but has already found both **software bugs** (e.g. variables that aren't being used or are duplicated) and **science issues** (e.g. variables that didn't represent the physical quantities the developer thought they did).

CCPPStandardNames (repo #4)

ESCOMP / CCPPStandardNames Public

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Repository for community CCPP Standard Names

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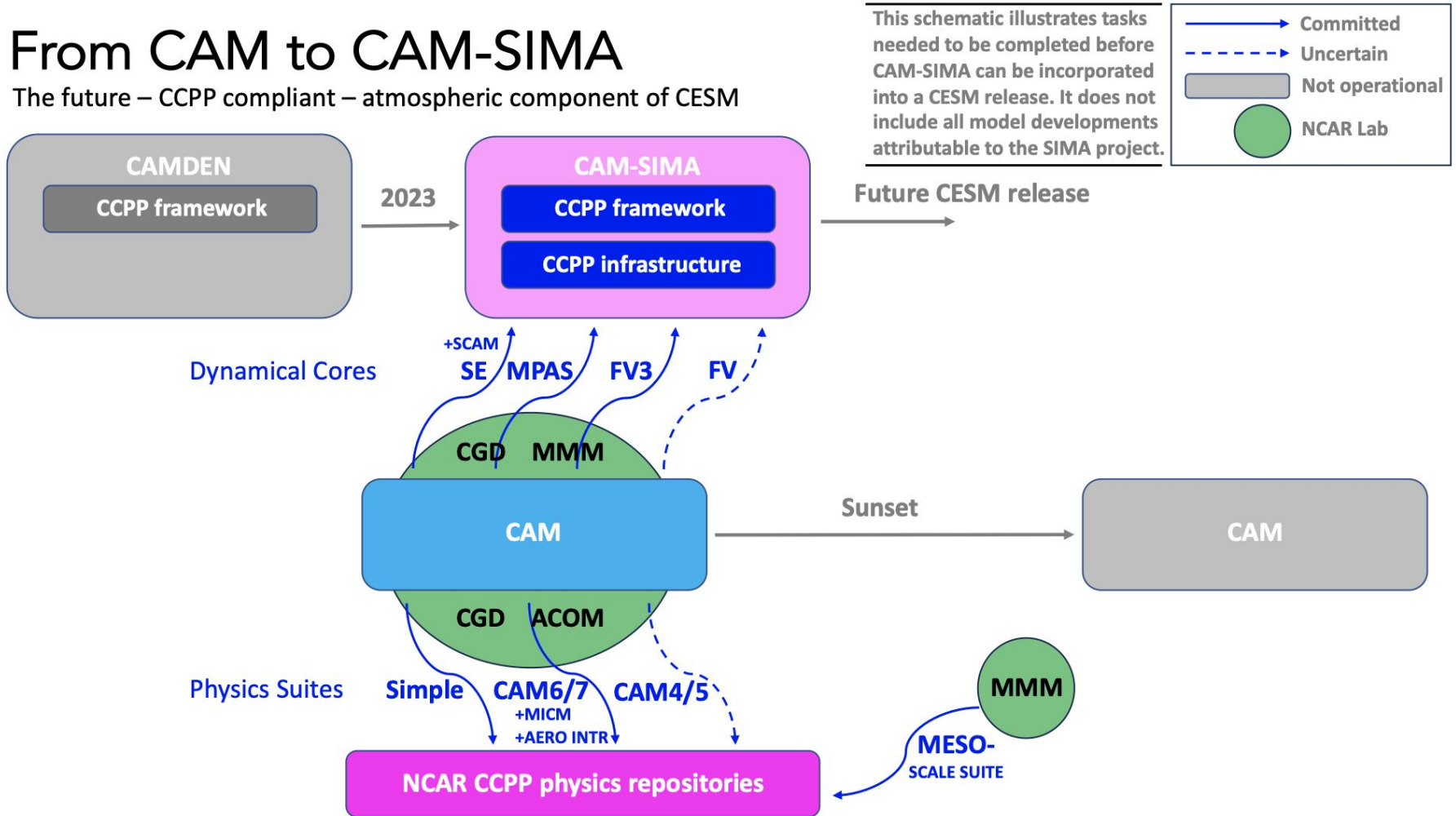
nusbaume Merge pull request #38 from MayeulDestouches/feature/specific_hu... 7ad5f7c 3 hours ago 97 commits

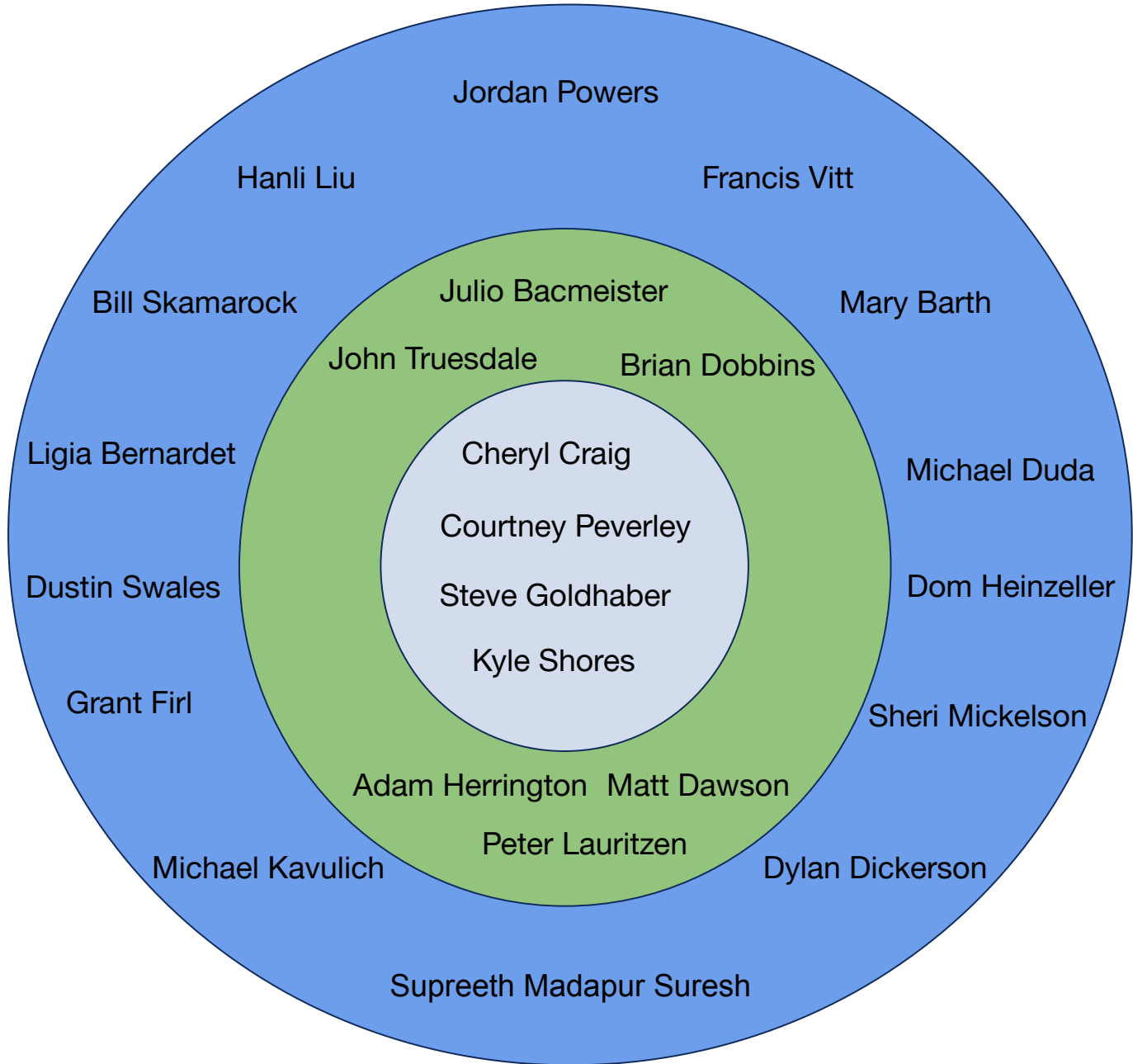
| | | |
|----------------------------|---|--------------|
| .github/workflows | Install xmllint in Actions workflow | 2 months ago |
| .gitignore | Move standard name database creation code from ccpp-framework | 3 years ago |
| LICENSE | Move standard name database creation code from ccpp-framework | 3 years ago |
| Metadata-standard-names.md | Rename ambiguous <code>specific_humidity</code> and <code>_at_2m</code> variant | 2 weeks ago |
| README.md | Move standard name database creation code from ccpp-framework | 3 years ago |
| StandardNamesRules.rst | Modify rule 5 about mixing ratios | 2 weeks ago |
| check_xml_unique.py | Validate XML in check_xml_unique.py script | 2 months ago |
| standard_names.xml | Rename ambiguous <code>specific_humidity</code> and <code>_at_2m</code> variant | 2 weeks ago |
| standard_names_v1_0.xsd | Move standard name database creation code from ccpp-framework | 3 years ago |

Summary

From CAM to CAM-SIMA

The future – CCPP compliant – atmospheric component of CESM





2023 CCPP Visioning Workshop (virtual, week of August 14, 2023)

What: discuss future direction for CCPP

Who

- CCPP project leads and developers
- Physics and atmospheric composition/chemistry developers
- Scientists working on coupling for ESMs, especially physics-dynamics coupling
- NOAA, NCAR, NRL, NASA, academia, private sector, etc.

Which models: UFS, SCM, NEPTUNE, SIMA etc.

Goals

- Inform the community about capabilities
- Gather input from developers/SMEs
- Discuss best practices for interoperability and collaborative development
- Create a prioritized list of required advancements for CCPP

Desired outcome

- Common understanding of the state of CCPP and prioritized requirements and needs to meet scientific and technological frontiers in the next 5-10 years

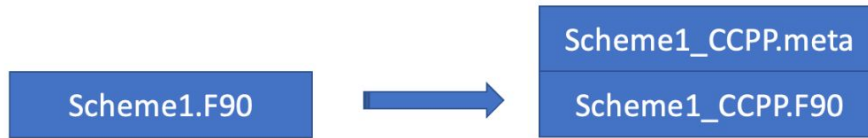


Questions?
Thanks for listening!

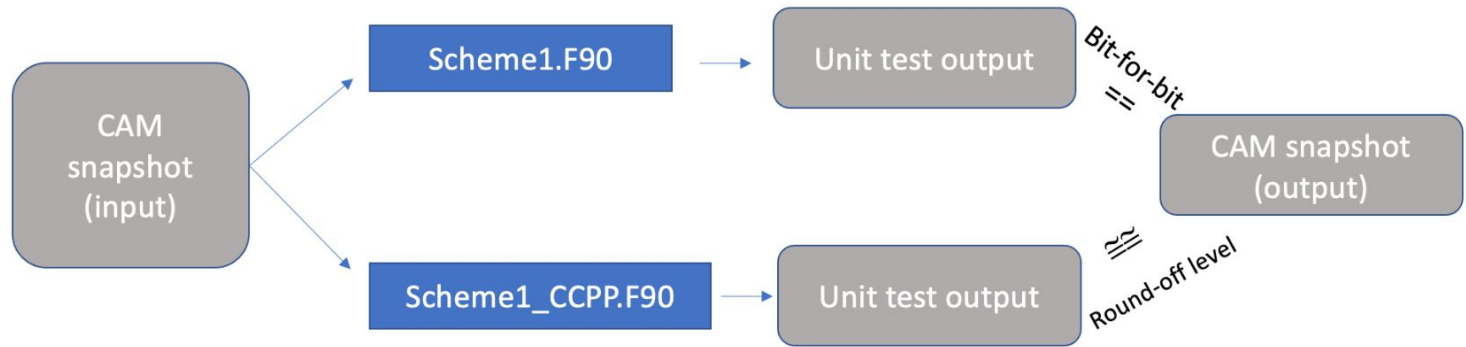


CCPP Implementation plan

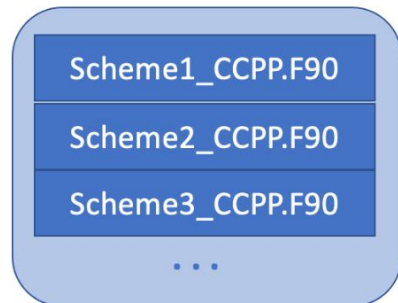
Refactoring)



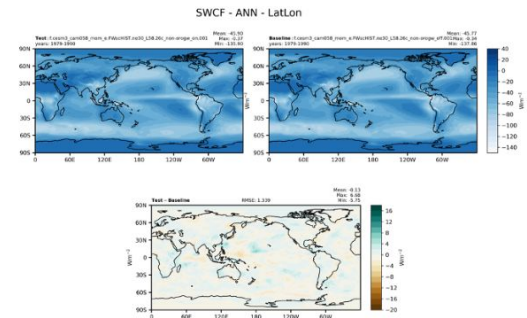
Validation)



Suite Generation)



Science Validation)



Challenges

There are several challenges that we are facing for this work:

1. Time/people -> Making sure there are enough SEs that can move this work forward without being pulled off onto other tasks/duties.
1. Technical -> Need to make sure the framework has the capacity to deal with the various edge/corner cases that can exist in CAM's physics schemes.