

State of vertical velocity retrievals in convective systems.

Scott Collis, Ed Zipser, Adam Varble, Scott Giangrade and Christopher Williams

Such an important parameter, so poorly understood.

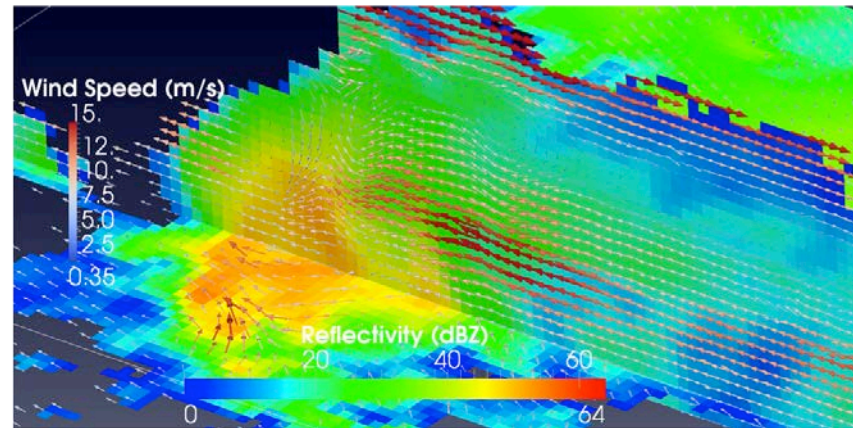
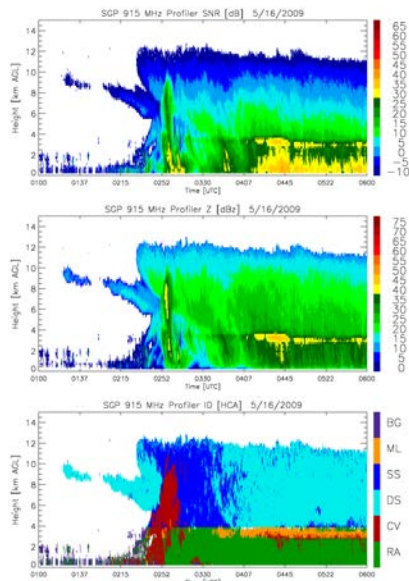
- Intimately related to microphysical habits in cirrus generated by parent convection and resulting radiative feedbacks.
- Near impossible to directly measure
- Hard to remotely sense
- Even harder to verify

“Truth in vertical velocity retrievals? That sounds really hard.....”

-Anon-
(I will not name names)

What can we do?

- Historically two scales of observation being related to two different scales of modeling.
- Observational scales on the three dimensional cloud and “soda straw” scales ($< 1\text{km}^2 < 1\text{ km}^3$), in situ poorly utilized.
- Modeling scales on the climate, regional (NWP) and cloud scale.
- Different process occur at different scales, so comparison is very difficult.
- The **big question** is what does a measurement at a particular scale represent? What is the sub scale uncertainty / variability? What are the tradeoffs for wider coverage in the spatial and temporal domain?



20,000ft view

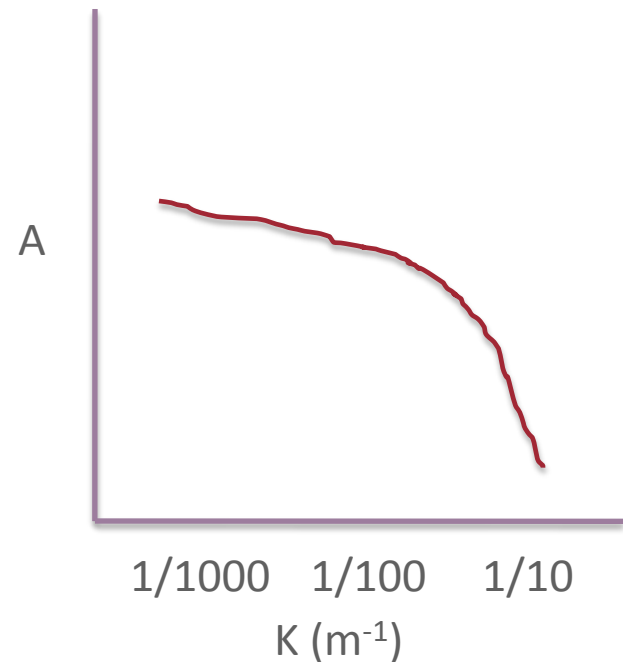
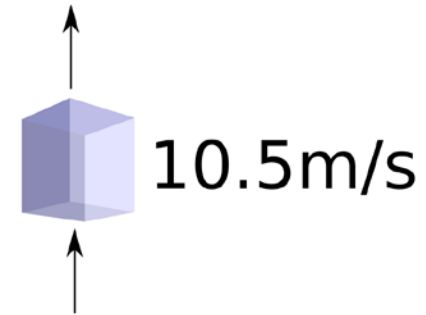
Technique	Spatial	Temporal	Issues
Variational retrievals from Doppler	1x1x0.5km	~6 min	Mass continuity, artifacts, topping/bottoming storms, need hydrometeors.
UHF profiler	~500m	6s	Fall speed correction.
Dual frequency (VHF/UHF)	~500m x 60m	1m	VHF systems are rare. Human in the loop.
In-situ	A few meters	seconds	Statistical significance, safety.

Roadmap

Technique	Maturity	Automation	ARM implementation
Variational retrievals from Doppler	Old in case study mode, not in climate	Automateable	Evaluation products for MC3E/TWP-ICE, VAPs after going through VAP WP process.
UHF profiler	Old in case study mode, not in climate	Automateable	PI products for MC3E, looking towards VAP development.
Dual frequency (VHF/UHF)	1990's	PI	PI products from MC3E
In-situ	A few meters	Ha!	IOPs only.

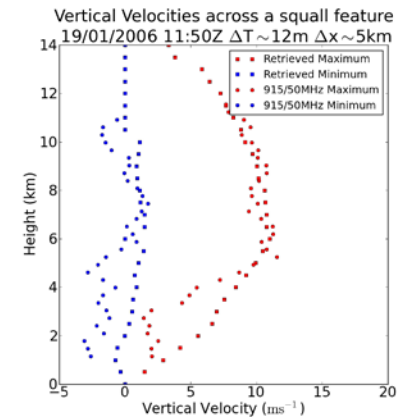
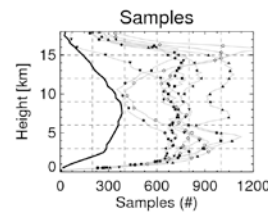
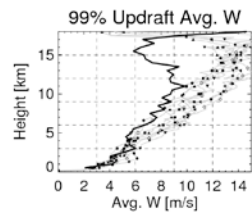
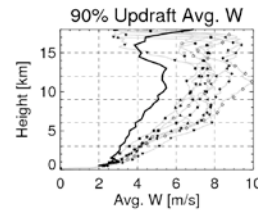
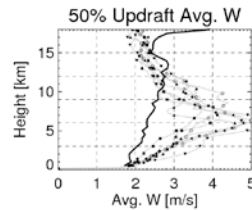
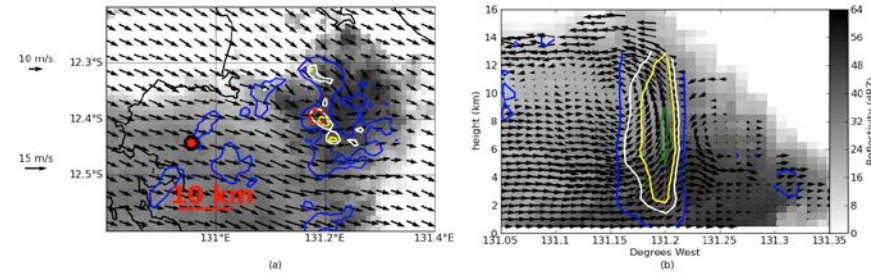
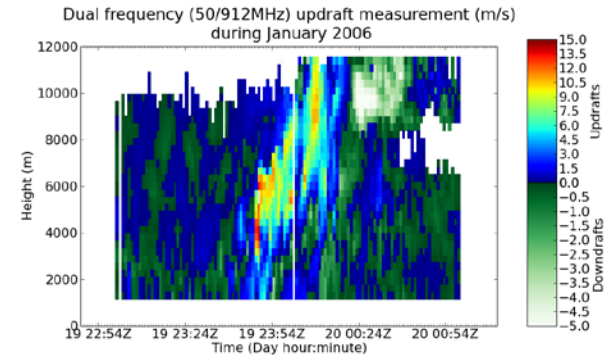
What are we measuring?

- What is the subgrid scale variation in w ?
- Various CRM runs for the TWP-ICE model intercomparison exercise have w greater than dual Doppler until they are degraded to the same resolution.
- Does this mean 3DVAR radar is not resolving updrafts or are CRMs driving to smaller updrafts bounded by mass flux forcing?
- What is the spectra of w ?



Synergistic approach

- No one measurement is a silver bullet
- Measurements cross cut ASR science



Synergistic approach

