Synthesis of Session 2A

Heavy Drizzle

Presenters: Feingold, Wood, Allen, Leon, Yuter, Wang

General

- Precipitation is a *necessary but not sufficient condition* for transition from closed to open cell structure
  - precipitation is wide-spread in closed-cell regions too
- Models can reproduce transition from closed to open cell state - either through lower aerosol concentrations - or through thicker clouds
- Self-organizing properties seem to apply
  - coherent patterns emerge from local interactions

Macro vs microphysics

- Models agree that the process of POC formation is more sensitive to meteorological controls (e.g. cloud depth) than it is to aerosol controls

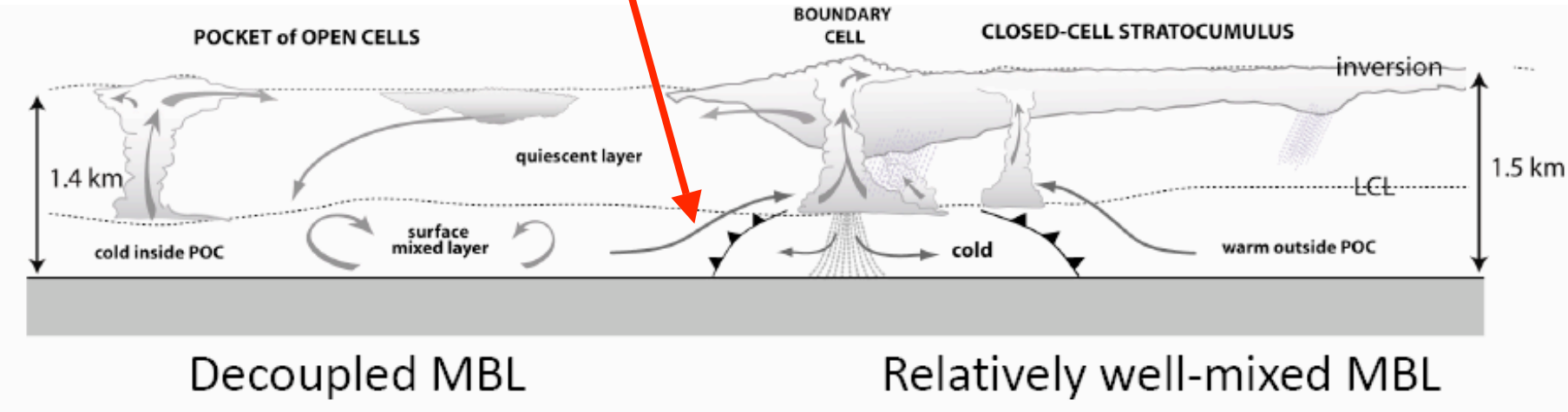
- Gravity waves may provide the required deepening of clouds to generate precipitation that drives open-cell formation

- Not all drizzling clouds form POCs
  - *What are the other controlling factors???*
  - Spatial distribution of precip?
  - Depth of boundary layer?

POC observations

- Cold pools are a persistent feature of the POC/closed cell boundary
- Precipitation is wide-spread in both closed and open-cell regions but is strongest near the edge
- Precipitation removes aerosol in POCs very effectively
  - perhaps more so than in open cells

Conceptual model of POC edge



Cooler, moister surface layer

- Surface mixed layer is rich in θ_e, vapor
- Lidar on *RHB* seems to support existence of return flow

POCs and Aerosol

- Unclear how the aerosol is replenished
  - DMS does not appear to be a sufficiently strong source of SO_2
  - How prevalent is nucleation?
  - Aerosol from above?
  - Other aerosol nucleation mechanisms?

Outstanding Questions

- How do precipitating cells maintain themselves for so long (hours)?
  - Usually drizzle cuts off moisture supply
- How do open cells transition to a closed state?
  - Is aerosol resupply sufficient?
  - Thin veil of clouds induced by ship tracks is not evidence of closing open cells
  - Changing meteorology?
- How does the boundary layer recharge with aerosol?