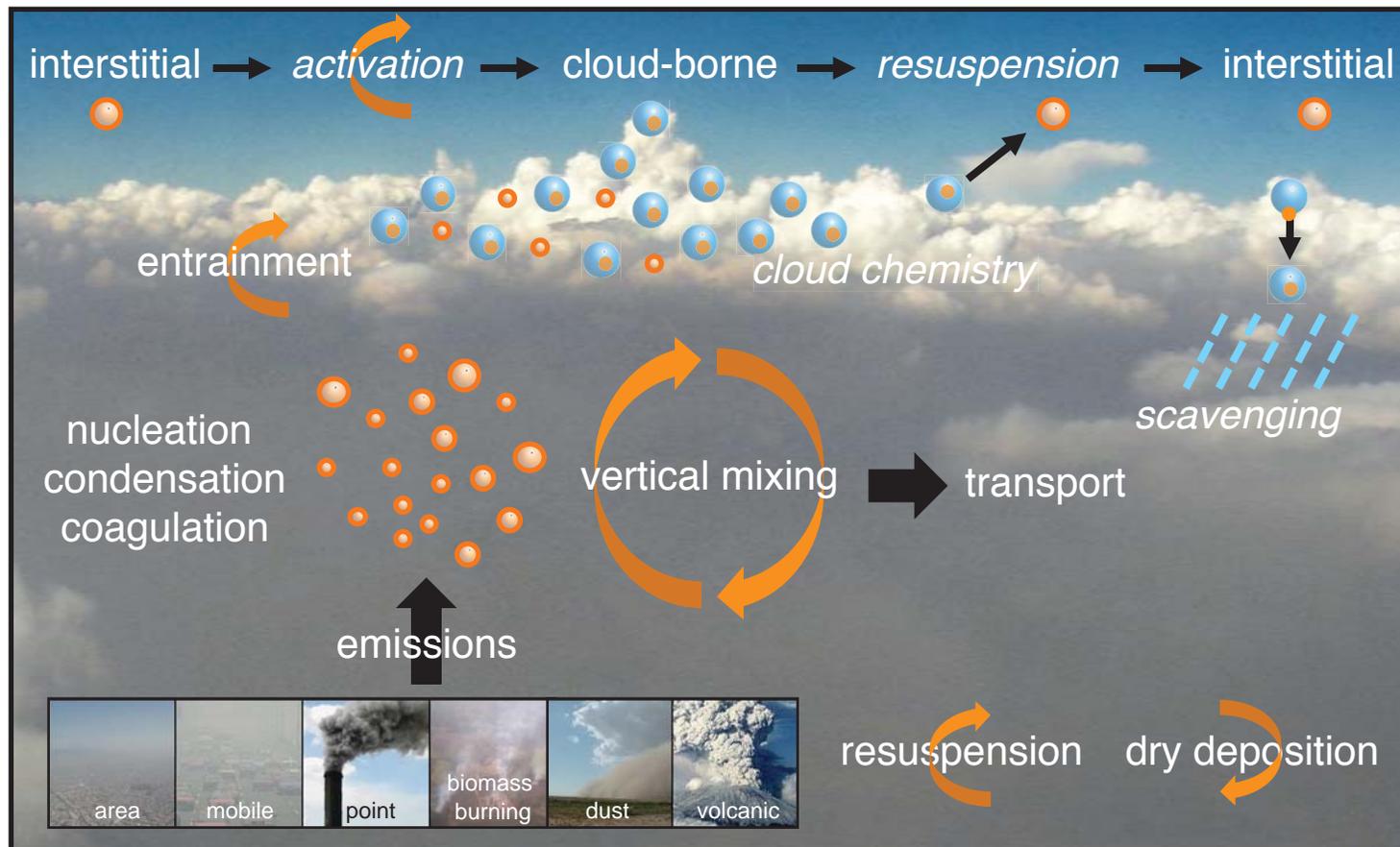


# Why Aerosol Modelers Care About PBL Height

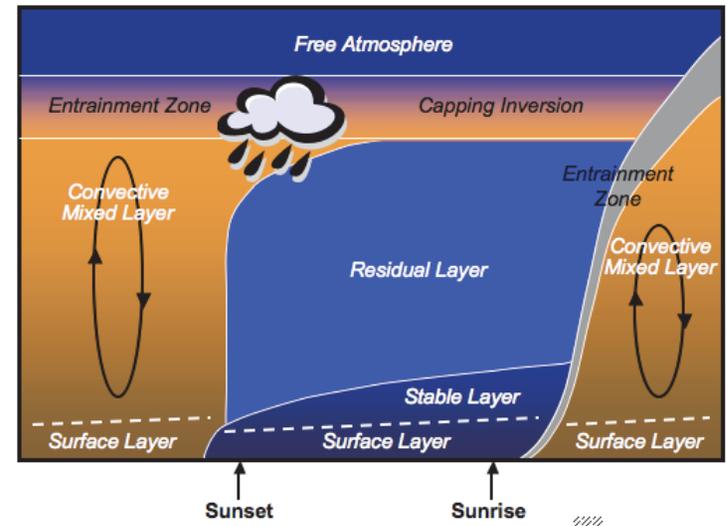
Jerome Fast  
PBL Height Breakout Session

## PBL Mixing Affects Aerosol Lifecycle and Consequently Clouds



# Modeling Issues

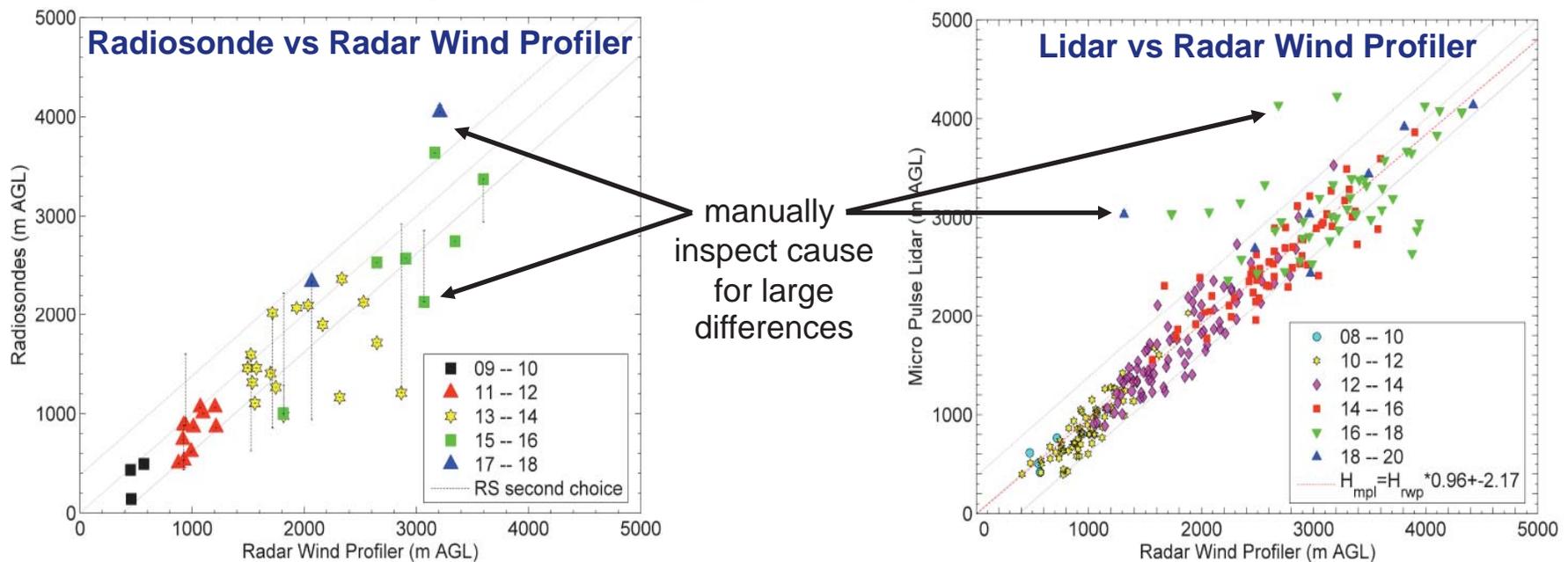
- Regional aerosol modelers frequently evaluate predictions of PBL height using available data (usually derived from radiosondes)
- Regional and LES modelers consider this an important metric, since uncertainties in predicted PBL height will contribute to uncertainties in the dilution of aerosols and aerosol precursors
  - *Well known in air-quality community, but also relevant to simulating climate processes*
- Contributions to uncertainties in predicted PBL height:
  - *PBL parameterizations themselves, that are coupled to simulated processes in the surface-layer and free troposphere*
  - *PBL parameterizations often have different ways of computing PBL height so that part of the variability among parameterizations is simply due to definition*
  - *Methods to compute simulated and observed PBL height are often different*



# Uncertainties in PBL Height Determination

- Methods that determine PBL height from measurements do not always agree with each other

Comparisons during MILAGRO [from Shaw et al., 2007]

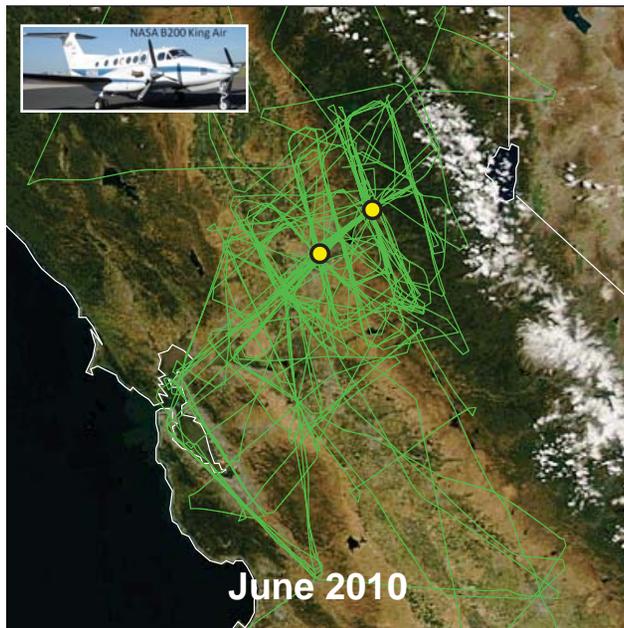


- Modelers need a “best estimate” of PBL height, otherwise they will pick and choose
- These differences can provide a useful way of quantifying measurement uncertainty which should be employed by modelers (not typically done presently)

# Example

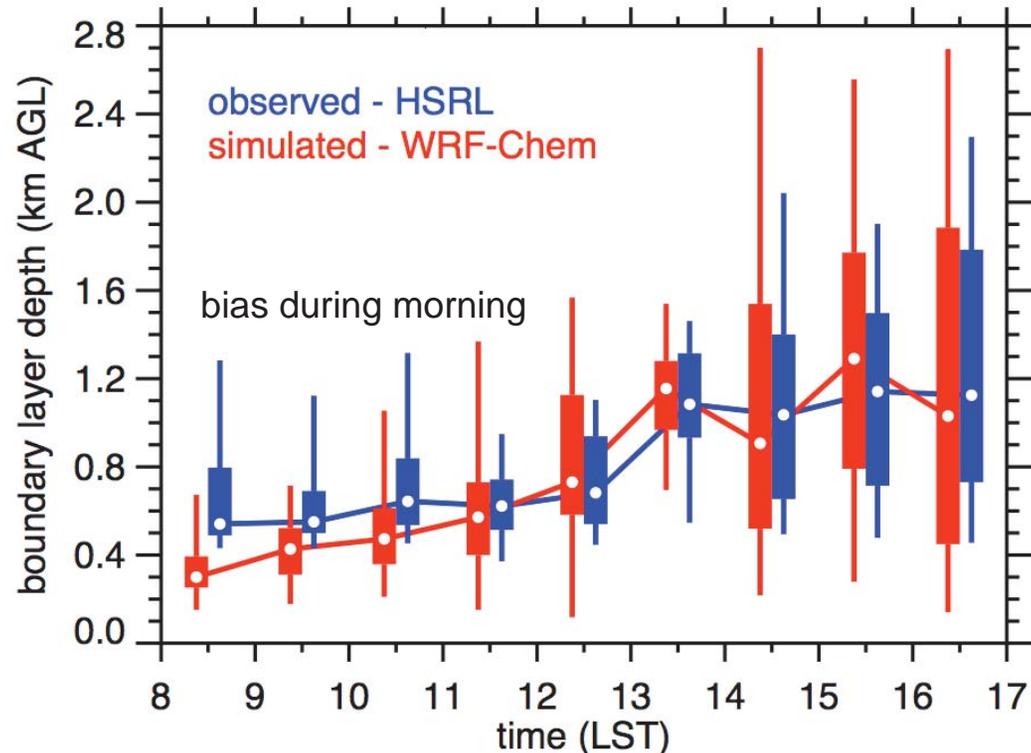
- Data collected during CARES being used to quantify errors in simulated PBL depth from WRF-Chem, since WRF-Chem is being used to simulate the aerosol lifecycle and test aerosol parameterizations

## B-200 Flight Paths with HSRL



from *Fast et al.* [2011]

## Model Evaluation Along All Flight Paths (Percentiles)



bias during morning  $\Rightarrow$  simulated surface of aerosols and precursors being high  $\Rightarrow$  photochemical production rate  $\Rightarrow$  afternoon concentrations