Small laboratory experiments of Tornadoes using Dry Ice, PET bottles and a home cleaner

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Tornadoes may be well-known disasterous phenomena, however, many people have not seen actually. Sometimes they can not recognise even the difference between a typhoon and a tornado.

We introduce simple laboratory experiments of tornadoes which are demonstrated in open-day events of our institute and many scientific classes organized by the MEXT and other local governments with the aim of people's better understanding of tornadoes.

We define a 'tornado' as a slender vortex which is intensified as the relatively weak vortex near the lower boundary is stretched by upward motion aloft. Tsubota (1999) showed a tornado experiment using Dry Ice, cardboard boxes and a small fan for a PC. We have improved this to make a tornado more conveniently in a PET bottle.

First, please cut off the bottom of the PET bottle, then incise several centimeters upward from the lower section (e.g. upside-down 'L' shape) in several place and bend inward 'fins' slightly. You should make them equally so that an air flow from outside can make a vortex smoothly. Next, put a fragment of Dry Ice into water in a dish of 1 or 2 cm depth and cover the smoke with the processed PET bottle. If the air in the PET bottle is sucked out from the mouth of it using a home cleaner, you can see a tornado about 1 cm in diameter visualised by smoke of Dry Ice.

Preparation of several kinds of processed PET bottles are useful for the explanation of the mechanism of tornadoes. You can show both of the clockwise and anti-clockwise tornadoes if you have bottles with CW and ACW 'fins'. The importance of the rotation near the surface is shown using a bottle with holes only, no rotational fins.

Children will be excited to see small bottle and a elongated bottle, which 2 or 3 bottles are connected !