

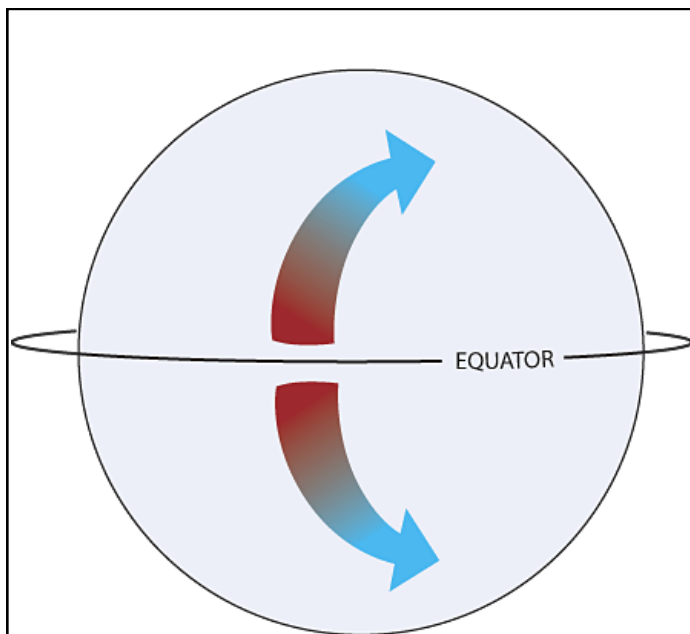
CORIOLIS EFFECT

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Fact or Fiction – Coriolis effect results in water in toilet bowl water spinning clockwise in the northern hemisphere and counterclockwise in the southern hemisphere? This little fable has really gotten around over the years...but truth be told, a fable it is, and therefore the answer is false.

What is Coriolis effect? – Coriolis describes the perceived change in position of an intended target on the earth's surface due to the earth's rotation. It is most evident at greater distances or for objects moving slowly towards a target. Coriolis effect was described by French scientist Gustave de Coriolis in 1835.



Because the earth rotates eastward, circulating air is deflected to the right in the Northern Hemisphere and to the left in the Southern Hemisphere. NOAA Image

The Coriolis effect is most evident in the path of an object moving longitudinally. On the Earth, an object that moves in a north-south or longitudinal direction will undergo apparent deflection to the right in the Northern Hemisphere and to the left in the Southern Hemisphere. Two reasons explain this: first, the Earth rotates eastward; and second, the linear velocity of a point on the Earth relative to its target is a function of latitude. Explained simply, the earth's surface is rotating faster at the equator (which is wide) than at either pole (which is narrow compared to the equator), so an object moving northward from the equator towards an intended target will be deflected eastward faster than was its target farther north.

The Coriolis deflection is therefore related to the motion of the object, the motion of the Earth, and the latitude. Coriolis effect results in winds deflected to the right in the Northern Hemisphere and to the left in the Southern Hemisphere thus creating our trade winds. Global winds drag on the water's surface, causing it to move and build up in the direction that the wind is blowing. This also results in the deflection of major surface ocean currents to the right in the Northern Hemisphere (in a clockwise spiral) and to the left in the Southern Hemisphere (in a counterclockwise spiral). These major spirals of ocean-circling currents are called "gyres" and occur north and south of the equator. They do not occur at the equator, where the Coriolis effect is not present. For years sailors have referred to this calm equilateral area as the doldrums.

The Ekman spiral, named after Swedish scientist Vagn Walfrid Ekman who first theorized it in 1902, is a consequence of the Coriolis effect. When driven by wind, the topmost layer of surface water in the Northern Hemisphere flows at about 45 degrees to the right of

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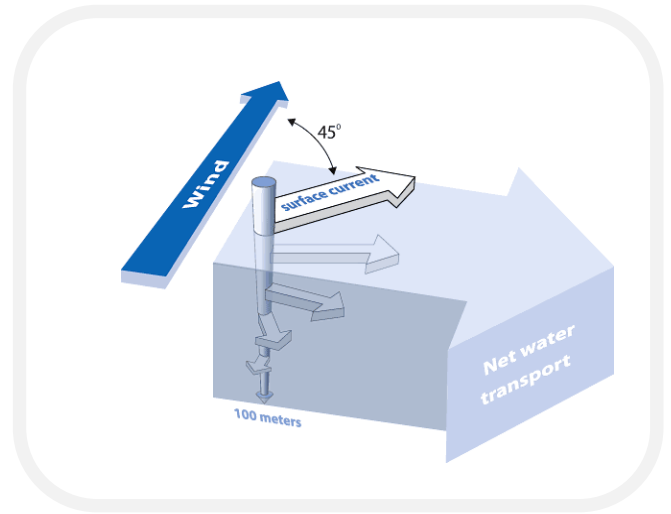
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the wind direction. Deeper layers of water respond to the friction of the layer above and also deflect to the right but at a slower speed. Each subsequent deeper layer slides horizontally over the one above it like a deck of cards creating a spiral effect, until the movement ceases at a depth of about 100 meters (330 feet). Because the deeper layers of water move more slowly than the shallower layers, they tend to “twist around” and flow opposite to the surface current.

So why doesn't Coriolis hold true for a toilet? The rotation of the Earth is very small: only one rotation per day. The water in a toilet might make a several rotations a second so its rotation rate is many thousand times greater than that of the Earth. As a result Coriolis force is orders of magnitude smaller than any of the forces involved in a flushing toilet. The Coriolis force is so small, that it plays no role in determining the direction of rotation of a draining toilet.

Source: NOAA Ocean Service Education

<http://oceanservice.noaa.gov/education/kits/currents/05currents1.html>



Eckman's Spiral occurs as a consequence of Coriolis. NOAA Image



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