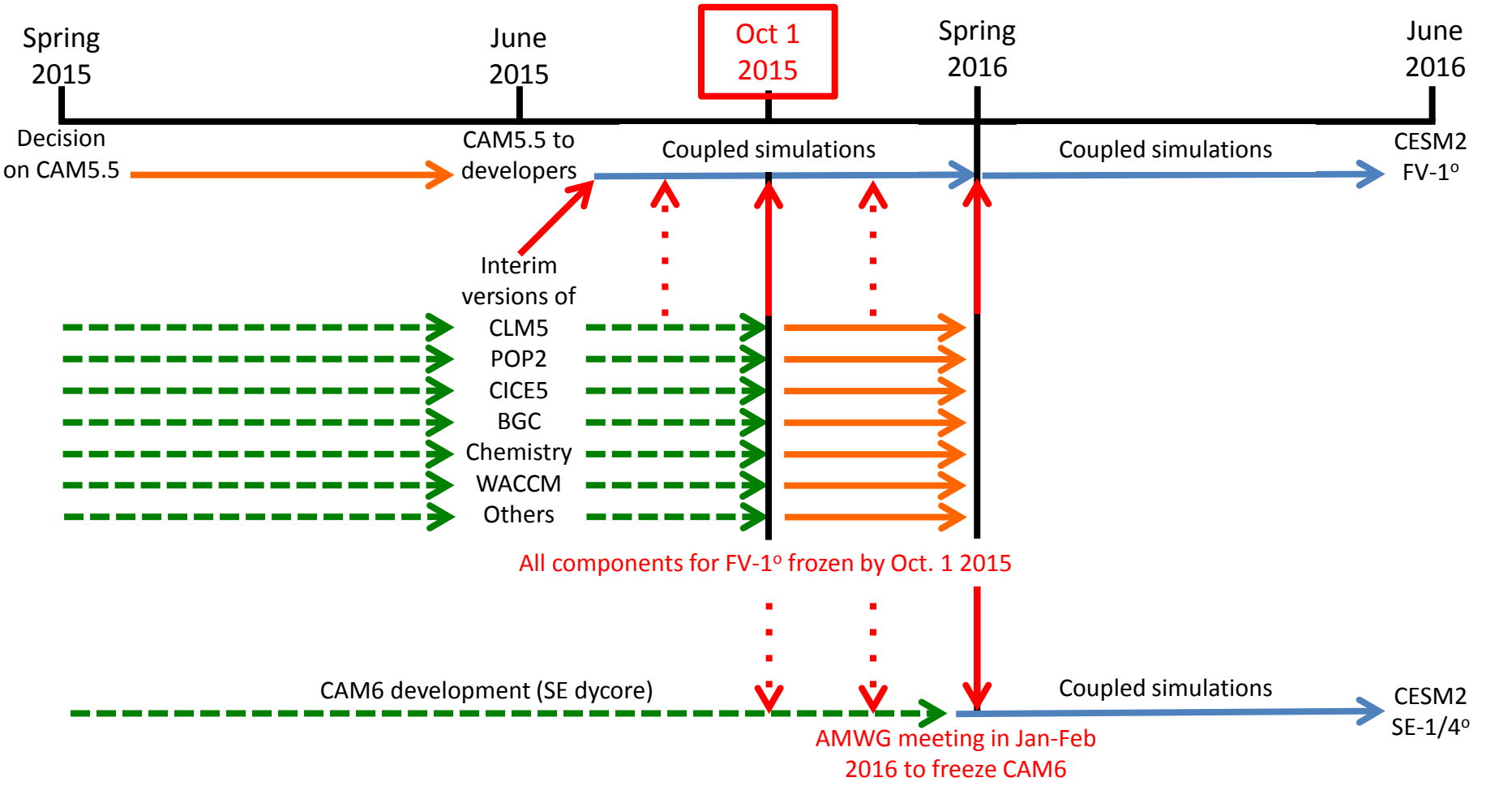
Discussion of Development Plans

CESM Chemistry Climate Working Group

- Plan of development before Oct. 1 freeze
- Scientific/model development issues identified for CESM2
- Other science and development plans

Timeline for CESM2



Code delivery

Potential code delivery

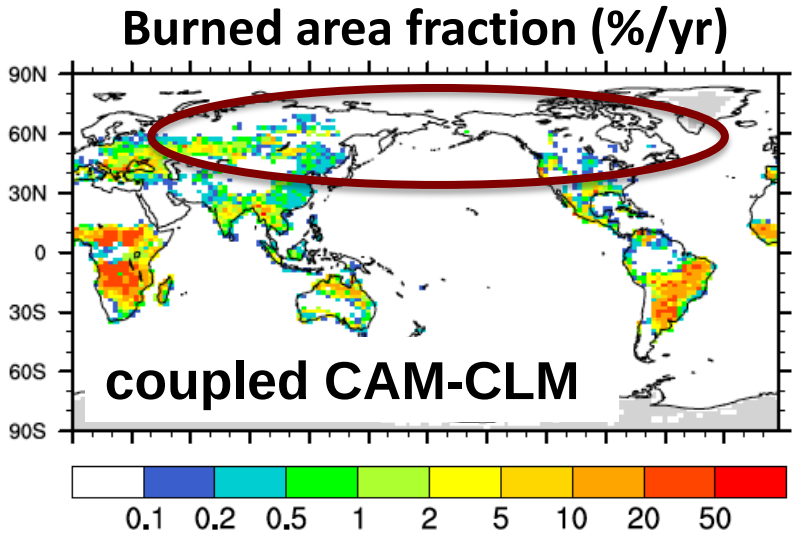
Potential code development

Assembling and optimizing coupled model

Joint Land-Biogeochemistry-Chemistry

Working towards "flagship" model: physical climate+atmos chemistry + biogeochemistry (1º, CO_2 emission driven, high-top)

- Methane – pieces available, but may not provide realistic/usable atmospheric concentrations
- Nitrogen cycle will not be closed, but many aspects have been implemented
- Biogenic VOCs – ongoing development for considering plant traits and more PFTs, accounting for stresses



- Fires – trace gas and aerosol emissions and injection height parameterizations implemented; boreal fires missing in coupled model
- Ozone damage to vegetation implemented

Chemistry-Climate WG development for CESM2

(attempt to complete for Oct 1)

- Improve chemistry representation:
  - **Implementation of FAST-J photolysis scheme, with CLOUD-J, accounting for impact of aerosols on photolysis [check aerosol properties assumed]**
  - **Improvements to secondary organic aerosol (SOA) formation (Manish's code)**
  - **Addition of nitrate aerosol**
  - **Code for fire emission injection heights (from Maria)**
- Test couplings of land, biogeochemistry and atmospheric chemistry
  - Including methane, biogenic VOCs, fire emissions
- Test chemical representation in CAM5.5 at 1-degree

Current Development & Evaluation Activities

- Evaluation within CCMI, HTAP2
- CAM5-chem - ¼°, ½° horizontal resolutions
- Expanded chemistry (aromatics, terpenes) – evaluation with SOAS, SEAC4RS campaigns
- SOA development using VBS scheme on-going
- FAST-J / Cloud-J
- MOSAIC for nitrate aerosol thermodynamics
- CARMA
- Always check dust representation

Additional planned activities

- CAM5-chem/WACCM with higher vertical resolution
- Test prognostic volcanic aerosols

Applications

- Tropospheric aerosol and chemistry description will be merged into WACCM for CMIP6
- BGC
- Geoengineering (strat & trop)
- Air quality
- Wildfire feedback
- Campaign analysis (SOAS, SEAC4RS, CONTRAST, FRAPPE)
- Pre-industrial conditions
- Natural & marine sources
- CAM-SD with full ocean (B-case with SD-atm) {in support of ORCAS field campaign over s.ocean}

Discussion – development aside from CMIP6

- Can increasing CO emissions improve OH?
- Future volcanic emissions using Caspar Amman's statistical model?
- Improve CAM-MAM sulfate formation (based on prescribed oxidants)