

Characteristics of Shallow Cumulus inferred from ARM observations over the Southern Great Plains



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Introduction



Fig. 1: forced vs. active shallow cumulus

Shallow cumulus clouds occur very often during summertime over large areas at US Southern Great Plains (SGP). On some days one observes only forced clouds whereas on other days active

clouds are present accompanied with forced clouds. (Fig. 1) We expect that dynamic and thermodynamic cloud properties to be different between forced and active clouds. We select and catagorize 13 years (1997-2009) of ACRF SGP observations of daytime shallow cumulus. Specifically we use "thin" and "thick" cloud criteria (daytime-averaged cloudthickness greater or less than 300 meters) to represent forced or active cloud days and try to answer the following questions:

1. How different are cloud properties and their radiative impacts between days with "thin" versus "thick" clouds?

2. How do environmental conditions differ between days with thin and thick clouds and do the differences provide any clues as to what controls the vertical extent of shallow cumuli?



4 km

3 km

1 km

Case Selection Criteria (Fig.2)

1. No precipitation 2. Boundary layer development under 4 km 3. Gradually rising cloud base 4. Diurnally varying cloud fraction and thickness 5. Less affected by previous night conditions 6. Not or less affected by other weather phenomena

Data Used for case selection

1. ABRFC precipitation 2. ARSCL cloud data 3. Satellite Images (NASA Langley Minnis Group) 4. Total Sky Imager images 5. Shallow cumulus index (2000-2007) (Berg and Kassianov, 2008)





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