Input for the Convective-Stratiform Anvil Transition Group

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A partnership between CSIRO and the Bureau of Meteorology

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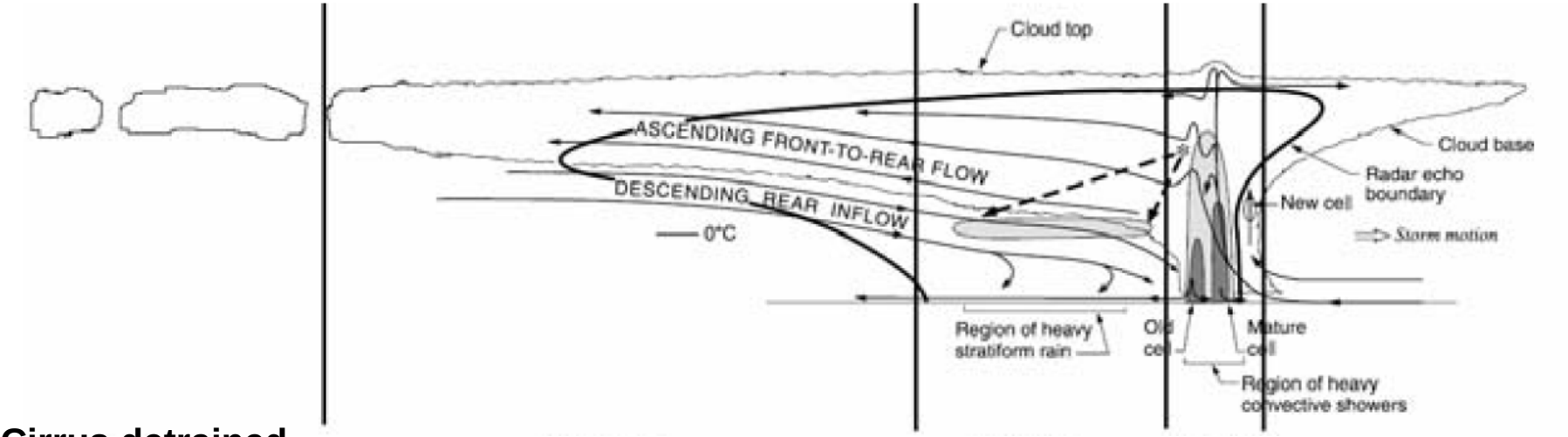
Thoughts about CStAT

We have the feeling that this problem has to be truly co-designed by model and observation people.

In this framework, observations can be used to characterize this convective-to-stratiform-to-anvil transition, typical lifetimes, and variability as a function of the large-scale “regime”

The main point of this characterization would be to assess how well different kinds of models (from cloud-resolving to large-sale) reproduce the observed properties of these transitions.

Composite analyses are probably a powerful tool to do that if we have a proper framework :



Cirrus detrained from convection | **Non-precip anvils** | **Stratiform** | **Convective**

Inputs from CAWCR

From scanning weather radars (CPOL, CSAPR)

Convective / Stratiform separation, area, fraction, rainfall
Large-scale atmospheric regime (for Darwin) to further bin the data
Hydrometeor classification in convective and stratiform
DSD properties (Nw, Do) and composite analysis of their variability
Convective cell volume, speed, lifetime, occurrence (for Darwin) in LS regimes
3D dynamics and mean advection speed of convective systems
(soon) 3D water content
Diurnal cycle of the above properties

From scanning and vertically-pointing cloud radars (SACR, KAZR, MMCR) and lidars

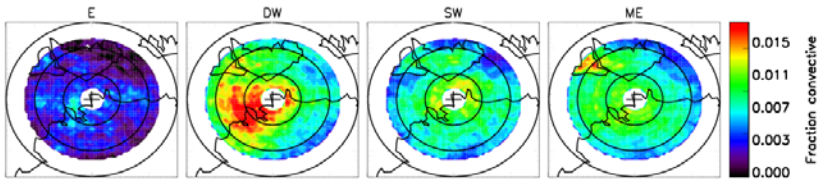
Ice cloud macrophysical (cloud fraction in model grid, frequency of cloud occurrence)
Ice cloud microphysical properties (IWC, extinction, fall speed, optical depth, concentration)
In-cloud vertical air motions

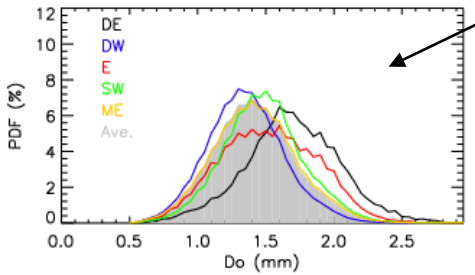
Can relate variability of ice cloud properties to properties of parent convection within the coverage of CPOL (not fully exploited yet, but "cirrus age" methodology developed)

Geostationary satellite could play an important role in this ? (eg Mace et al. 2006 JAS)

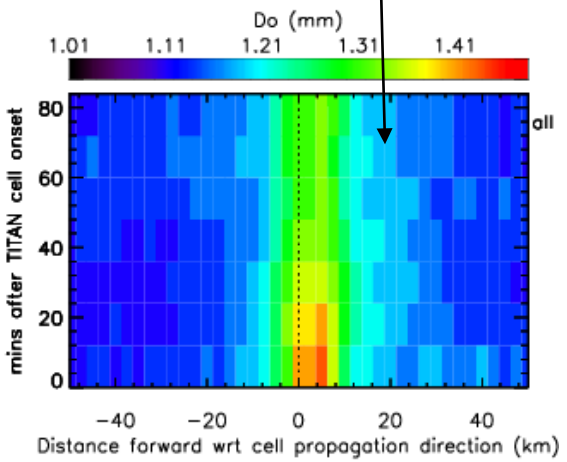
Recent work (Kumar, Protat, May, Jakob)

Convective top height occurrence vs LS regime (Stenier)

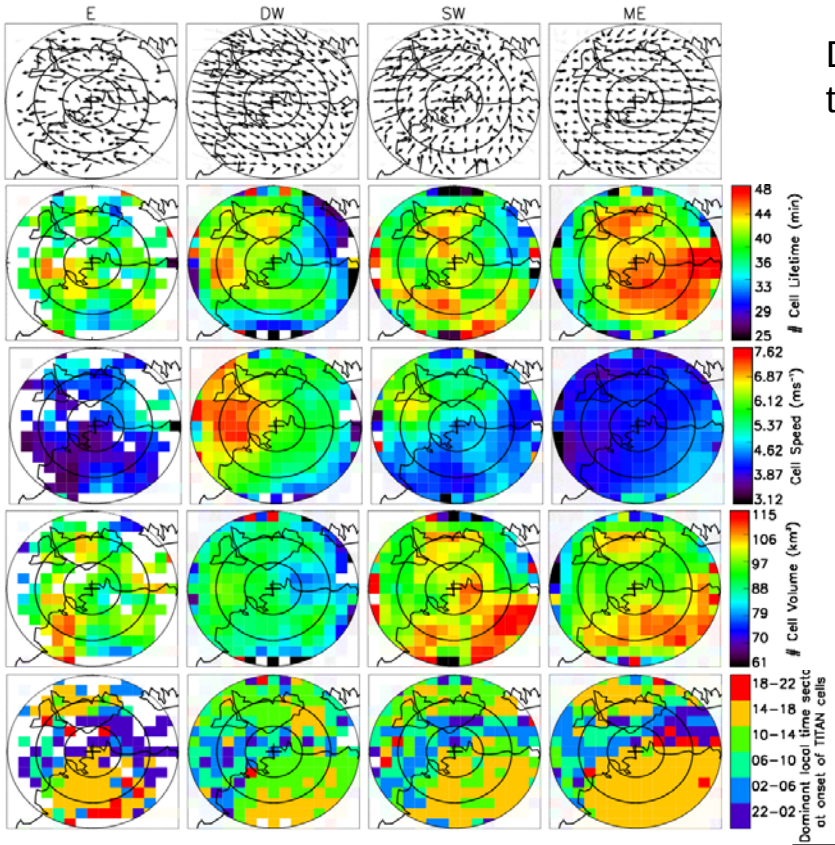




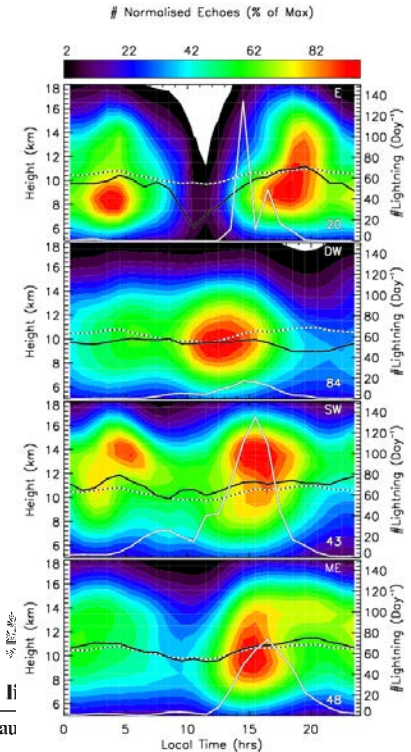
Composite analysis of DSD properties



Convective cell properties vs LS regime (TITAN)



Diurnal cycle of convective top heights vs LS regime



Z PDFs comparisons (TWP-ICE)