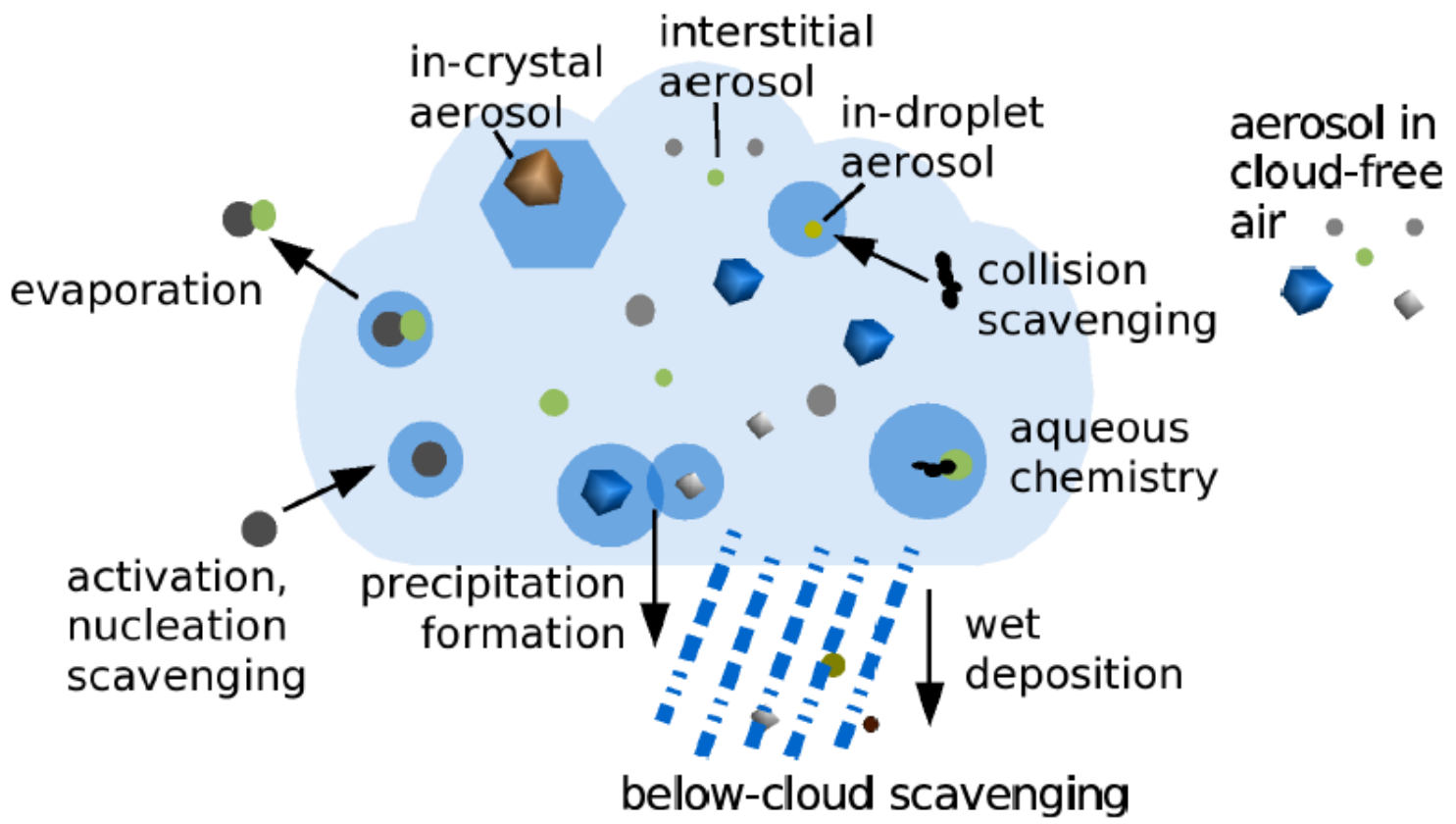




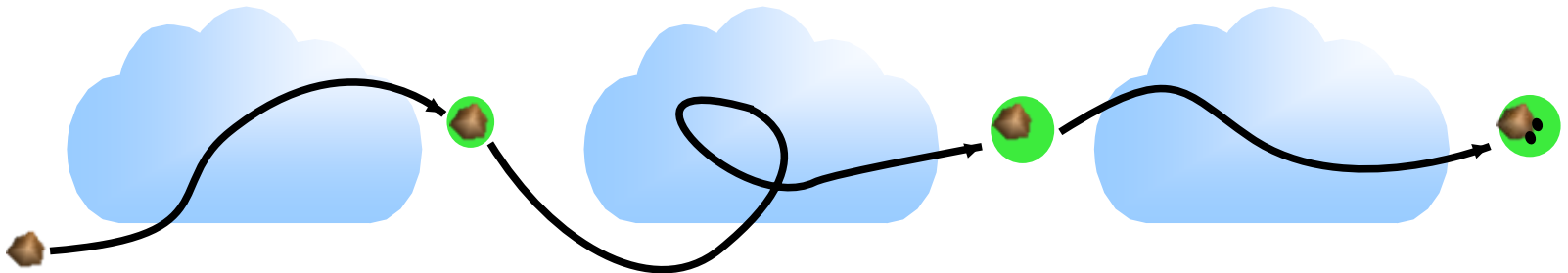
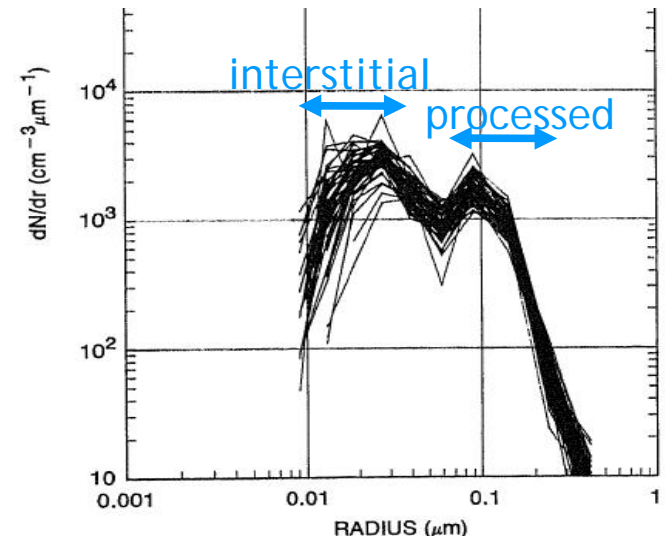
Explicit representation of in-droplet and in-crystal particles in ECHAM5-HAM



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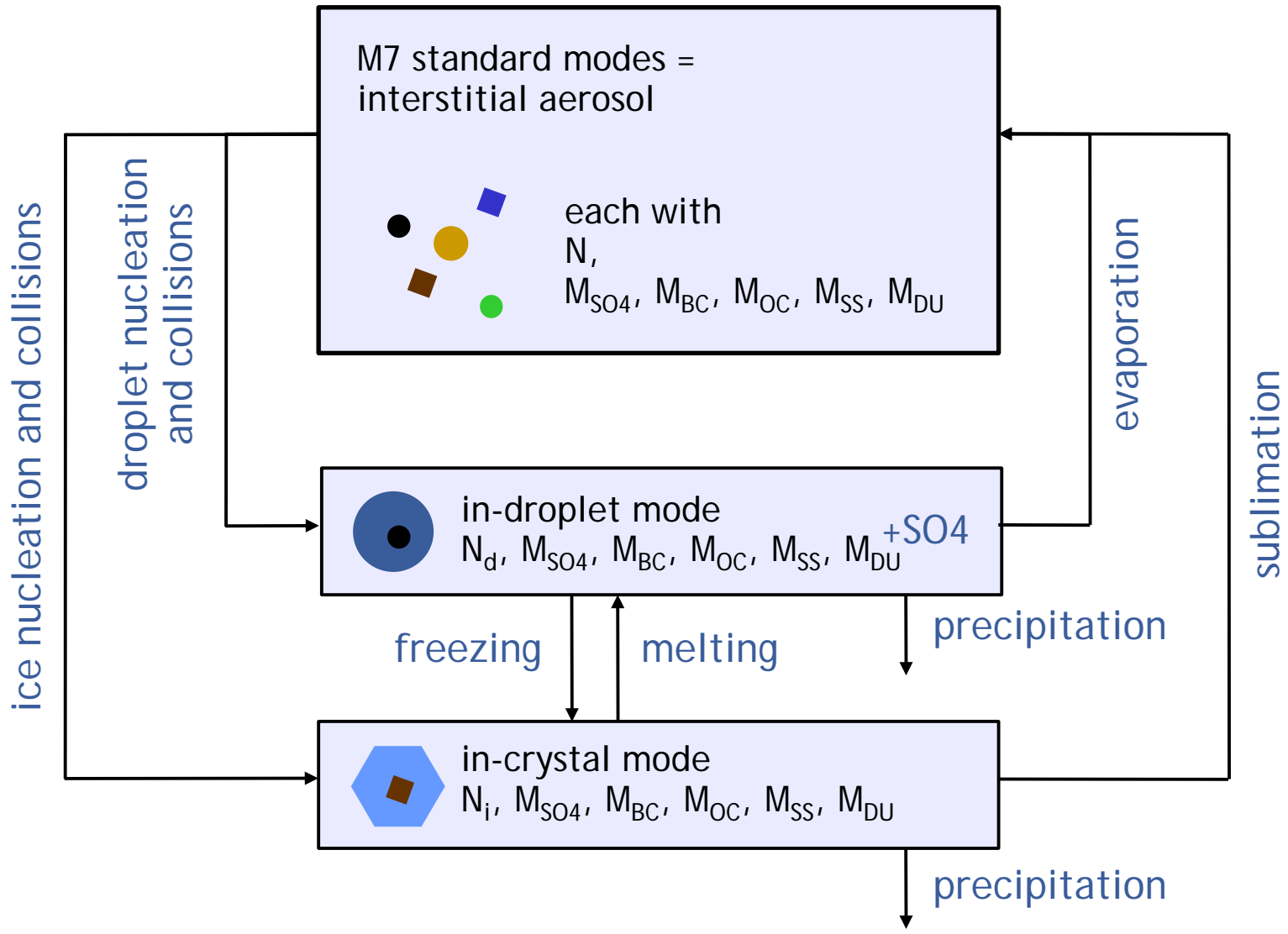
Motivation

- Cycling through clouds modifies physical and chemical properties of particles
- *Hoppel et al. (1990)*: bimodal structure in marine boundary layer aerosol due to cloud processing
- *Pruppacher & Jaenicke (1995)*: aerosol sampled at a remote location has been cycled through clouds 3 times





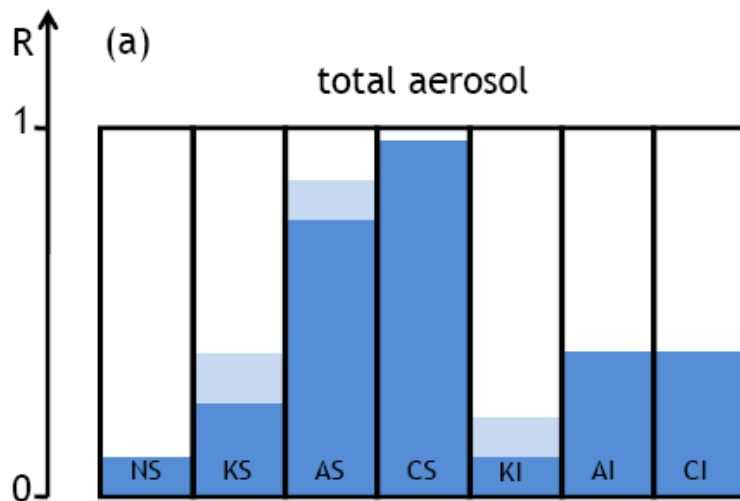
ECHAM5-HAM with aerosol processing



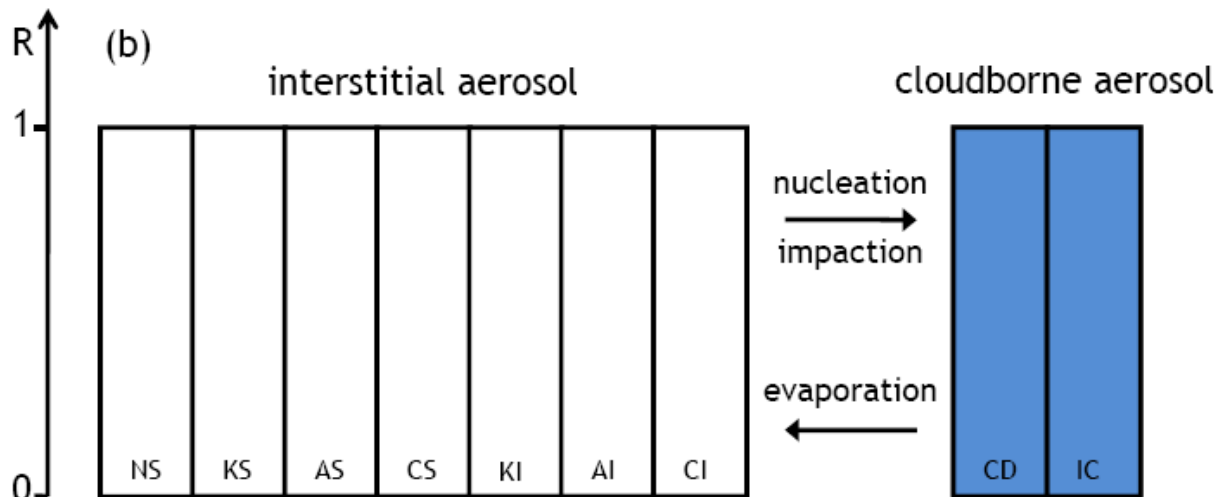


Simulating the scavenged fraction R

Standard
ECHAM5-
HAM (CTL)



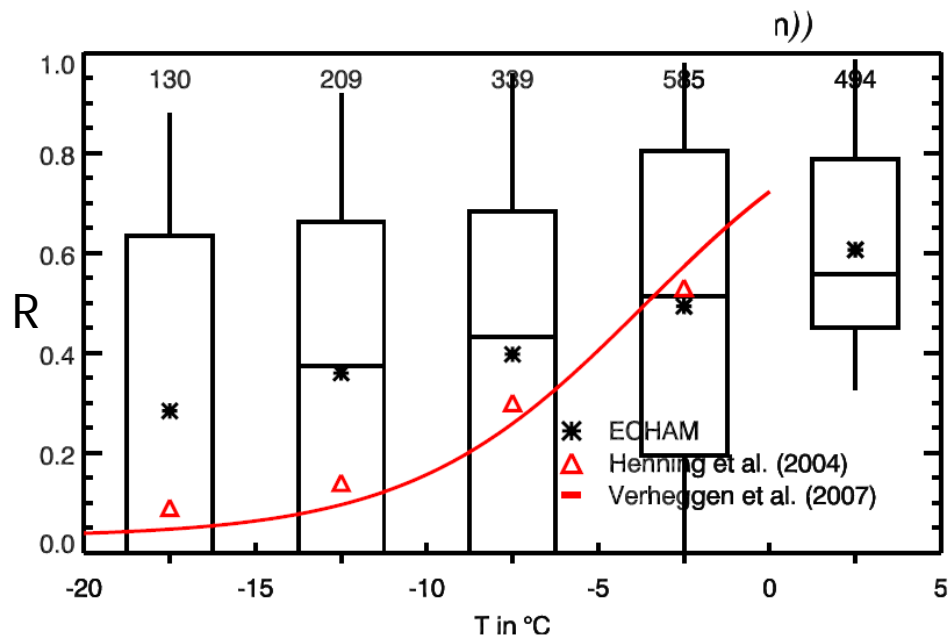
With in-cloud
modes (AP)



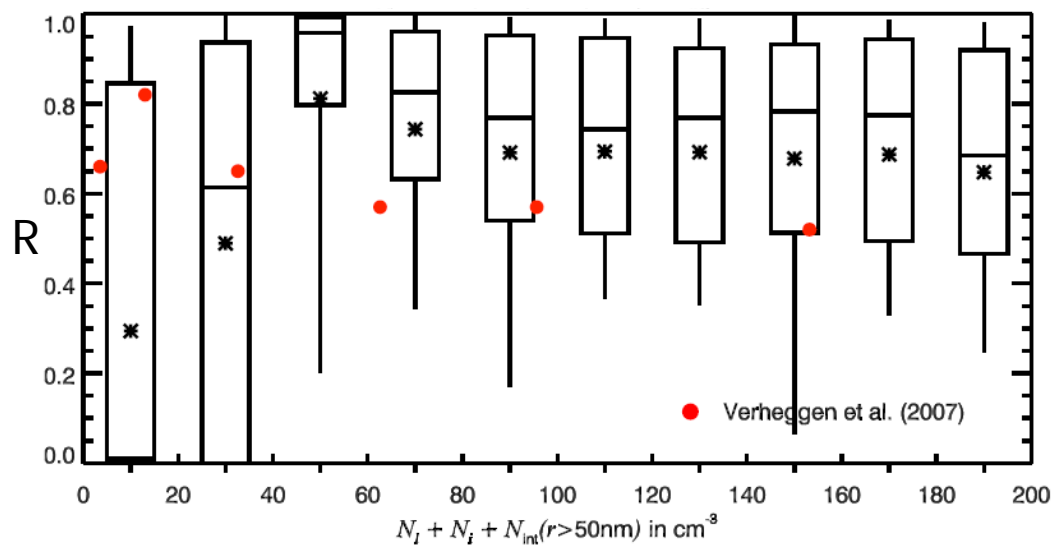


Scavenged fraction at the Jungfrauoch

- Scavenged fraction vs T

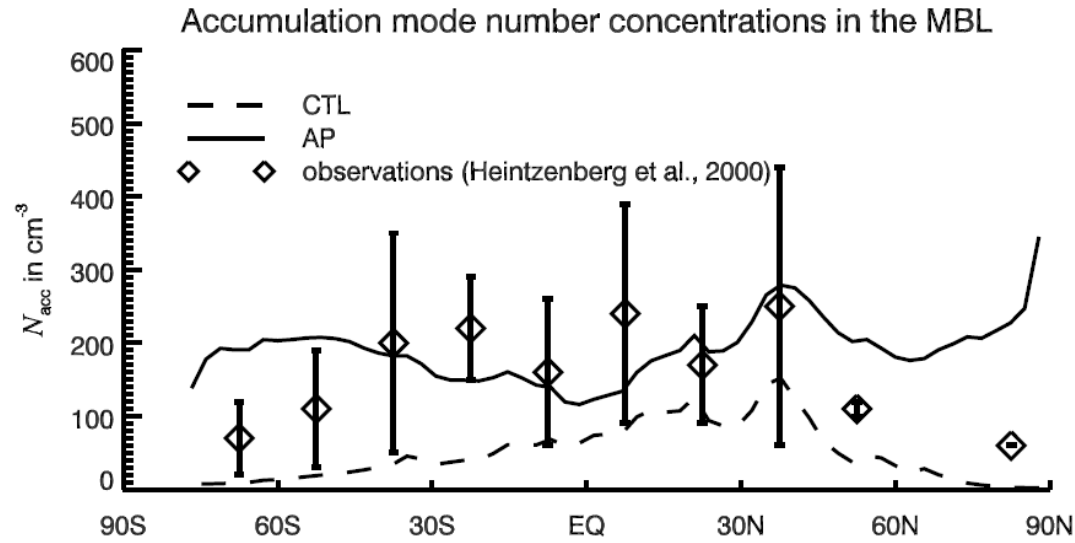


- Scavenged fraction vs total aerosol concentration



Hoose, Lohmann, Bennartz, Croft & Lesins (ACPD 2008)

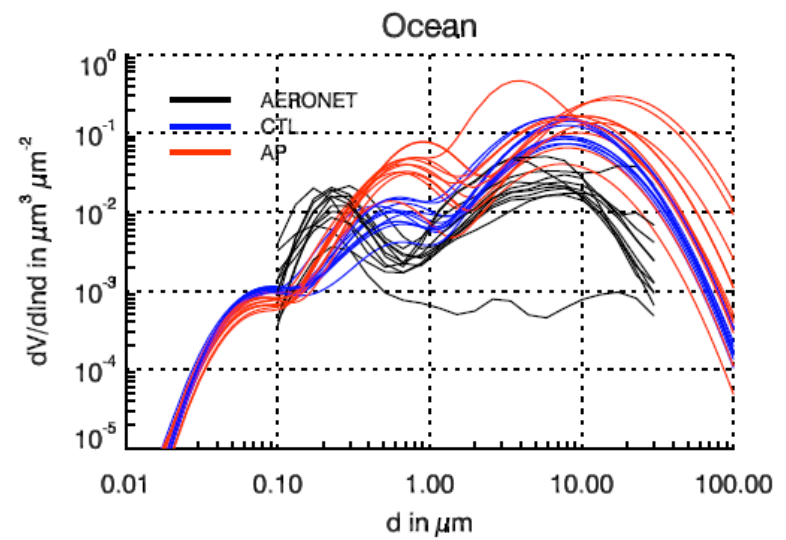
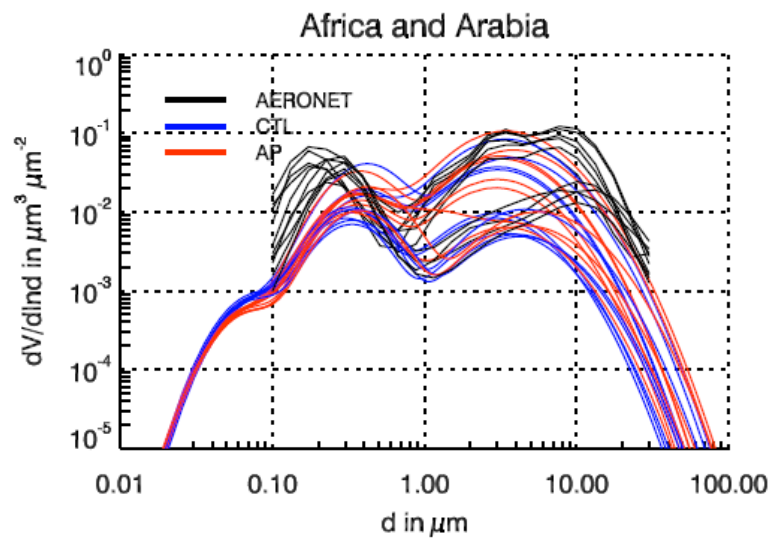
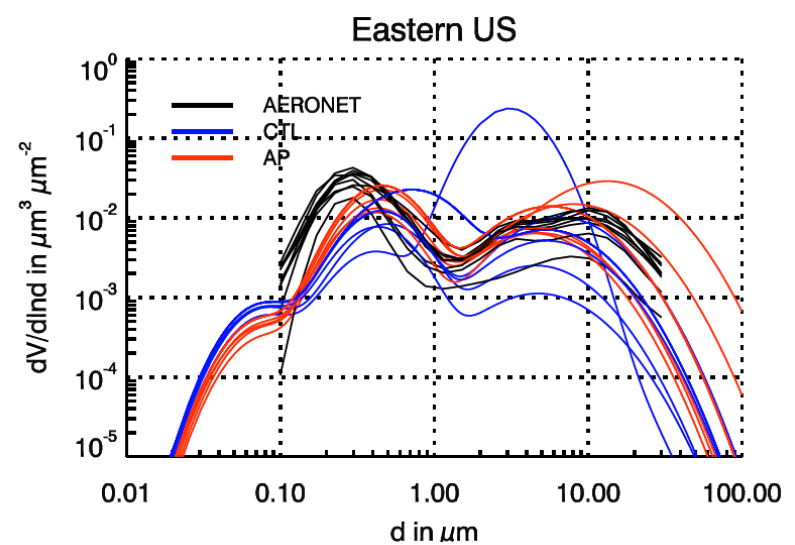
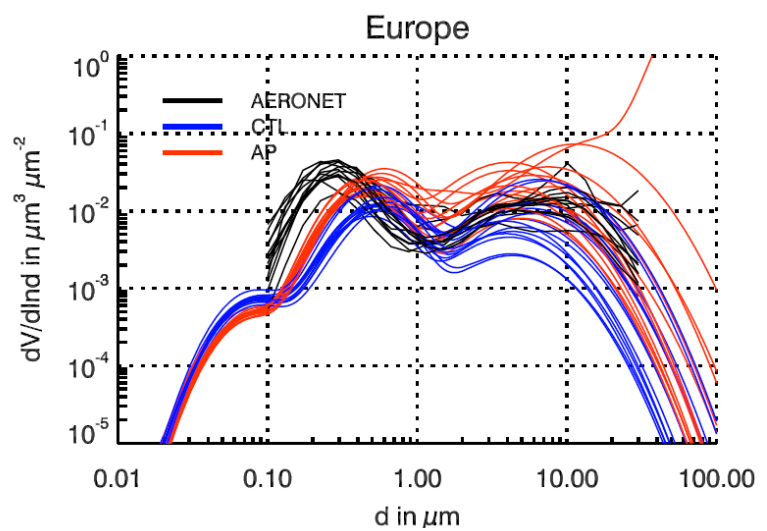
Comparison to observations: MBL aerosol numbers



- in general more particles in simulation AP (with explicit aerosol processing)
- source term from evaporating cloud and rain drops
- less wet deposition
- marine aerosol: increase of accumulation mode particle numbers

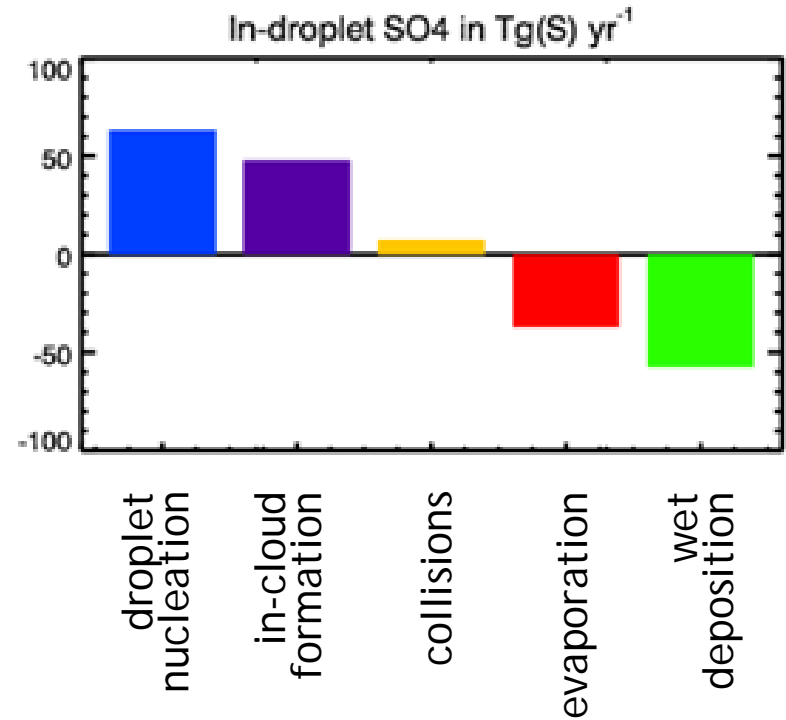
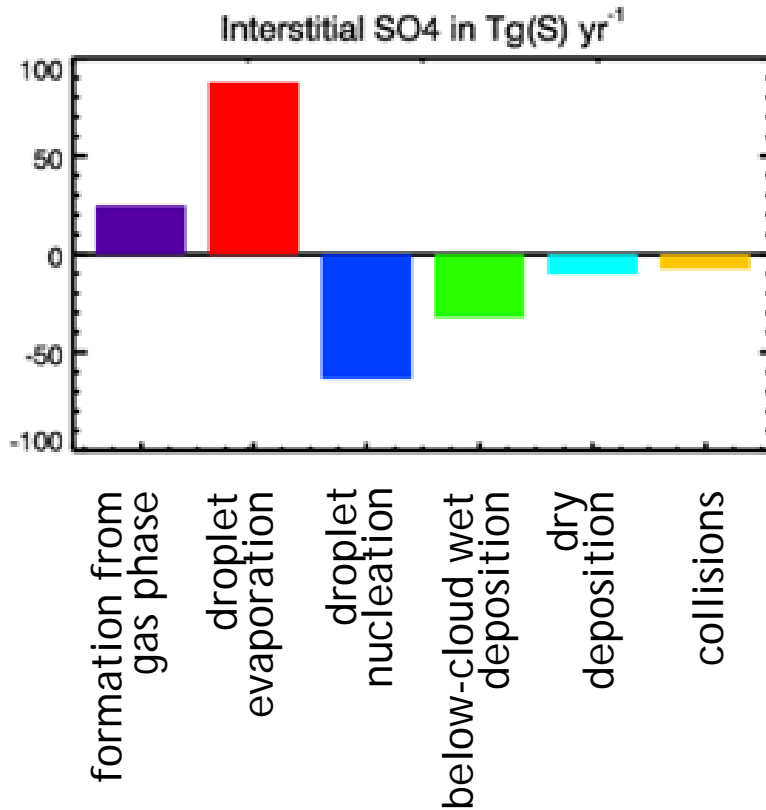


Aerosol size distributions





Global simulations: budgets of in-droplet aerosol mass



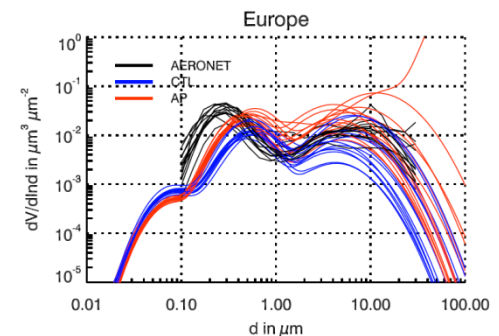
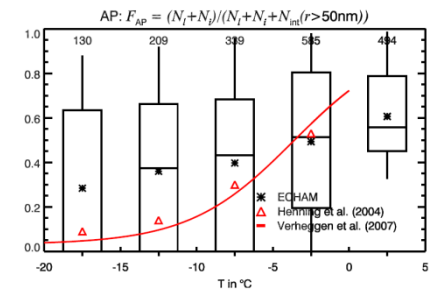
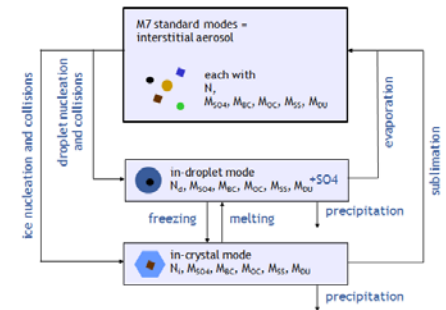
-> on average 0.5 cycles through (stratiform) clouds



Summary

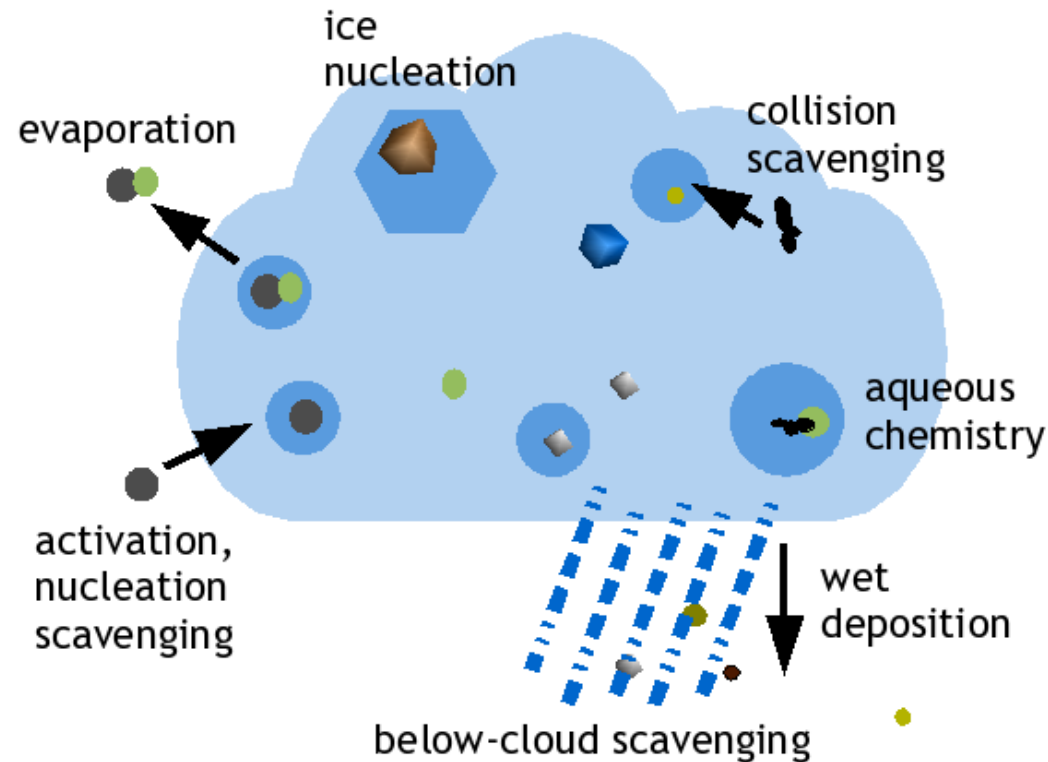
- in-droplet modes coupled to cloud scheme
- prognostic scavenging coefficients
- resulting in less wet deposition
- cost: 10(5) more tracers
- Future work:
 - Improved collision scavenging coefficients (B. Croft)
 - Aerosols in convective clouds

Thanks to U. Lohmann, R. Bennartz, B. Croft, J. Feichter, S. Ferrachat, G. Lesins, P. Stier, B. Verheggen, and E. Weingartner





Explicit representation of in-droplet and in-crystal particles in ECHAM5-HAM



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