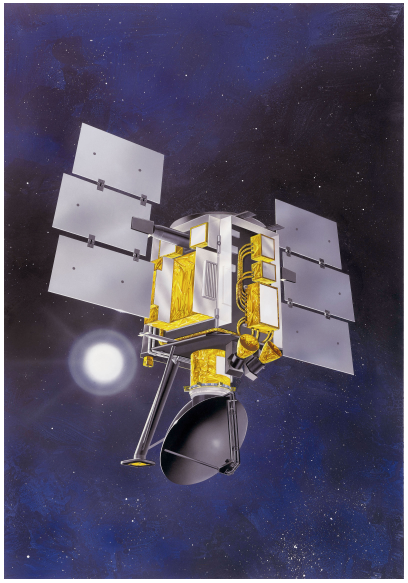
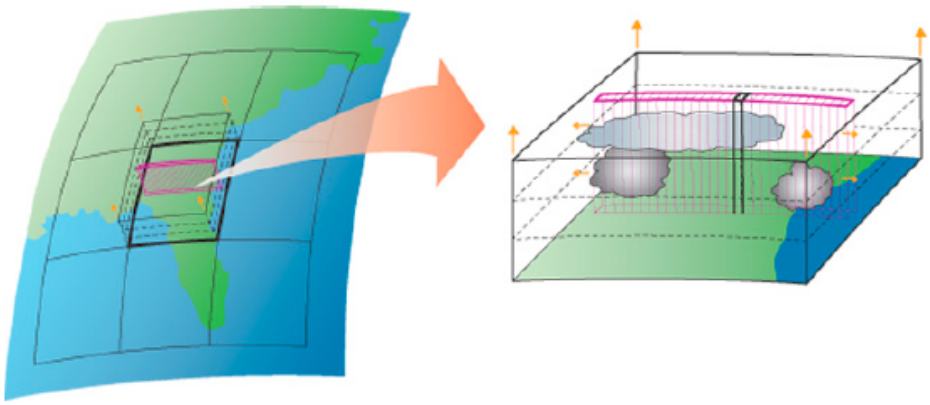




Documenting the Transition from Light To Heavy Rainfall in the Tropics

Greg Elsaesser
2011 CMMAP Grad Colloq

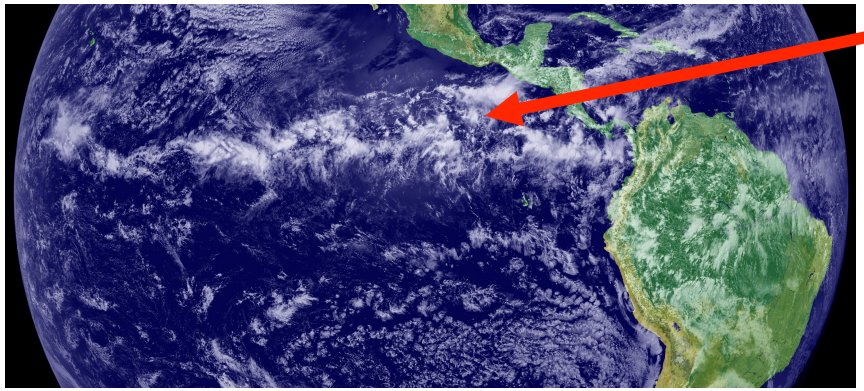
In spare time…

Rest of time…

Investigate properties of tropical Rainfall using both observations and models.

Why?

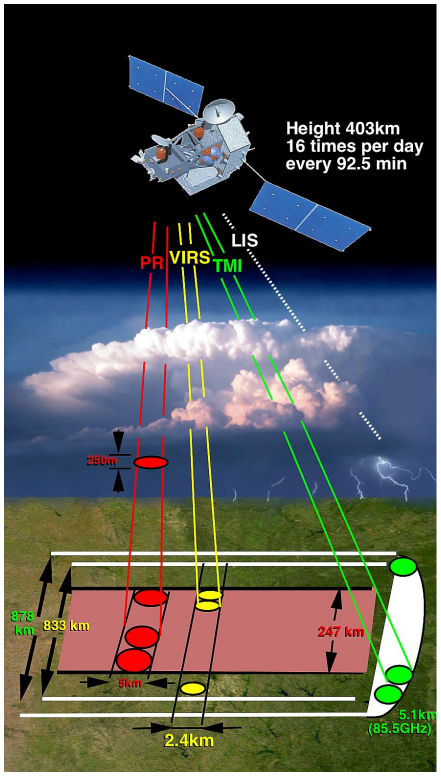
-Most obvious: water and prosperity are intertwined



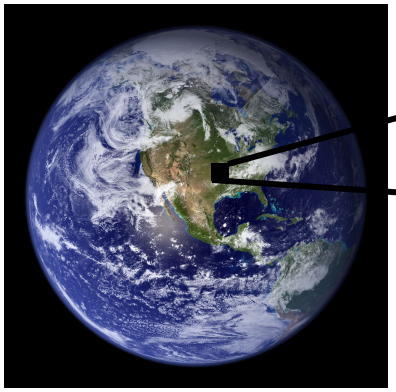
-Notice the various types of raining systems; many climate models have difficulty simulating the transition from Light to heavy rain, variability of raining clouds for "heavily convecting" locations, for eg.

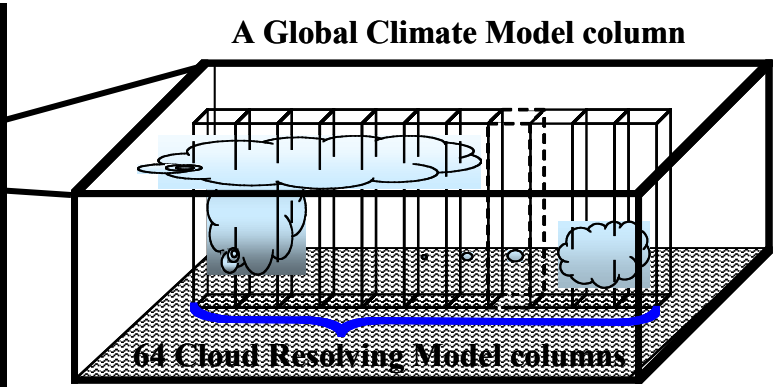
My Approach to problem entails a collaborative effort

Use state-of-the-art satellite observations…



…and a state-of-the-art climate model.





Attempt to derive picture of rainfall pick-up on short (sub-daily) timescales

- In general, the following affect cloud growth (not necessarily all inclusive):

- Moisture (Lack of it can inhibit cloud growth)
- Convective Available Potential Energy (CAPE); related to buoyancy, and it is important for deep cloud growth
- Convective Inhibition (CIN); acts as a “cap” and prevents widespread development of rainfall
- Presence of lifting mechanisms. Boundaries / cold pools for instance. Mechanisms such as these are unresolved in current climate models.

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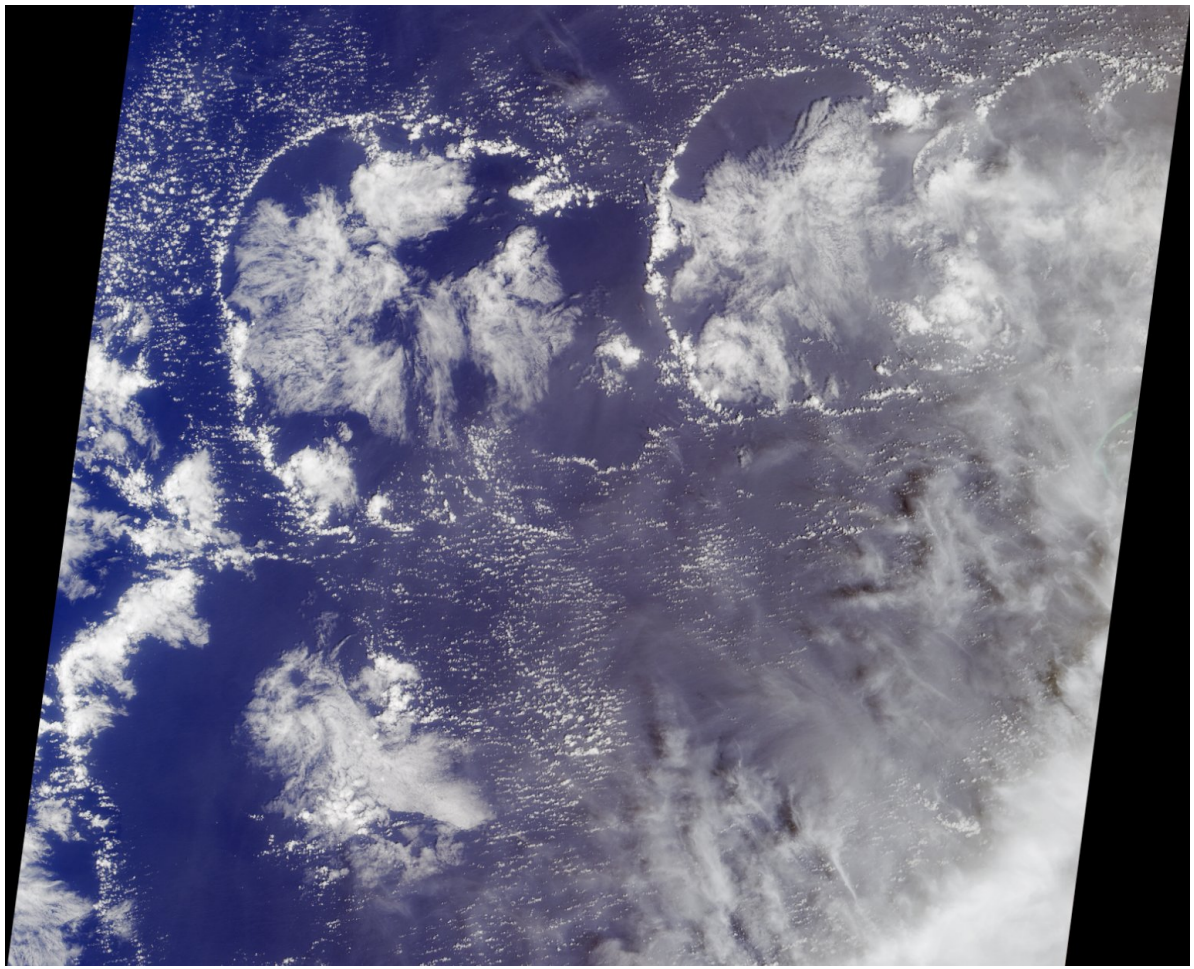
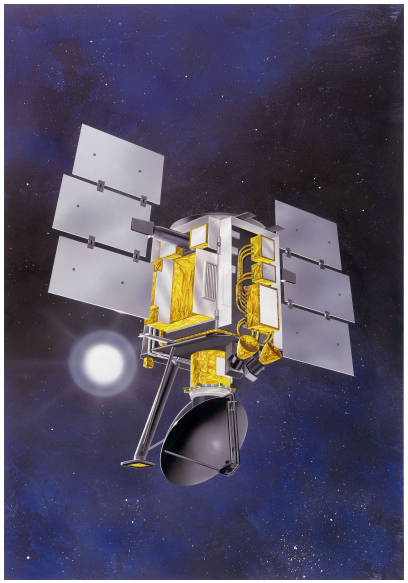
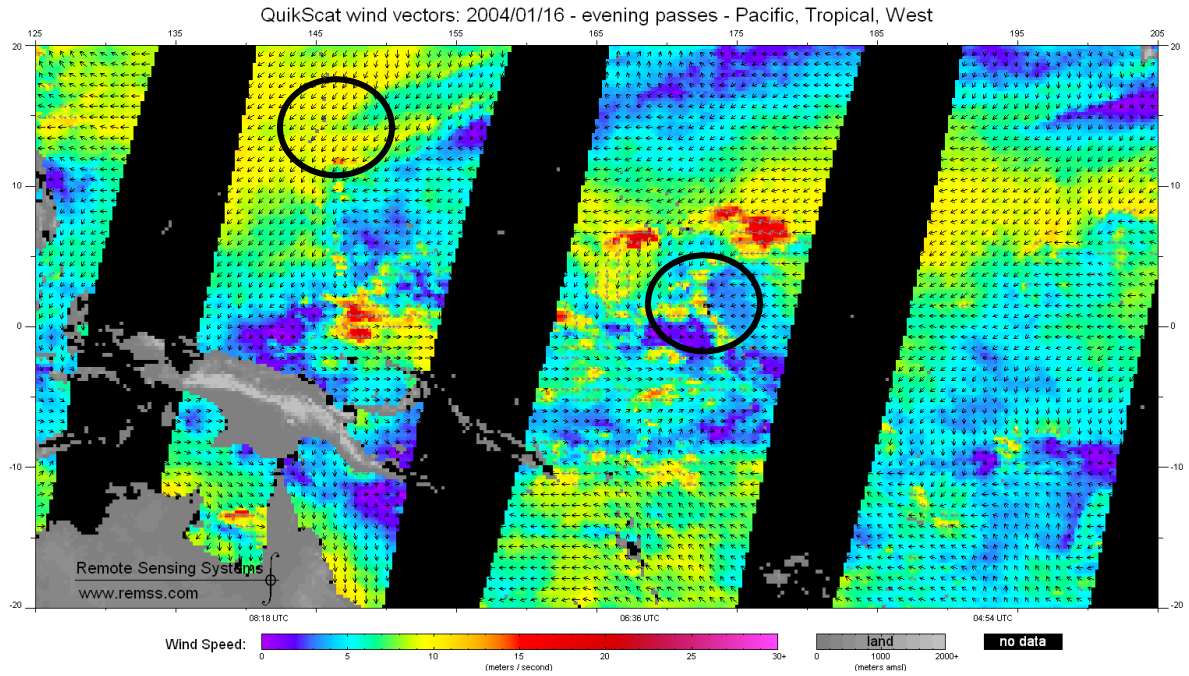
DIFFICULT TO OBSERVE!

What might cold pools look like?



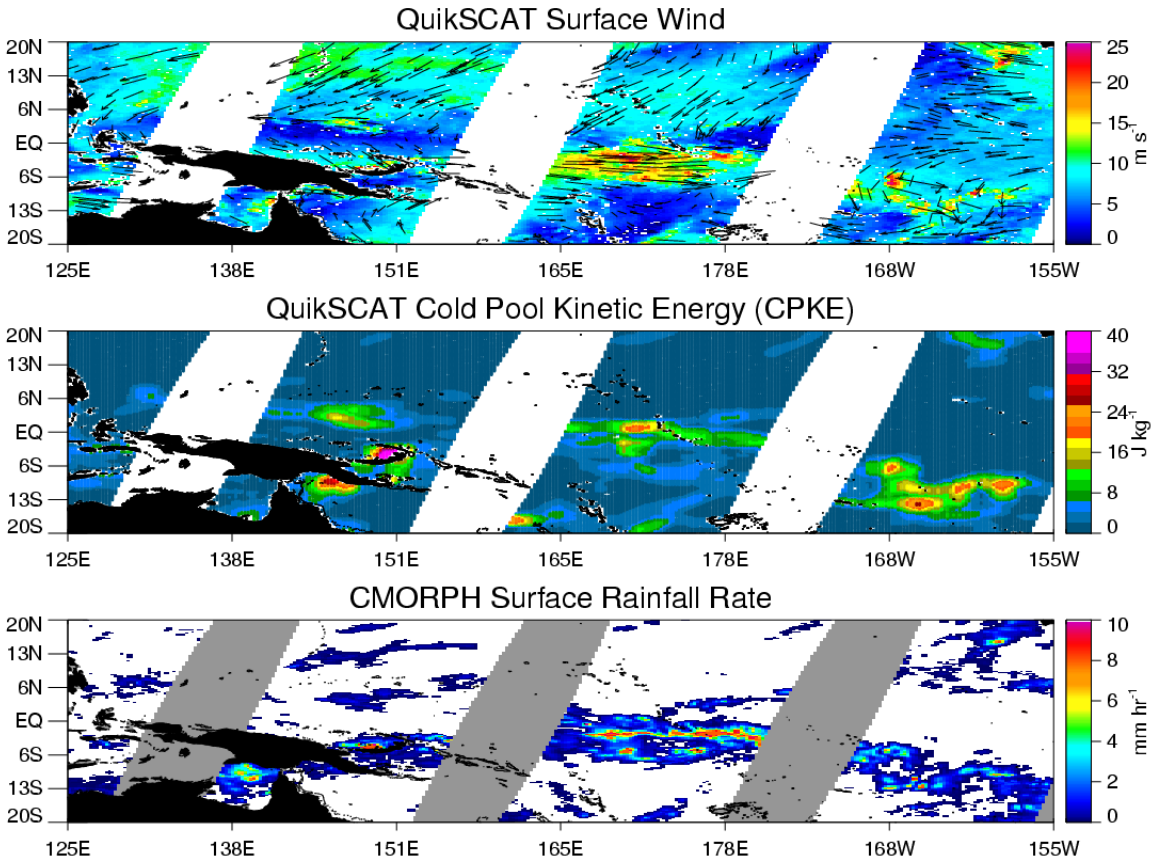
Make attempt to observe from satellite



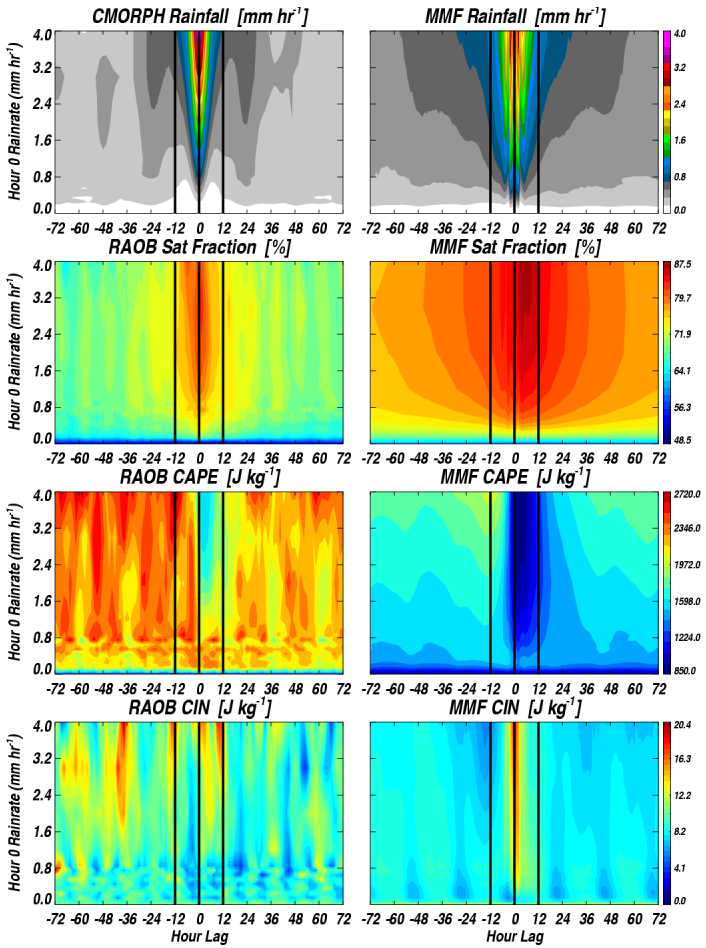


Look at wind vector fluctuations; convert to an energy unit. Call it cold pool kinetic energy (CPKE)

From a satellite perspective (QuikSCAT), it looks like this:



Put everything (moisture, CAPE, CIN, CPKE and rainfall) together



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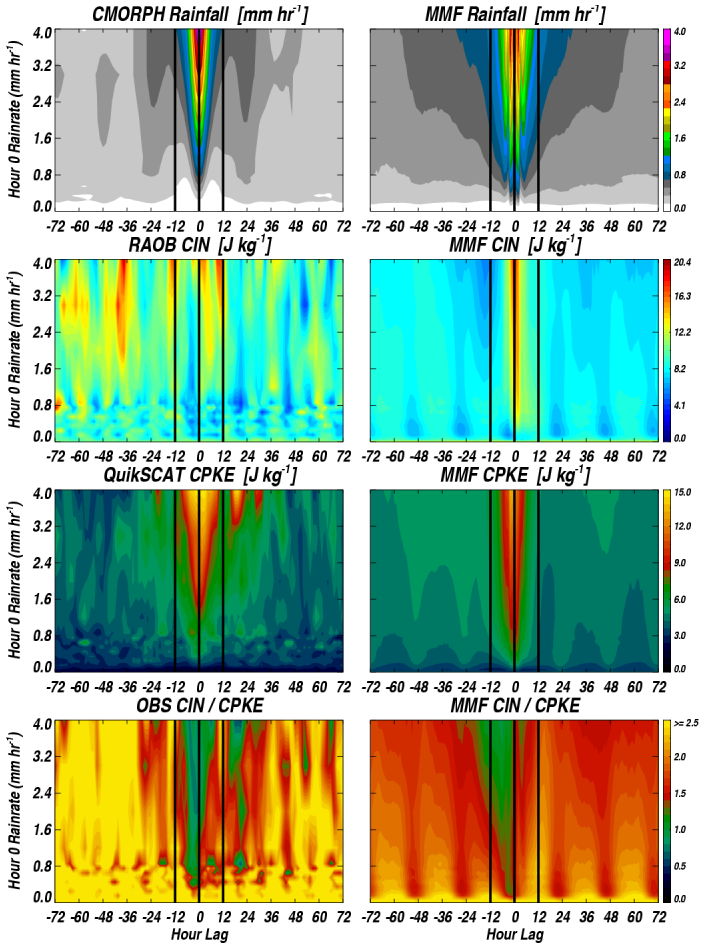
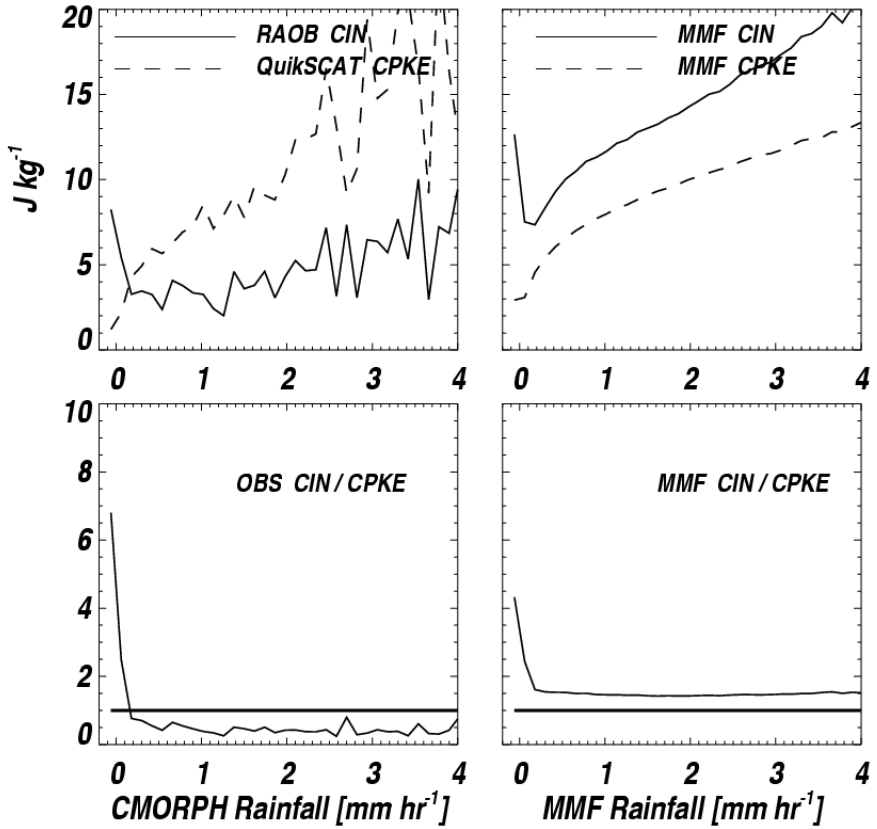


Summary



Transition from light to heavier rainfall may Occur when CIN and CPKE are comparable in magnitude…

CAPE and increased relative humidity are necessary- but maybe don't dictate the time at which rainfall really begins increasing…?