Above anvil plumes and jumping cirrus
A visible storm top feature when wave breaking occurs – the jumping cirrus.
Fujita’s jumping cirrus

“One of the most striking features seen repeatedly above the anvil top is the formation of cirrus cloud which jumps upward from behind the overshooting dome as it collapses violently into the anvil cloud”. (Fujita, 1982)

Fujita (1989)’s five categories:

1. Clean overshooting domes
2. Curly-hair cirrus
3. Fountain cirrus – cirrus, which splashes up like a fountain, 1 to 2 min after an overshooting dome collapses into an anvil. This appears to be what mentioned in the quotation above.
4. Flare cirrus – cirrus that jumps 1 to 3 km above the anvil surface and moves upwind like a flare.
5. Geyser cirrus – cirrus that bursts up 3 to 4 km above the anvil surface like a geyser.
WISCDYMM simulation of CCOPE Supercell
Isentropic surface and penetration
Similar shape, size, orientation and occur at similar relative location

From: Wang (2004, GRL)
Jumping cirrus atop a Bavarian multicell storm system
WISCDYMM simulation using Stuttgart sounding
Lee waves

- The jumping cirrus mechanism is very similar to the configuration of lee wave where wave breaking may occur in the lee side of an obstacle.
- This suggests that the storm does look like an obstacle (though it is not solid).
Jumping cirrus is just part of the story

- Another plume source appears to be near the summit of the overshooting top.
- The “overshooting plume” may be the combined effect of instability and wind shear. It sometimes looks like a small scale wave breaking.
- The instability effect is most clear when there is no wind shear.
CCOPE without wind shear
Rayleigh-Taylor instability
Storm top pancake!
Simulated CCOPE supercell without wind shear
A pancake cloud above a Cb over Taiwan
CCOPE Supercell

\[ y = 27\text{km}, t = 70-80\text{ min} \]

\[ \theta \text{ (line) and RH} \text{i (color)} \]