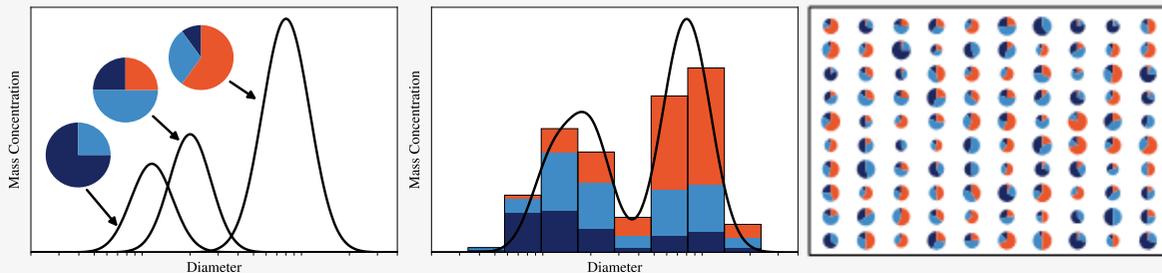


Host model



Modal

Sectional

Particle-resolved

Kokkos enabled solvers

Sundials CVODE

TINES TrBDF2

TChem-atm

Kinetic Mechanism

Gas data

Aerosol data

Input parser

Atmospheric Chemistry Core

Source term function construction

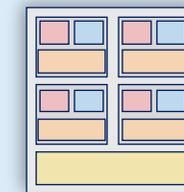
Analytic or numeric Jacobian evaluation

Kokkos programming model

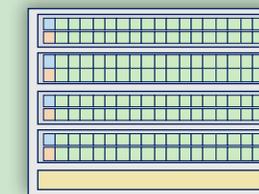


Hardware backend

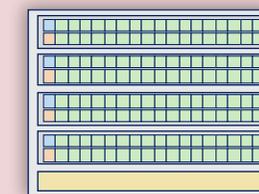
CPU (OpenMP)



NVIDIA GPU (CUDA)



AMD GPU (HIP)



YAML input

Increasing complexity

~10 reactions
(e.g., tropospheric ozone mechanism)

```
reactions:
- coefficients:
  A: 3.0e-12
  B: 0.0
  C: -1500.0
products:
NO2: 1.0
reactants:
NO: 1.0
O3: 1.0
rxn_id: R3
type: ARRHENIUS
- coefficients:
...
```

~100 reactions
(e.g., Carbon Bond 05¹
+ SIMPOL SOA²)

```
reactions:
- coefficients:
  A: 2.54e-11
  C: 407.6
products:
ISOP-P1: 0.192
reactants:
OH: 1
ISOP: 1
type: ARRHENIUS
- coefficients:
  A: 7.86e-15
  C: -1912.0
...
```

~1000 reactions
(e.g., CRACMM³)

```
reactions:
- MUSICA_name: R019
reactants:
MACR: 1.0
products:
HO: 0.34
HO2: 0.66
ACO3: 0.67
MACP: 0.33
XO2: 0.34
CO: 0.67
HCHO: 0.67
type: PHOTOLYSIS
...
```