

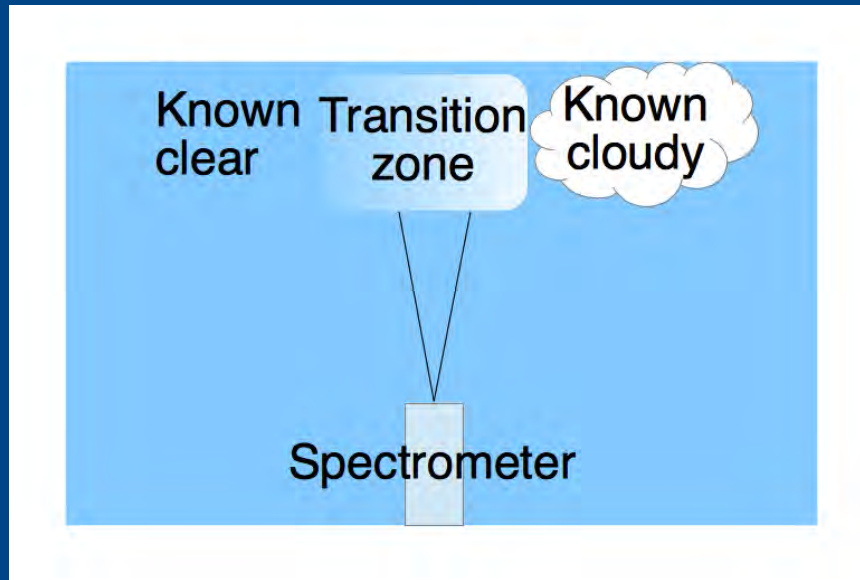
Exploring droplet variability at the cloud edge and through the cloud transition zone

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ASR 2014 Science Team Meeting
Potomac, MD



Cloud transition zone



Retrieve *qualitative* cloud properties in the cloud transition zone using m and b .

$$\frac{I(t, \lambda)}{I(t_{\text{known_clear}}, \lambda)} = \frac{I(t_{\text{known_cloudy}}, \lambda)}{I(t_{\text{known_clear}}, \lambda)} m(t) + b(t)$$

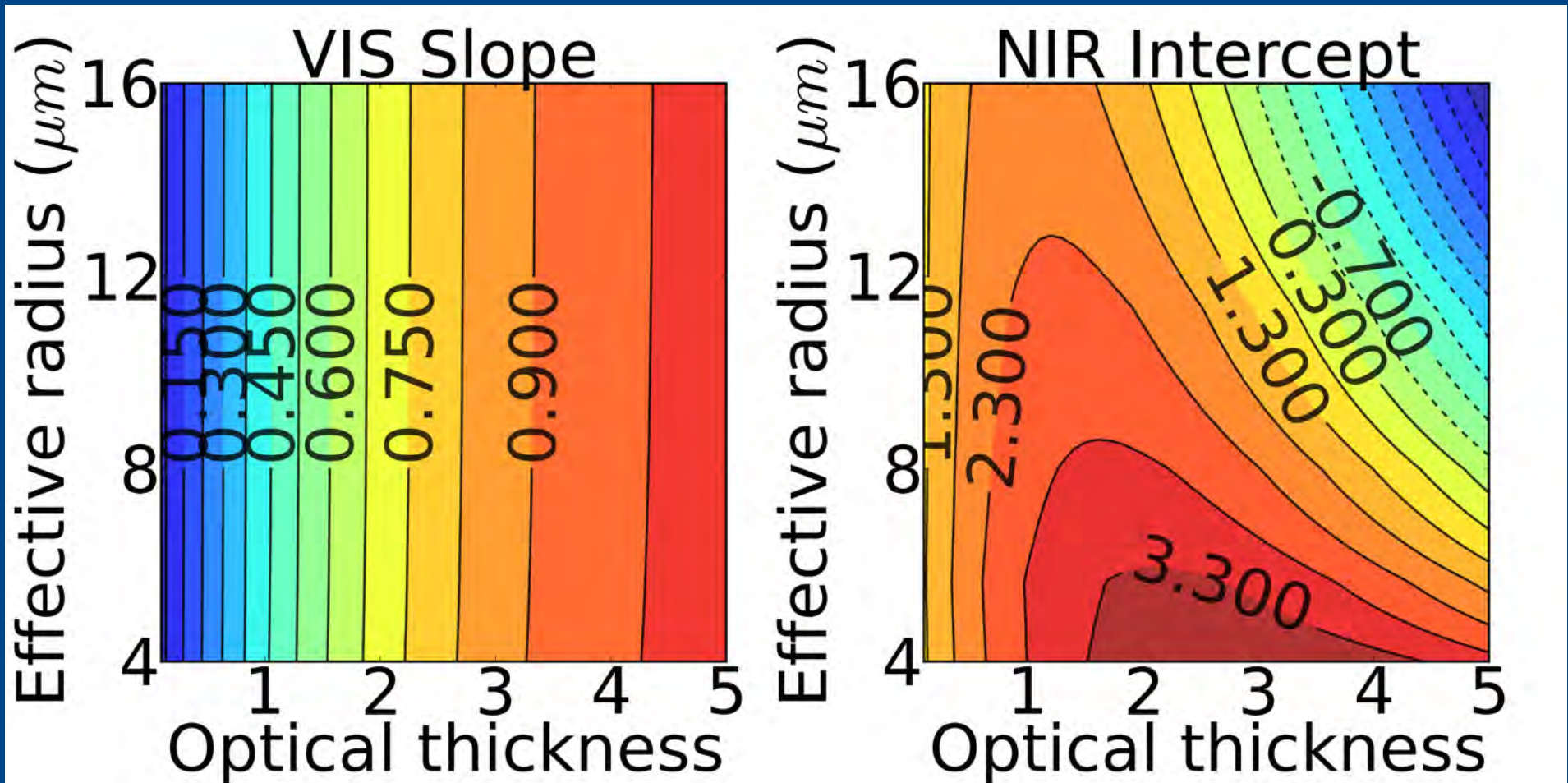
Solar spectral flux radiometer



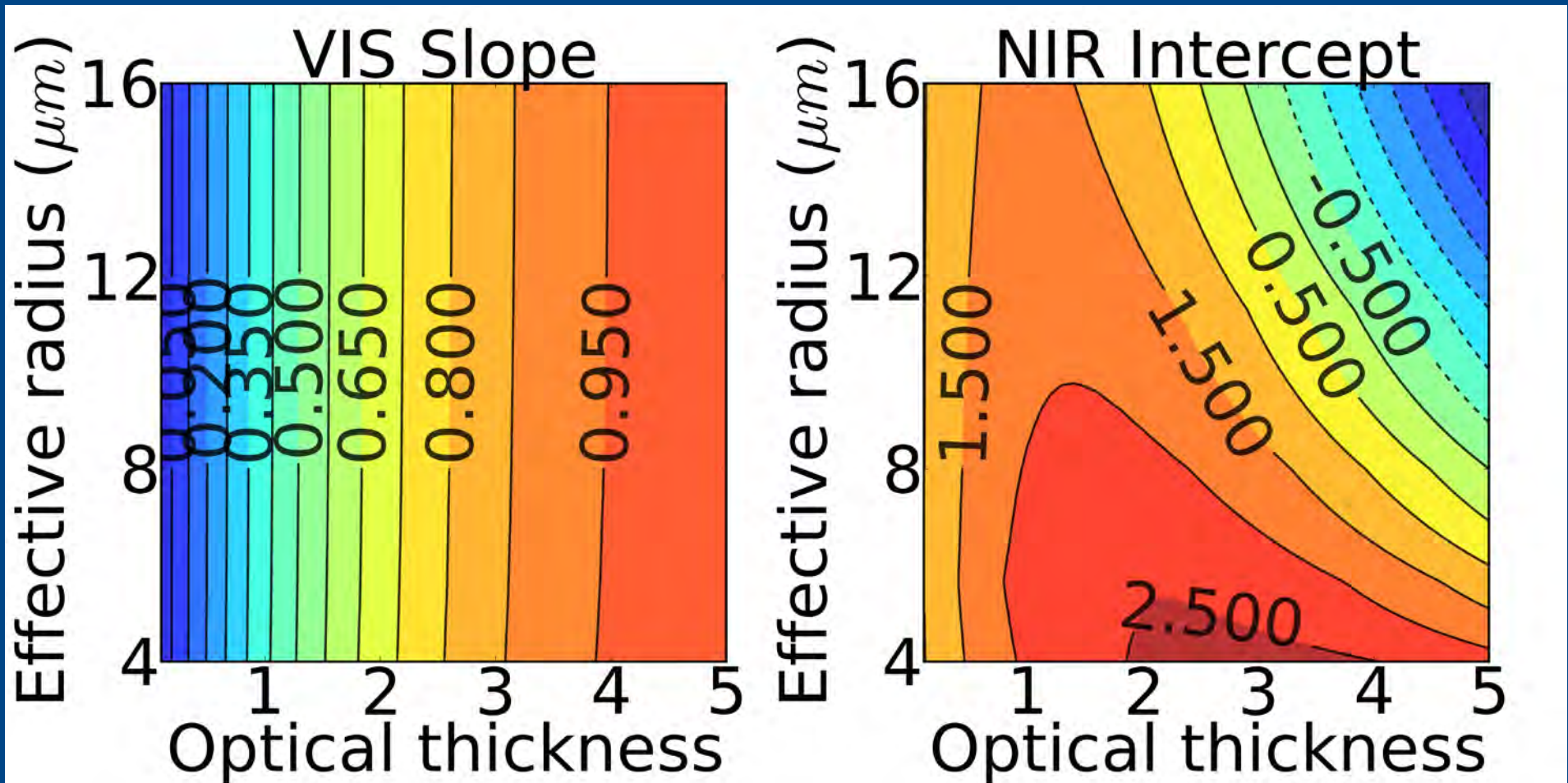
FOV 2.8°
Spectral range: 350-1700 nm
Frequency 1 Hz



Modeled slope and intercept

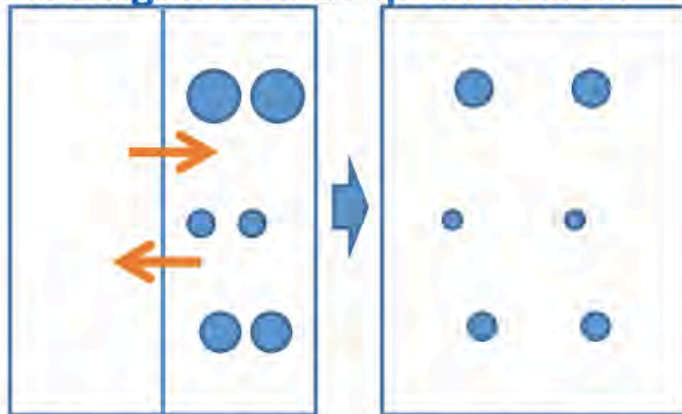


Unknown “known clear”

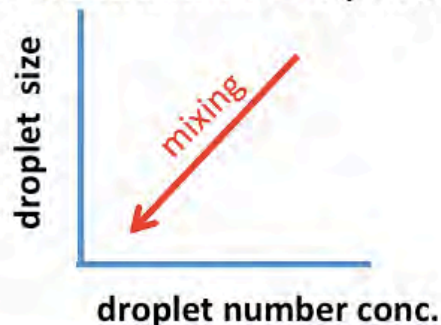


Cloud entrainment

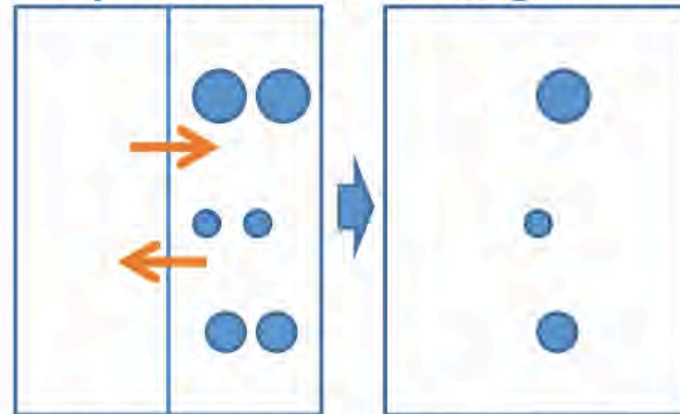
Homogeneous mixing Mixing first & Evaporate later



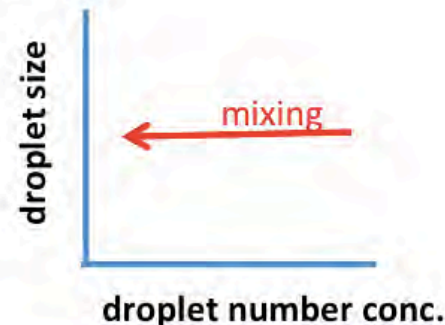
- The number concentration does not change/decreases.
- All droplets decrease their size because of evaporation



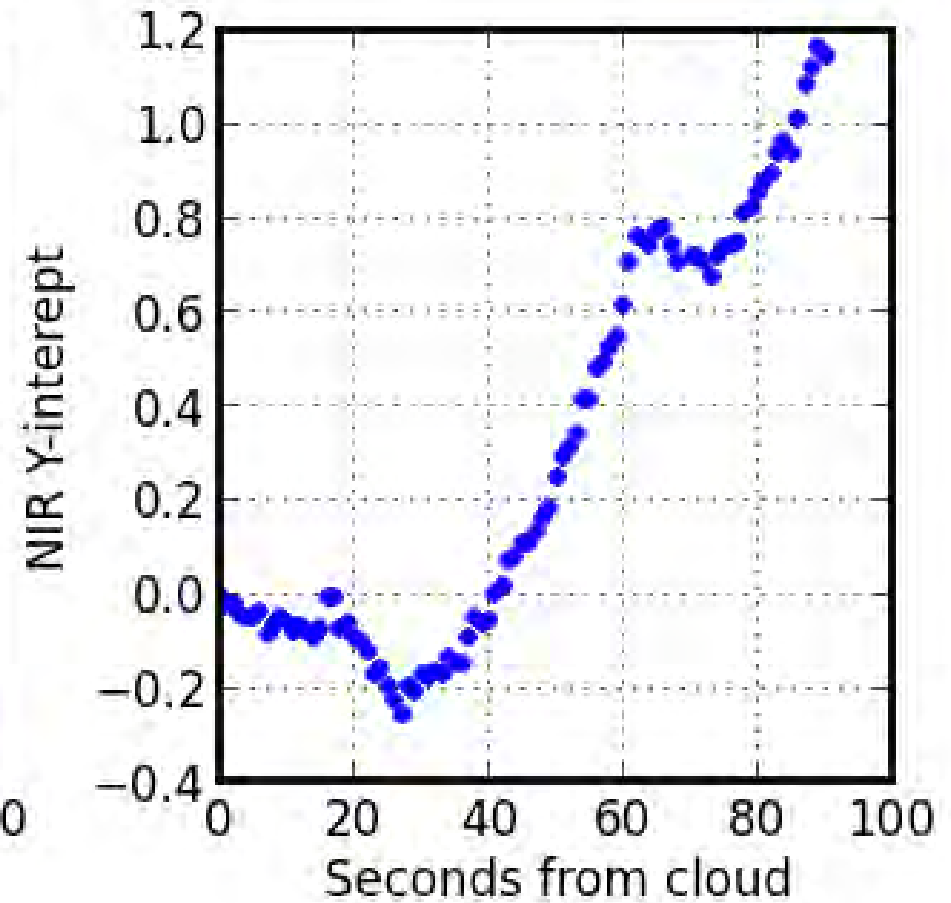
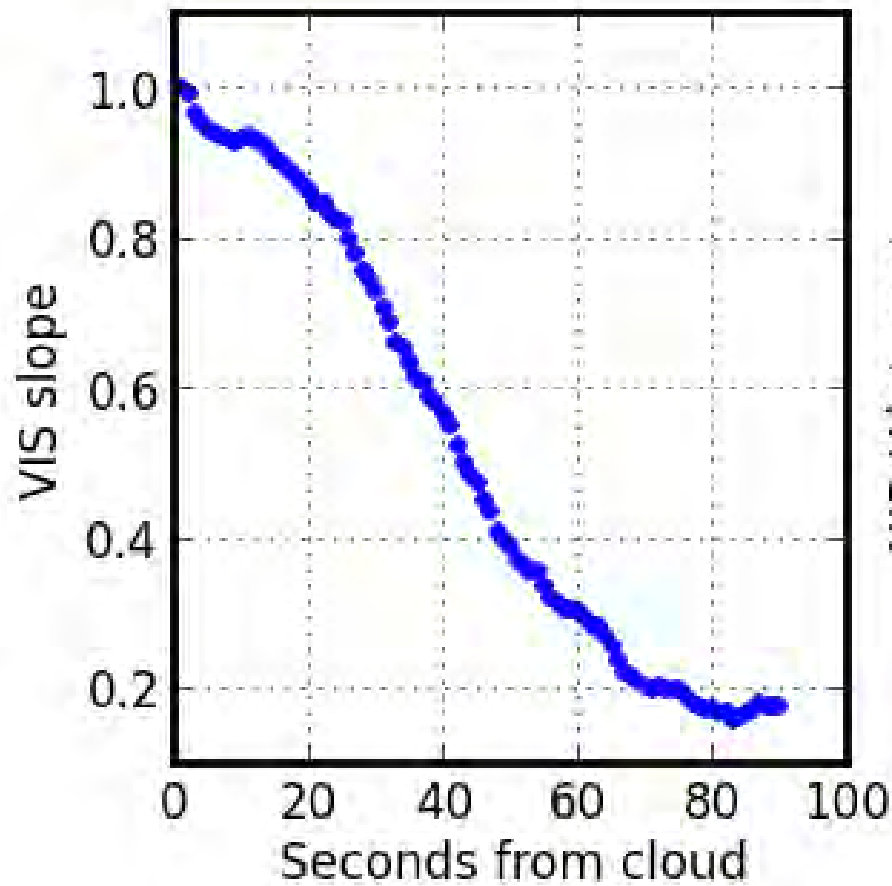
Inhomogeneous mixing Evaporate first & Mixing later



- The number concentration decreases even more.
- The surviving droplets keep their size.



Transition zone from MAGIC



Summary



- Developed a retrieval algorithm to retrieve *relative* change in cloud droplet size with 75% confidence, under the assumption of decreasing cloud optical thickness
- Results are not significantly affected by cloud contamination of the “known clear” spectrum
- Results are applicable to the study of cloud entrainment
- Example from MAGIC showed an unchanging droplet size followed by a period of decreasing droplet size which supports a homogeneous mixing scenario

The end



Results from RACORO

