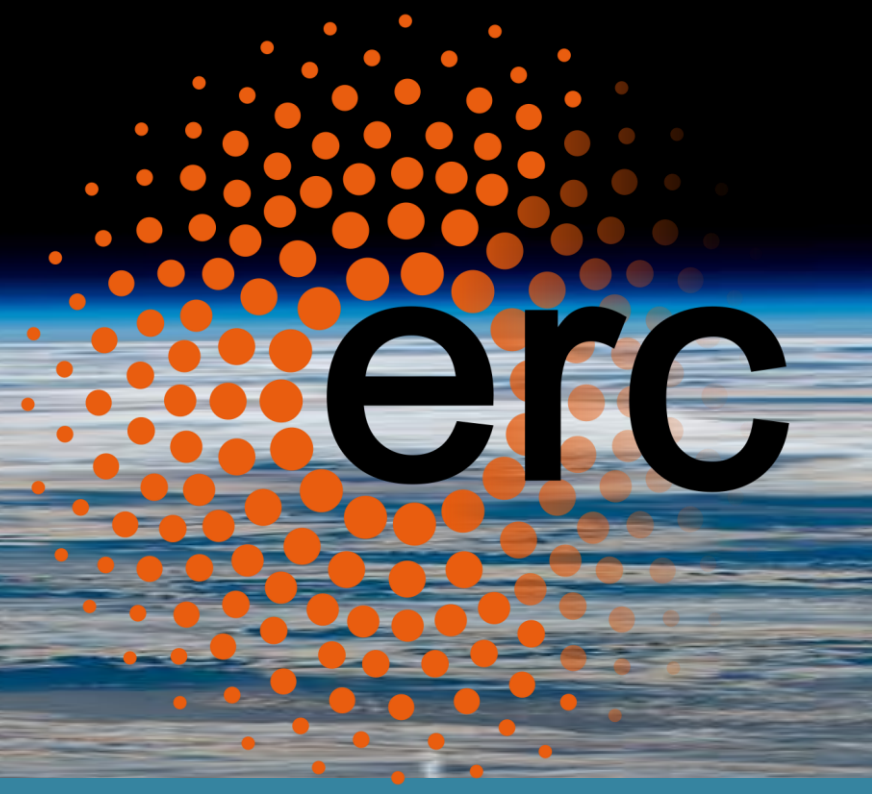


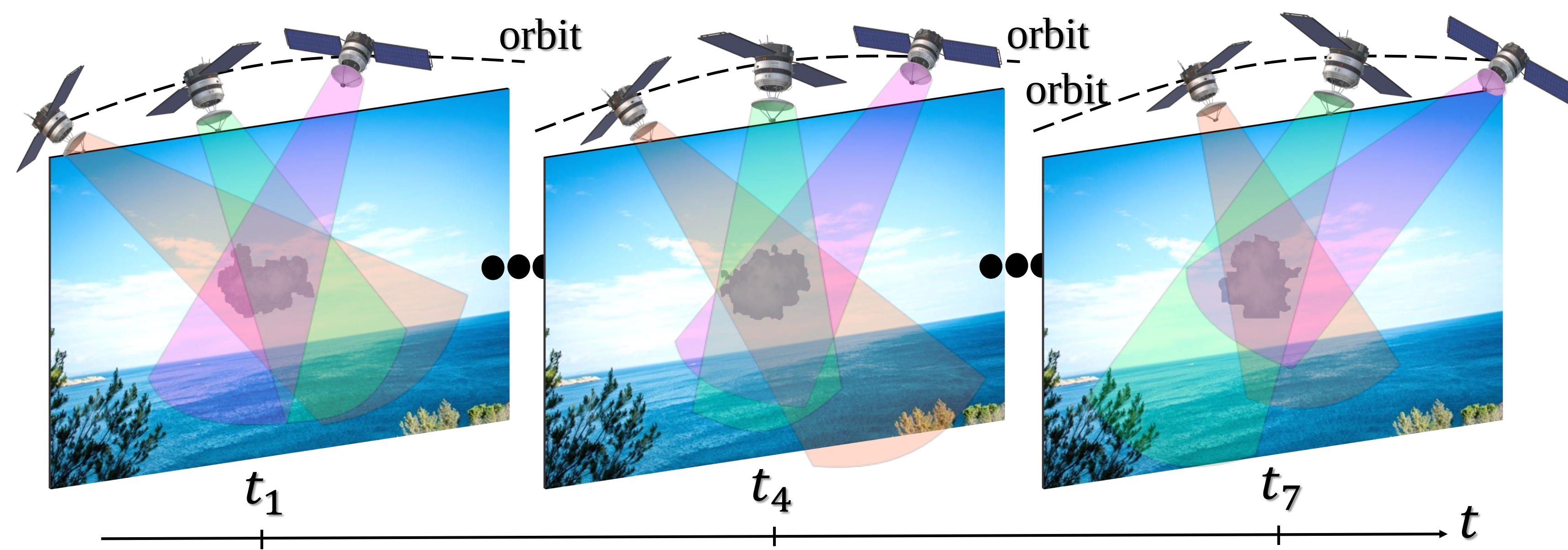
Spatiotemporal tomography based on scattered multiangular signals and its use for resolving evolving clouds using moving platforms

Roi Ronen, Yoav Y. Schechner and Eshkol Eytan



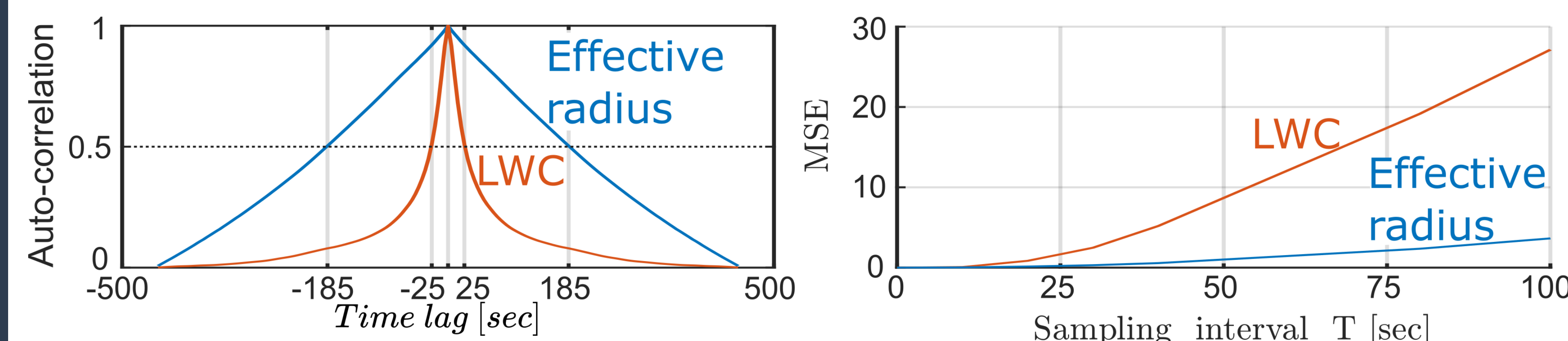
Spatiotemporal Cloud Scattering Tomography

- A cloud evolves during the imaging process
- Multiview imaging is done over time
- Cloud microphysics are retrieved spatiotemporally



Clouds: Correlation Time and Sampling

- Warm convective clouds correlation time is about $\sigma \approx 20 - 50\text{sec}$
- Efficient temporal sampling interval should satisfy $T \approx \sigma$
- Cloud liquid water content (LWC) has a shorter correlation time than its horizontally-averaged droplet effective radius r_{eff}
- Cloud LWC is retrieved in 4D, while r_{eff} is retrieved as time-invariant



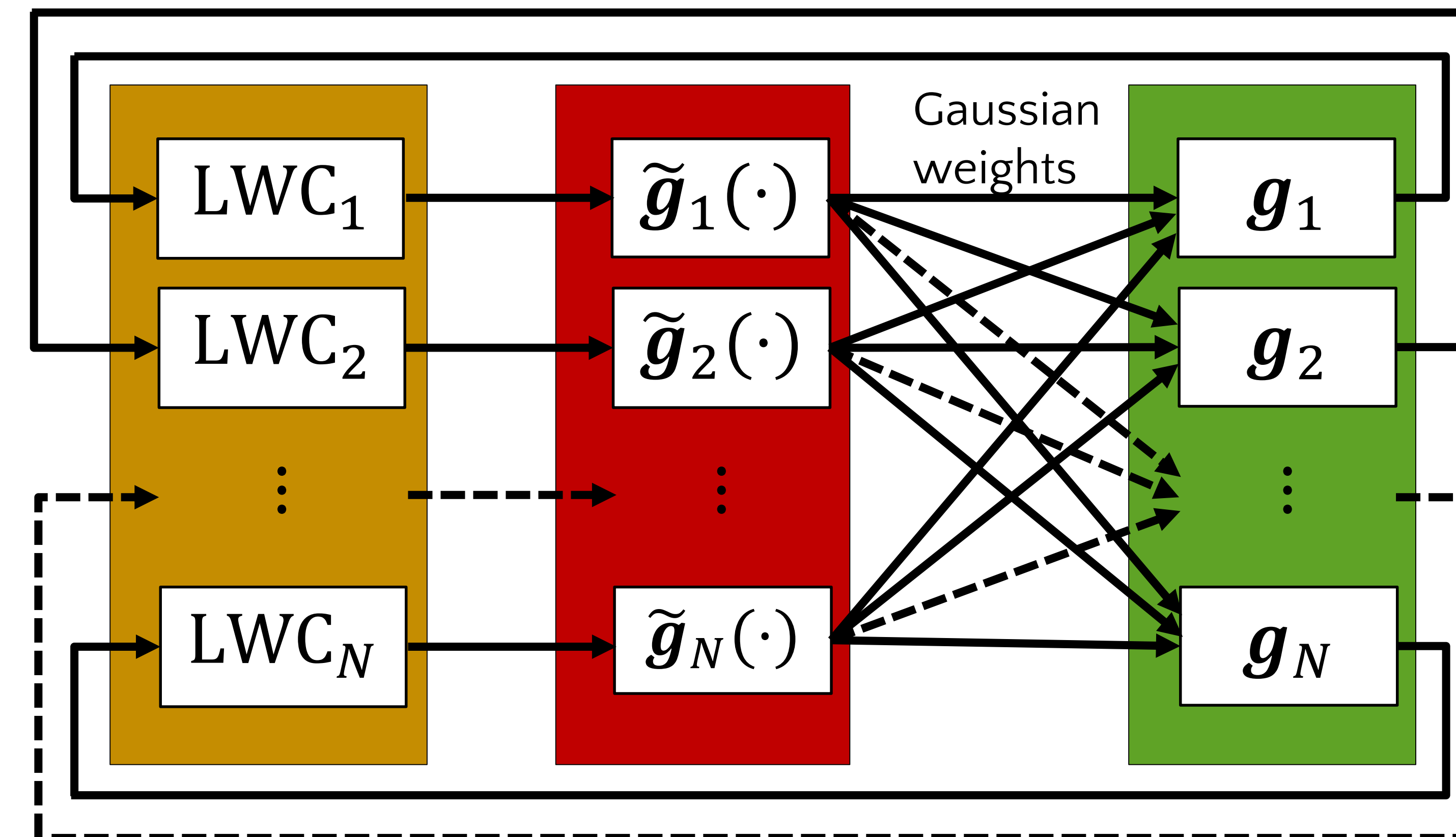
Acknowledgements

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Iterative Procedure for 4D Cloud LWC Retrieval

- Given sequential measurements, the LWC at time t at the k_{th} iteration is

$$\text{LWC}_t(k) = \text{LWC}_t(k-1) - \alpha g_t(\{\text{LWC}_{t'}(k-1)\}_{t'})$$



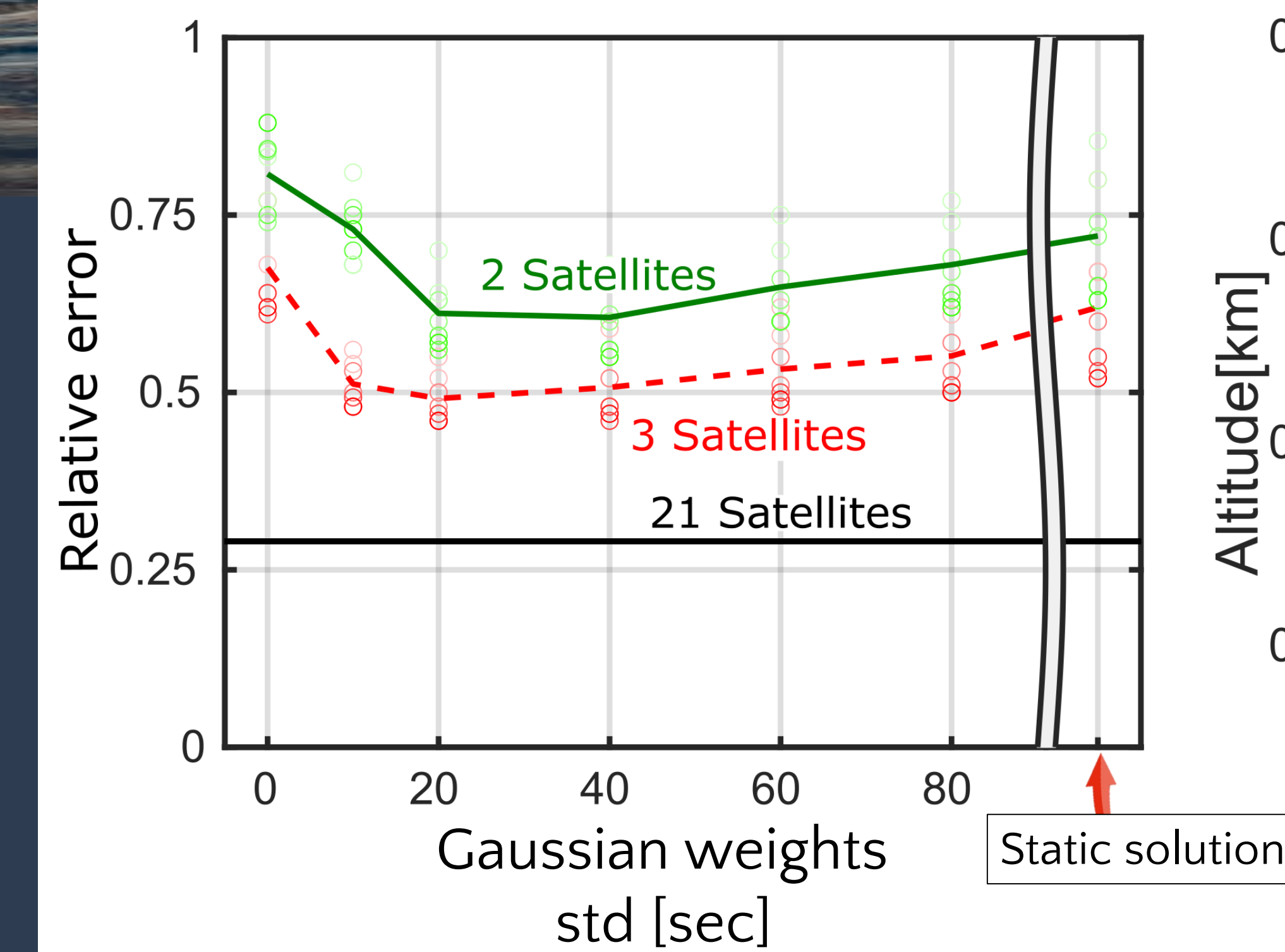
Parametric Model for r_{eff} Retrieval

- A common approximation in convective cloud models is that r_{eff} tends to increase with altitude
- We use a parametric model for retrieving r_{eff} by seeking the optimal parameters ξ_r, z_0 and r_0

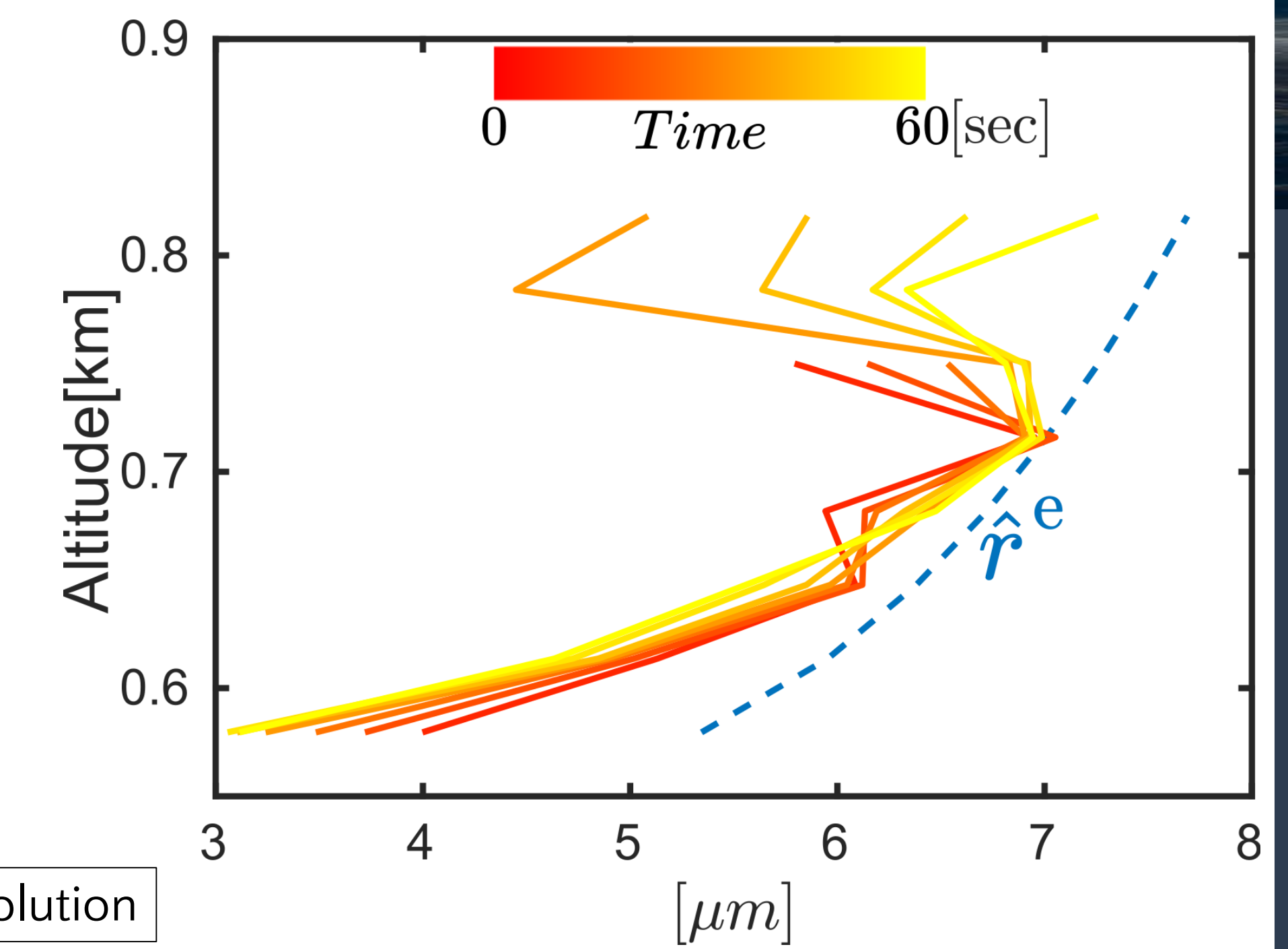
$$\hat{r}_{\text{eff}} = \xi_r(z - z_0)^{\frac{1}{3}} + r_0$$

Simulation Results

Spatiotemporal (4D) LWC retrieval



Time-invariant retrieval of r_{eff}



Real-World AirMSPI Results

