Soot particle Ice Nucleation Ability: Dependence on the Volatile Content

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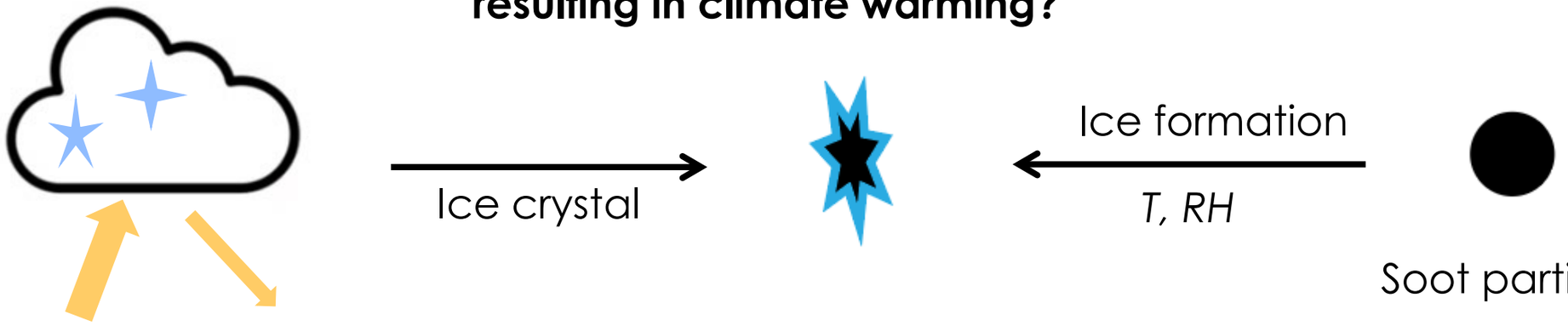
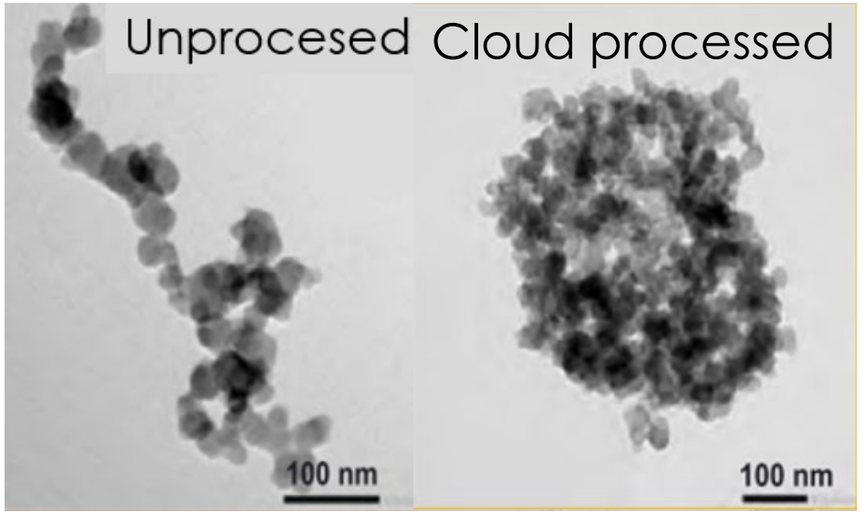
Soot Particles Exert Radiative Effects via Cloud Interactions

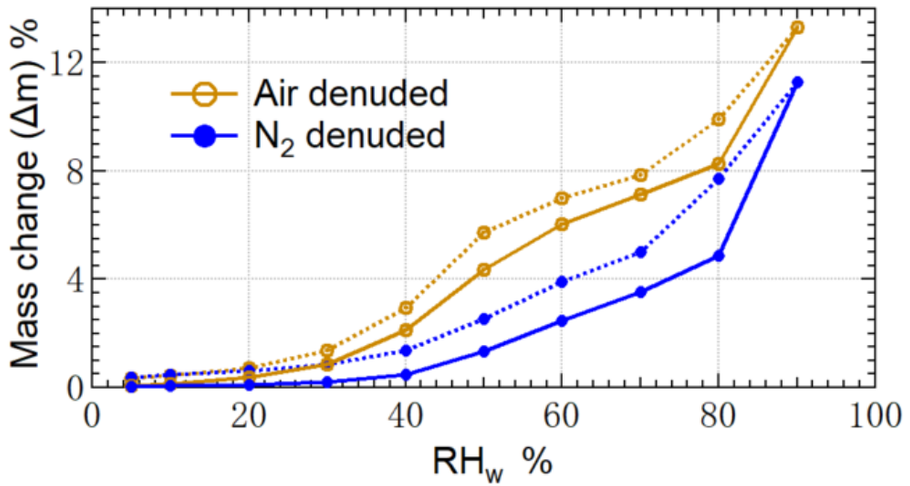
Do soot particles forming ice crystals contribute to cirrus cloud formation ? (T < - 38 ℃) resulting in climate warming?



The ice nucleation ability of soot particles depends on their morphology and surface properties



Soot aggregates Transmission Electron Microscopy images



Propane flame soot (miniCAST Black) water interaction activities at T = 25 ℃

Mahrt et al. 2020 J. Geophys. Res. Atmos.

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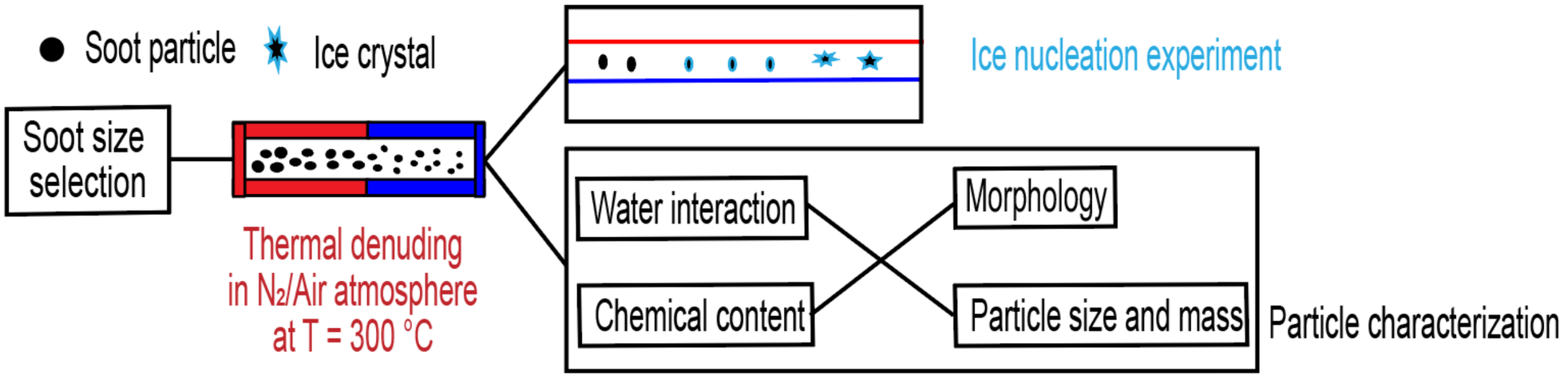
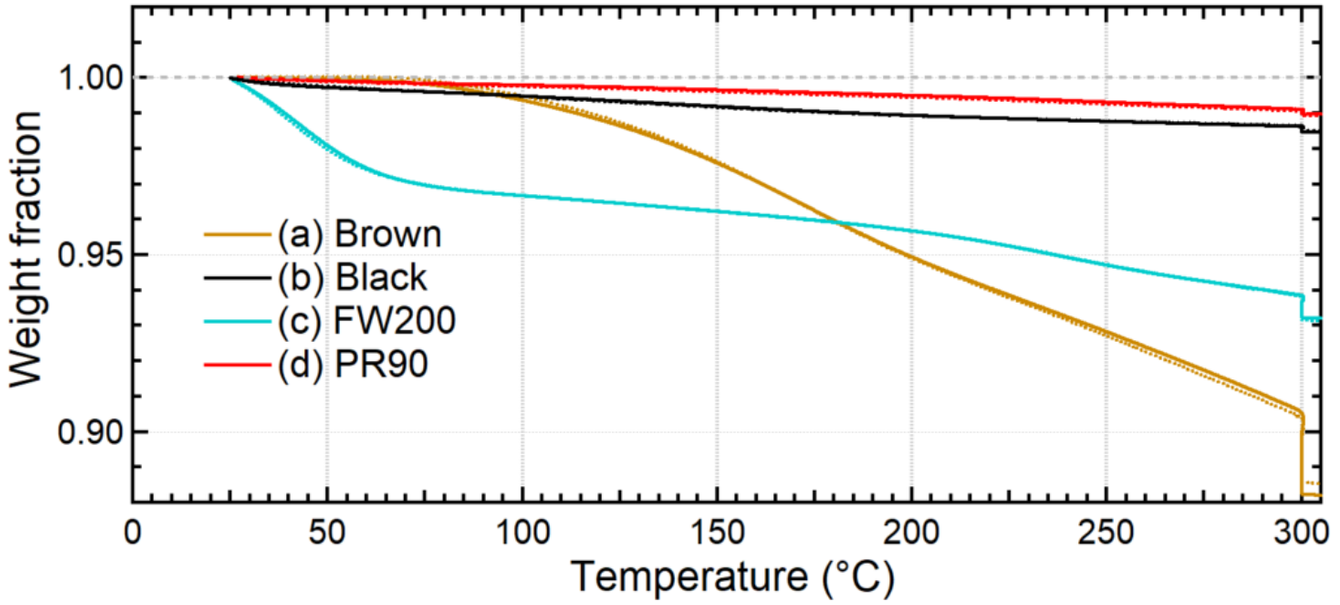
Experimental Design and Soot Samples Investigated



Volatile mass in soot samples as a function of *T* ℃ (Under N_2 atmosphere)



Brown soot (propane fuel-rich) Particles: Property Characterization and Ice Nucleation Abilities

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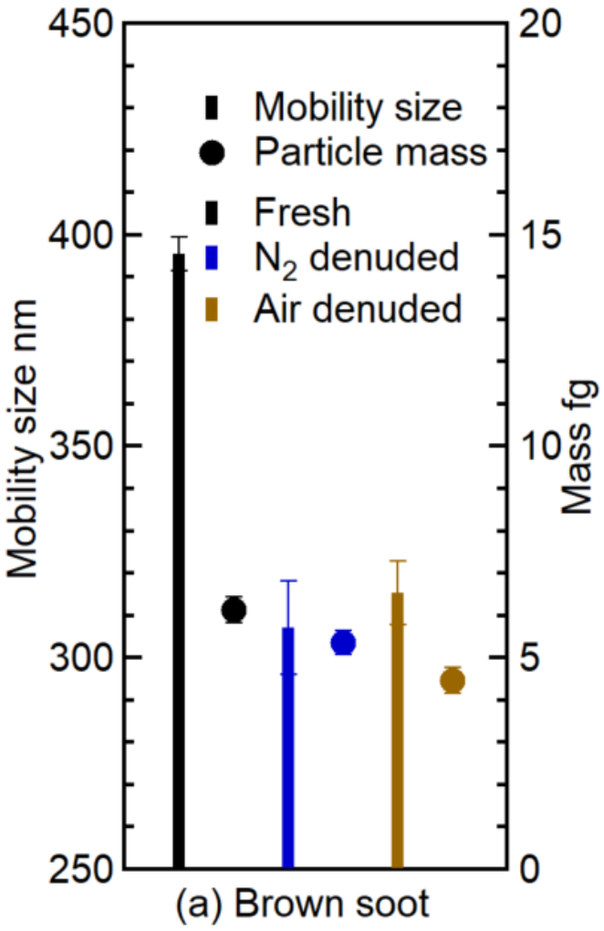
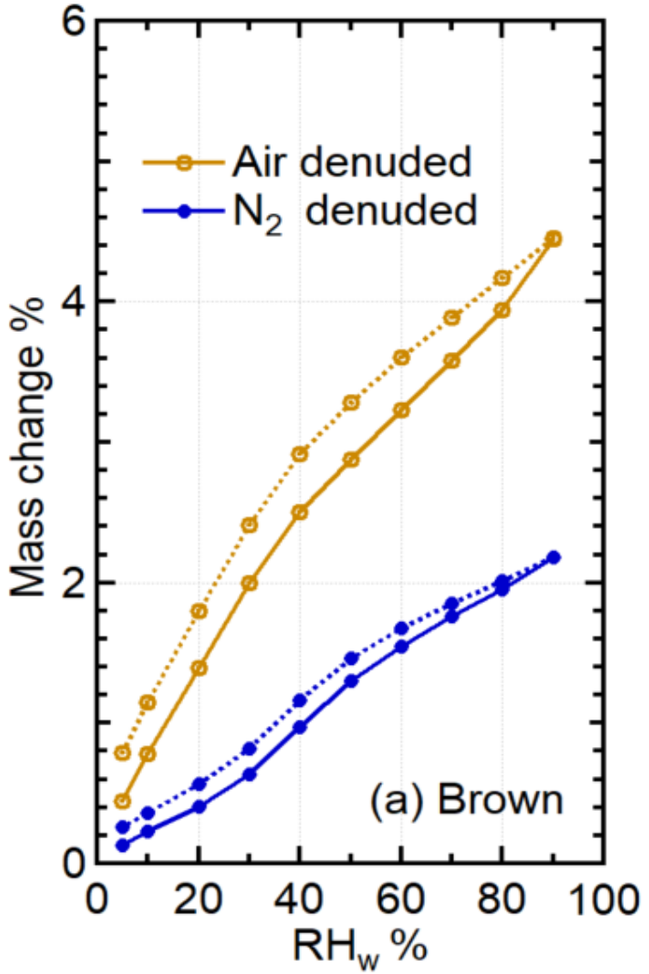
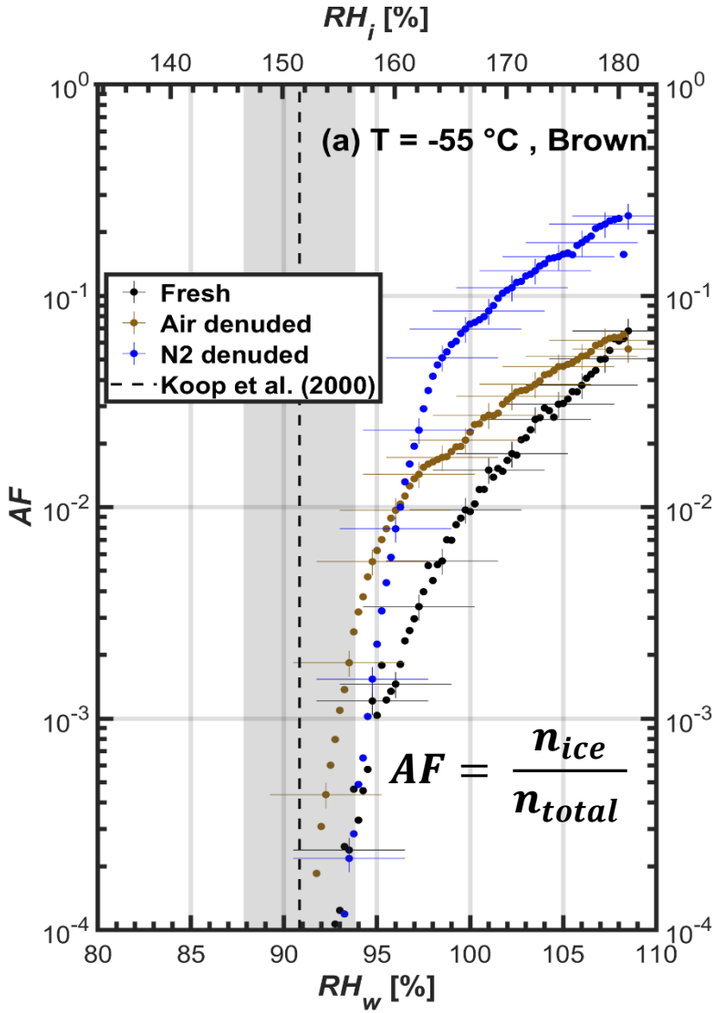


The size and mass of soot particles



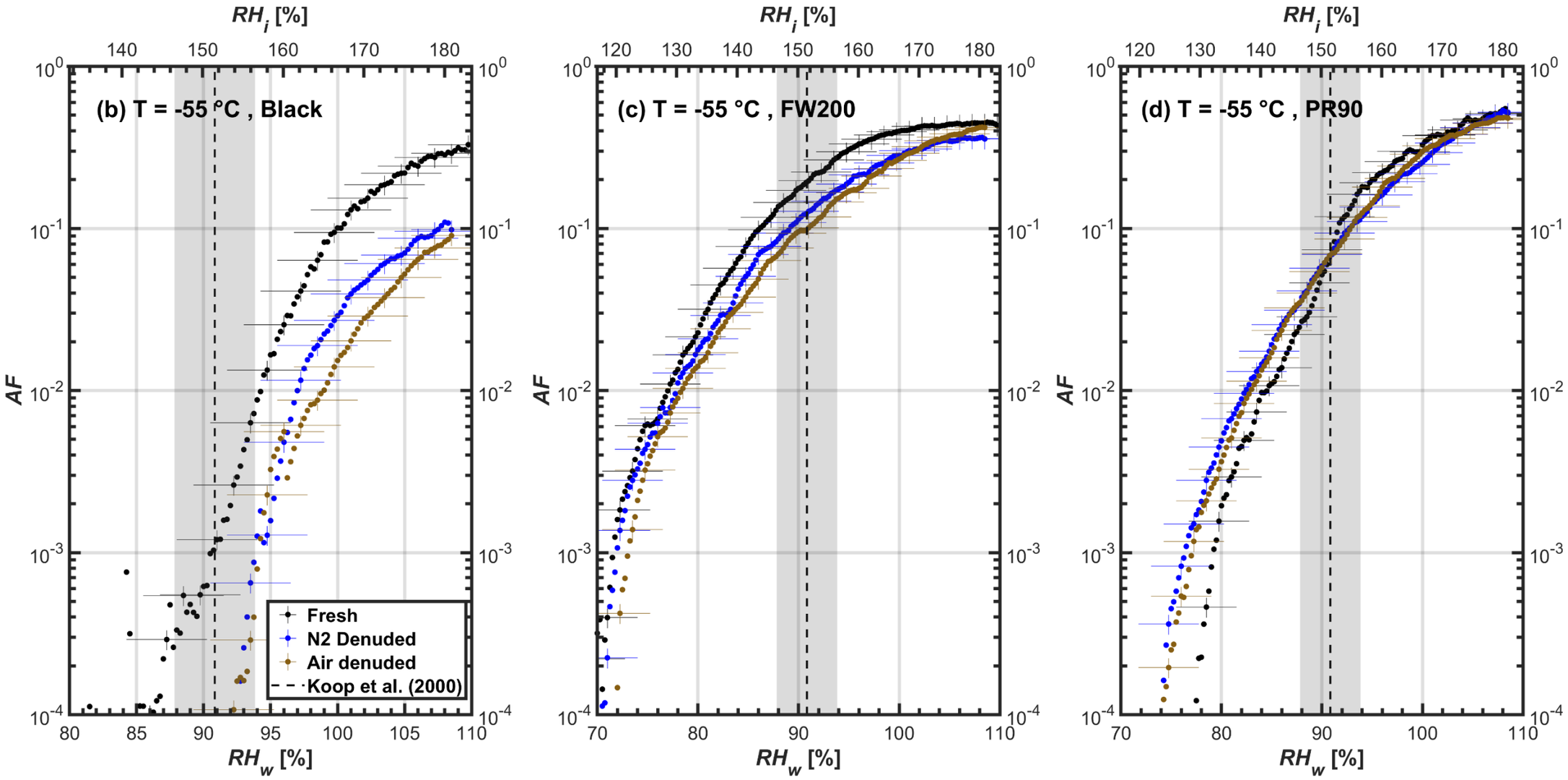
Soot-water interaction abilities at T = 25 ℃



Soot particle activated fraction (AF) as a function of relative humidity (RH)

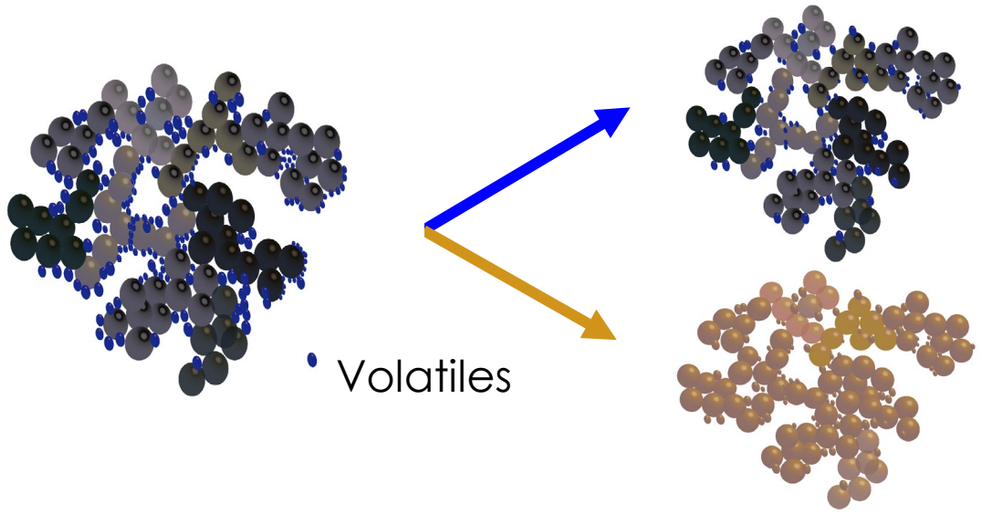
- Thermal denuding induced aggregate compaction and wettability enhancement promotes Brown soot (organic rich) homogeneous freezing more easily

Black Soot (propane fuel lean) and Black Carbon Particles: Ice Nucleation Abilities



- Thermal denuding depresses Black soot (organic lean) homogeneous freezing
- Thermal denuding slightly regulates black carbon soot ice nucleation activities

Conclusions



N_2 atmosphere denuding (T = 300 ℃)

Air atmosphere denuding (T = 300 ℃)

- Thermal denuding modifies soot particle surface wettability
- Results in soot aggregate morphology change
- Impacting soot particles ice nucleation activity

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