

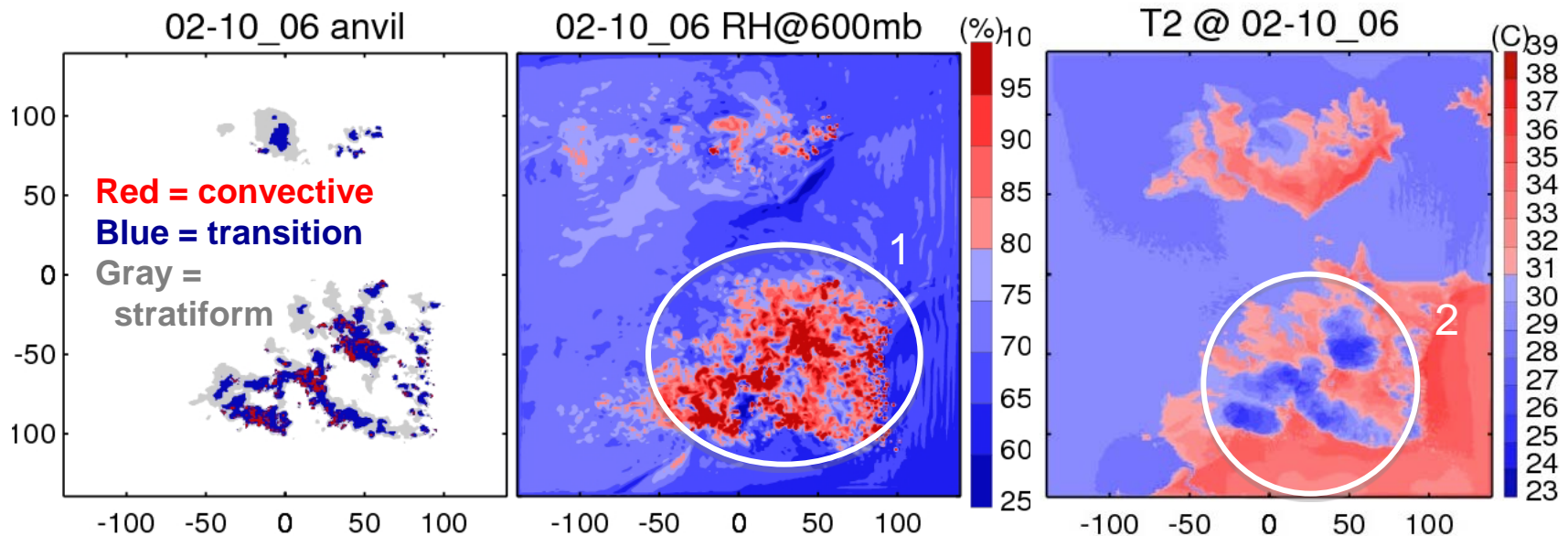
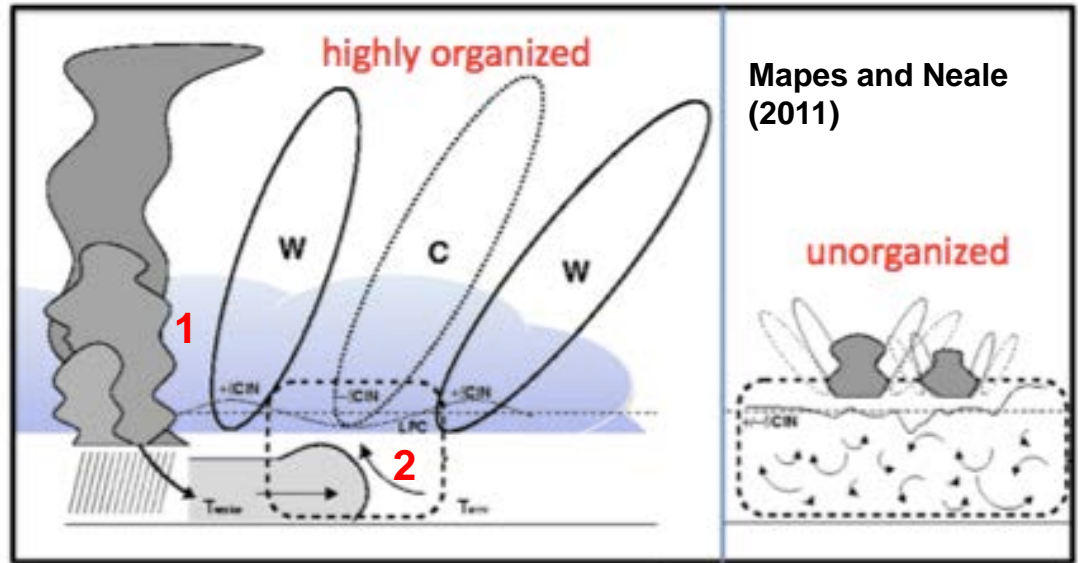
MESOSCALE ORGANIZATION OF CONVECTION AND MC3E – A GCM PERSPECTIVE

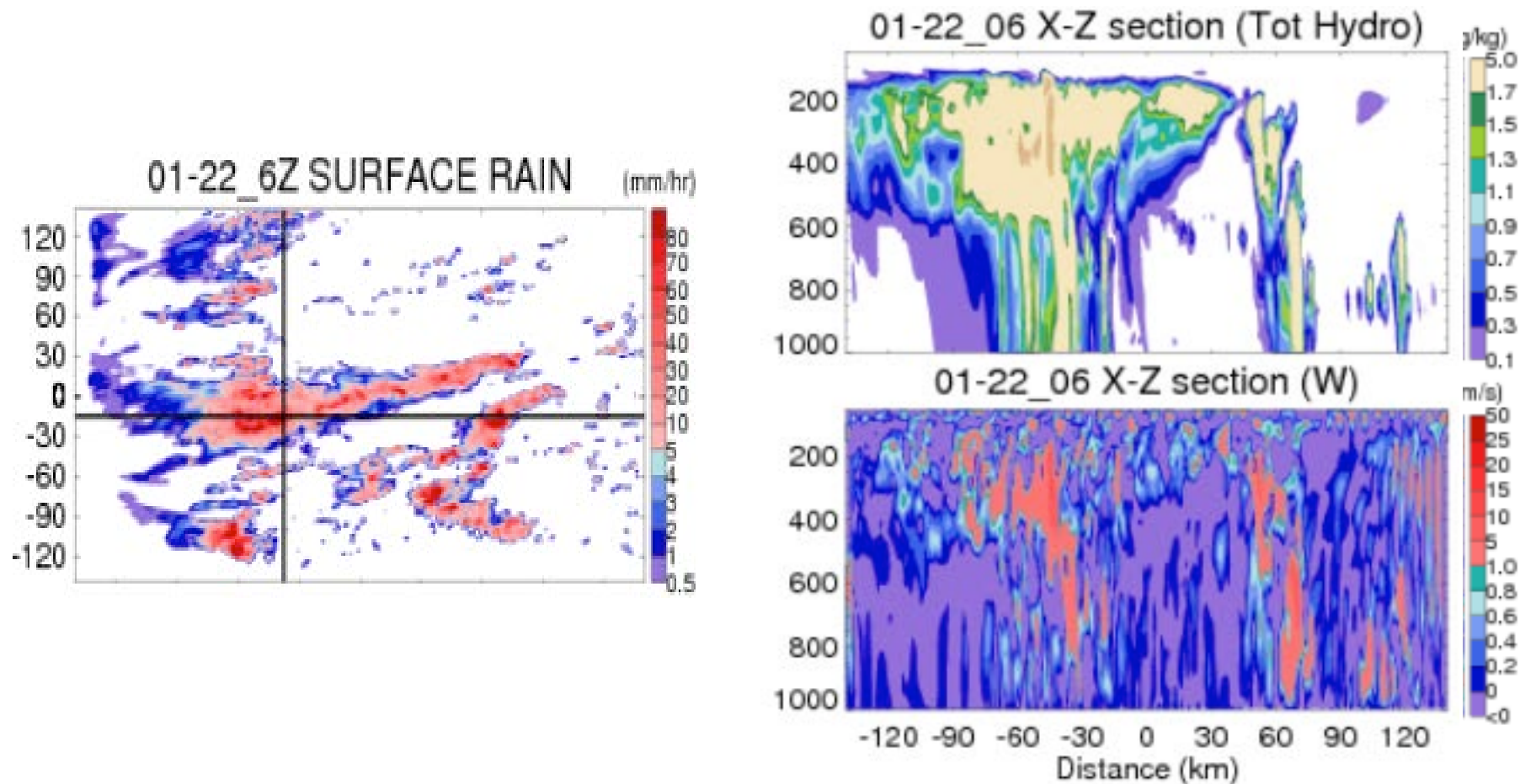
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Some questions a GCM cumulus parameterization needs to answer:

- **Given an unstable atmosphere moist enough to give rise to deep convection, when does it organize, and why?**
- **How does anvil initiation relate to the properties of the parent convection?**
- **What determines the evolution of the areal extent?**
- **What determines the strength of the mesoscale updraft and downdraft?**

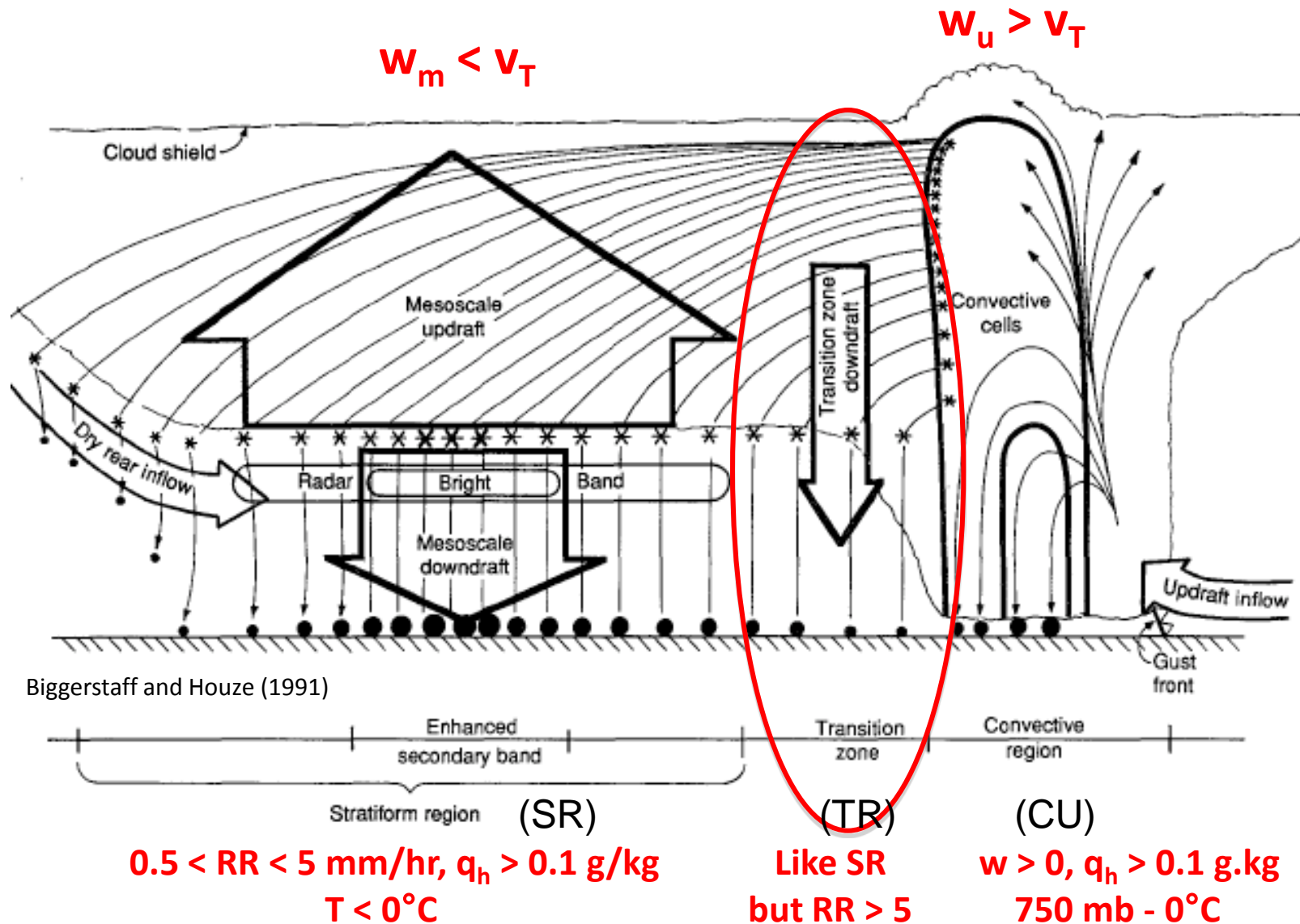
1. Document updraft and downdraft regions, cold pools, and relation to subsequent evolution of cluster

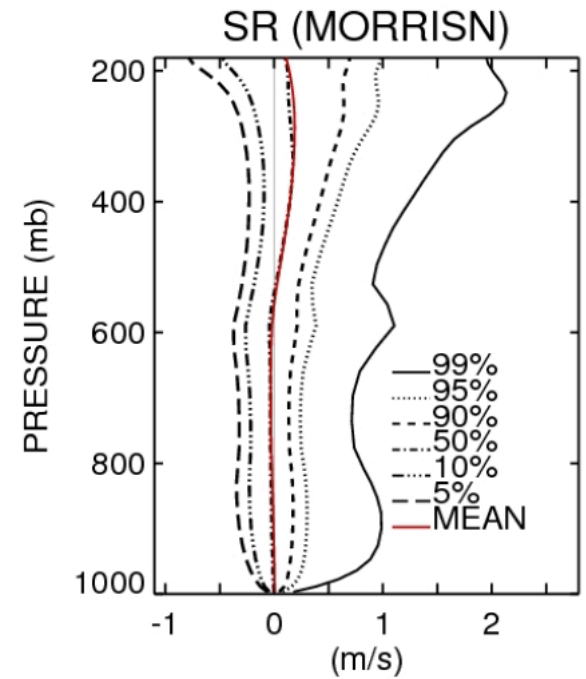
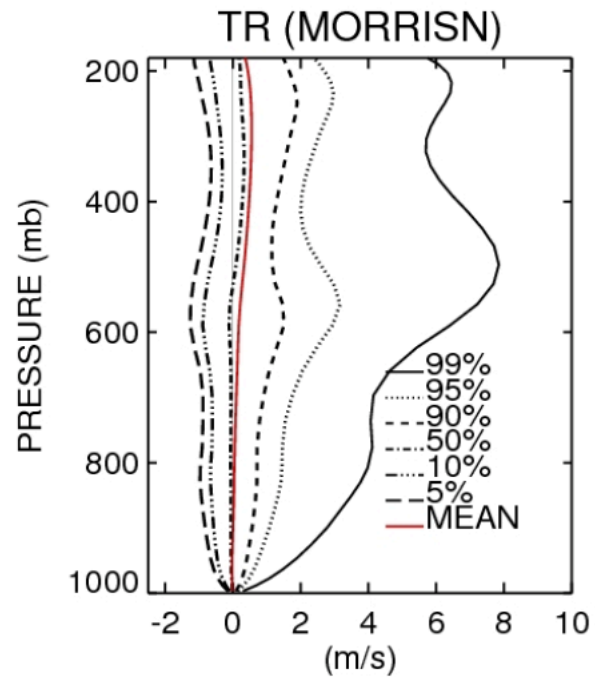
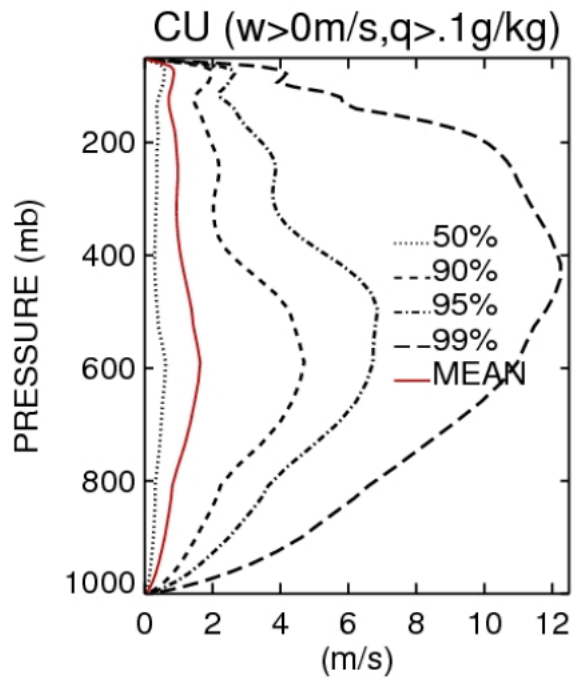




**An (ideal) MC3E view of one timestep in the WRF model –
how do we distill this into information a GCM can use?**

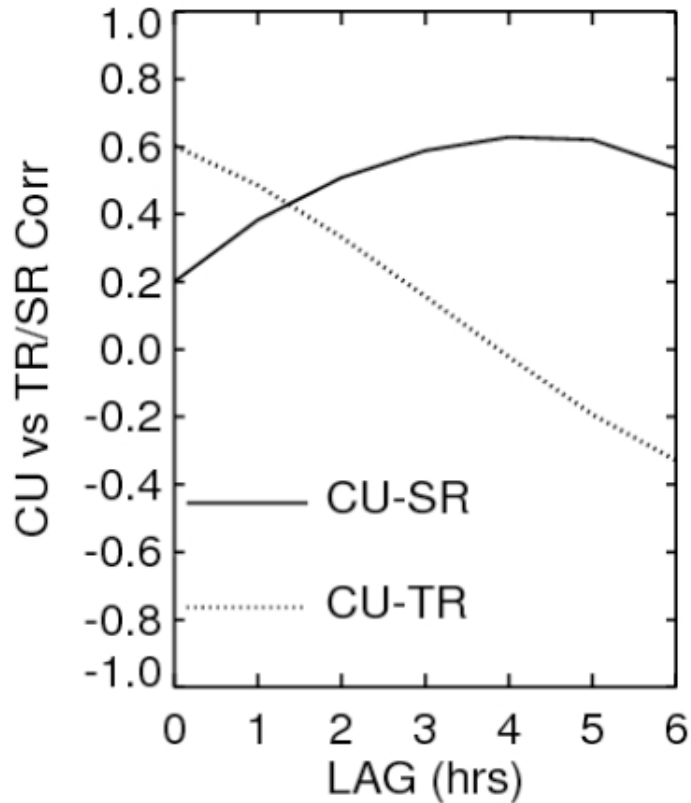
2. Classify the physically distinct regions of a mesoscale convective system



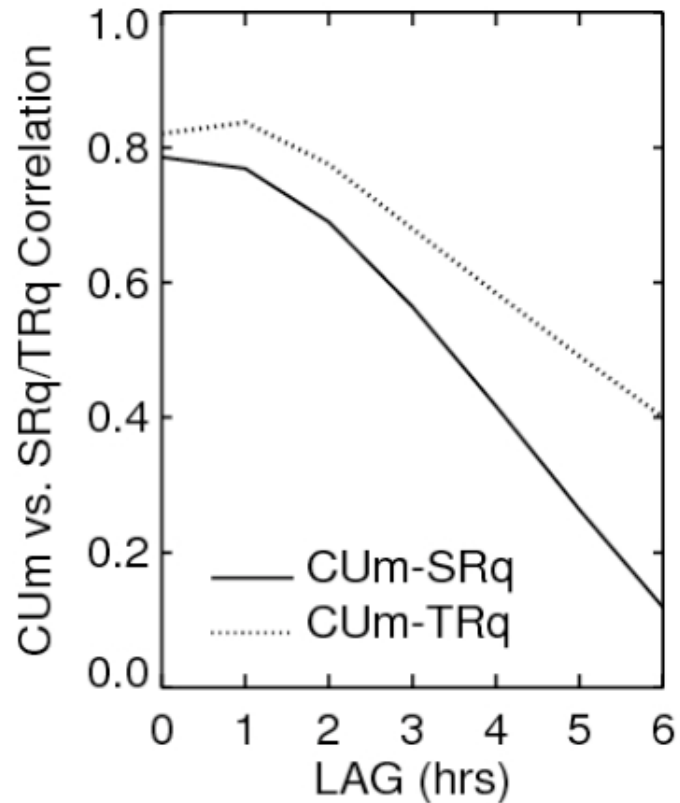


3. Document differences in their dynamical characteristics

4. Determine relationships between properties of convective area and transition/stratiform areas

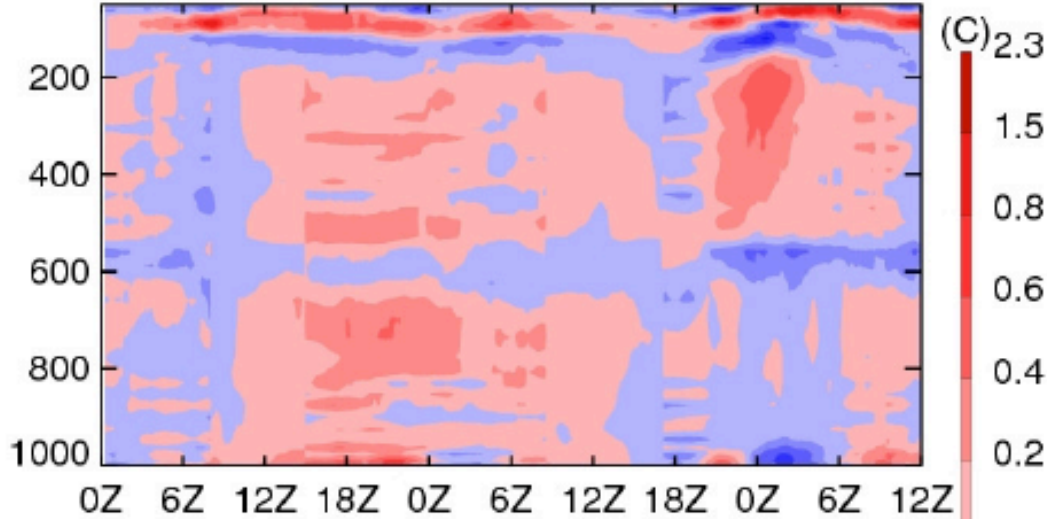


Lag correlation convective area vs. transition and stratiform areas

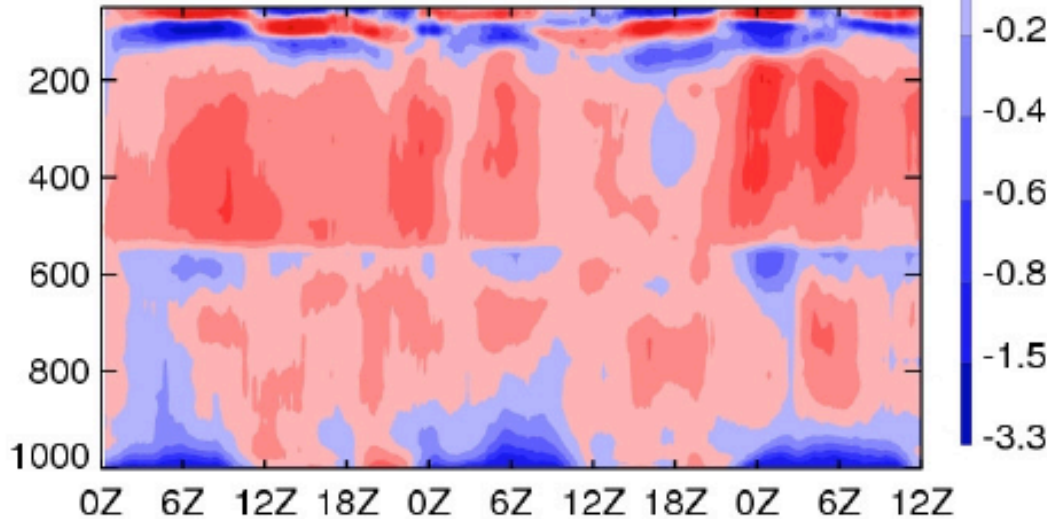


Lag correlation convective mass flux vs. transition and stratiform hydrometeor content

T ANOMALY OVER SR



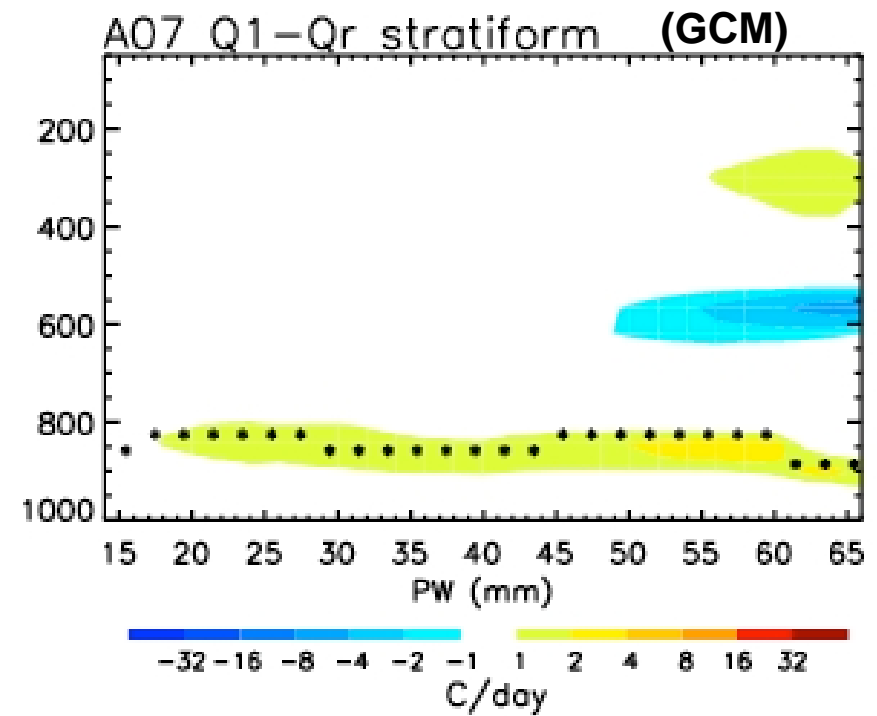
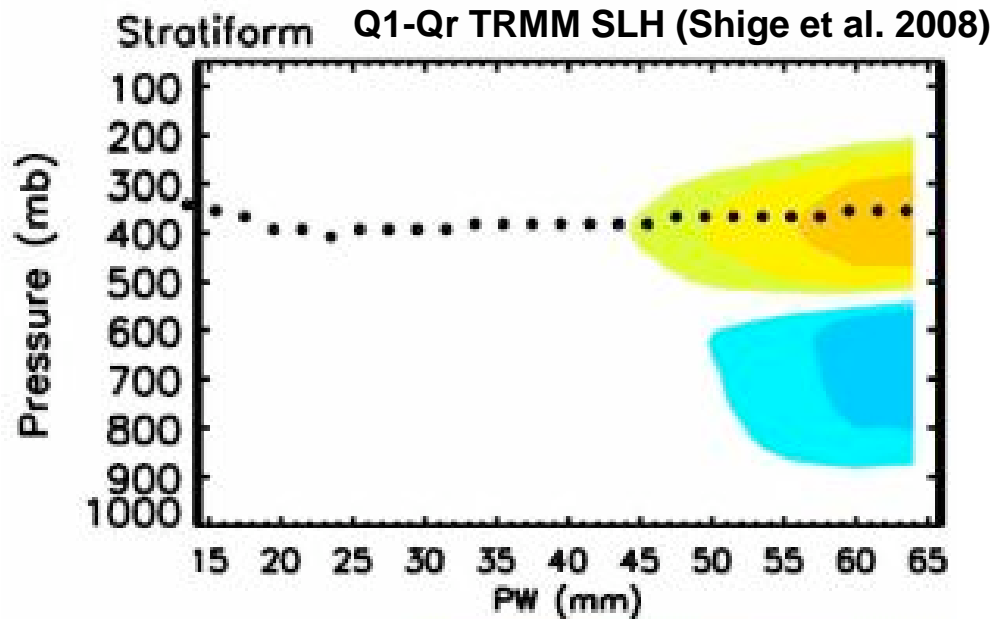
T ANOMALY OVER TR



5. Characterize thermodynamic structure of transition and stratiform regions – what constrains mesoscale updraft speed?

Buoyant ascent (diagnostic w eqn.)?

Neutral ascent ($Q_{ad} \sim Q_R$)?



One eventual goal: 2nd baroclinic mode (upper-level heating, lower-level cooling) profile in GCMs in mature phase of convective cluster, as observed

MC3E observation/retrieval needs

- **Case identification: with and without organization, incipient vs. propagating**
- **Large-scale forcing to differentiate cases (Ascent? Shear? Lapse rate? Humidity?)**
- **Downdraft vertical velocity profiles + AERI cold pool detection**
- **Updraft vertical velocity profiles + hydrometeor water content and type to classify areas and determine relationships**
- **Soundings through different areas of cluster to determine T anomalies**
- **Radiative heating/cooling profiles through transition and stratiform areas**