

> Vortices, Volcanoes and Very big storms

[Volcanoes and vortices](#)

[Experiment 1: Vortex in a glass](#)

[Experiment 2: Vortex in a bottle](#)

[Video: vortex rings](#)

[Storm chasers](#)

[Pulsating vortex illusion](#)

> Volcanoes and vortices



Photo Courtesy of [NASA](#)

In 1811, a sea captain sailing through the Azores archipelago in the Atlantic Ocean witnessed a volcano eruption surging from the sea. He described the plume of ash and smoke rising "like an horizontal wheel", while lightning "continually issued from the densest part of the volcano." Then the plume "rolled off in large masses of fleecy clouds, gradually expanding themselves in a direction nearly horizontal, and drawing up to them a quantity of waterspouts."

The captain was describing a vortex, a spinning, turbulent flow of ash and smoke, and his observations are the topic of a paper in this months' [Nature Geoscience](#). The same effect – known as a mesocyclone – occurs inside severe thunderstorms. Circulating cloud is caught up into a vertical vortex, which drags up hail, repeatedly coating it with layers of ice.

Vortices form when fluid (such as air, water, cloud, or a plume of ash) rotates rapidly. You can see vortices when you pull the plug out of your bath or flush the toilet. They can also occur in magnetic fields, in weather, tidal systems and the turbulent flow of air around aeroplane wings. Researchers are interested in vortices in volcanic plumes because a vortex can keep particles suspended in the air for longer. When Mt Pinatubo erupted in 1991, a vortex in the ash plume sent tonnes of sulphur dioxide 40 km into the air, cooling the global climate by 0.5°C for the next two years.

Want to make your own volcano?

[Click here for the simple experiment done around the world!](#)

> Experiment 1: Make a vortex in a glass

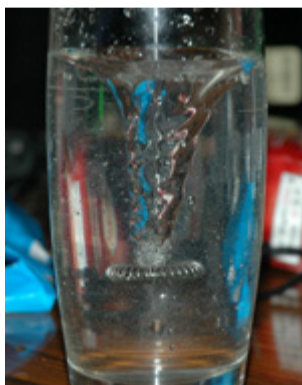


Photo courtesy of Wikipedia.

If you like your vortices more contained, try this one for size.

You will need

a large glass of water
coffee plunger or hand-operated, milk-frothing device.

Simply stick the plunger into the glass, hold it steady and rapidly plunge it up and down – you should form a whirlpool, a vortex of water pulled from the rotation of the water around the glass.

Image: vortex in a glass

Credit:Stassats (Wikipedia)

> Experiment 2: Make a tornado in a bottle

You will need

two plastic bottles the same size with lids
a hammer and thick nail to poke a hole in the lids
thick, waterproof stickytape
food colouring
glitter

Make a hole in the centre of two bottle lids using a thick nail. Using some

Physics quotes:

"In science there is only physics; all the rest is stamp collecting."

Lord Kelvin, Irish physicist famous for developing the Kelvin scale of temperature, 1824–1907.

Another quote

"Desire is storm, greed is whirlpool, pride is precipice, attachment is avalanche, ego is volcano. Discard desire and you are liberated."

Sri Sathya Sai Baba, Indian spiritual leader, born 1926.

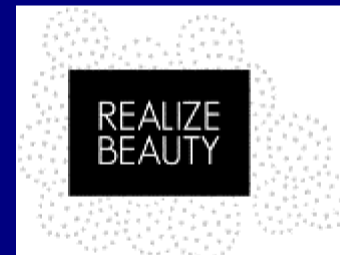
Yet another quote

"The image is more than an idea. It is a vortex or cluster of fused ideas and is endowed with energy."

Ezra Pound, U.S. poet, 1885–1972.

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thick, canvas-backed plastic tape (needs to be waterproof), attach the lids together so that the tops of the lids are touching and the hole goes through both lids. Fill one bottle 3/4 full with water, food colouring and glitter. Attach the lids to the bottles so that one bottle sits on top of the other. Invert so that the water runs from one bottle to the other. Observe what happens.

Invert the bottles again, and this time, give the bottles a rapid twirl in a horizontal direction. This should start off your vortex, or 'tornado in a bottle'.



1973 Union City Tornado

Photo courtesy of [NOAA](#)

Centri-what force?

The vortex spins because of centripetal force - the one that famously makes an iceskater spinning on the spot twirl faster when his or her arms are pulled into their body. As the water spins, it moves faster at the base of the bottle, where the bottle neck is smaller. The faster-moving water pulls the water down into the bottle.

At the same time, air from the bottom bottle is let into the top bottle because of the shape of the vortex, which allows a funnel for the air to flow. Because the air and water can both flow freely while the water is spinning, the water pours into the bottom bottle faster than it did when there was no vortex.

> [Video: Vortex ring collision... what happens?](#)



[Click here for the video](#)

By the way, we make fog vortex rings at our school science show 'Flight & Weather' as well as during [kids parties!](#) See below for a simple video...



[Click here for the video](#)

> [Storm chasers in Australia](#)

If the idea of a catching a glimpse of a vortex in a severe storm excites you, you're not alone. You can find help and like-minded storm lovers here:

[Sydney Storm Chasers](#)
[Brisbane Storm Chasers](#)
[Australian Severe Weather Association](#)

> [Pulsating vortex illusion](#)

This static vortex image tricks the brain so that it seems like the image pulsates. Warning: image flashes so watch out if you're prone to photo-seizures. [Pulsating vortex illusion](#)

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