Liu et al

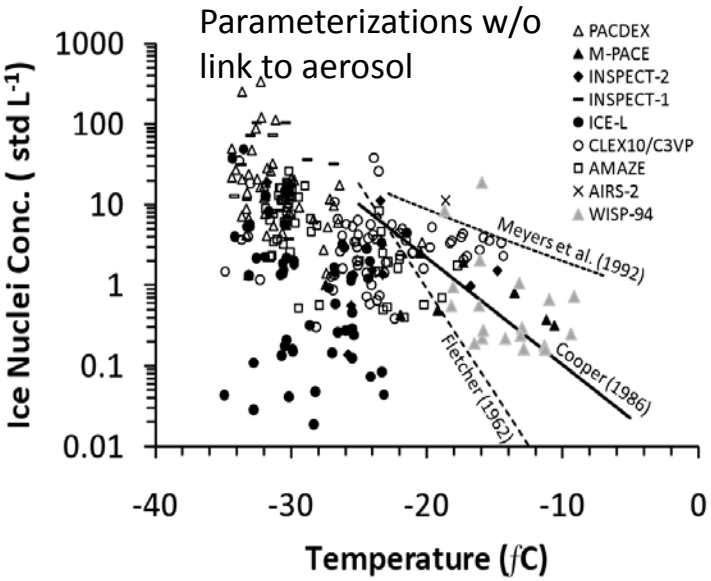
Aerosol effects on ice nucleation and ice clouds

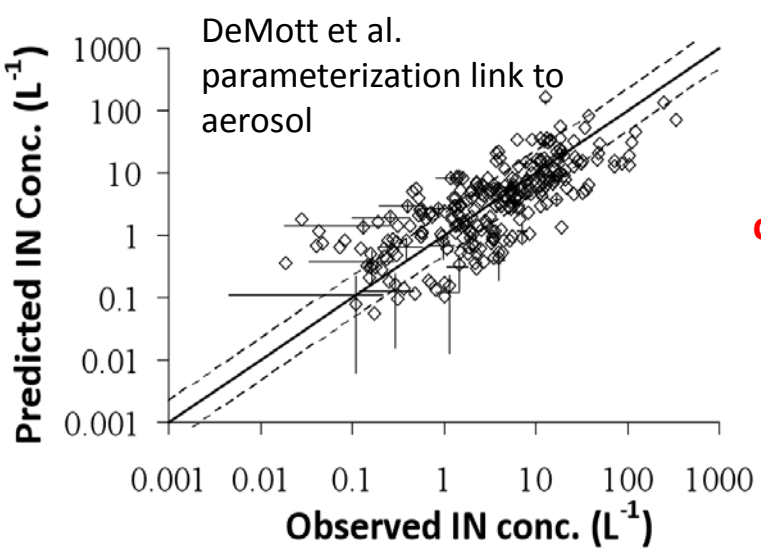
Aerosol – Ice Nucleation – Cloud Ice

X. Liu, P. DeMott, Z. Wang, G. de Boer

Challenges in modeling ice generation in ice and mixed-phase clouds

Parameterized vs. observed IN

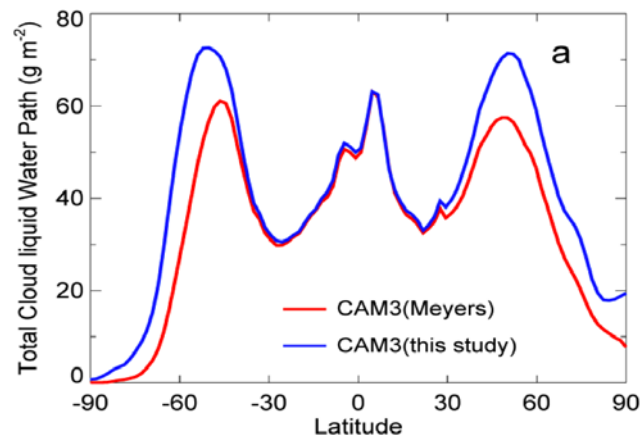


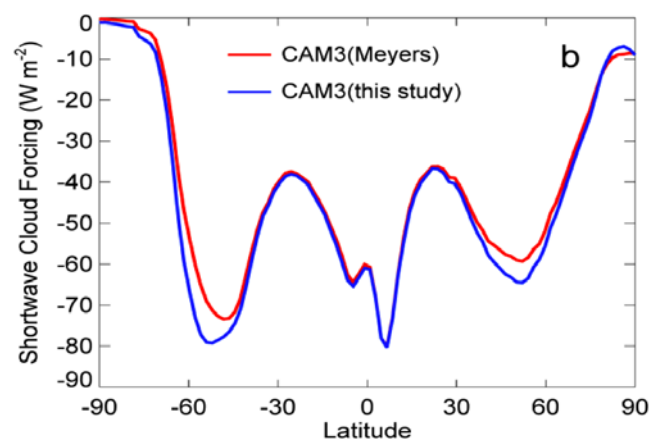


Multiple ice nucleation mechanisms related to aerosol & meteorological conditions

Uncertainties in IN parameterizations produce significant changes in CAM modeled LWP, cloud forcing and cloud fraction

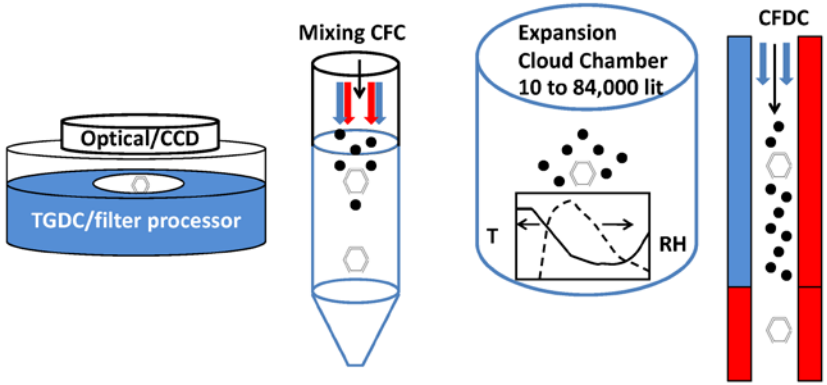
LWP and SWCF with two IN parameterizations

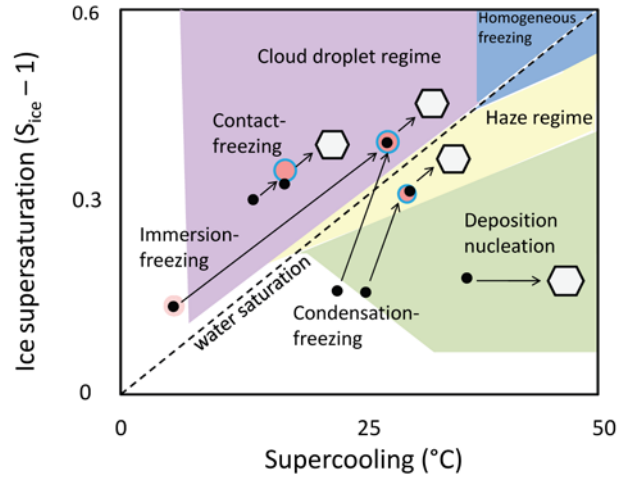




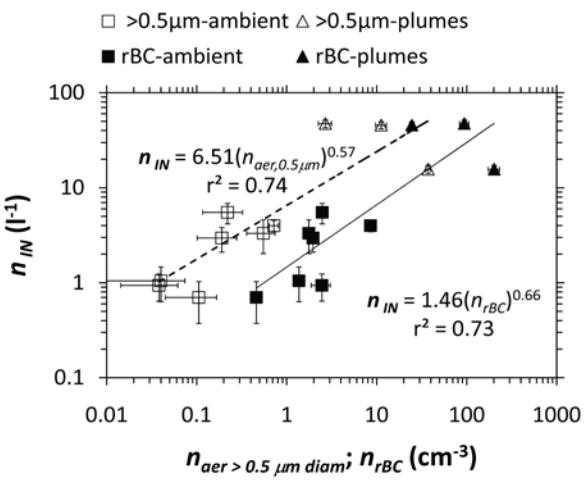
DeMott et al. (2010)

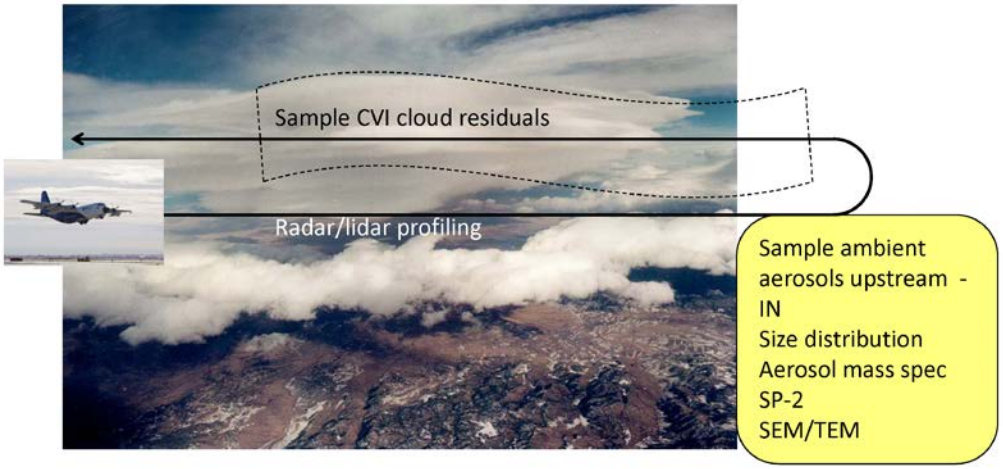
Challenges and issues in measuring ice nuclei, their link to aerosol properties, and their role in ice formation



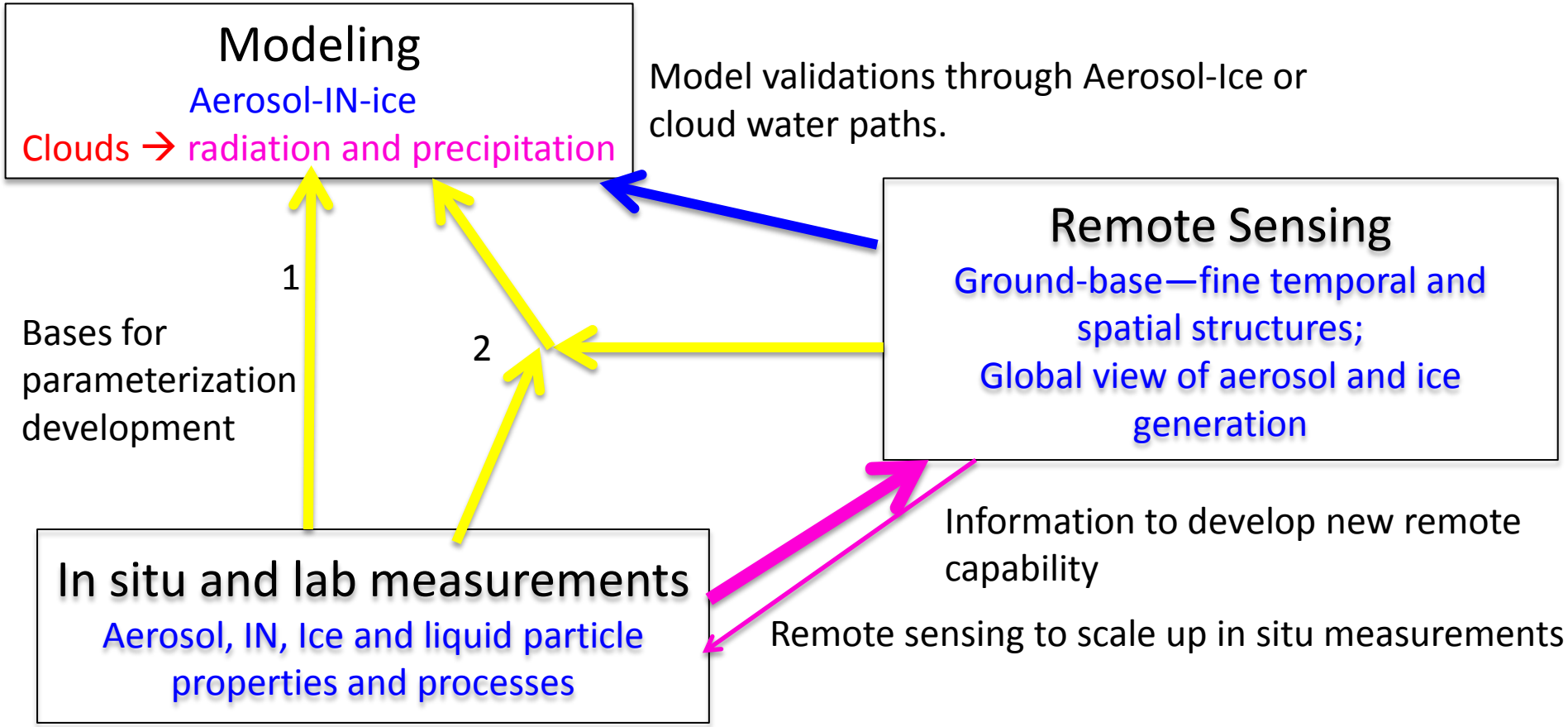


Many devices, need for calibration standards, uncertain role of time, multivariate and multi-mechanistic populations representing a very small fraction of total aerosols so relations to other aerosols require validation by difficult IN composition measurements, special cloud conditions required for directly relating IN to ice in clouds (e.g., role of secondary ice fo





The Path forward



Science Tasks and Questions

1. Aerosol/meteorological conditions for different ice nucleation mechanisms
2. Roles of BC (e.g., from biomass burning) in the ice nucleation
3. Development of aerosol/meteorology dependent parameterizations
4. Scaling issues between in-situ (and even remotely sensed) measurements and GCMs