



The Common Community Physics Package (CCPP)

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NCAR

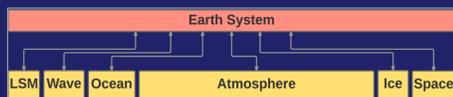


Who is creating the CCPP?

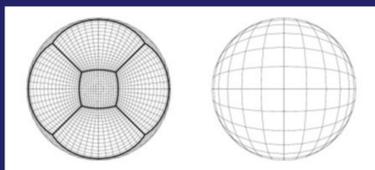
- The CCPP is being developed in the Global Model Test Bed (GMTB), a group within the Developmental Testbed Center.
- GMTB is funded by the NWS to help improve its operational model through the transition of innovations developed in the broader scientific community.
- Physics developers can contribute to the CCPP

Why do we need a CCPP?

NOAA is developing a next-generation global prediction system with multiple component models.



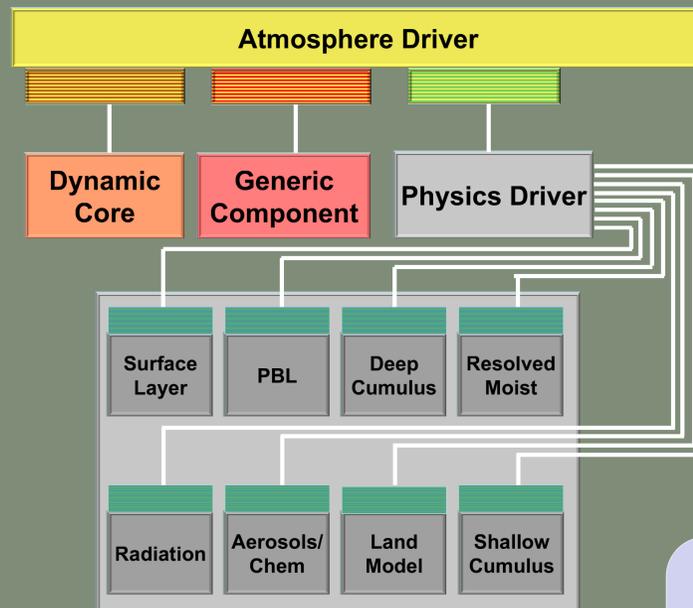
The Finite Volume in the Cubed Sphere (FV3) dynamic core has been selected and an important next step is physics advancements



<https://www.gfdl.noaa.gov/>

A distributed group of scientists is working on the development of physical parameterizations, so infrastructure is needed to facilitate distributed development so physics can be tested in various models (including single column model)

What is the CCPP?



- CCPP is a collection of **vetted, dycore-agnostic**, physical parameterizations. There can be multiple of each type (PBL, cumulus etc.) to support various applications (high-res, seasonal etc.) and maturity level (operational, developmental)
- Vetted** means that there is a governance process to determine what is included in CCPP
- Dycore agnostic** means that the parameterizations can be used with any dycore through an **Interoperable Physics Driver (IPD)**

CCPP Status

- Under development (no release yet)
- Works with the GMTB SCM; FV3 next
- First parameterization has been added - Grell-Freitas convection

Some properties of the CCPP

- Can be used with any dycore (interface needed)
- Allows selecting parameterizations/suite at runtime
- Configurable order/frequency of physics calls
- No changes required in the Physics Driver for connection with new dycores or physics
- Parameterizations have structured in/out information, with metadata, making them straightforward to connect through auto-manufactured interfaces

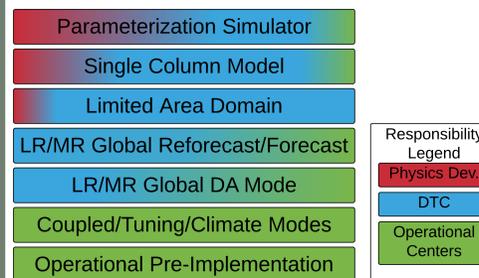
Parameterizations in CCPP are fully documented

This is one of the technical criteria for inclusion in supported CCPP

The screenshot shows the GFS Operational Physics Documentation. It includes a 'Detailed Algorithm' section with mathematical formulas and a 'Calling Hierarchy Diagram' showing the flow from GLOOPE to GBPHYS, MONINEDMF, and MFPBL. A 'Parameters' table is also visible at the bottom.

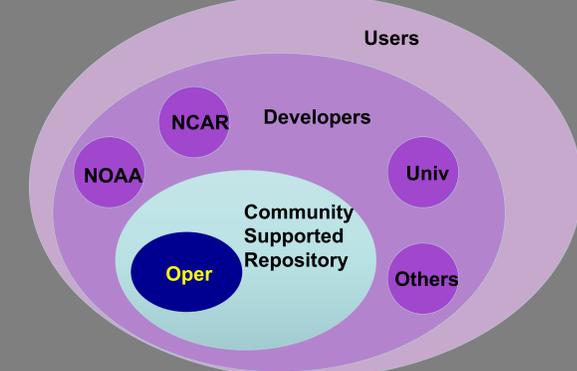
Testing hierarchy

Physics Testing Hierarchy



Inclusion in the CCPP is contingent on a variety of tests, which can be conducted using the GMTB test harness

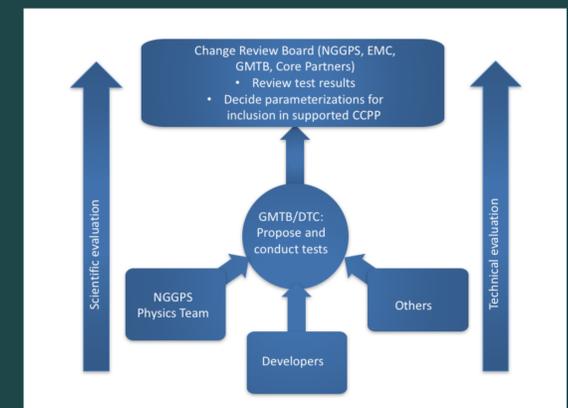
Code Ecosystem



Git and web-based Git-hosting services are being utilized to support the easier sharing of physical parameterization software. Users, developers, and operational centers can both download and contribute code.

Governance

Scientific and technical criteria are used to determine contents of the CCPP. GMTB collects and synthesizes information, but the ultimate decision of what is included in CCPP rests with the funding agency and its core partners



Example scientific criteria for inclusion in CCPP:

- Demonstrated merit as a mature development (through peer-reviewed literature or use in NWP applications)
- Sufficiently different from other schemes in CCPP

Community Involvement



Priorities for physics development were discussed in the November 2016 workshop at the NWS. Examples were scale aware and stochastic schemes, as well as inter-parameterization connections.

Get involved!

- Contact: Ligia.Bernardet@noaa.gov
- DTC has a Visitor Program that funds collaborators, see <http://www.dtcenter.org/visitors>