To see how a hurricane intensifies, we're going to look at a cross section of a developing hurricane and follow the paths of air parcels through the storm. In reality, air parcels spiral inward toward the center of low pressure at the surface as a hurricane swirls along, but we're not going to worry about the storm's rotation, and instead we're going to focus on the secondary circulation to see how tropical cyclones intensify.

To start, we'll assume that we have a minimal hurricane with a minimum central pressure of 985 millibars. Air flows toward the center of low pressure at the surface, and on its path in toward the center of the storm, evaporation of warm ocean water moistens the low-level air, making it more favorable to rise in thunderstorm clouds in the eye wall. Air parcels rise in tall thunderstorms in the eye wall, and most of the air parcels flow outward at the top of the storm, creating upper-level divergence that acts to reduce surface pressure by reducing the weight of air columns near the center of the storm. But, some air parcels sink into the eye and they warm up as they sink. This warming also helps reduce surface pressure because warmer air columns over the center of the storm are less dense.

As the surface pressure drops, now at 966 millibars in our example, the pressure gradient across the storm increases, which causes wind speeds to increase. So, low-level air rushes in toward the center of the storm even faster. Faster moving air over the warm ocean water increases evaporation rates, which fuels more intense thunderstorms in the eyewall. More air then flows outward at the top of the storm, creating stronger upper-level divergence, while sinking air in the eye increases too, causing surface pressure to decline even more.

Our example hurricane here now has a central pressure that has dropped to 949 millibars, and we have a really formidable hurricane now. An extremely strong pressure gradient causes air to race in toward the center of the storm at an even faster rate, and high evaporation rates and strong-low level convergence cause eye wall thunderstorms to continue to intensify. The greater upward transport of air in the eye wall leads to more air sinking into the eye and warming, which maximizes the storm's warm core, and also leads to stronger upper-level divergence, both of which favor additional declines in surface pressure.

This feedback loop can continue if a hurricane remains in an environment with favorable ingredients, but if one or more of the ingredients for tropical cyclones becomes unfavorable, thunderstorms near the center either weaken or become disrupted, which ultimately leads to increasing surface pressure and a weakening tropical cyclone.