

# Creating data products to classify atmospheric state

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# Motivation

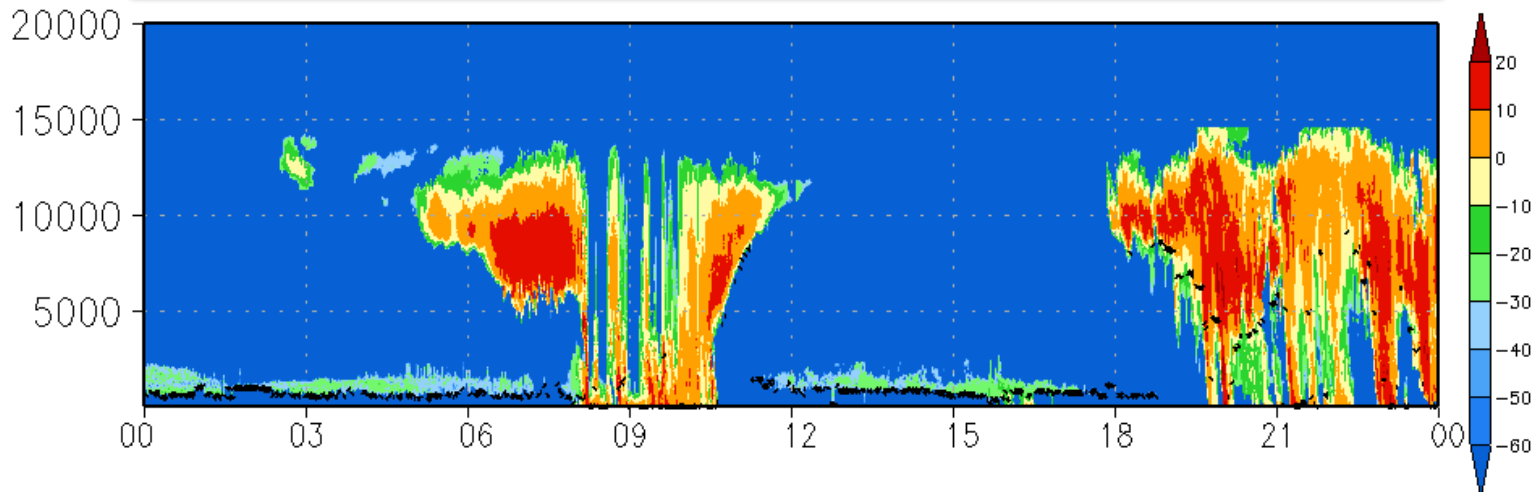
- Cloud classification VAPs to identify periods of shallow cumulus for LASSO
- Discussion: Previous feedback indicates something like this would be useful for creating composite statistics of long-term ARM data sets for model comparison (e.g. cloud existence)

**Value Added Product:**

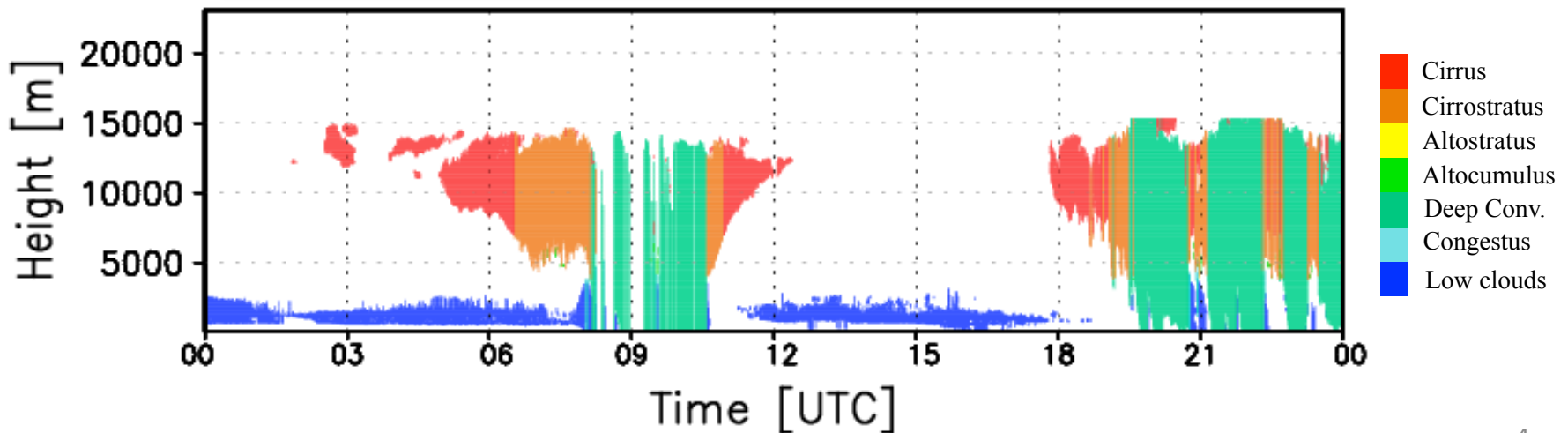
**1. CLDTYPE (Classified Cloud Types)**

# Example of classified cloud types

Time-height evolution of radar reflectivity from MMCR at the ARM SGP C1 site on 24 May 2008



classified cloud types



# Simple definition of cloud types relying on cloud macrophysical quantities such as cloud height and thickness

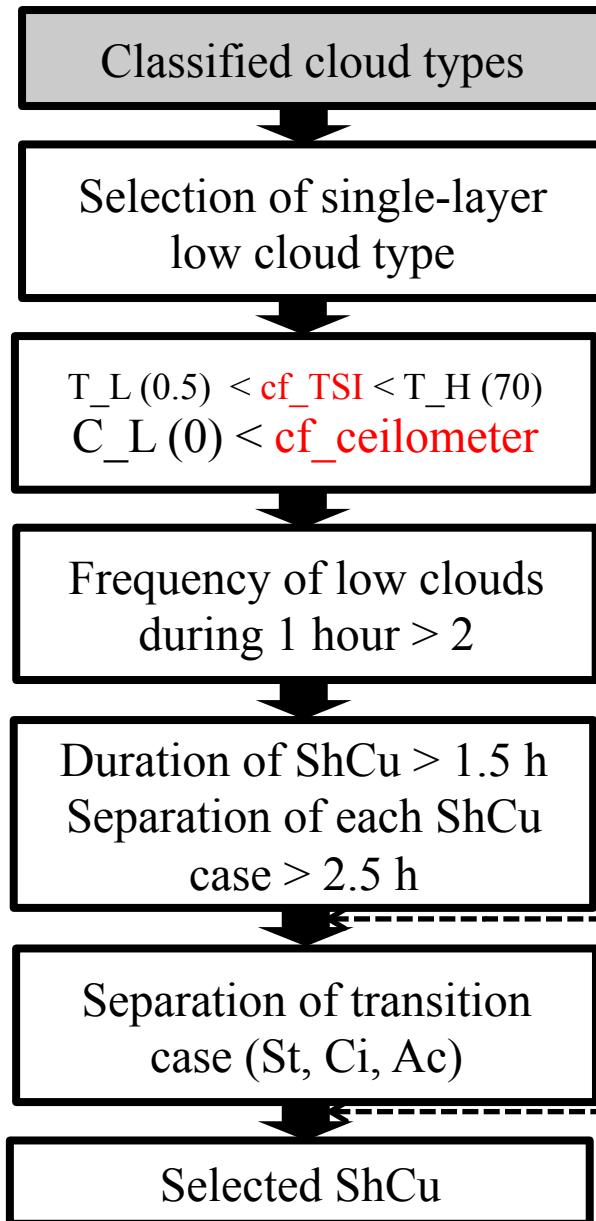
Cloud type	Cloud base	Cloud top	Cloud thickness	Frequency
Low clouds	< 3.5 km	< 3.5 km	< 3.5 km	
Congestus	< 3.5 km	3.5 - 6.5 km	$\geq 1.5$ km	
Deep convection	< 3.5 km	> 6.5 km	$\geq 1.5$ km	
Altostratus	3.5 - 6.5 km	3.5 - 6.5 km	< 1.5 km	
Altostratus	3.5 - 6.5 km	3.5 - 6.5 km	$\geq 1.5$ km	
Cirrostratus/Anvil	3.5 - 6.5 km	> 6.5 km	$\geq 1.5$ km	
Cirrus	> 6.5 km	> 6.5 km	No restriction	

- ❑ **Advantage:** It can be easily duplicated in cloud resolving models including a large-eddy simulation (LES) model.
- ❑ **Disadvantage:** The classified cloud type using this method is sensitive to pre-defined threshold values.

**Value Added Product:**

**2. ShCuTime (Shallow cumulus period)**

# Schematic diagram of ShCu selection procedure



❑ **cf\_TSI**: Alto Cumulus have larger opaque TSI cloud fraction.

❑ **cf\_ceilometer**: Detected cloud base information from ceilometer is the critical component to distinguish the real clouds from smoke plume.

▪ Check Cf\_T during ShCu

▪ Incorporate VISST  
Cf > 25%  
Cld\_top > 7.5 km

## Evaluation of algorithm using manually identified ShCu from Berg & Kassianov (LB08) and Zhang and Klein (ZK13) during 9 years (2000-2008)

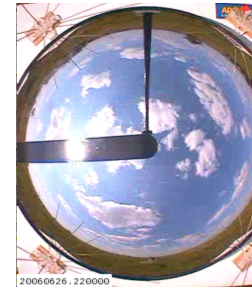
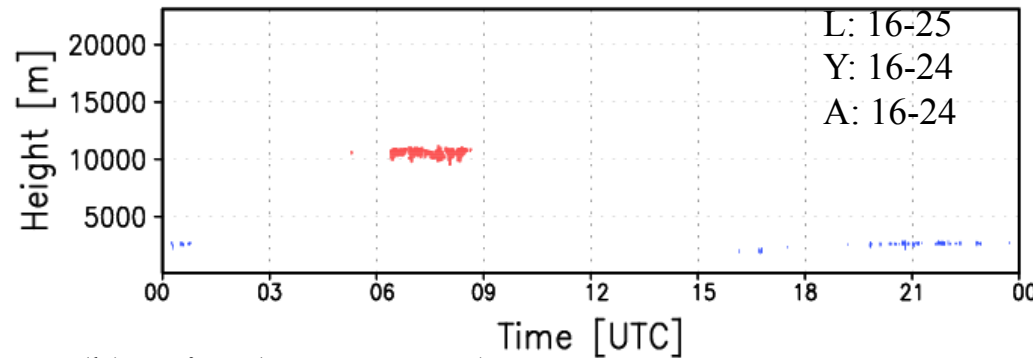
Hit	Miss	Overlap	False positives	Transition	Data issues
Both (Either)			(Large-scale/smoke/Ac)		
35 (59)	5	9	17 (3/1/10)	15	17

- ❑ Based on a comparison of our samples with the dataset from both in LB08 or ZK13, our method shows 61 percent success rate.
- ❑ If we consider any hit from either LB08 or ZK13, our method shows 73 percent agreement.

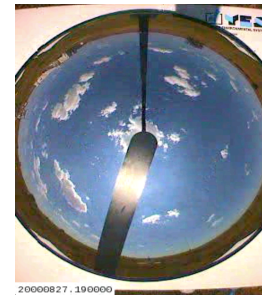
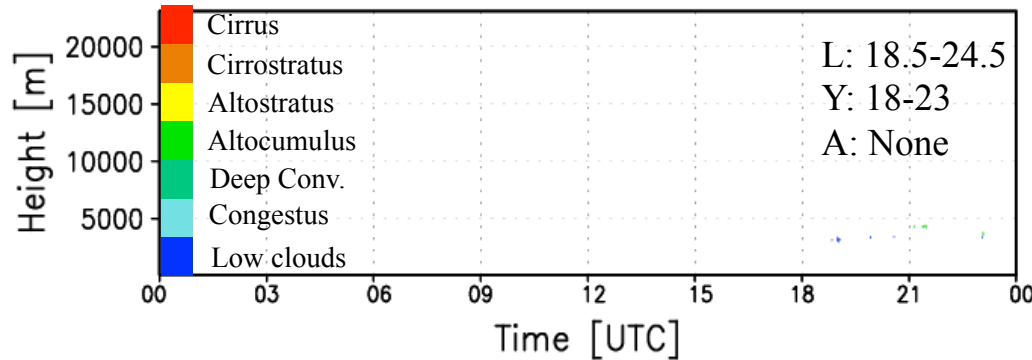


# Example of Hit, False positive impacted by large scale, Miss, Overlap cases.

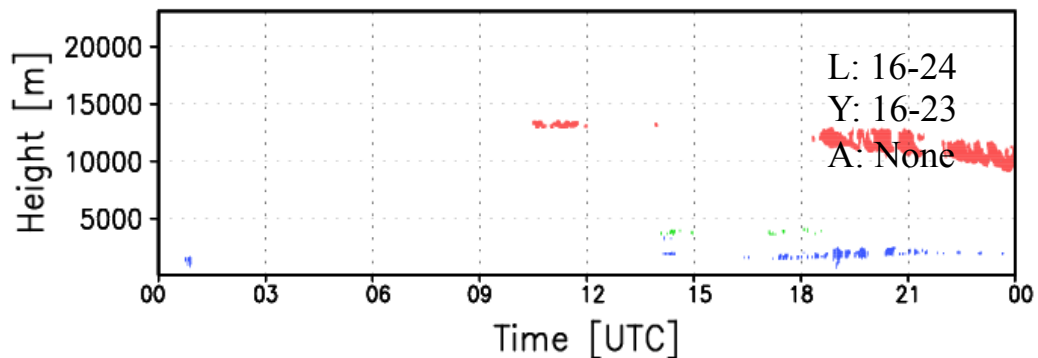
(a) Hit (2006.06.26)



(b) Miss (2000.08.27)



(c) Overlap (2001.06.26)



# Questions & Discussion:

- Is a general cloud type classification of interest at other sites besides SGP?
- What other indices are of interest to describe the atmosphere or partition ARM observations?