Phase Partitioning and Mixed-Phase Clouds

*Stratiform Mixed-Phase Clouds:*

External (macrophysical)

- Large scale thermodynamics and moisture

Internal (microphysical)

- Ice Nucleation
- Habit Evolution/Vapor Deposition
- Riming/aggregation

Evaluation of budgets within ARM/ASR:

- *Water budget:* New instrumentation (HSRL, doppler lidar and radar for precipitation, and tethersondes/UAS for advected water vapor) can help us to constrain these budgets.
- *Aerosol budget:* Can the ice nucleation closure studies proposed in the ice nucleation group help us to understand our IN sources?
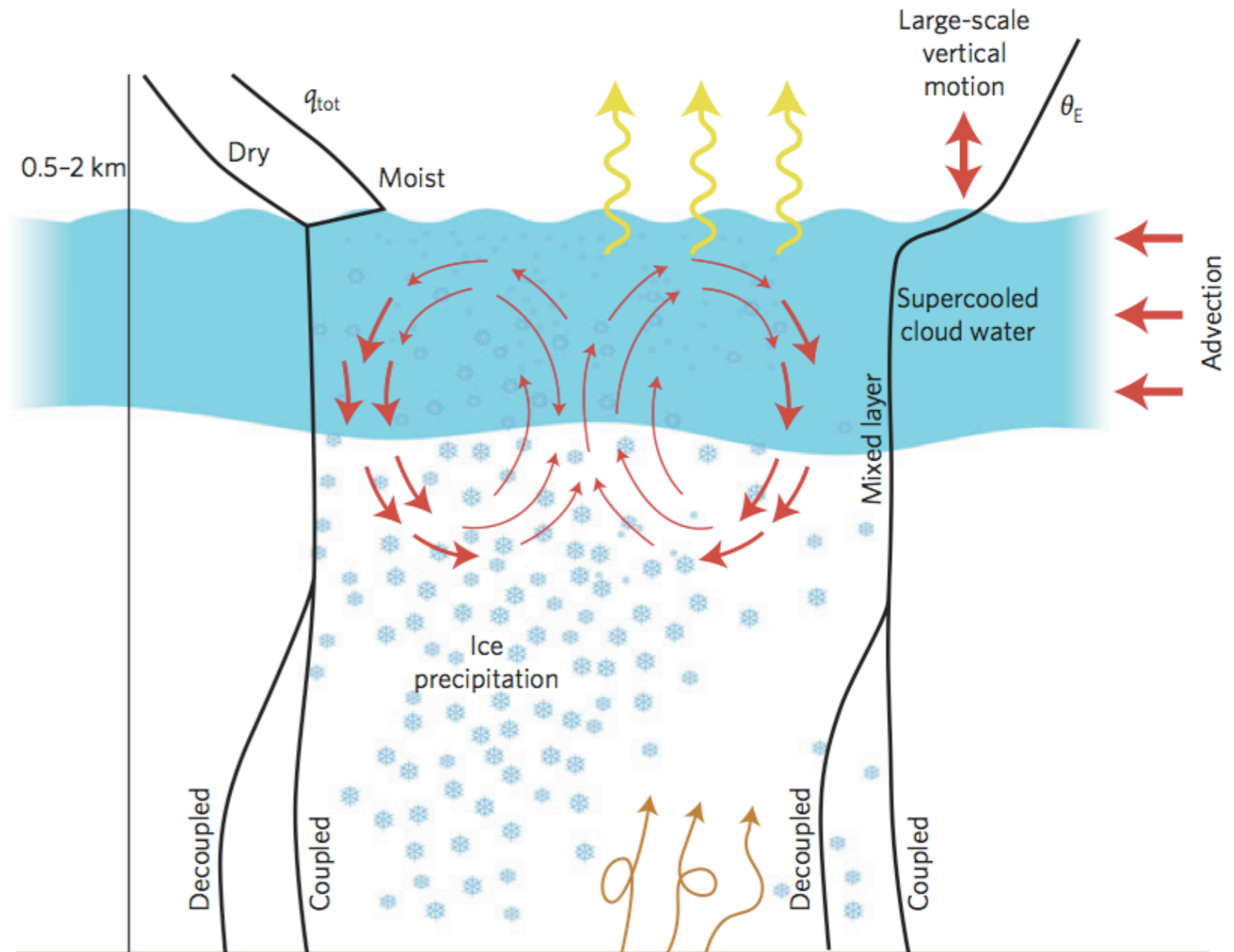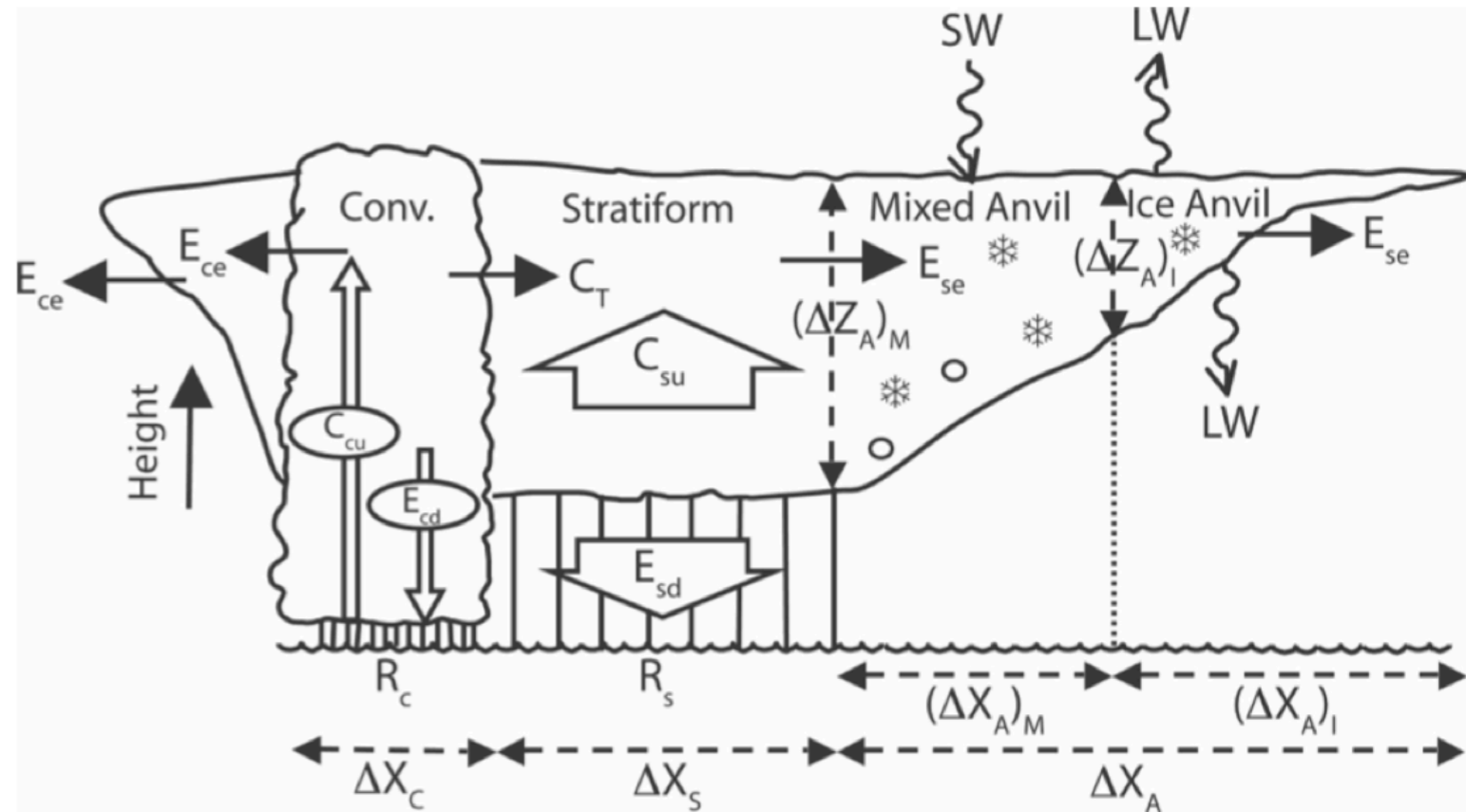

(Morrison et al., 2012)

Evaluation of macrophysical distributions by ARM/ASR:

- Subgrid scale joint PDFs of phase-relevant properties (liquid and ice mass, updraft velocity and RH, etc.) would be very helpful for GCM development.

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Convective Clouds:

- What processes control evolution of the mixed-phase cloud in updraft regions?
- Does the mixed-phase cloud in the updraft region influence stratiform rain and anvil cloud?
- What sensitivities prevent models from producing liquid in the anvil region?
- Habit growth and its influence on fall speed is important in terms of feedback of hydrometeor phase on cold pool and other dynamics
- To what extent can we expect GCMs to represent both deep-convective and stratiform mixed-phase processes with a single set of parameterizations?

(Frederick and Schumacher, 2008)