

# Development of MOSAIC-mix

Objective: Develop a version of MOSAIC that resolves BC mixing state for use in regional models.

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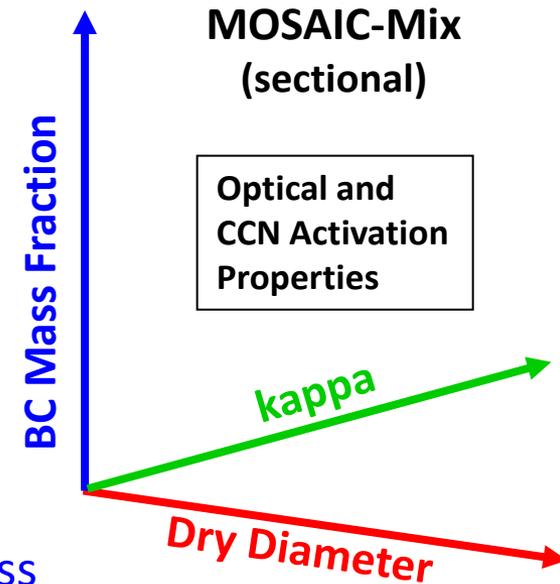
Collaborators: Nicole Riemer

Funding status: funded

Challenges or needed resources/collaborators: none

Summary of progress:

- Box-model version of MOSAIC-Mix is nearly complete
- The simulated errors in CCN and optical properties are quantified using the explicit PartMC-MOSAIC model for 10 idealized environmental scenarios.
- A configuration with 24 size bins, 2  $\kappa$  bins, and 2 BC mass fraction bins gives reasonably good accuracy.
- A paper describing the model is in review.



# Optimized Mixing State Bin Configuration

Bin Configuration	Optimum $\kappa$ Bin Boundary	Optimum $w_{BC}$ Bin Boundary	Overall Min. Avg. Error in CCN (%)	Overall Min. Avg. Error in Optical Props (%)	Overall Min. Avg. Error in $B_{abs}$ (%)
24 $D_{dry}$	-	-	14.2	12.8	21.4
24 $D_{dry}$ x 2 $\kappa$	0.20	-	6.7	7.3	12.3
24 $D_{dry}$ x 3 $\kappa$	0.06, 0.20	-	4.7	6.9	11.6
24 $D_{dry}$ x 2 $w_{BC}$	-	0.26	9.7	2.8	4.3
24 $D_{dry}$ x 3 $w_{BC}$	-	0.10, 0.36	7.0	1.9	2.8
<b>24 <math>D_{dry}</math> x 2 <math>w_{BC}</math> x 2 <math>\kappa</math></b>	<b>0.10</b>	<b>0.30</b>	<b>5.4</b>	<b>2.4</b>	<b>3.8</b>

Note: All errors are with respect to a high-resolution bin configuration 24  $D_{dry}$  x 35  $w_{BC}$  x 30  $\kappa$  used as benchmark.

# Computational Efficiency

	Model Configuration <sup>a</sup>	Total Number of Bins	CPU Time <sup>b</sup>
Original MOSAIC	Gas-phase chemistry only <sup>c</sup>	-	~18 s
	24 D <sub>dry</sub>	24	~33 s
	24 D <sub>dry</sub> x 2 w <sub>BC</sub>	48	~43 s
	24 D <sub>dry</sub> x 2 κ	48	~43 s
	24 D <sub>dry</sub> x 3 w <sub>BC</sub>	72	~50 s
	24 D <sub>dry</sub> x 3 κ	72	~50 s
Optimized MOSAIC-mix	24 D <sub>dry</sub> x 2 w <sub>BC</sub> x 2 κ	96	~70 s
High-resolution MOSAIC-mix	24 D <sub>dry</sub> x 35 w <sub>BC</sub> x 30 κ	25,200	~3-5 days
	PartMC-MOSAIC <sup>d</sup>	100,000 <sup>a</sup>	~2-5 days