Common Community Physics Package
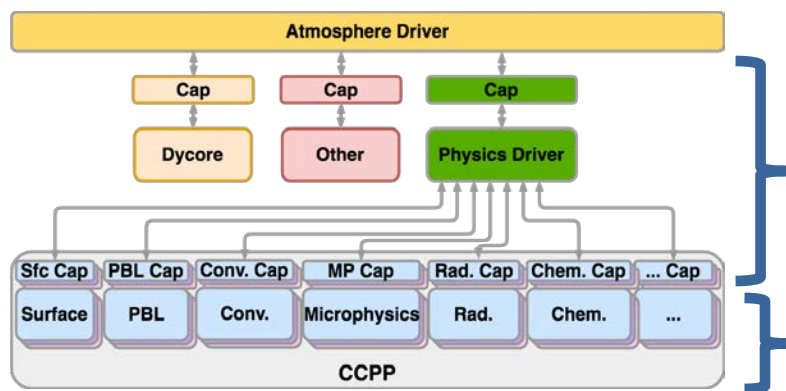
Ligia Bernardet

NOAA/ESRL GSD/CU CIRES

Acknowledgement to EMC, GSD, GFDL, NRL,

and NCAR (RAL, MMM, CGD)

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Common Community Physics Package: Two components

CCPP FRAMEWORK: infrastructure to connect to host
- Capability to **autogenerate** parameterization caps from **standardized metadata**
- Host model communication with parameterizations is enabled by new datatype/methods that also contain extensive error-checking to ensure that host and parameterizations have necessary compatibility
- Time sequencing is not hard-coded but **run-time generated** from user-specified file

CCPP PHYSICS: a library of physical parameterizations
- Contains both operational and developmental schemes and suites
- Independence from host model key to engage the wider community and **enhance R2O**
- Authoritative repository is open source, on GitHub and well supported
- Curation of parameterizations will be facilitated by hierarchical model development and testing

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CCPP Development and Releases

V	Date	Physics	Host
v1	2018 April	FY17 GFS operational	Single Column Model (SCM)

CCPP v1: https://dtcenter.org/gmtb/users/ccpp/
- Physics and Framework
- Access: GitHub (release code and access to development)
- Portability: Theia, Cheyenne, Mac and beyond
- Docs: Scientific Doc, Users Guide, Developer's Guide, FAQ, Known Issues
- Technical overview, requirements, design
- Helpdesk: gmtb-help@ucar.edu

V	Date	Physics	Host
v2	2018 Summer	FV3GFS Beta	SCM FV3 for developers
v3	2018 Fall	FV3GFS + FY20 physics candidates	SCM and FV3

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Adding new physics to the UFS through the CCPP

	FV3GFSv1	RAP/HRRR	EMC/CPT	HWRF
Status	CCPP v2	Fall 2018	Fall 2018	HS funding
Group	GMTB	GSD	GMTB	EMC
Microphysics	GFDL	Thompson	M-G	Ferrier-Aligo
PBL	GFS/EDMF	MYNN	SHOC	GFS/EDMF
Deep convection	saSAS	Grell-Freitas	Chikira-Sugiyama	saSAS
Shallow Convection	saSAS	MYNN	SHOC	saSAS
Radiation	RRTMG-GFS	RRTMG-GFS	RRTMGP	RRTMG-WRF
Land	Noah	RUC	Noah MP	Noah

CCPP will be used for FV3GFS v2

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New NOAA-NCAR Collaboration for CCPP Framework development

- NCAR has committed to using and further developing the CCPP Framework

- The CCPP framework will be a cornerstone of the new NCAR *Singletrack* project that involves sharing physics among its models (WRF, MPAS, and CESM)

- CCPP Framework collaboration is one area of the NOAA-NCAR MOA and an active NOAA-NCAR collaboration has already begun and will benefit NOAA

- NCAR has identified additional requirements for the CCPP-Framework and will contribute to the development (joint NCAR-NOAA development)

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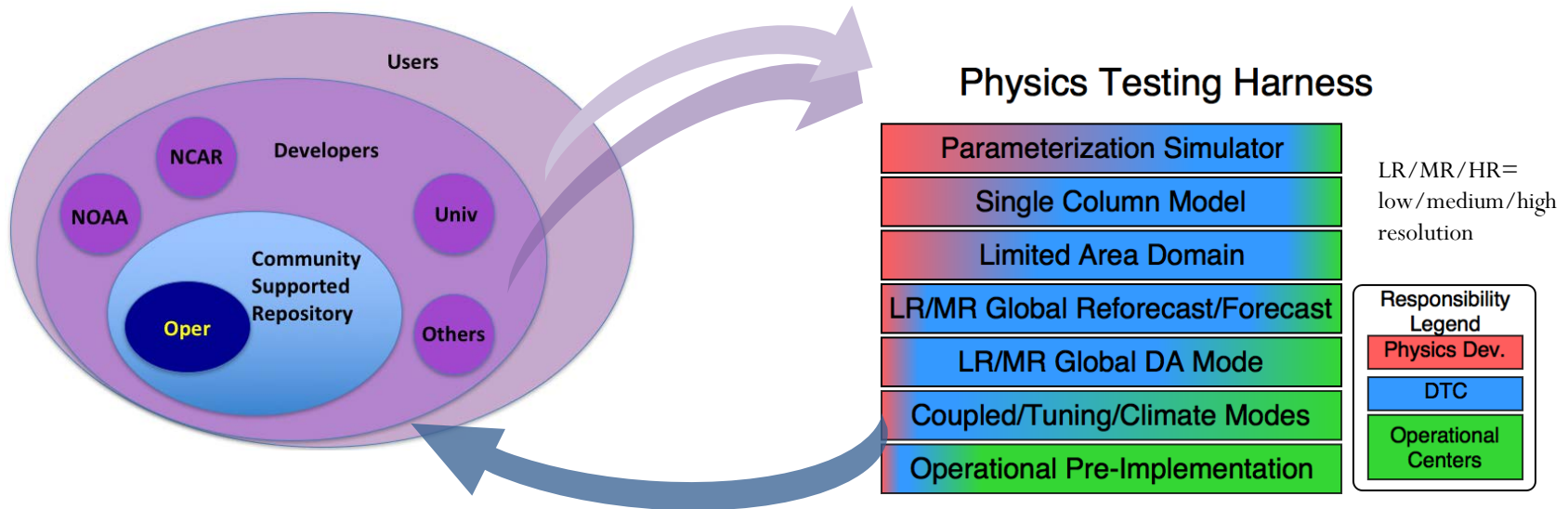
Governance is being established

- **CCPP-Framework**
  - Goals: common infrastructure, mutually beneficial system, agile, robust to prevent code breaking, sensitive to operational timelines
  - Emerging governance will encompass contributing organizations (NOAA and NCAR for now – with probable joining of NRL)
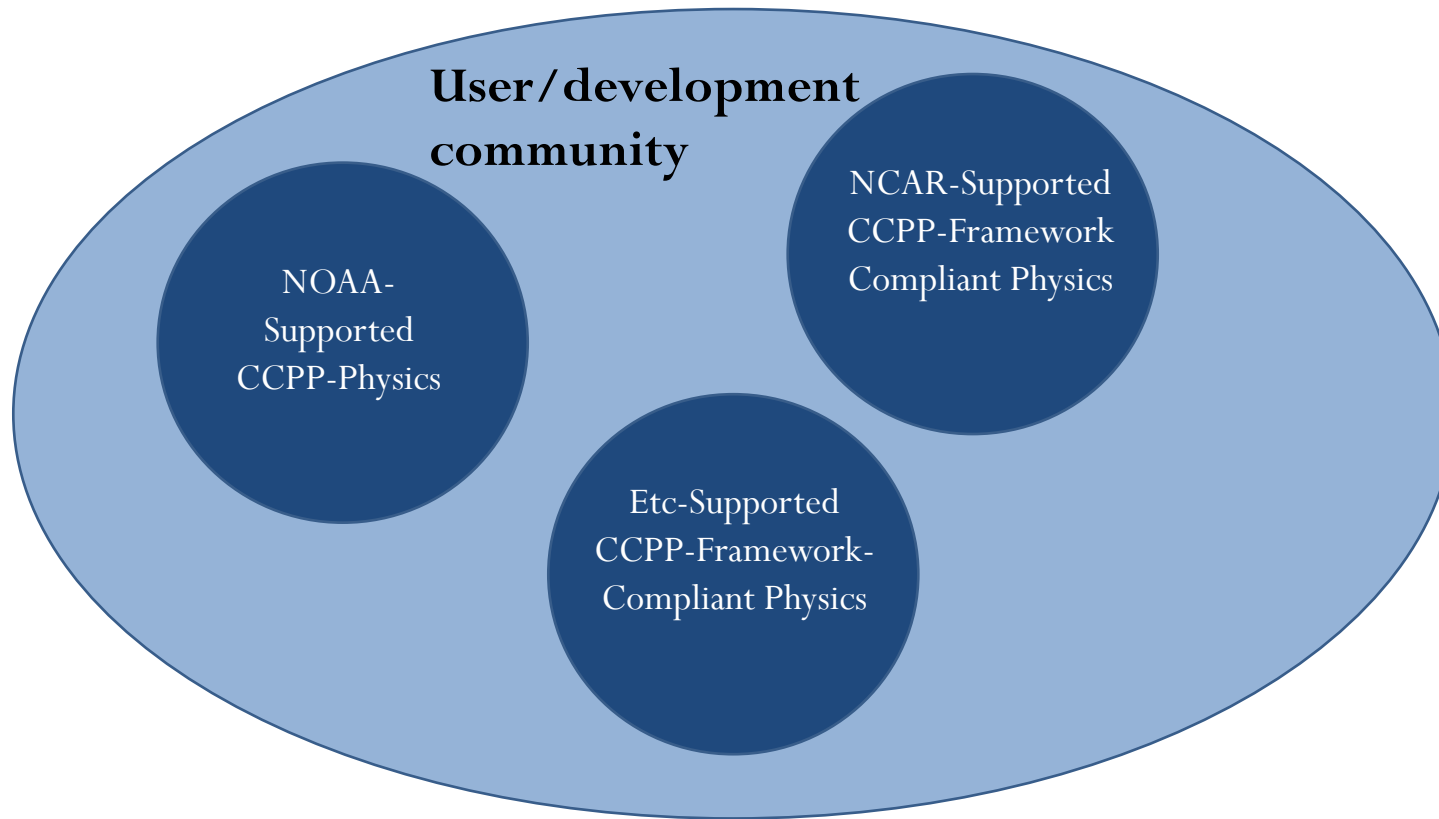- **NOAA-Supported CCPP Physics**
  - Emerging governance is being designed to be NOAA-centric, with an advisory board that has non-NOAA participants

CCPP-Physics will leverage a hierarchical development process

Physics Testing Harness

Parameterization Simulator
Single Column Model
Limited Area Domain
LR/MR Global Reforecast/Forecast
LR/MR Global DA Mode
Coupled/Tuning/Climate Modes
Operational Pre-Implementation

LR/MR/HR= low/medium/high resolution

Responsibility Legend
- Physics Dev.
- DTC
- Operational Centers

The community uses, develops, and contributes to the vetted, supported CCPP-Physics.
The Hierarchical Testing Framework is integral to R2O2R.

CCPP-Physics: Potential for multiple supported sets that will ultimately benefit UFS and other models

User/development community

NOAA-Supported CCPP-Physics

NCAR-Supported CCPP-Framework Compliant Physics

Etc-Supported CCPP-Framework-Compliant Physics

Different institutions may have different criteria and governance for what is included in their CCPP

This ecosystem will facilitate the UFS and benefit R2O

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In Summary

- **Solid progress in CCPP** (physics/framework) development and integration with EMC
  - Public release in authoritative GitHub repository - CCPPv1 + Single Column Model
  - Integration with FV3 master codes in VLab is in advanced stages
  - More training for users and developers will be provided– tutorial planned for early 2019
- **CCPP Physics**
  - NOAA-centric governance being stood up for defining NOAA-supported CCPP
- **CCPP Framework**
  - Established collaboration with NCAR infrastructure team
  - Started joint development and governance of CCPP-Framework

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