Welcome to
NGGPS Physics Workshop

November 8-9, 2016
NCWCP, College Park, MD

Organizing Committee:
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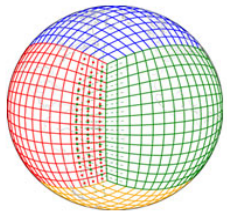
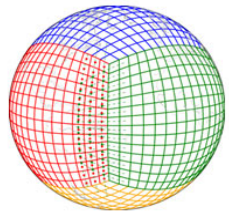




NGGPS Physics Workshop Goals

- Workshop Goal: Leave with refined investment strategy (physics package candidates and process)
  - Obtain recommendations on highest priority physics development activities to refine investment strategy and input on the planned evaluation and implementation process
  - Recognize difficulty in gaining consensus on evolution of the Global Model physics package
  - Desire focused input on governance/process and specific development that will facilitate fielding of most promising advanced physics
- Investing in infrastructure necessary to quickly evaluate, integrate and subsequently implement new capabilities into the operational GFS (primarily at the GMTB and EMC)
- Funding efforts at GSD, NRL, and EMC, as well as grants to the community, to advance the CCPP

NGGPS Physics Workshop Agenda

- Session 1: Scientifically-based Working Groups (SWG) to provide an overview of NGGPS priorities for each SWG and planned physics testing, aligned activities/timelines/deliverables, and identify any major gaps and opportunities.
  - *Topics include: Convection & Boundary Layer; Cloud Microphysics; Radiation; Gravity Wave and Large-scale orographic and non-orographic drag; and Earth System surface fluxes*
  - *Related topics include: Stochastic physics and aerosol interactions with physics*

- Session 2: Governance and streamlining of NGGPS Physics development process, roles and responsibilities, and long-term strategies for physics management

- Session 3: Collaborative framework describing Interoperable Physics Driver; Hierarchical testing protocols; GMTB; CCPP; Physics suites; testing and diagnostic tools for assessing physics interactions

NGGPS Physics Workshop Agenda

- Session 4: Breakout sessions and report out for defining priorities for advancing competing physics schemes
  - *How do we determine the most promising parameterization scheme(s) that can be delivered by 2019 for potential implementation into operations? What are the next steps and priorities?*
  - *How do we ensure the advanced physics options support NWS's unified modeling goals for all applications (global weather, ensemble, seasonal climate, convective scale, hurricanes, etc.).*
  - *What set of metrics should be used to evaluate physics packages?*
  - *What procedure(s) should be used for identifying advantages of different approaches?*
  - *What tests/diagnostics are needed for physics evaluations and to evaluate the fidelity of the interactions between schemes?*
  - *What tools and data sets do developers need for their development and testing?*

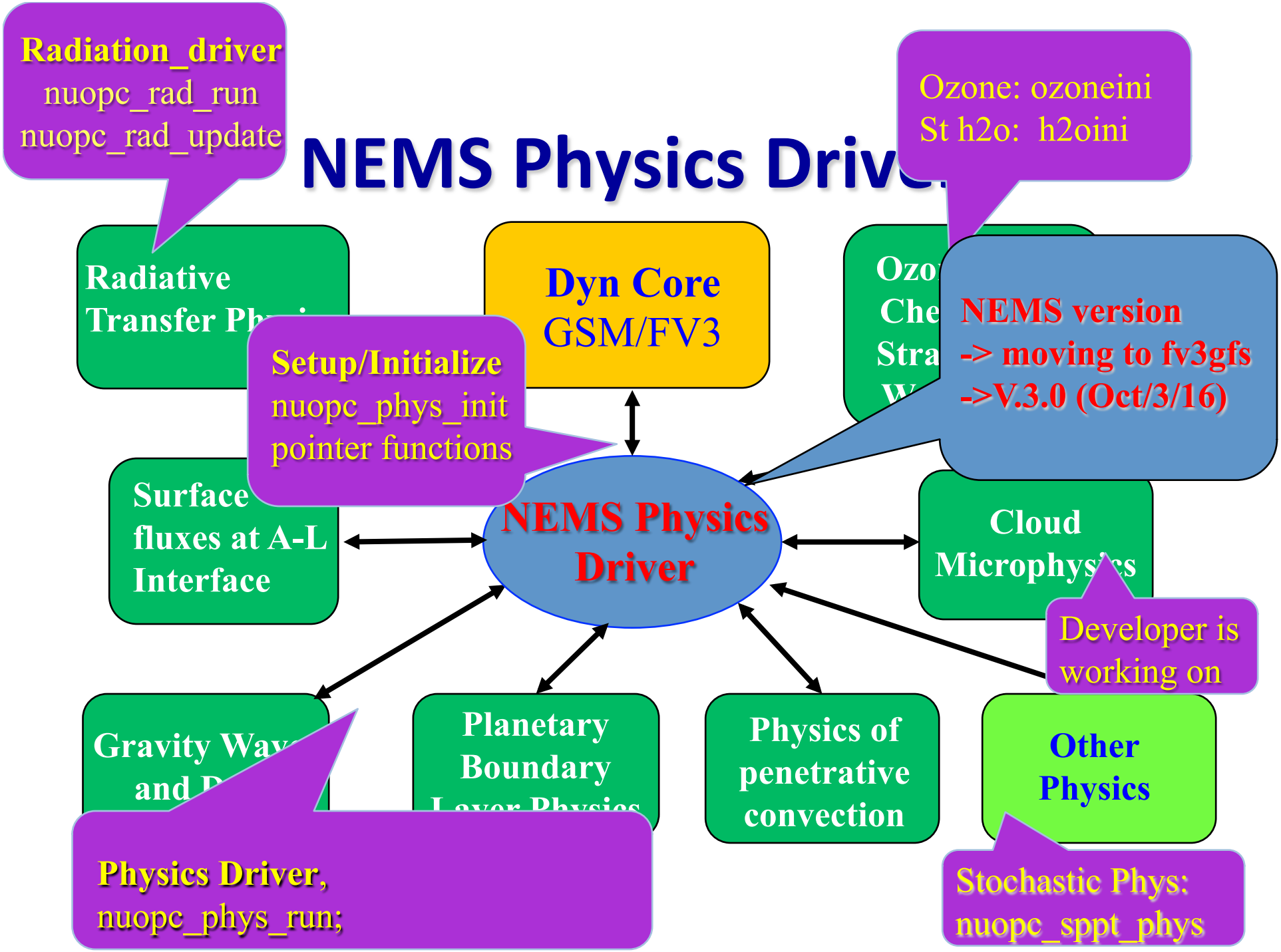
- Focus on scale-aware physics suitable for all spatial and temporal scales; stochastic physics to include uncertainty
- Development and T&E closely tied with operational implementation schedule and available R&D HPC resources

Physics: Two-Stream Strategy

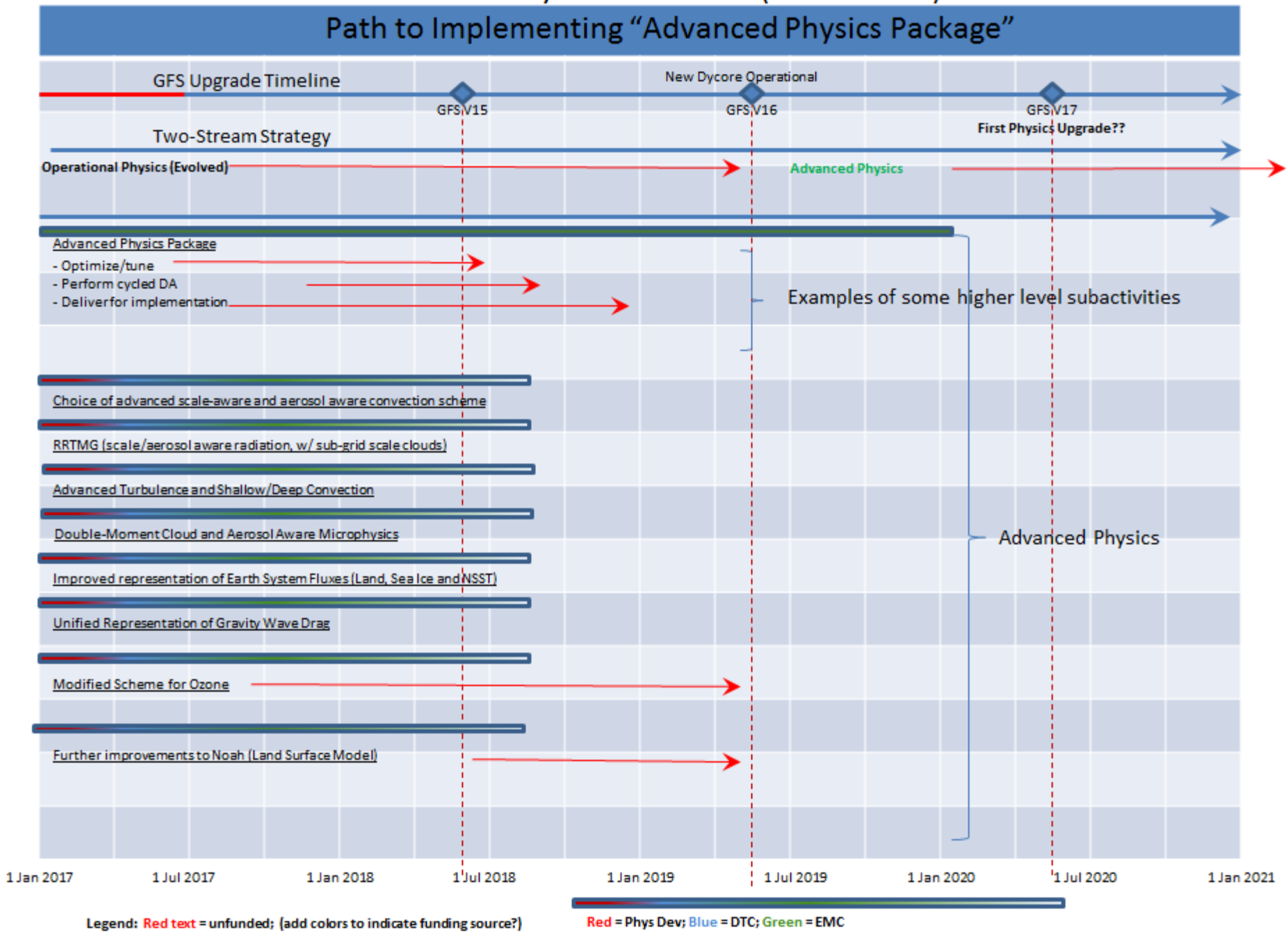
NUOPC Physics Driver in NEMS using Community Common Physics Package

Physical Processes	Operational Physics (Evolved)	Advanced Physics* (CCPP – ongoing activities)
Radiation	RRTMG	RRTMGP (scale and aerosol aware, w/sub-grid scale clouds)
Penetrative convection and Shallow convection	SAS RAS	Scale-aware Chikira-Sugiyama & Arakawa-Wu; Grell-Freitas
Turbulent transport (PBL)	Hybrid EDMF	CS+SHOC (unified convection & turbulence)
Cloud microphysics	Zhao-Carr WSM-6	Double Moment scheme (Morrison, Thompson, Barahona)
Gravity wave drag	Orographic GWD Stationary convective GWD	Unified representation of GWD
Ozone physics	NRL simplified scheme	Modified NRL scheme
Land surface model (LSM)	Noah	Noah and LIS
SST	Reynolds/RTG SST	NSST

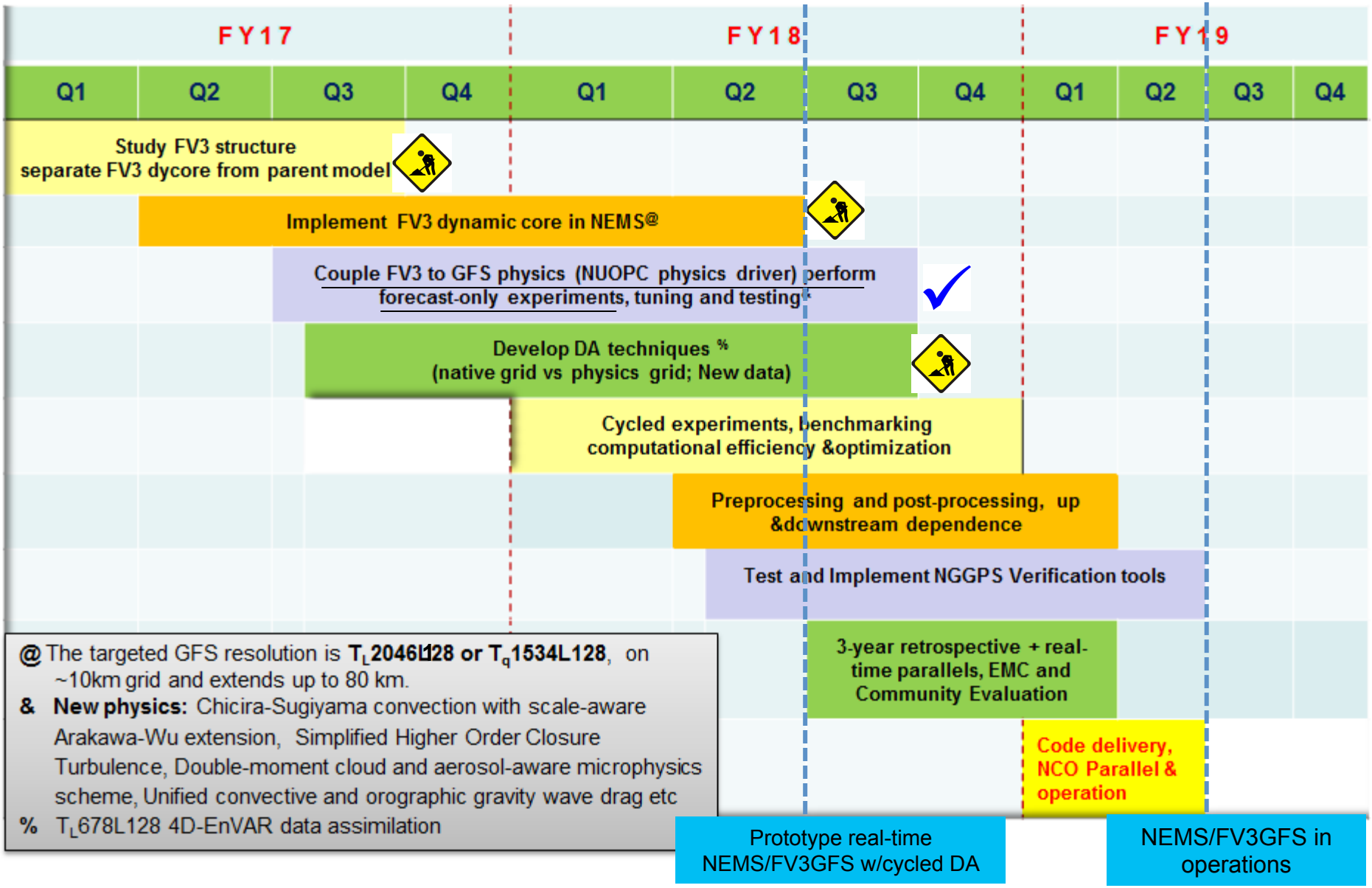
Includes aerosol chemistry (NGAC) module


Radiation_driver
nuopc_rad_run
nuopc_rad_update
NEMS Physics Drive
Ozone: ozoneini
St h2o: h2oini
Radiative
Transfer Ph
Dyn Core
GSM/FV3
Ozo
Che
Stra
W
NEMS version
-> moving to fv3gfs
->V.3.0 (Oct/3/16)
Setup/Initialize
nuopc_phys_init
pointer functions
Surface
fluxes at A-L
Interface
NEMS Physics
Driver
Cloud
Microphysics
Developer is
working on
Gravity Wav
and
Planetary
Boundary
Layer Physics
Physics of
penetrative
convection
Other
Physics
Physics Driver,
nuopc_phys_run;
Stochastic Phys:
nuopc_sppt_phys

NGGPS Physics Team Plan (12 Oct 2016)



Legend: Red text = unfunded; (add colors to indicate funding source?)

Red = Phys Dev; Blue = DTC; Green = EMC

Implementation Plan of FV3 Dynamic Core in NEMS GFS (FY17-FY19)