

# Atmospheric Chemistry Modeling at NCAR

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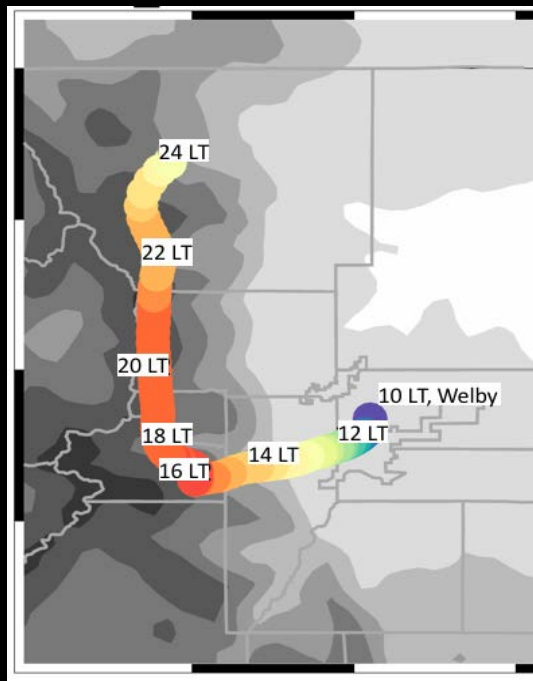
and other **significant** contributors

National Center for Atmospheric Research

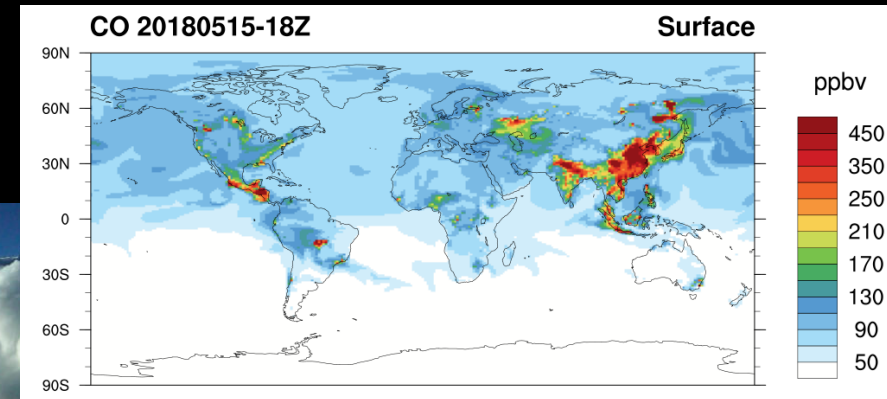
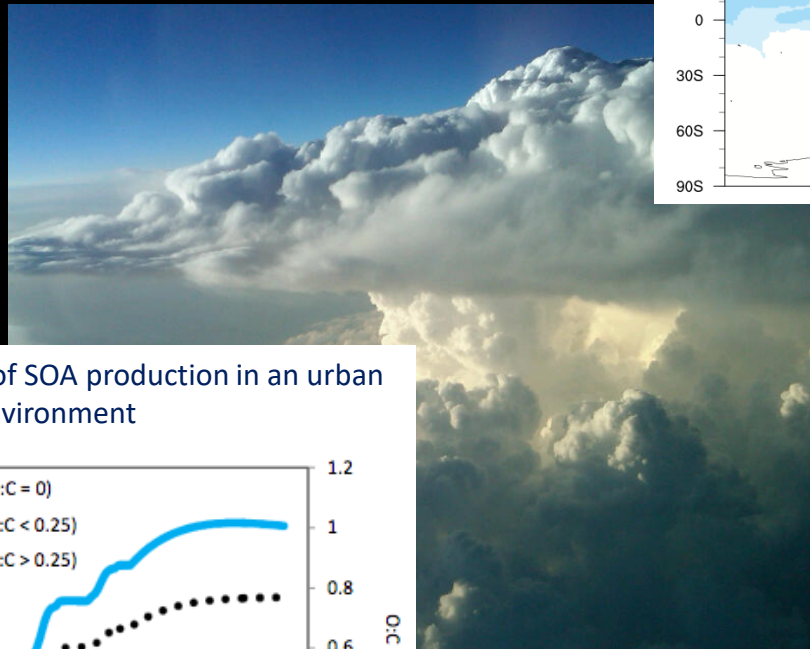
# Atmospheric Chemistry Modeling Studies

## Chemical Weather

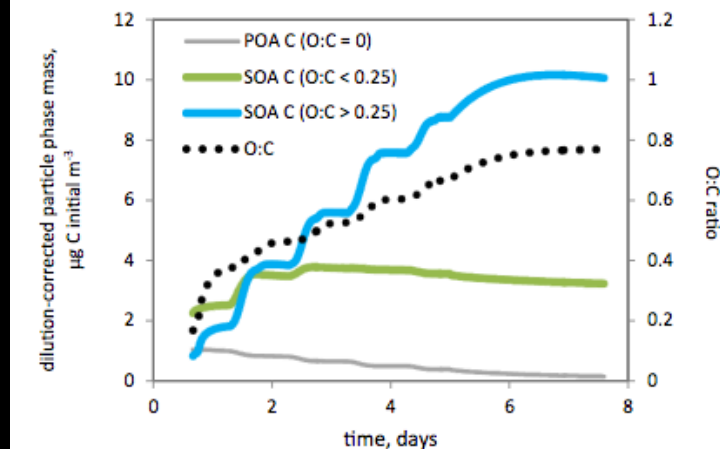
Prediction of ozone along a trajectory from Denver westward into mountains



## Understanding Processes Affecting Atmospheric Composition, Impacts



## GECKO-A simulation of SOA production in an urban environment

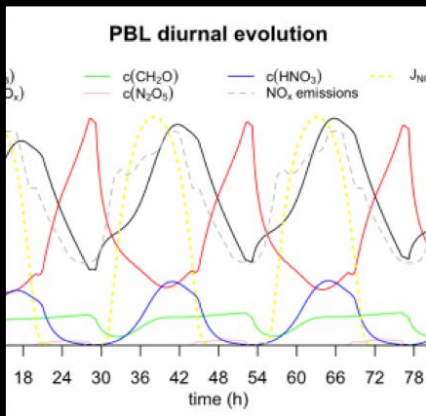


# Current Atmospheric Chemistry Modeling at NCAR

## Understanding the Chemistry in Detail

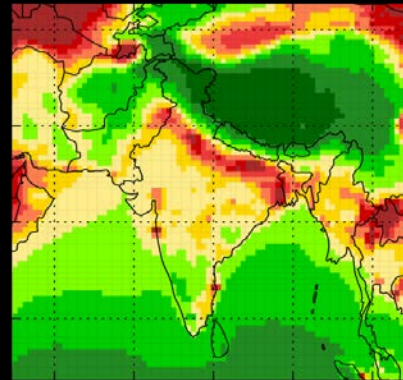
Generator of Explicit Chemistry and Kinetics of Organics in the Atmosphere (GECKO-A)

BOXMOX = box model with chemistry as represented in many 3-d chemistry transport models

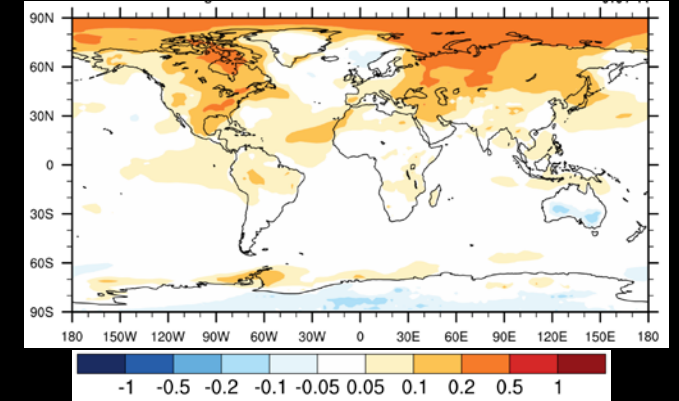


## Examining the Urban/Cloud to Regional Scales

Weather Research and Forecasting model coupled with Chemistry



## TS impacts from US SO<sub>2</sub>



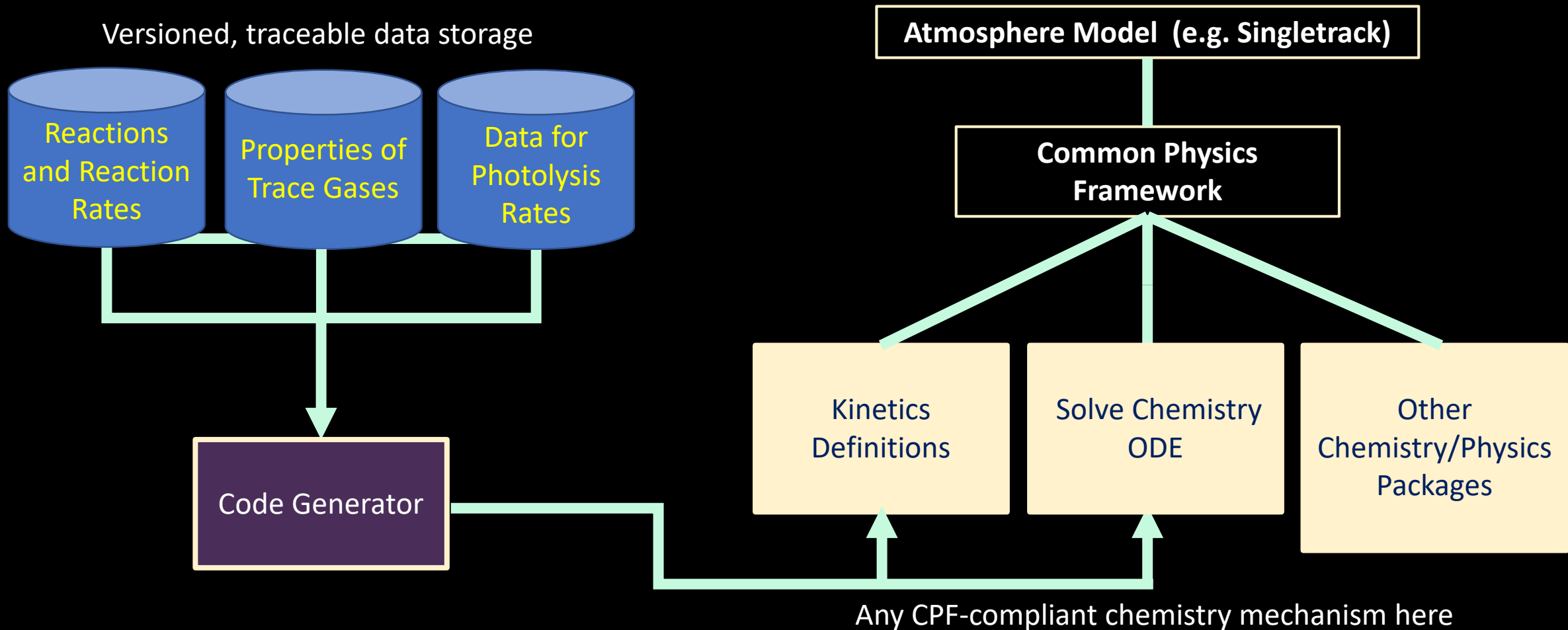
## Global Scale Impacts of Atmospheric Chemistry

Community Atmosphere Model with Chemistry

Whole Atmosphere Community Climate Model

# Model-Independent Chemistry Module (MICM)

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



# Model-Independent Chemistry Module

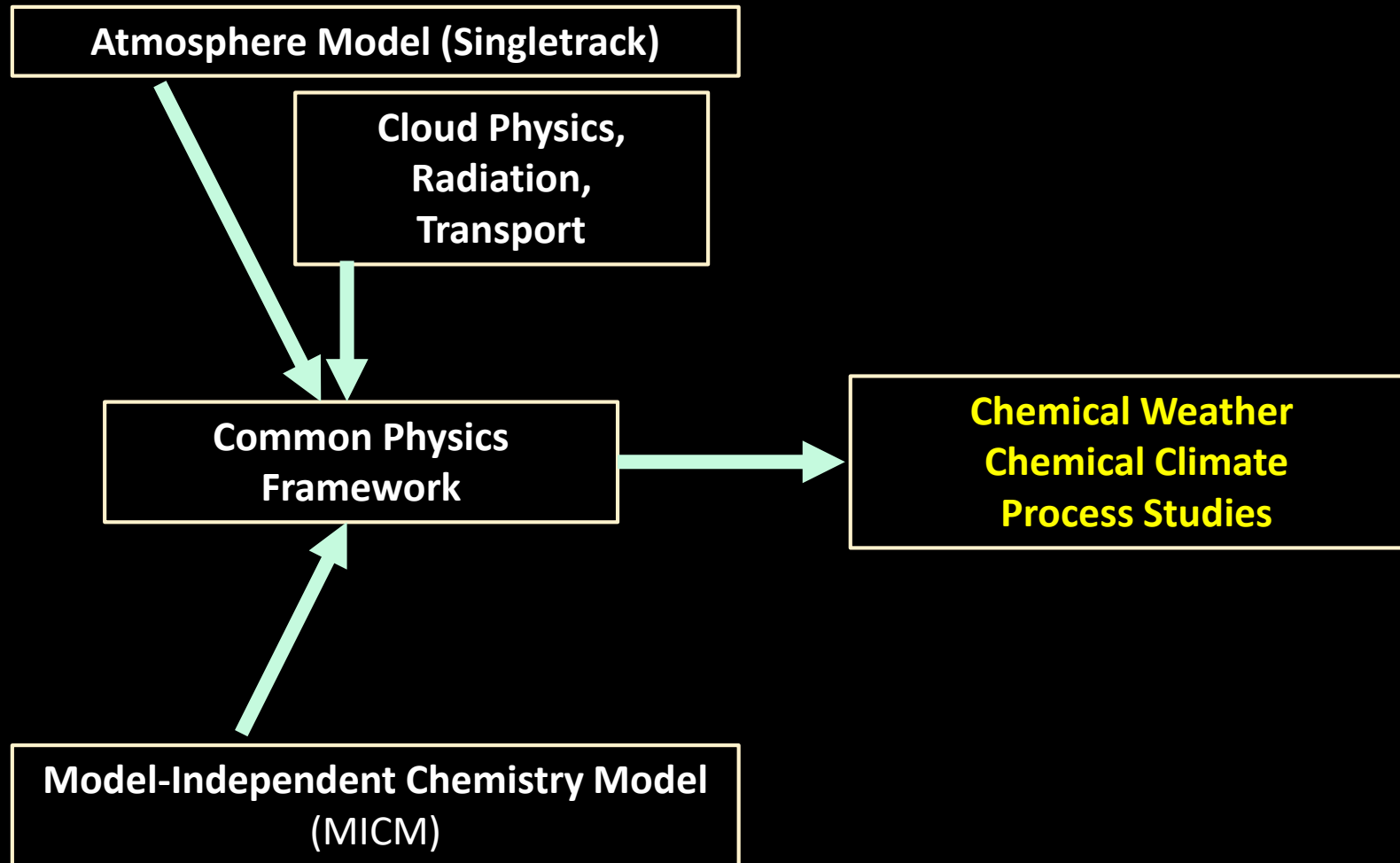
## Year 1:

- Standalone gas-phase chemistry implementing CPF (e.g., box model)
- Community input on initial prototype

## Year 2: (if funded)

- Add aerosols – community involvement
- Add heterogeneous and aqueous chemistry
- Connect the atmosphere model, e.g.,
  - Transport
  - Deposition

# Future Atmospheric Chemistry Modeling at NCAR



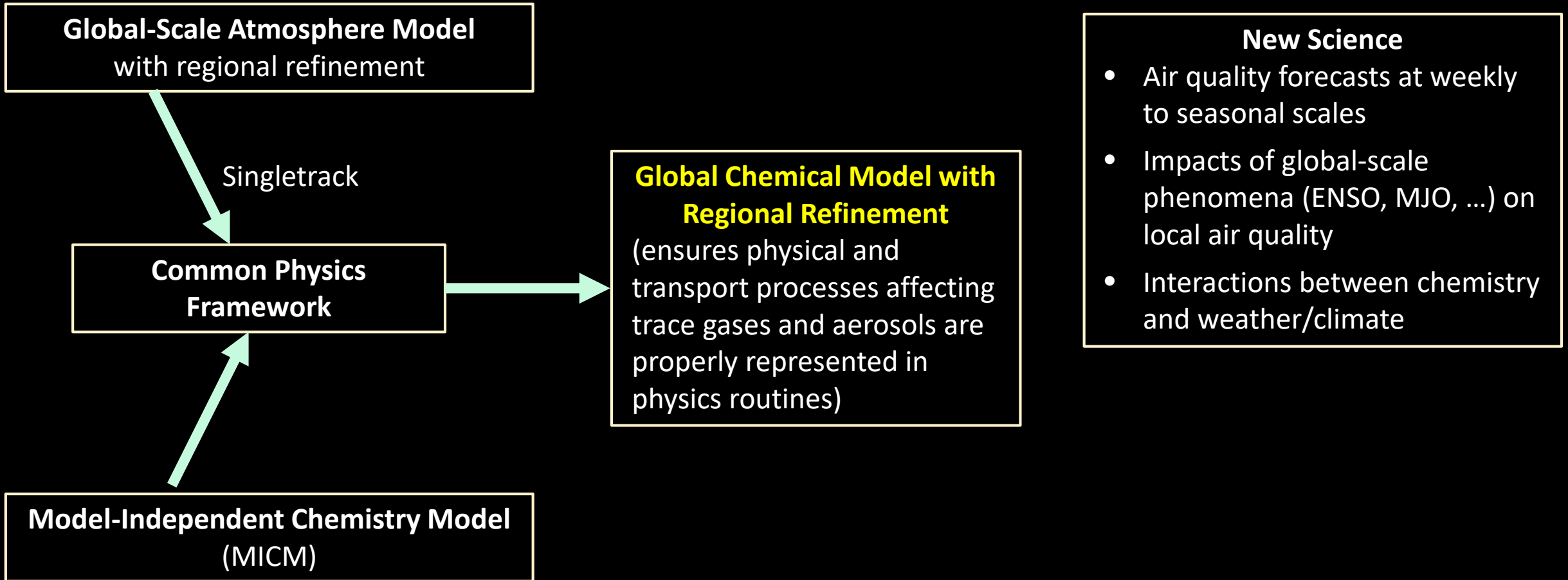
Ensures physical and transport processes affecting trace gases and aerosols are properly represented in physics routines, e.g.,

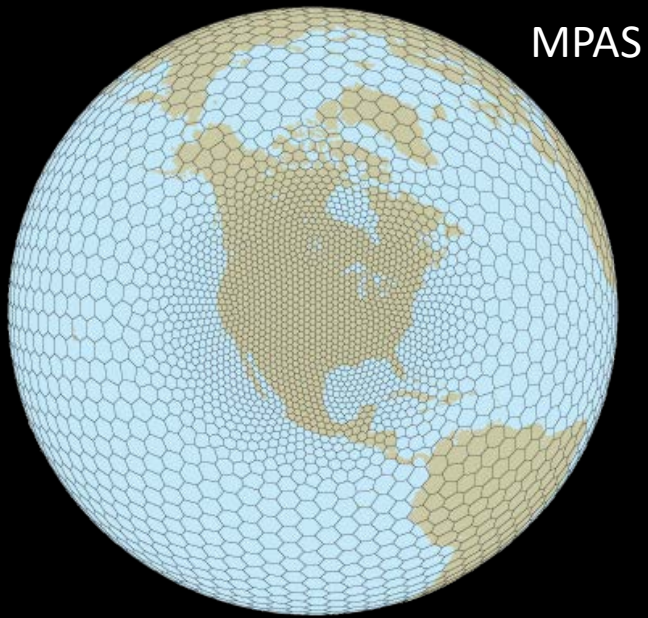
- Convective parameterization includes convective transport and wet deposition of trace gases and aerosols
- Cloud physics includes wet deposition of trace gases and aerosols
- PBL parameterization includes vertical mixing of trace gases and aerosols
- Scale-Aware / Scale-independent

Need to support such studies

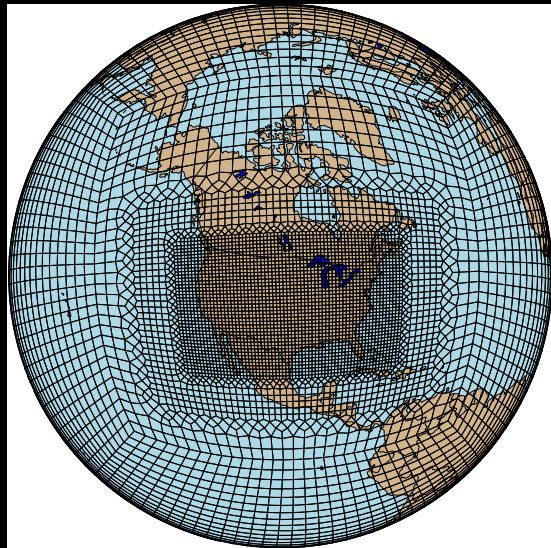
# Goal: Multiscale Infrastructure for Chemistry and Aerosols: MUSICA

Community Workshop in early 2019



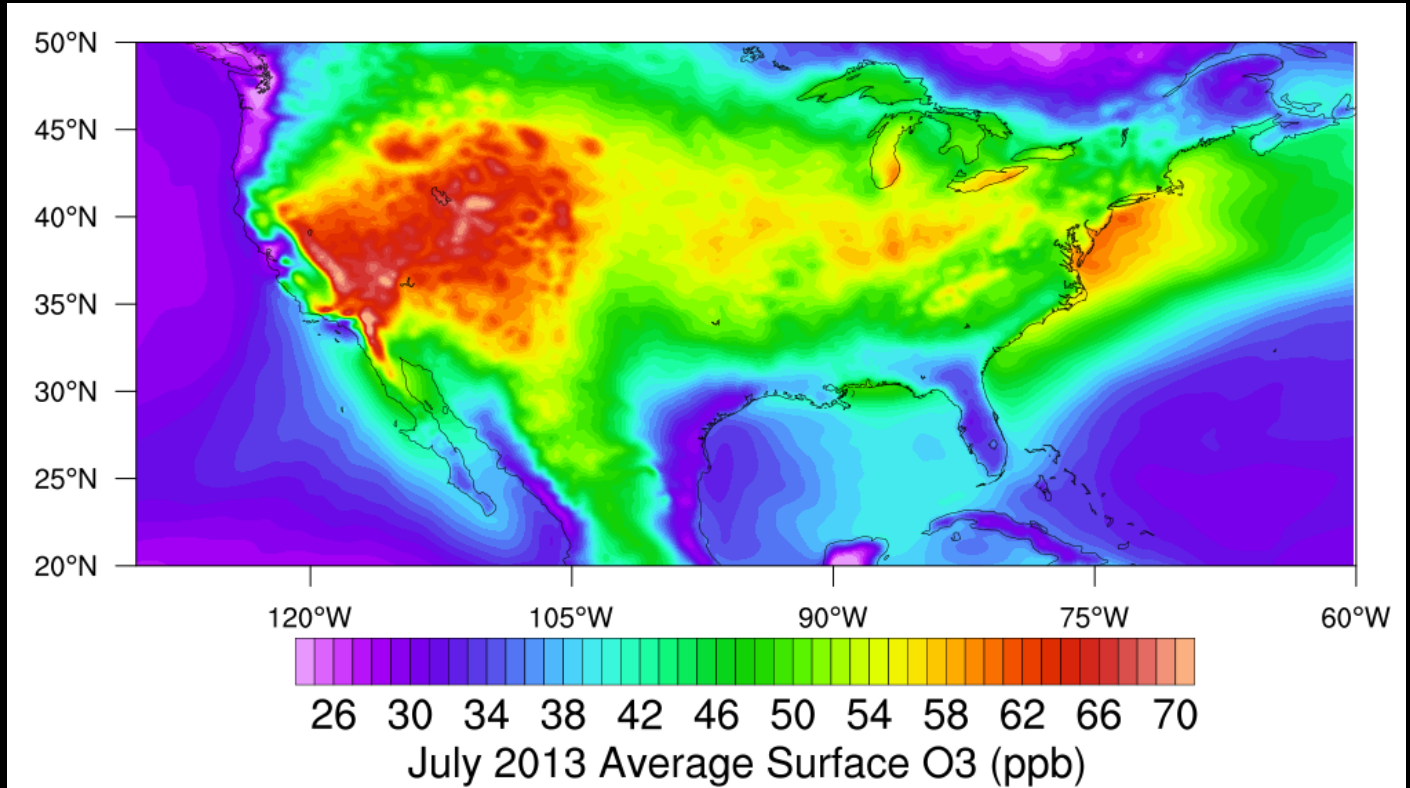


MPAS



CESM-SE

### Biogenic Emissions, chemistry, CONUS refinement



Rebecca Schwantes, Forrest Lacey, In Development