Geometry and synchronization in precipitating open cells

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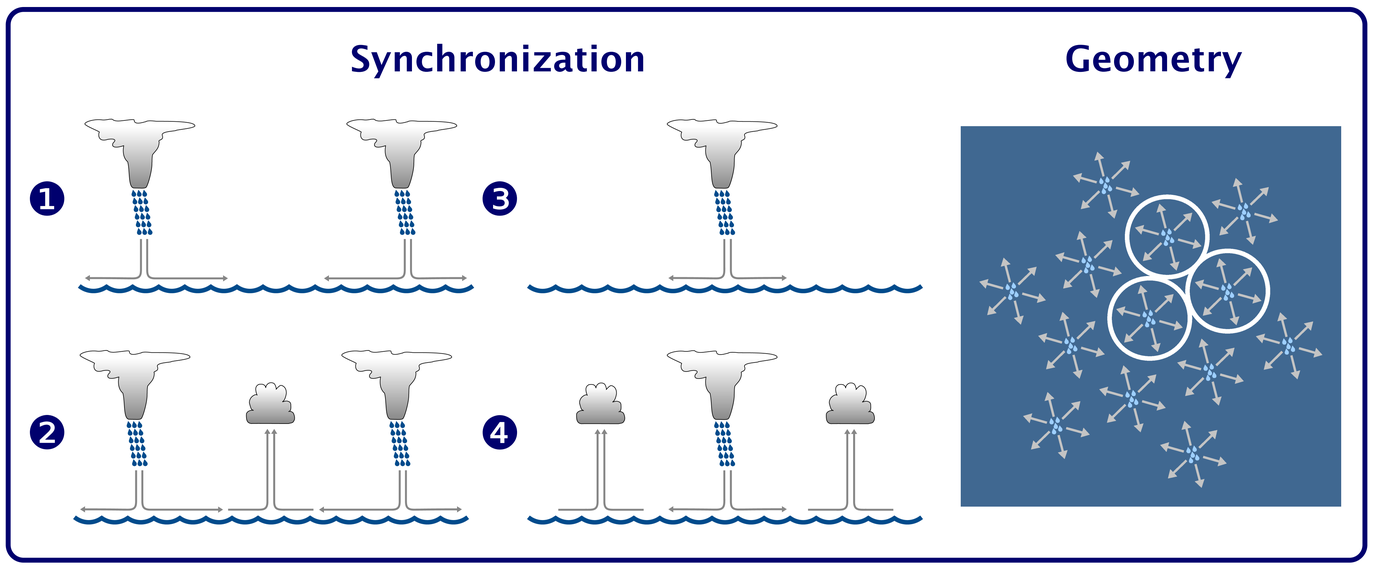
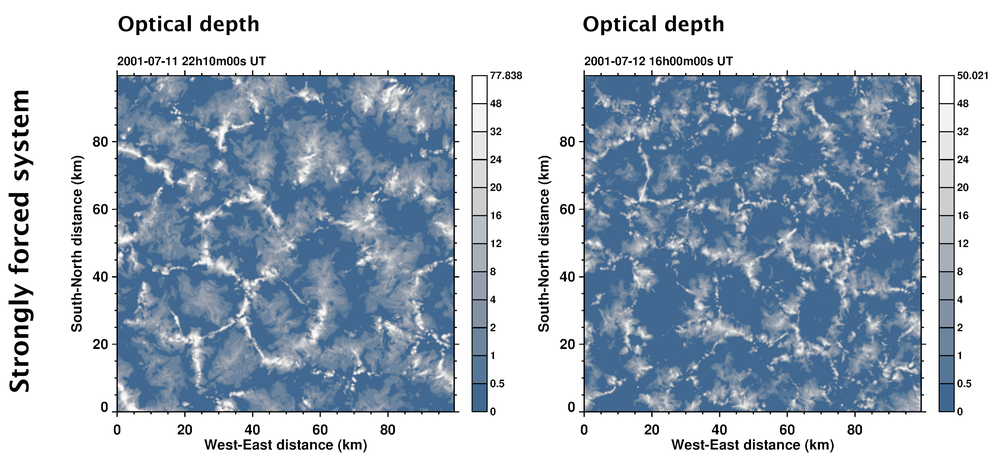
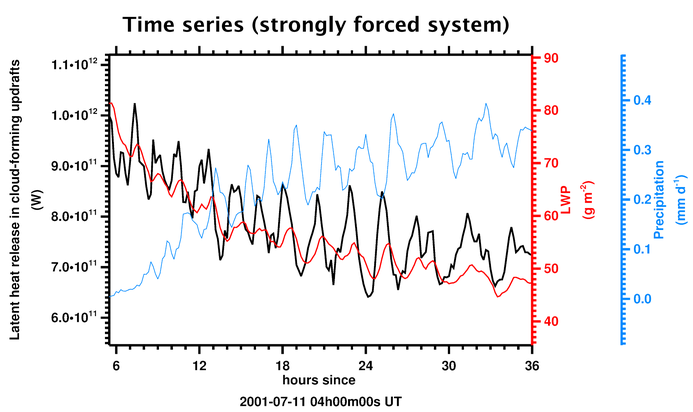
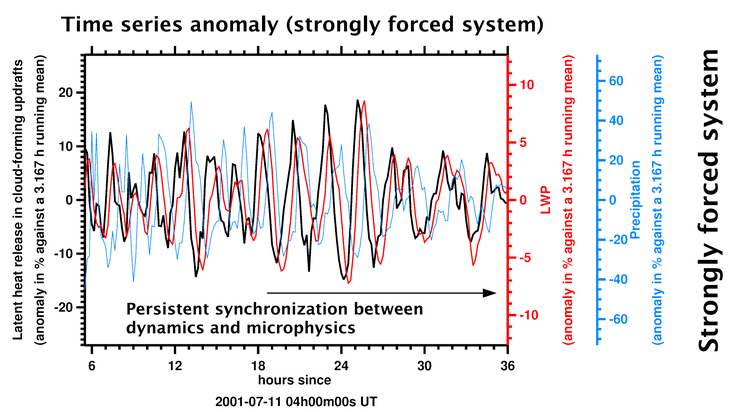
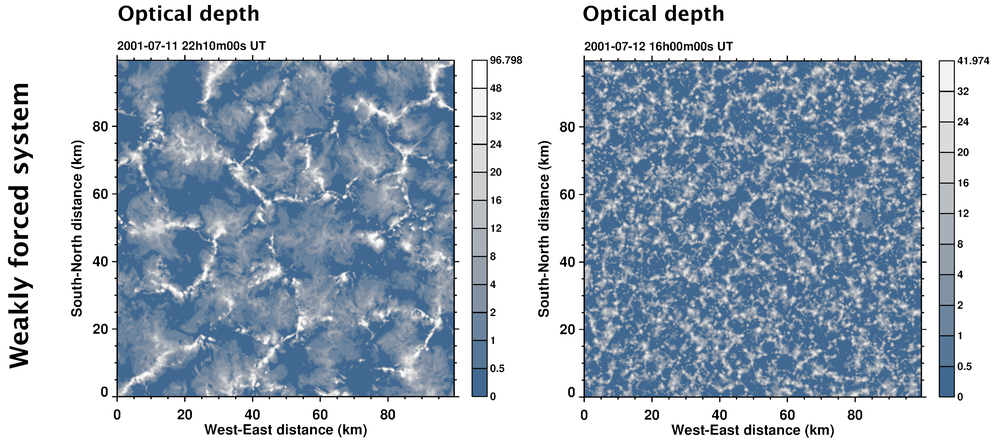
- Cloudy marine boundary layer states (different cellular states, shallow cumulus convection) derive their importance from their different effect on radiative forcing.
- The conditions required for the perpetuation of a given state or for a transition to another state, and the involved mechanisms are not well understood.
- WRF/Chem simulations of the precipitating open-cell state were carried out with higher ("strongly" forced, ~18 W m^{-2}) and lower ("weakly" forced, ~5 W m^{-2}) surface sensible heat flux.
- In the strongly forced simulation, synchronization of dynamics and cloud properties is maintained, and the open-cell state persists. In the weakly forced simulation, synchronization between dynamics and cloud properties deteriorates and a shallow cumulus-like state develops.

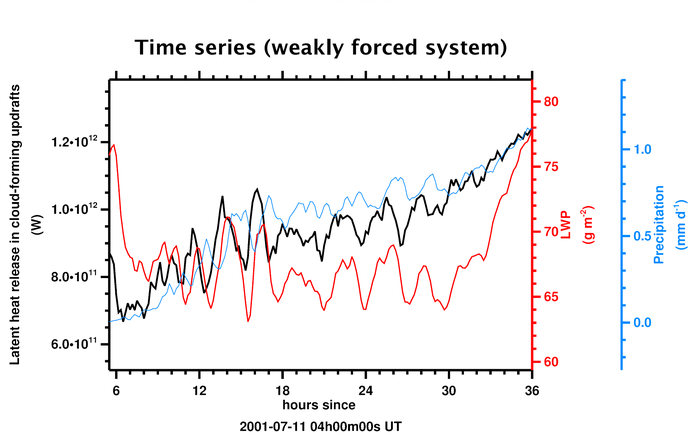


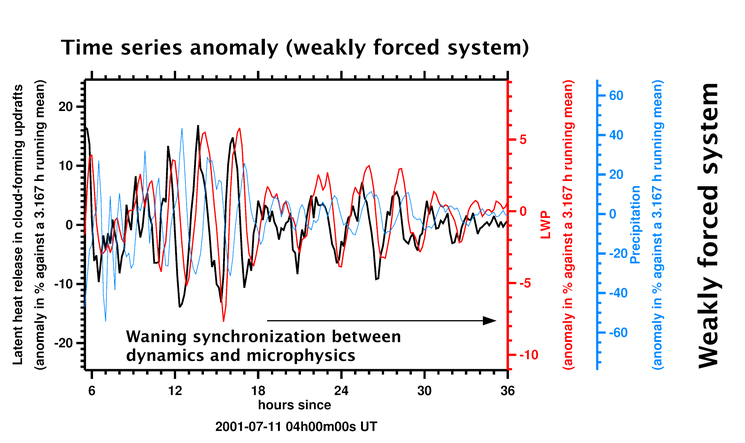




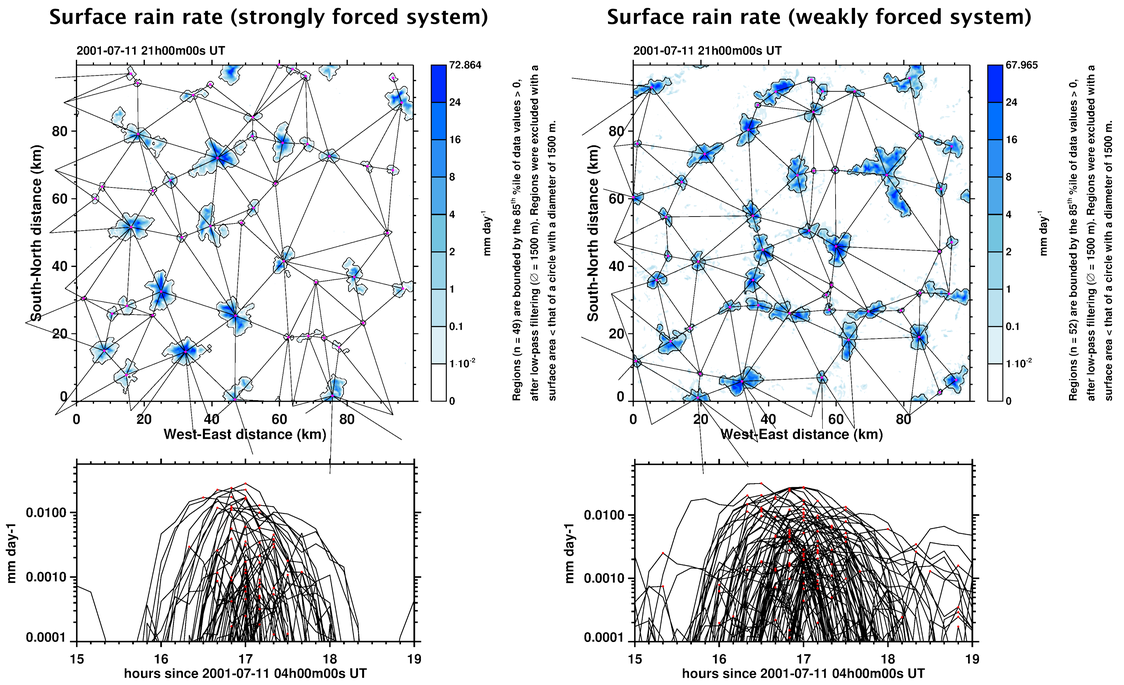








- The geometry of the system is established by the Delaunay triangulation of precipitating regions.
- Distances between neighboring regions are measured along the Delaunay edges.
- The synchronization of the system is measured by the temporal dispersion of precipitation (standard deviation of peak times) in the precipitating regions.



Mean distortion of the Delaunay grid (mean of longest/shortest edge ratio at each vertex)

Time since 2001-07-11 04h00m00s UT	Strongly forced	Weakly forced
17 h	3.21	2.77
23.75 h	3.30	3.15
29 h	3.62	3.08
32.5 h	3.01	2.85

Temporal dispersion of precipitation (standard deviation of precipitation peak times)

Time since 2001-07-11 04h00m00s UT	Strongly forced	Weakly forced
17 h	21.3 min	38 min
23.75 h	29.7 min	39.5 min
29 h	28.3 min	47.1 min
32.5 h	30.85 min	44.6 min

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