are quite irregular both in direction and velocity.

C. S. Durst, one of the authors of the publication last referred to, has put forward the idea that the major eddies may be regarded as convectional cells moving along with the wind, the gusts being due to down currents in the rears of the cells. He conceives of the cells as being roughly horseshoe-shaped in horizontal cross-section, with the open end of the horseshoe facing in the direction of the wind. The horseshoe shape is supposed to be formed by discontinuities in the wind, which may be called "gust fronts." In describing his conception of the convectional cells, Durst states:

"Within these horseshoes (at the surface) the air is warm and tending to rise, while on the outside of the horseshoes the air is cold and tending to sink. The rising air having recently lost momentum by contact with the ground is slow-moving; the sinking air brings down with it the momentum, humidity, turbulence and direction of the wind at a higher layer. Hence, as a gust passes an observer there will be a sudden fall in temperature; a fall in humidity, a sudden rise in wind velocity and veer of wind direction and also a decrease in the small-scale turbulence. After the gust front has passed there will be a gradual decrease of wind velocity as the friction with the ground surface retards the air flow, an increase in temperature due to the heating up by contract with the surface and an increase of humidity, if the ground surface is damp. The gust fronts are considered to have sloping surfaces."

In explanation of the latter statement, the author supposes that the underside of the gust fronts slope upward toward the direction of motion of the wind, so that the gusts will strike the highest point on a pole before it arrives at a point vertically below it. As Durst states: "If such a picture is true the retardation of flow at the earth's surface will cause the warm air to be trapped and the vertical section of the gust front will take on an irregular shape—, with 'gust tongues' striking downward. When such gust tongues strike the ground they will form splashing eddies—." The phenomenon under consideration is analagous to that which occurs in connection with the overhanging nose mentioned previously in relation to line squalls and cold fronts.

To give some idea of the intensity of gusts under fairly severe conditions, the publication of Giblett and co-workers previously referred to indicates that "In the case of a line squall which can be characterized as sharp, but not probably exceptionally so, the greatest vector change of wind between consecutive one-minute mean values of the wind was 35 miles per hour."

Since gusts of greater than the average velocity over a period of one minute invariably occur within the period, maximum change in gust velocity must have been considerably more than the specified value. It may be assumed as experience has shown, that "the maximum gusts reach velocities with average values between 50% and 70% in excess of the mean velocity."[1]

A change from average wind velocity of 52 m.p.h. to maximum gust velocity of approximately 112 m.p.h. has been reported in the British Isles which shows that sometimes the difference exceeds 100% of the mean velocity. The accelerations in the wind can be very great during storm conditions, for changes from lull to gust may take place in a few to several seconds.

When an intense line squall disturbance passes a given point, the abrupt burst of air descending from aloft at great velocity produces the most powerful wind accelerations observed in nature, except in tornadoes and possibly some hurricanes. The squall is accompanied by a radical shift in direction, usually averaging roughly 100°, but sometimes greater than 180° and sometimes as low as 10°. Wind squalls associated with thunderstorms often produce severe wind shifts, similar to those just outlined.

[1] W. R. Gregg, "Aeronautical Meteorology," 2nd Ed., 1930, New York, p. 272, Chapter II, "Airship Meteorology," by F. W. Reichelderfer.

Cold Front Roll Cloud