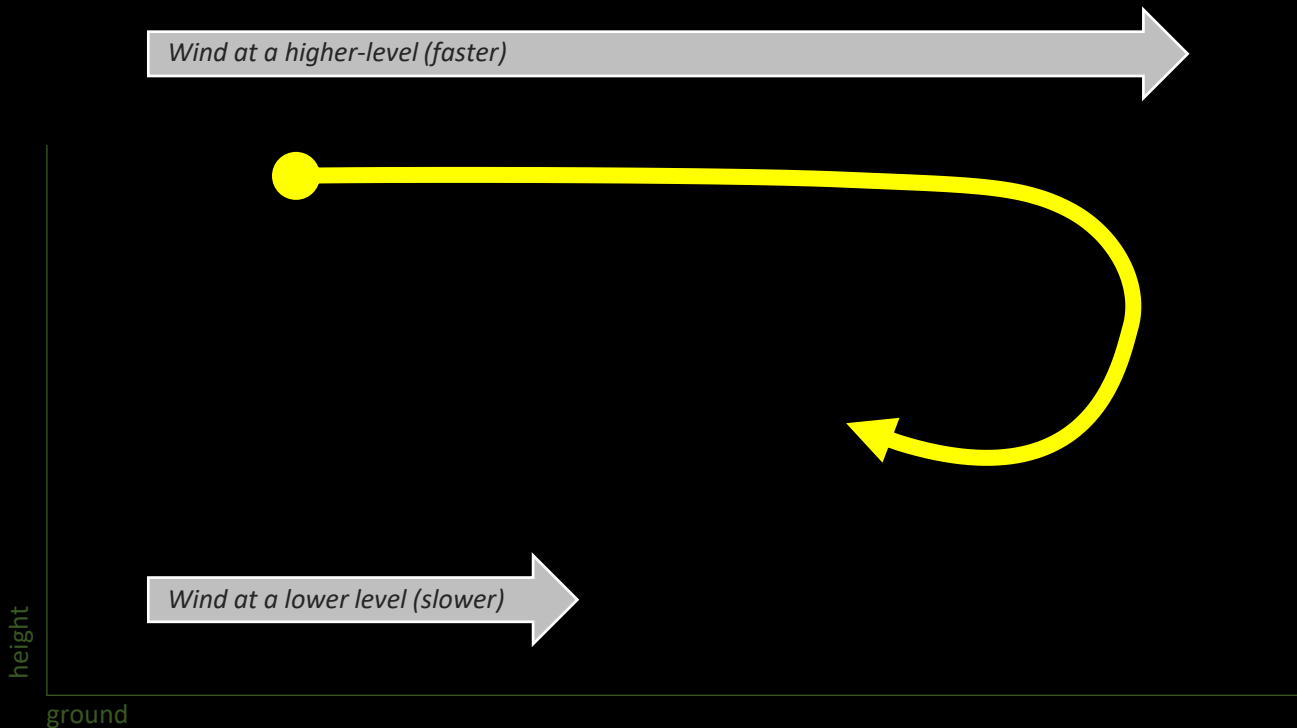


What makes supercell storms *super*?

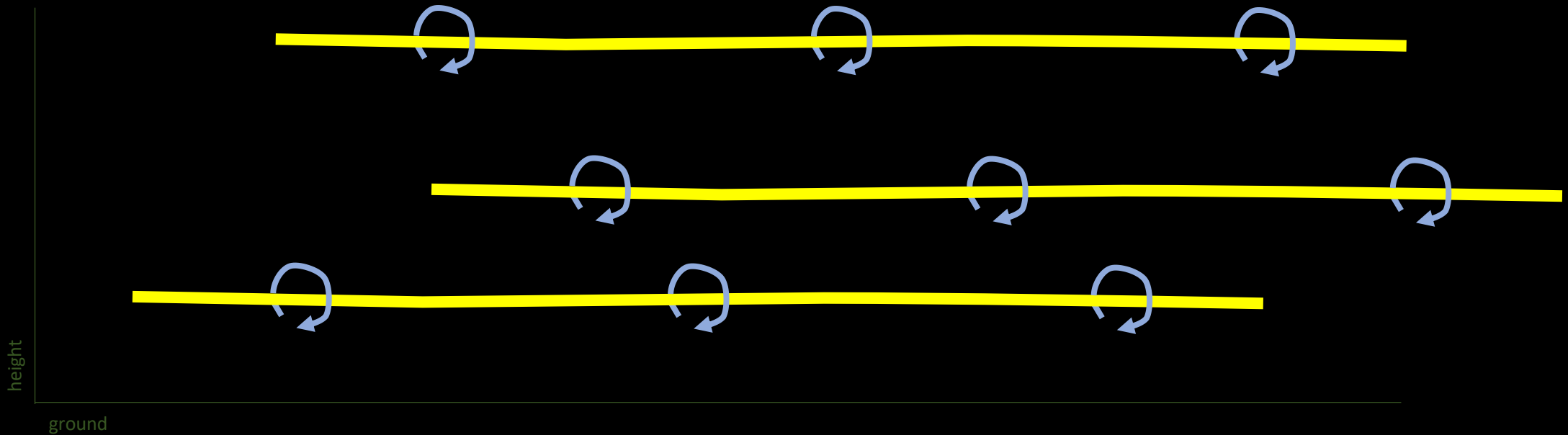
The origin of rotation in supercell thunderstorms





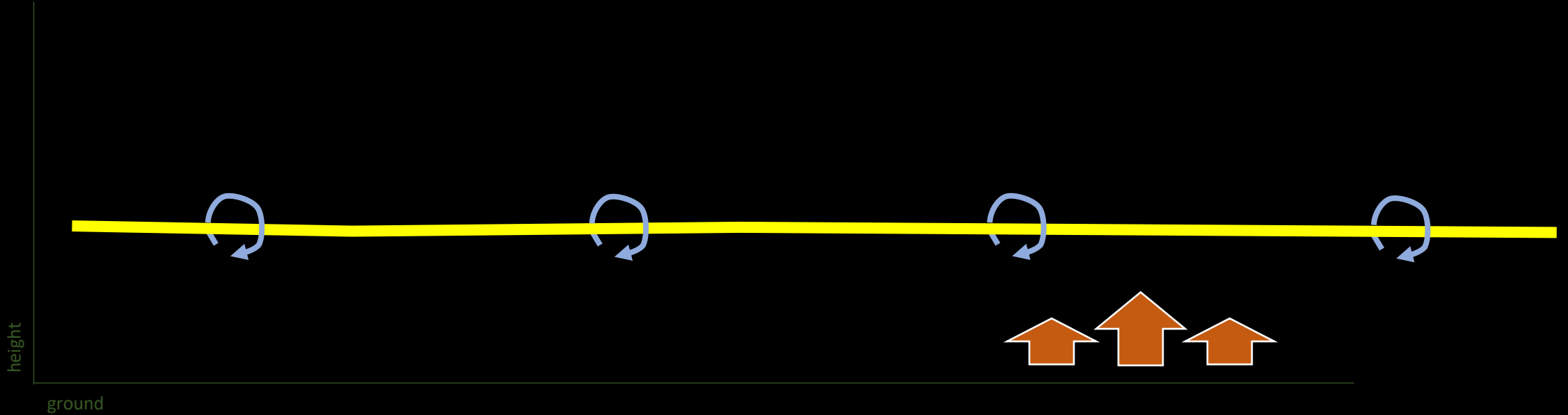
Wind Shear (differences in wind speed and direction with height) generates “tubes” or “sheets” of spinning air in the open atmosphere.

These “tubes” are **vorticity**.



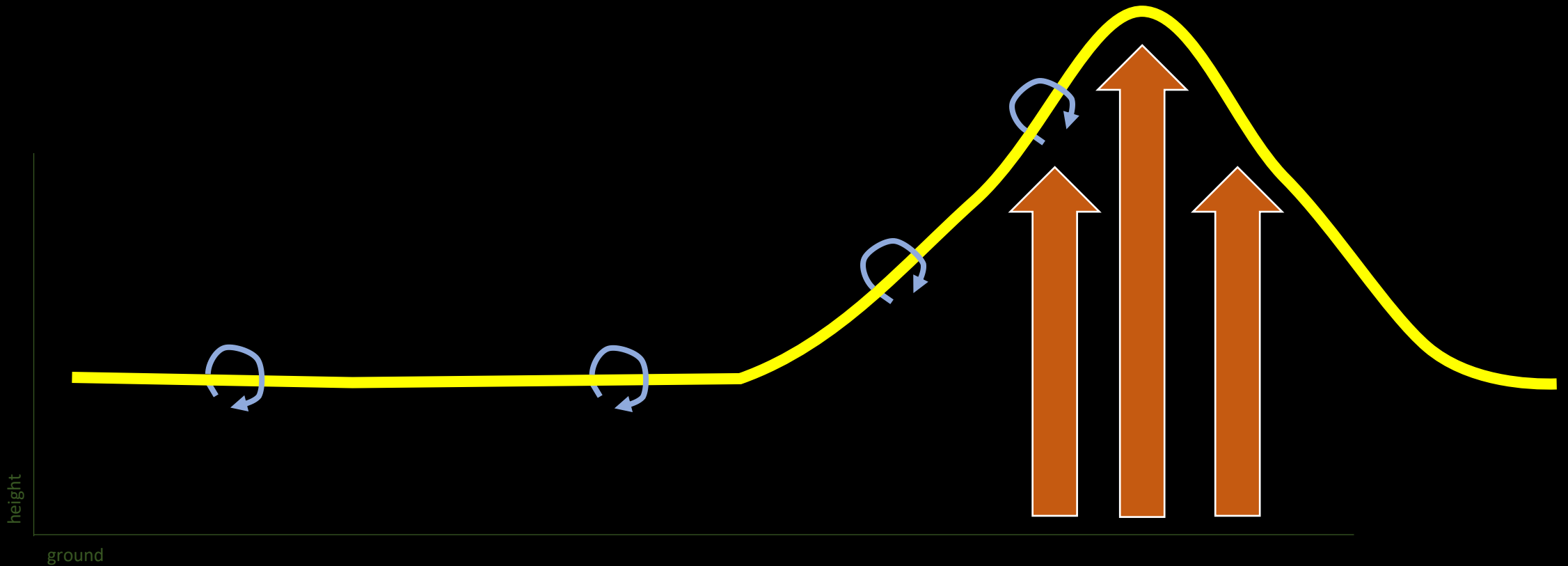
Now imagine the open atmosphere filled with *spinning* “tubes” of **vorticity**.

This characteristic of the atmosphere occurs when we have strong **speed shear** (wind speed changing with height) and is **the reason we want strong wind shear for supercells**.



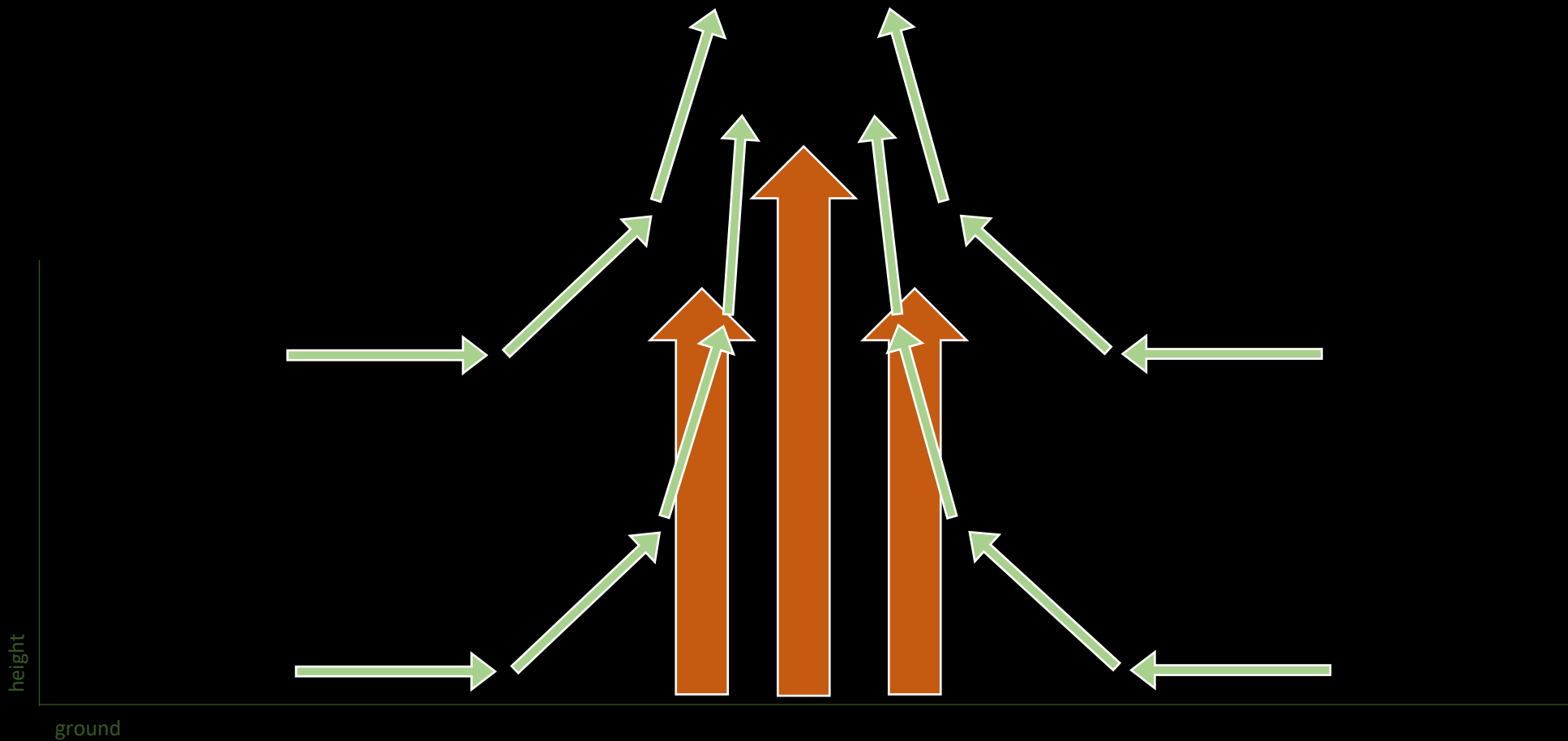
Why do we want this?

Imagine we introduce an *updraft* below one of these tubes.



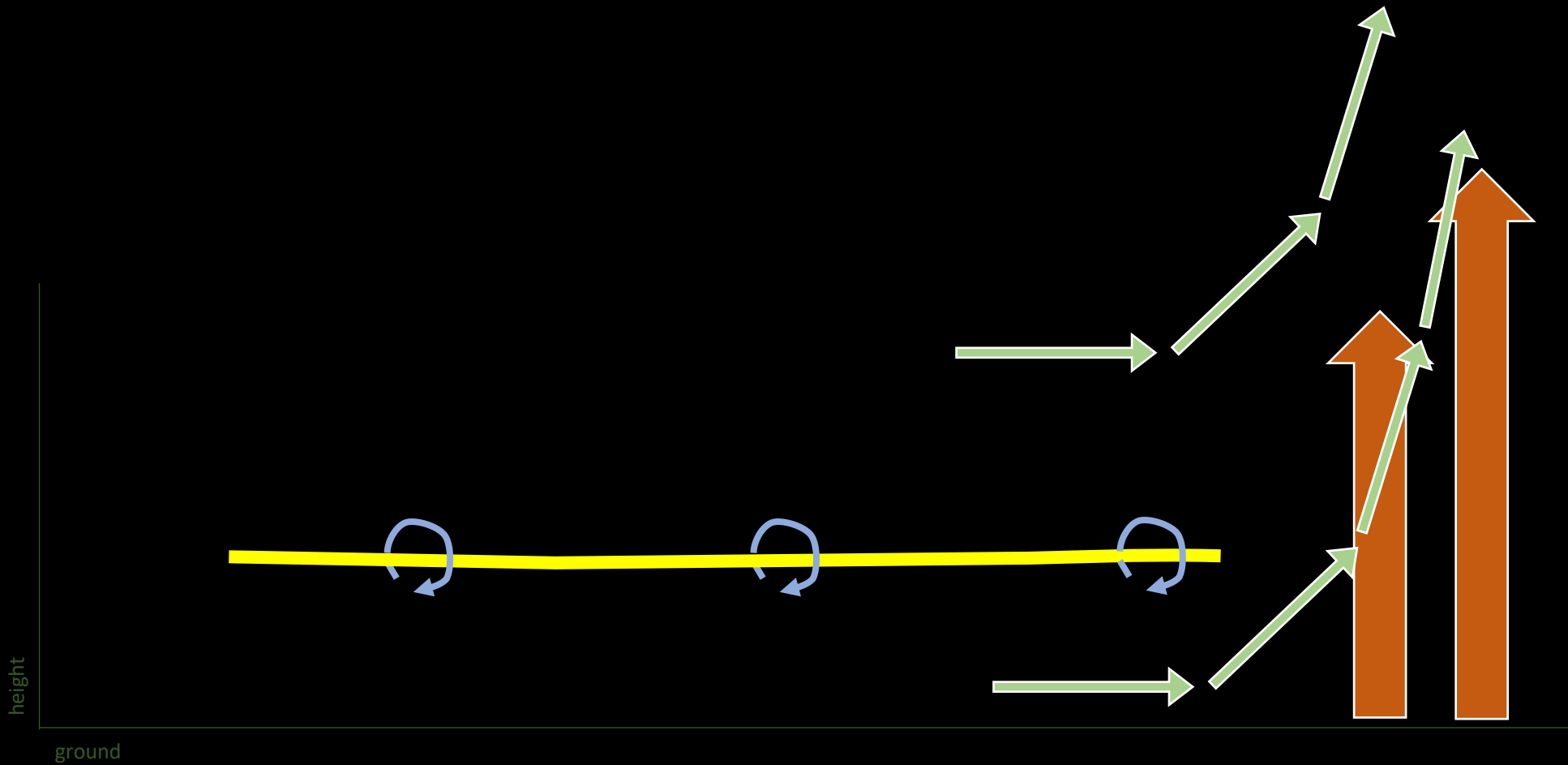
Now, because of the **updraft**, this tube of spin (**vorticity**) is oriented **vertically**!

This is called tilting.

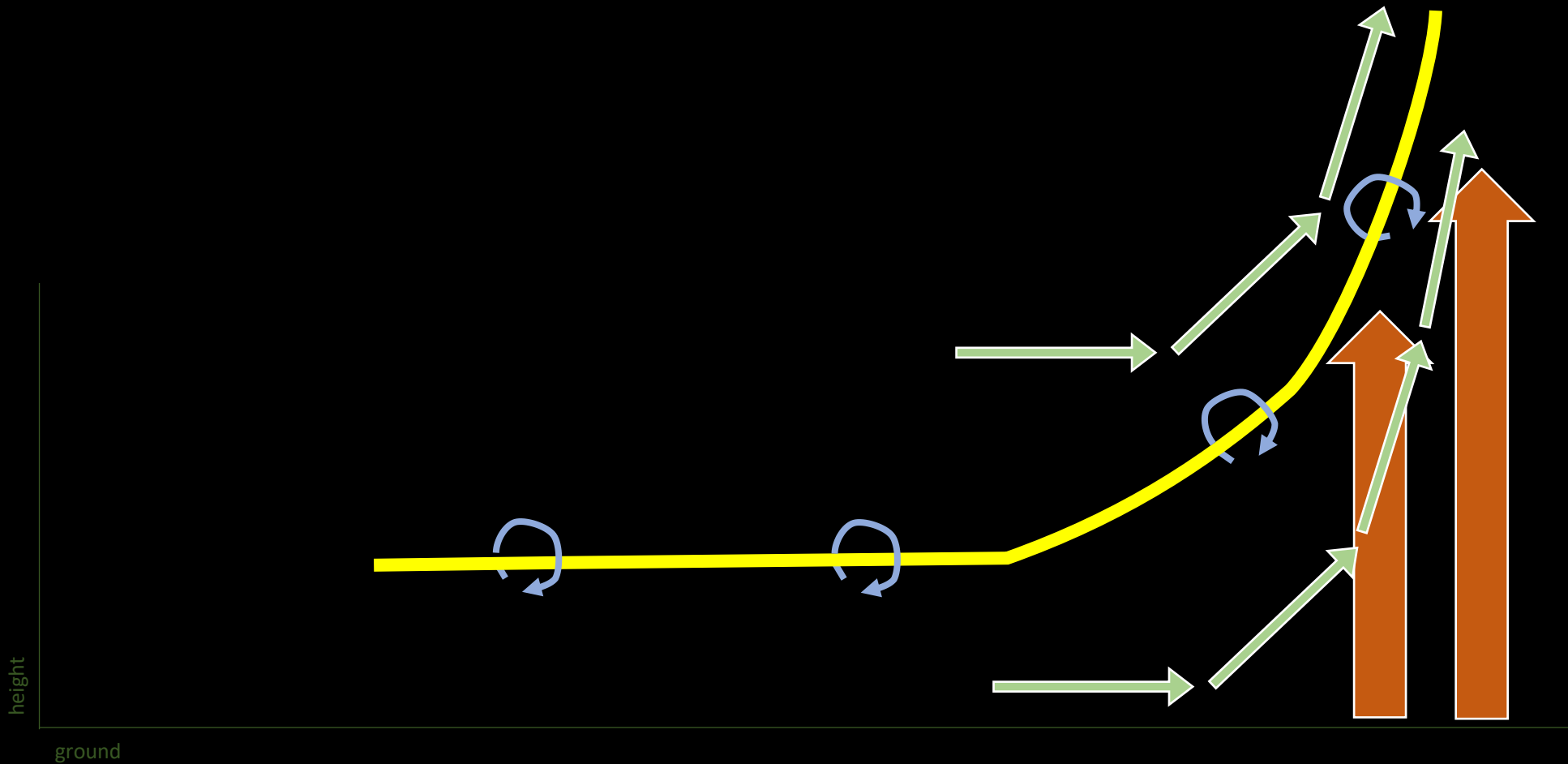


Because an updraft is accelerating air upwards, away from the ground, air around it must rush inward to fill the void.

This is *inflow*.

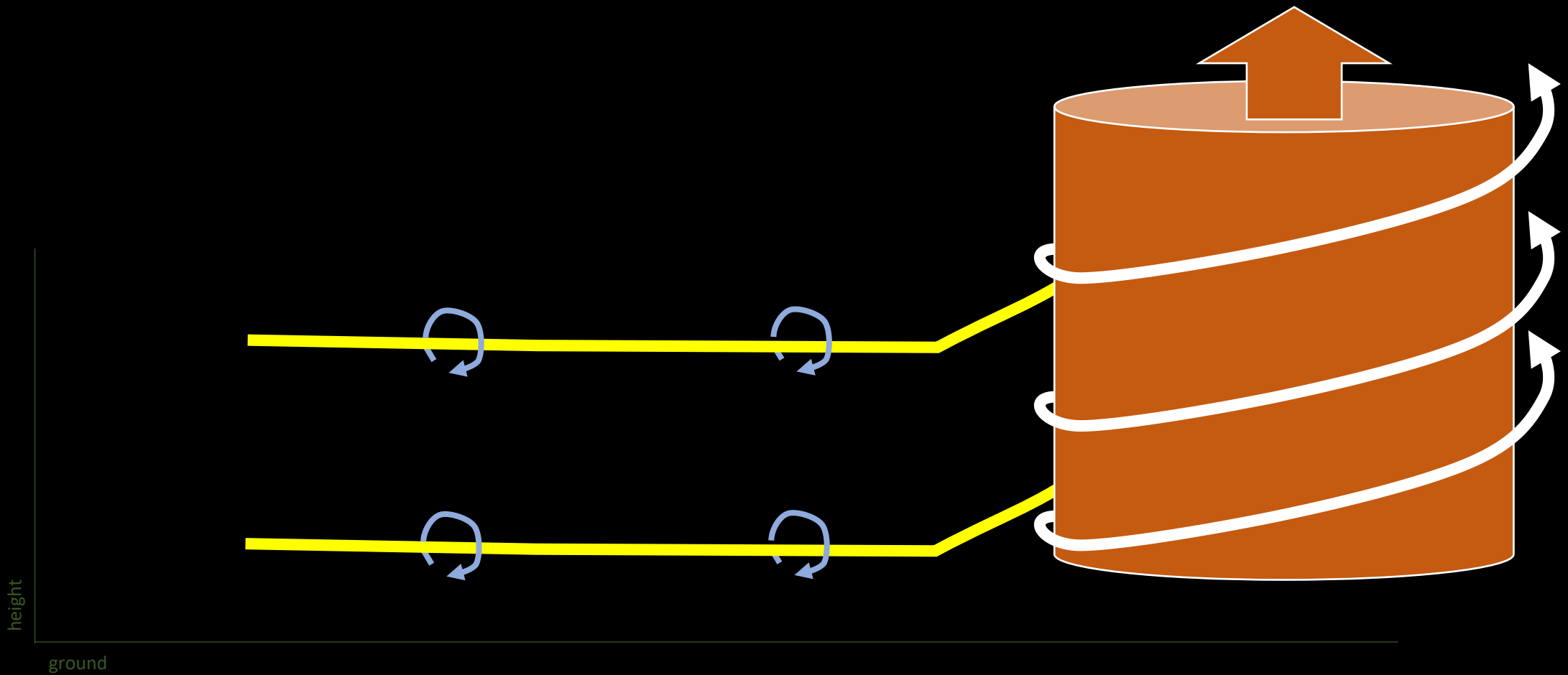


So now imagine our tube of **vorticity** being “pulled on” by the **inflow** (advection).



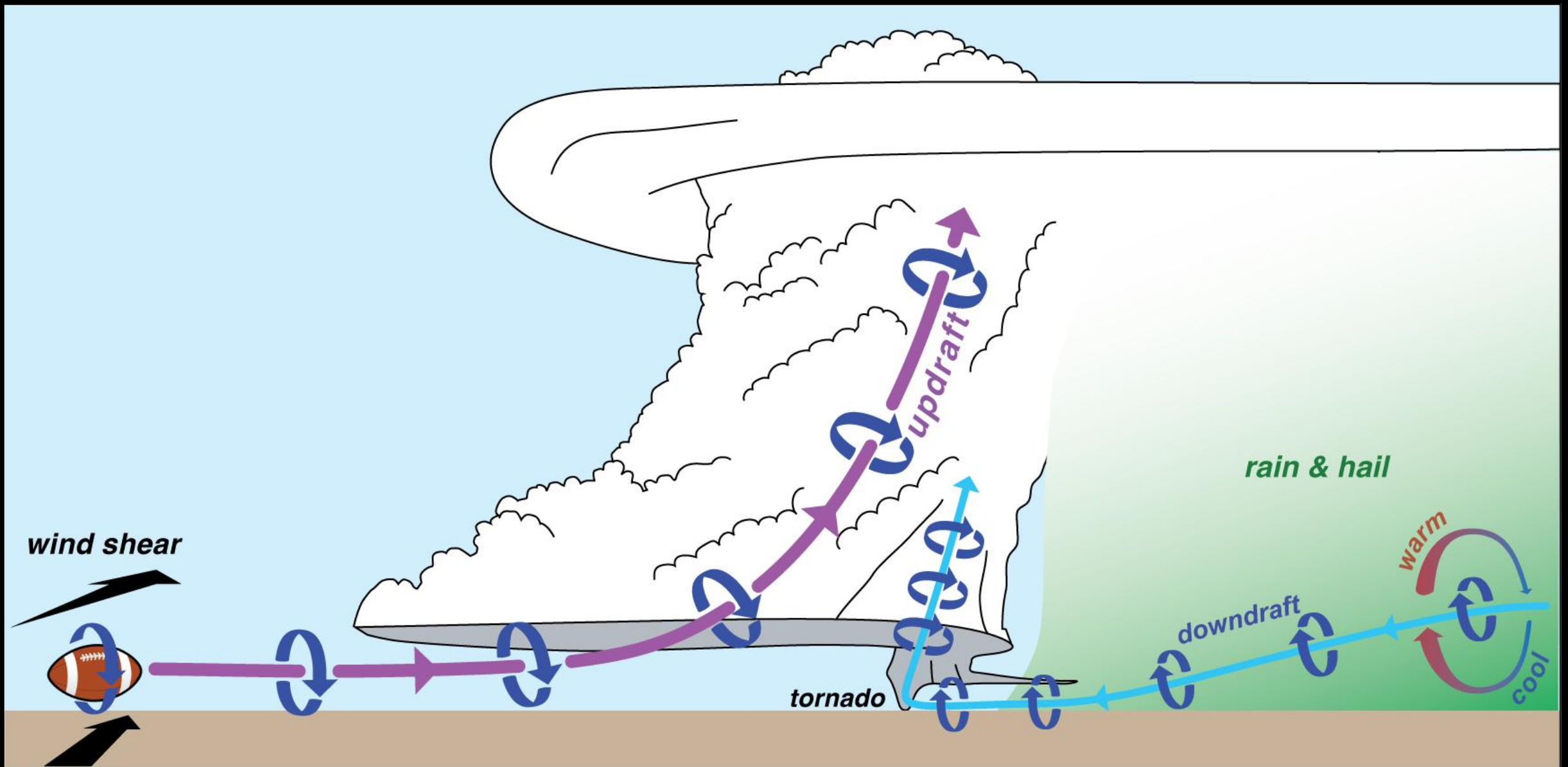
So now imagine our tube of **vorticity** being “pulled on” by the **inflow** (advection).

The **vorticity tube** is continuously ingested & tilted by the **updraft**.



Because the *updraft* is ingesting spinning air (*vorticity tubes*), it acquires *rotation*.

Our updraft is now a *mesocyclone*.





Kyle Gillett Photography



Kyle Gillett Photography



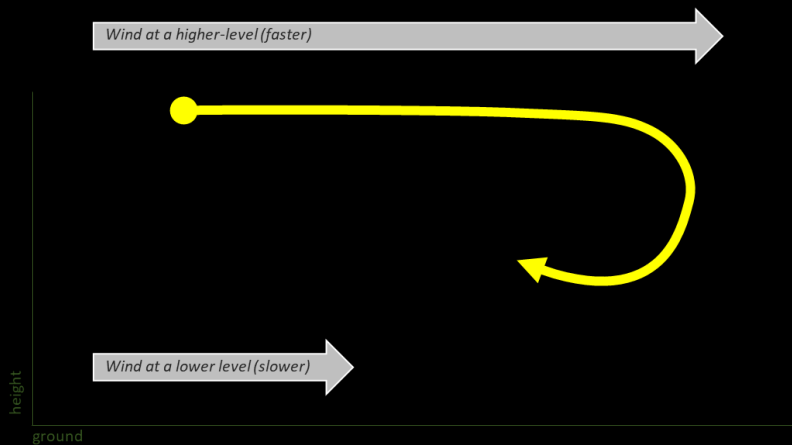
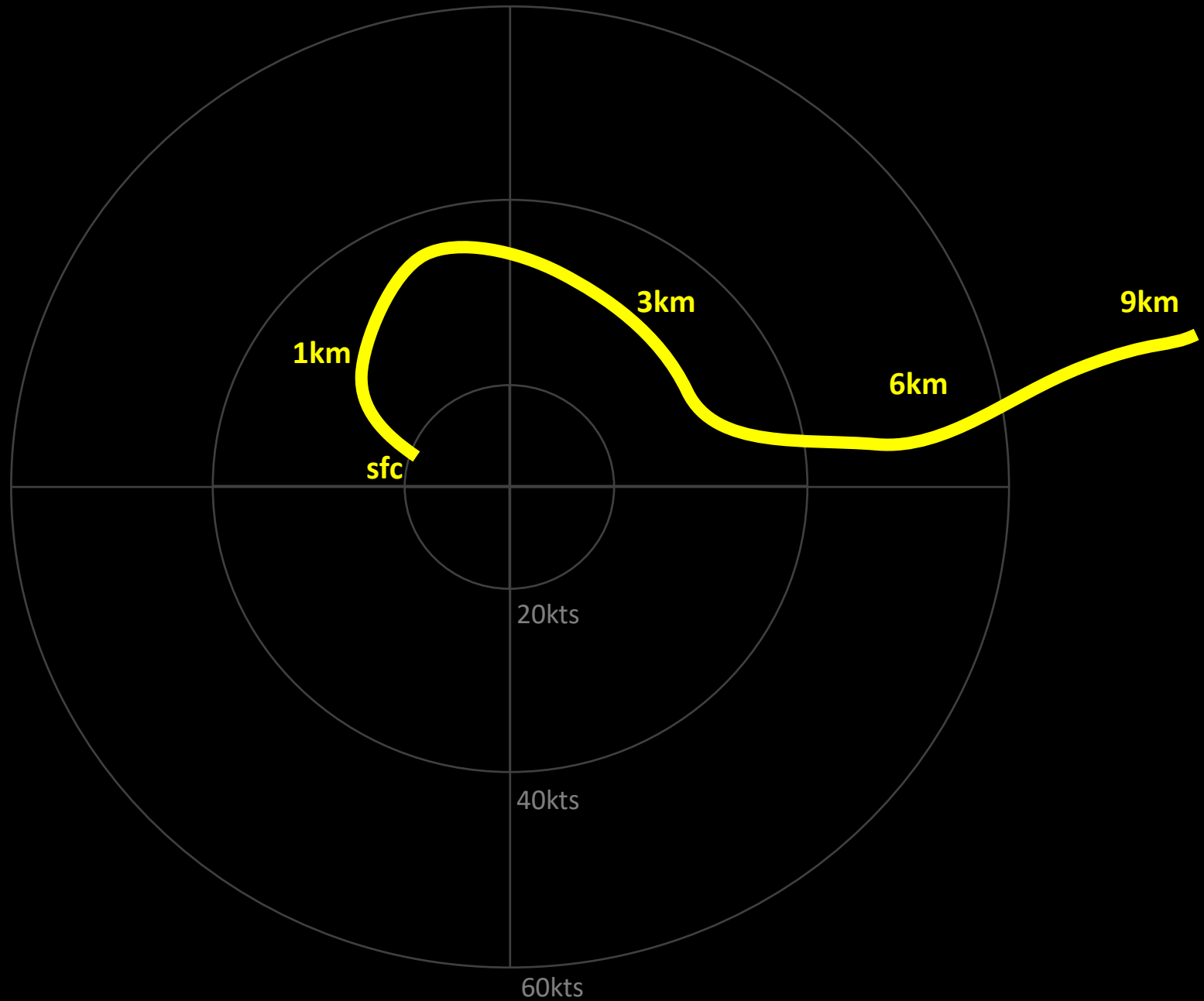
Kyle Gillett Photography

sfc: **20kts**

3km: **30kts**

6km: **50kts**

9km: **80kts**



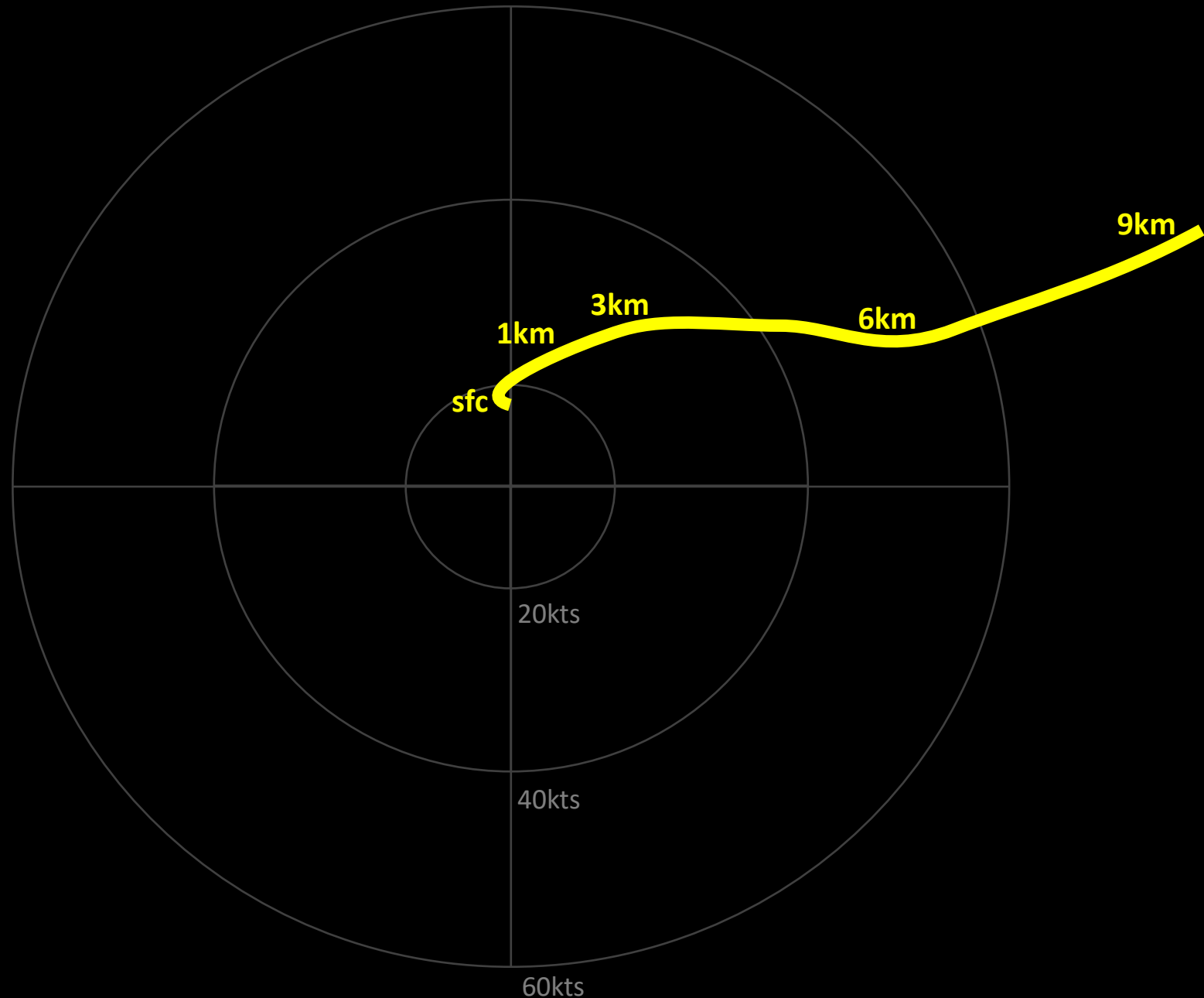
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Even in “unidirectional
flow”, large *speed shear*
can support supercells

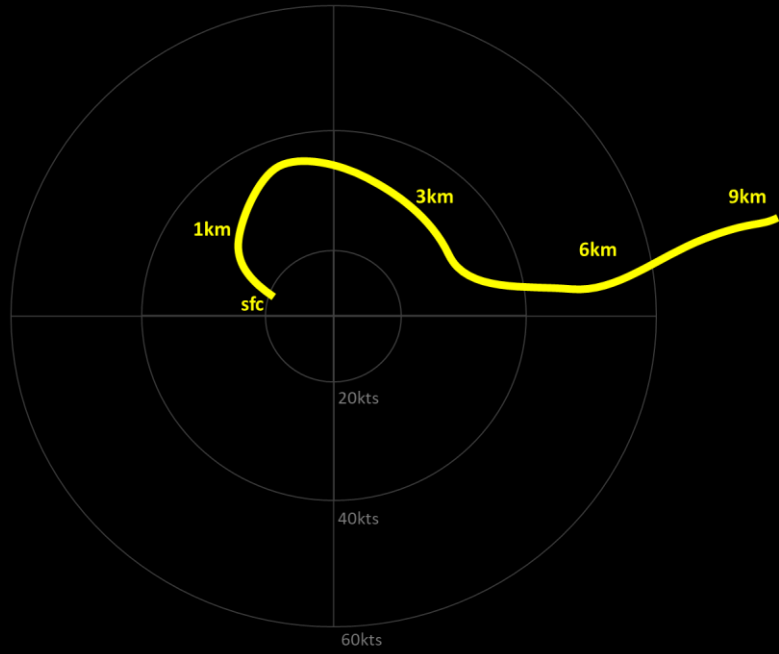
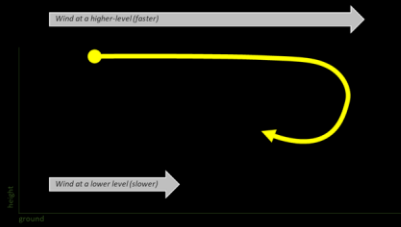


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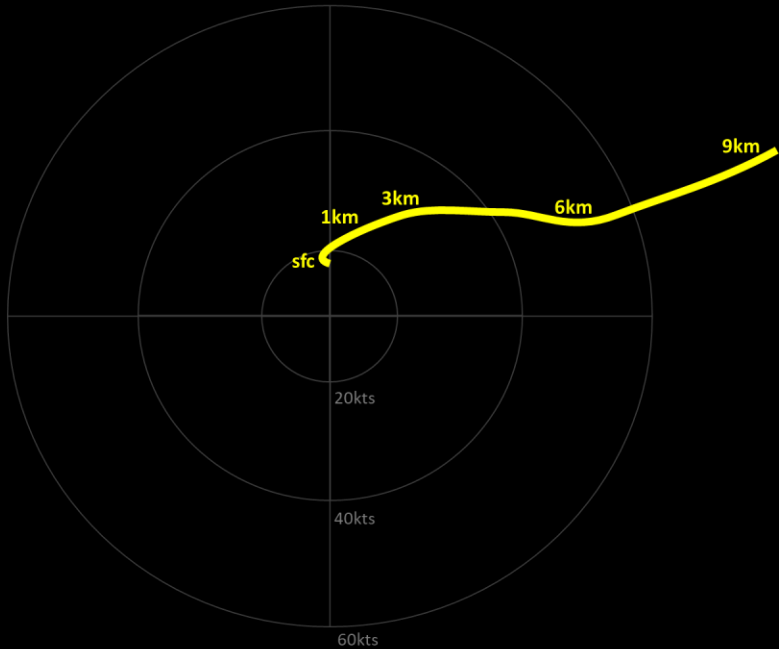


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Even in “unidirectional flow”, large *speed shear* can support supercells

sfc: **20kts**

10kts

3km: **30kts**

20kts

6km: **50kts**

30kts

9km: **80kts**

Winds increase with
height

*And wind shear
increases with height!*

This is simply how supercells *initially* become supercells.

After this process occurs, several...far more complicated processes regulate mesocyclone rotation.

Vorticity can also be generated by boundaries, friction, terrain, and internal storm features but these sources typically are not sufficient for deep mesocyclones.

What about tornadoes? Tornadic rotation must ***originate at the ground*** requiring a different process (some mentioned above!)