# The Where and Why of Tropical Thick Anvil

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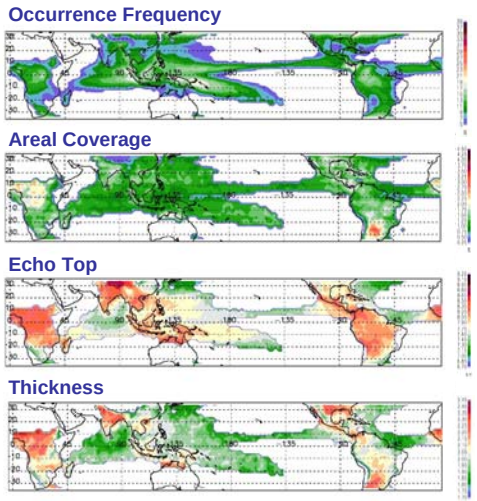
## 1. Introduction

This poster presents the geographical distribution and interannual variability of tropical anvil (i.e., thick, non-precipitating cloud associated with deep convection) observed by the TRMM Precipitation Radar (PR) from 1998-2007. Convective characteristics and variations in the large-scale environment (i.e., shear and humidity) associated with anvil production are also explored.

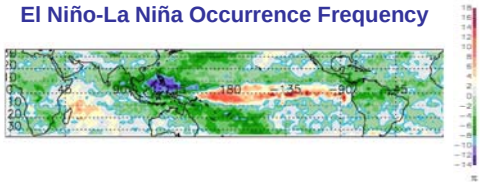
In order to quantify the amount of anvil that the PR is missing due to its lack of sensitivity to smaller hydrometeors, coincident TRMM PR-CloudSat Cloud Profiling Radar (CPR) overpasses were examined.

## 2. TRMM PR Anvil Climatology



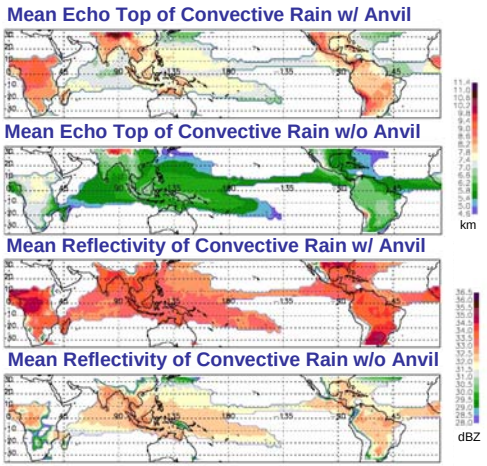

- Anvil occurs most frequently over the Maritime Continent and West Pacific, but covers the largest area over tropical Africa.
- Anvil over land is higher and thicker than over ocean.

## 3. Interannual Anvil Variability due to ENSO



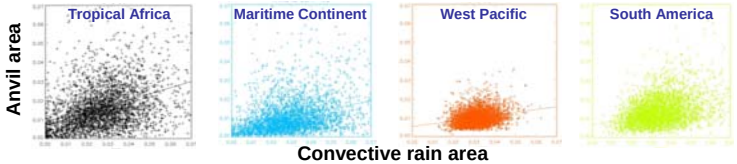

- Anvil occurs more frequently over the Pacific ITCZ and Indian Ocean and less frequently over the Maritime Continent during El Niño compared to La Niña.

## 4. Convective Characteristics



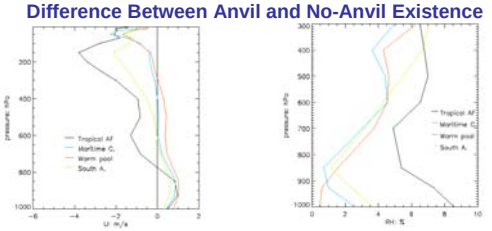

- Deeper and more intense convection is prone to generate thick anvil.

## 5. Anvil Area vs Convective Rain Area



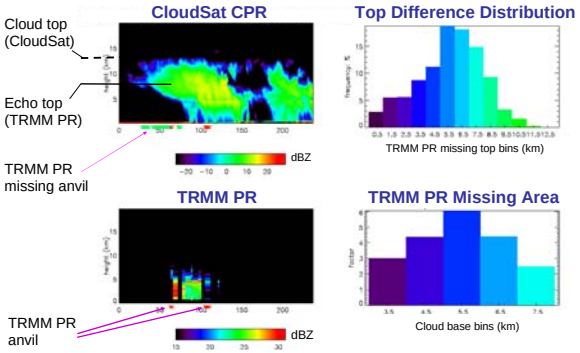

- The ratio of areal coverage of thick anvil to convective rain ranges from 1.6/7 to 3/7.
- More anvil occurs over land than over ocean per unit convection.

## 6. Large-scale Environment




- Strong upper level shear assists anvil formation.
- Anvil occurrence is associated with moister mid-to-upper levels.

## 7. Clousat vs TRMM PR




- The PR misses ~5 km near cloud top and a factor of 4 in the horizontal.
- Anvil observed by the CPR is defined as cloud base between 3 and 8 km (Riley and Mapes 2009).

## 8. Future Work

Thin cirrus is part of mature tropical convective systems and has different radiative properties than thick anvil. Future work will examine the climatology of cirrus and the importance of its radiative heating to the total diabatic heating and its large-scale impact.

Reference

Riley, E. and B. Mapes, 2009: Unexpected peak near -15° C in CloudSat climatology. Submitted to *Geophys. Res. Lett.*