

Discussion

Whole Atmosphere and Chemistry-Climate WGs

MUSICA

MUSICA: *MU*lti-Scale *I*nfrasturcture for Chemistry & Aerosols

<https://www2.acom.ucar.edu/sections/multi-scale-chemistry-modeling-musica>

Vision: Within five years develop, *jointly with the community*, a computationally feasible global modeling framework that allows for simulation of large-scale atmospheric phenomena, while still resolving chemistry at emission and exposure relevant scales.

MUSICA is being built on

SIMA: System for Integrated Modeling of the Atmosphere

SIMA Vision: An integrated global & regional atmospheric modeling system capable of simulating cloud to global scales in a community earth system model

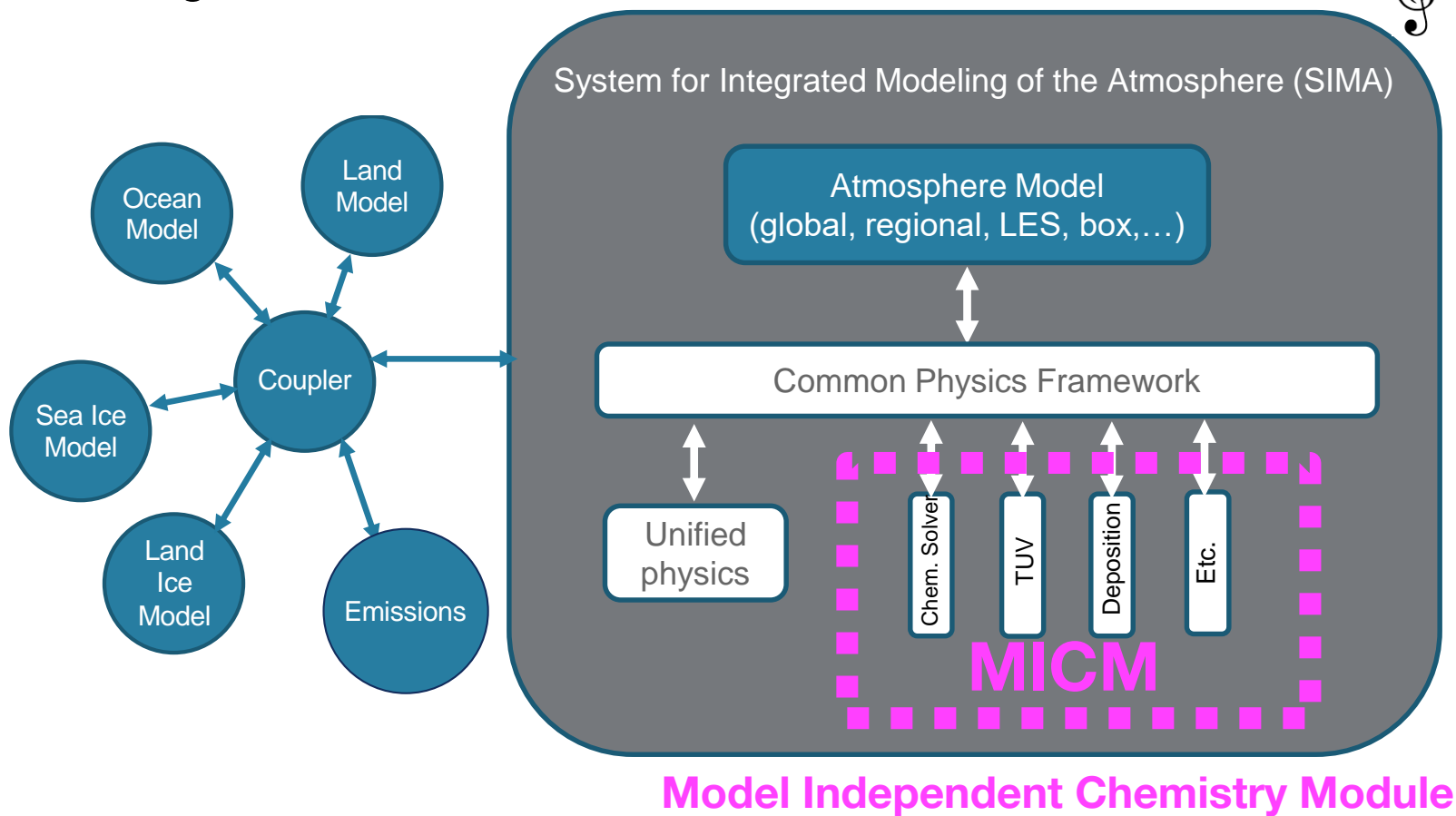
- Encompass Climate, Weather, Chemistry & Geospace Applications
- Prediction (Initialized and Forecast) capabilities
- Complement & extend existing applications (CESM/WRF/MPAS)
- One community system: shared infrastructure and components

MULTI-SCALE INFRASTRUCTURE FOR CHEMISTRY & AEROSOLS

MUSICA



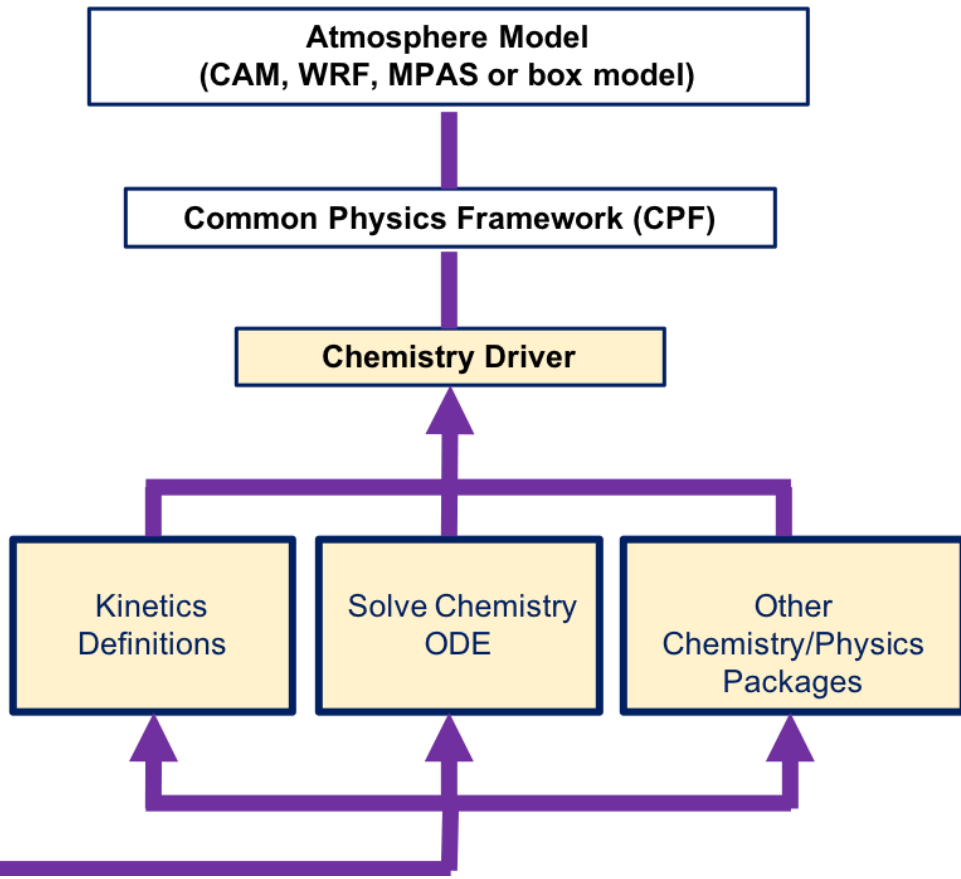
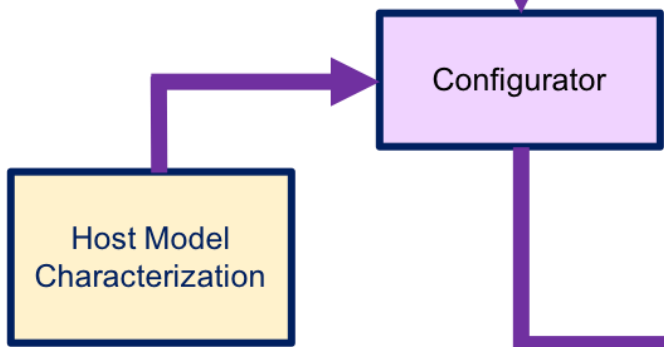
Configuration



Model-Independent Chemistry Module (MICM)

Same infrastructure for box models, regional-scale models, and global models

Chemistry Café Databases:
Versioned, traceable data storage



Community involvement in development of MICM and MUSICA is needed!

Discussion questions

- What are the primary applications for CESM, and its “niche”?
- What should CESM do / focus on for the next five years?
- What are the needs of WACCM & CAM-chem?
- What should the format of the summer workshop and winter WG meetings be?

Specific Topics

- Chemical Mechanisms
 - More complex: terpenes, higher alkanes, fire compounds and their oxidation (Becky Schwantes)
 - Simpler: Troposphere-only (T1)?
Improve “Reduced HC” scheme (trop&strat)?
- Model configurations
 - 2-degree
 - finer horiz. resolutions?
 - Vertical resolution (110L – needs development) & MOPED (more BL levels)
 - Spectral Element with CSLAM: ~1 deg, ~0.25deg?
 - SE with regional refinement
 - CTM (no interaction between chemistry and climate, i.e., aerosols on clouds) to study differences in chemistry, emissions, etc.



Development Activities and Plans

(from Chem. WG meeting Feb 2019)

- Specified Dynamics at 32 Levels - MERRA2 interpolated to 32L, investigating nudging factors, fields to constrain, etc.
- Inorganic nitrate aerosols and MOSAIC (Zaveri et al., Zheng Lu, Duseong Jo)
- Brown carbon (published in CAM5.4, need to move to CAM6)
- Improved wet scavenging in convective clouds (Pengfei Yu, Yunpeng Shan)
- Improved dust representation (Xiaohong Liu et al.)
- Online ocean emissions of VOCs, DMS, NO (Siyuan Wang)
- Updated chemistry: terpenes, higher alkanes, fire compounds and their oxidation (Becky Schwantes)
- VSL halogen chemistry (Doug Kinnison, Alfonso Saiz-Lopez, Siyuan Wang, et al.)
- Spectral Element/refined grid with chemistry (Forrest Lacey, Becky Schwantes, et al.)
- CAM-chem-SE-RR with meteorology nudging (Simone)
- Online TUV and/or Fast-J
- Update MEGAN biogenic emissions (in CLM) (Alex Guenther, UCI)
- CARMA implementation (Pengfei and NCAR)
- VBS improvement: add high NO_x environment (especially for higher horiz. resolution)
- Updated SOA from Isoprene/IEPOX & Terpenes (Duseong Jo)