The Lightning Threshold

Thunderstorm inflow rises through the cumulus cloud as an updraft. The updraft carries water droplets above the deep convective freezing level with some forming ice crystals or larger super cooled ice crystals joined together. They fall at different speeds producing lightning. The threshold cumulus updraft speed of 7 m/s or 25 km/h has been suggested by Del Genio (2007) for the occurrence of lightning. This threshold is identical to that given for a storm with lightning by the Secret Law of Storms. It occurs where the sea level pressure falls at least 3 hPa over 3 hours. A 4 hPa fall in barometric pressure over 3 hours can be used so as to provide a margin of comfort for prediction purposes. A thunderstorm also typically requires the barometric pressure to be less than 1009 hPa (or mb).

Reference

A.D. Del Genio, A. D., Yao, M.-S., and Jonas, J., (2007) Will moist convection be stronger in a warmer climate?, Geophys. Res. Letters, vol. 34, L16703, doi:10.1029/2007GL030525, page 2.