FORMING AND STOPPING TORNADOES. LABORATORY EXPERIMENTS

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Abstract: *Tornadoes can be caused not only by interaction between hot and cold air currents, but also by certain energies (very small black holes) on the surface of the Earth. This original paper attempts to explain the formation of tornadoes through laboratory experiments by help of singularity. Stopping tornadoes have been experimentally determined using different methods with different efficiencies.*
Keywords: *tornadoes, singularity, vortex, black holes, laboratory experiments*

1. INTRODUCTION

The authors are grateful to the Creator of heavens and earth without whom this research would never have been possible.
Detailed information regarding the derivation and simplifications of different tornado-like vortex models is provided in reference [1]. Vortex models are able to represent certain flow patterns but fail in replicating the entire three-dimensional flow structure. The characteristics of several numerical expressions for tornadic wind were investigated. There is quite a large variation in the velocity components among the numerical models. Most numerical models include the maximum tangential velocity and its radius as the main parameters. Only the Kuo-Wen and Fujita models have three bounded velocity components [2]. Tornadoes are directly related to vortex genesis and the vortex stability. A mathematical model applied to tornado genesis is built on a bifurcation process in which an axisymmetric non-rotating updraft satisfying an adherence condition at the ground is considered [3, 4]. A numerical tornado simulator have been used to investigate vortices flow fields generated in a tornado by help of the LES turbulence model. Detailed corner flow patterns have been obtained using mean velocity fields. One-cell as well as two-cell type vortices have been investigated using the Navier-Stokes equations [5]. The influence of a large scale vortex in a turbulence vicinity have been investigated in reference [6]. In the central zone of the vortex a strong decrease in the amplitude of the velocity fluctuations and of the dissipation have been noticed. To reproduce tornado in nature, effects from translation have to be considered. Similarity law still works even tornado is translating or ground is rough. Effects from ground roughness are not same for different types of tornadoes [7].

2. OBSERVING TORNADOES IN NATURE

A tornado is a destructive vortex of high speed rotating winds presenting a cone-shape appearance that moves on the ground surface beneath a large storm system. In general, observing tornadoes in nature, a tornado grows upside down with its root up like an icicle. From these observations a few questions arise. If the gravitational attraction acts on the tornado cloud, why do not form more cones, as in the case of the icicles? It results that there is only one force on the surface of the Earth. Which is an unknown force so far (Fig. 1). If we look closely at the surface of the earth below the tornado peek, there is a swirl that rotates very quickly around its axis. What is there (Fig. 2)? Are the currents of cold air and hot air? If yes, why at the beginning there is a point movement on the ground? At the top of the tornado there is a singularity ($F = m \cdot a$) where F represents the drive force; m is the mass that tends to zero and a represents the acceleration that tends to infinity (Fig. 3). So, this singularity at the top of the tornado can be a very small black hole, (see Fig. 4). The singularity moves to the surface of the Earth (Fig. 5). Moreover, the singularity pulls the tornado after it (Fig. 6). Singularity puts in motion large rows of air, forming a cyclone (Fig. 7). The cyclone curves space and absorbs matter on the surface of the Earth. The swirling air mass curves the space to form whirlwinds (cyclones). The air moves in a circle, that is, the wind rotates instantly on the cyclone's edge towards its center, emitting columns of dust, smoke, snow, papers, dried leaves, lighter objects, etc. An interesting tornado is the fire one. In this case, the singularity attracts from clouds positive and negative electric charges that cause lightning within the tornado cone (Fig. 8).

Figure 1: Tornado with its specific cone-shape

Figure 2: Swirl that rotates with high speed

Figure 3: At the beginning there is a rotation point motion on ground

Figure 4: The singularity (very small black hole) at the top of tornado

Figure 5: The singularity moves on the ground

Figure 6: Singularity pulls tonado after it

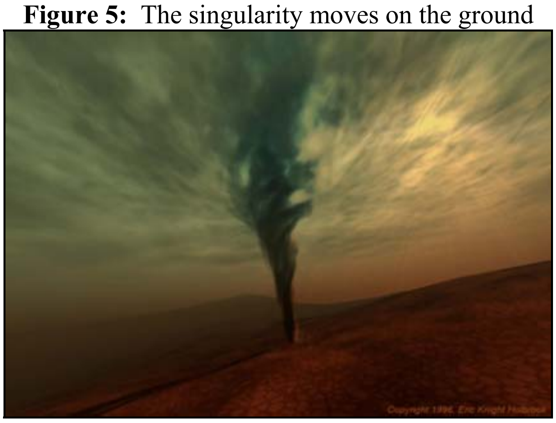

Figure 7: Singularity that forms a cyclone (https://eng.hebus.com/#)

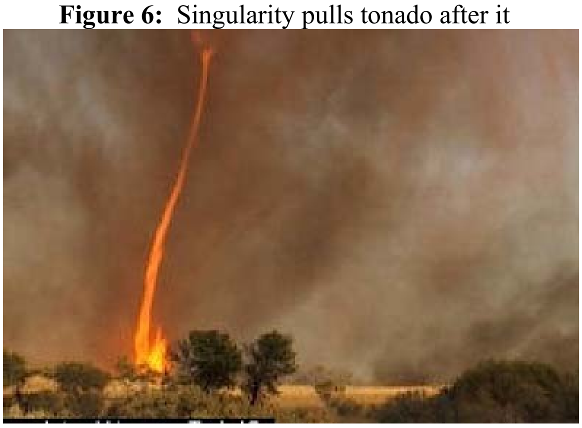

Figure 8: Singularity can form a fire tornado

3. EXPERIMENTING TORNADOES IN LABORATORY BY HELP OF SINGULARITY

For the formation of a tornado we need: a stirrer (1), a high glass (2) and a cylindrical magnet (3) as singularity (very small black hole, see Fig. 9). Fill the high glass (2) with 80% water of its height, as shown in Fig. 10. Start the stirrer (1) from the start button, which rotates the magnet (3) at 2500 rotations per minute. We notice how the tornado slowly begins to form from the water surface to the base of the glass. We notice how the tornado grows upside down (Fig. 11), like an icicle, due to the rotation of the singularity (magnet). If the glass moves on the surface of the agitator, the tornado tip does not leave the singularity, so the tornado cone curves. On the ground, singularity moves and pulls the tip of the tornado after it (Fig. 12). The force that causes the tornado is: $F = m \cdot a$, where m is the mass and a represents the acceleration. But: $a = v^2/r$, so $F = mv^2/r$. For tornadoes caused by singularities, $m < 1\ kg$, $r < 1\ m$, $v < 1$ m/s, so $F = 1 \cdot 1^2/1 = 1\ kgm/s^2$. The singularity with force $F = 1\ kgm/s^2$ cannot form a tornado. Conclusion: at low speeds, tornadoes cannot form singularities.

Figure 9: The experimental set-up

Figure 10: Rotational magnetic field with 2500 rotations/minute forms a tornado from water surface

Figure 11: Tornado that grows upside down due to the rotation of singularity (magnet)

Figure 12: When singularity moves, pulls the tornado tip after it

4. ATTEMPTS TO STOP A TORNADO

Stopping a tornado through laboratory experiments can be done in several ways:

- Using a sphere with a diameter of 30 mm. The efficiency is 75% (Fig. 13);
- With spheres having different densities. The efficiency is between 65% ÷ 75% (Fig. 14);
- By help of two spheres linked together. The efficiency is 78% (Fig. 15);
- Using three spheres linked together. The efficiency is 80% (Fig. 16);
- Using the “floating diaphragm”. The efficiency is 100% (Fig. 17);

Singularity curves space like a cyclone. The cyclone behaves like a black hole. Cyclone curves space and absorbs matter on the surface of the Earth (Fig. 18). The swirling air mass being in high speed rotational motion curves the space to form whirlwinds (cyclones). The air moves in a circle, that is, the wind rotates around a fixed point from the cyclone's edge towards its center, emitting columns of dust, smoke, snow, papers, dried leaves, lighter objects, etc. The fire tornado is highlighted with a red colored oil paint. In fact, we think that the tornado cone draws negative (-) and positive (+) electric charges from cloud, leading to a strong lightning in the tornado cone (Fig. 19). Tornado grows and attracts positives and negative electric charges from clouds on the flame cone. Tornado behaves like a black hole (Fig. 20).

It can be noticed that if the singularity moves, the tip of tornado follows singularity as in nature (Fig. 21). Tornado behaves like a black hole. The black hole swallows all the matter that lies near it.

Figure 13: Stopping tornado using a sphere of 30 mm diameter. 75% efficiency.

Figure 14: Stopping tornado using spheres with different densities. 65% - 75% efficiency

Figure 15: Stopping tornado using two spheres linked together. 78% efficiency

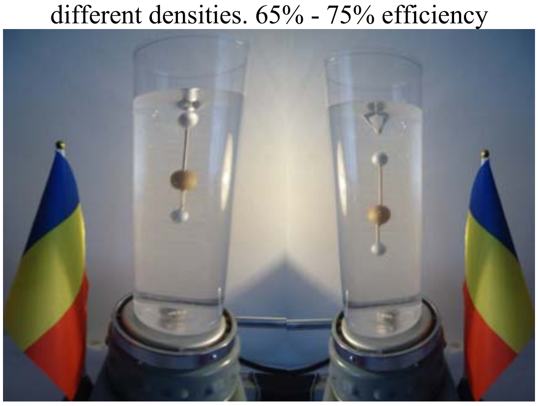

Figure 16: Stopping tornado using three spheres linked together. 80% efficiency

Figure 17: Stopping tornado by help of a „floating diaphragm”. 100% efficiency

Figure 18: Singularity curves space like a cyclone. (https://eng.hebus.com/#)

Figure 19: A fire tornado highlighted with a red colored oil paint

Figure 20: A fire tornado grows and attracts positives and negative electric charges from clouds

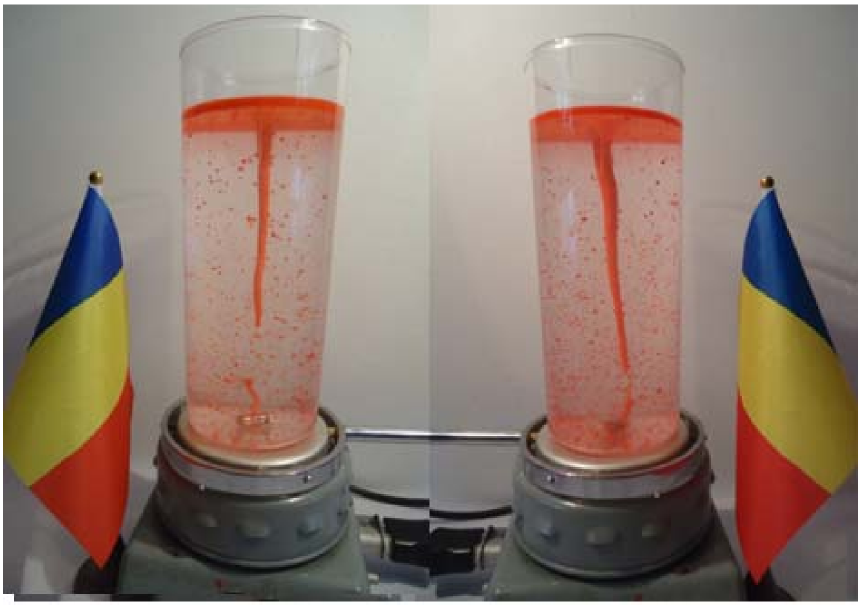

Figure 21: If the singularity moves, the tip of tornado follows singularity as in nature

5. CONCLUSION

Some tornadoes are formed due to singularity (very small black holes) fallen on the surface of the Earth. Singularities move on the surface of the Earth, pulling the tornadoes after them. Singularities impart high speed rotation motions to air masses, which cause great damages on ground.

REFERENCES

[1] Gillmeier S., Sterling M., Hemida H., Baker C.J., A reflection on analytical tornado-like vortex flow field models, Journal of Wind Engineering and Industrial Aerodynamics, 2018, 174, 10-27.

[2] Kim Y.C., Matsui M., Analytical and empirical models of tornado vortices: A comparative study, Journal of Wind Engineering and Industrial Aerodynamics, 2017, 171, 230-247.

[3] Larcheveque M., Chaskalovic J., A new mathematical model applied to tornado genesis, International Journal of Engineering Science, 1994, 32, 1, 187-193.

[4] Chen J.M., Vortex affected by the conical shape of generator in tornado-type wind-energy system, Journal of Wind Engineering and Industrial Aerodynamics, 1978, 3, 4, 307-313.

[5] Ishihara T., Oh S., Tokuyama Y., Numerical study on flow fields of tornado-like vortices using the LES turbulence model, Journal of Wind Engineering and Industrial Aerodynamics, 2011, 99, 4, 239-248.

[6] Andreotti B., Maurer J., Couder Y., Douady S., Experimental investigation of turbulence near a large scale *vortex*, European Journal of Mechanics - B/Fluids, 1998, 17, 4, 451-470.

[7] Liu Z., Ishihara T., Study of the effects of translation and roughness on tornado-like vortices by large-eddy simulations, Journal of Wind Engineering and Industrial Aerodynamics, 2016, 151, 1-24.