

## Kepler's Law of Areal Velocity in Cyclones

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**Abstract.** Faraday's law of electromagnetic induction and Kepler's law of areal velocity are two manifestations of a single principle which requires two distinct phenomena for its full understanding. The former is an expression for the rate of change of angular momentum, with particular reference to the sea of tiny molecular vortices which acts as the domain of the electromagnetic field. The latter expresses conservation of angular momentum in situations in which there is no net tangential force in that same sea of molecular vortices. The single principle which lies behind these two laws needs to be split into two distinct phenomena for the full understanding of the principle. These two phenomena are Coriolis force  $\mathbf{v} \times \mathbf{H}$  and angular force  $\partial A / \partial t$ . The Coriolis force that is observed in all vortex phenomena is a constituent part of the general principle that underlies both Faraday's law and Kepler's second law. It is a hydrodynamical effect.

### Faraday's Law of Electromagnetic Induction

I. The rotational aspect of the electric field can be written in terms of a Coriolis component and an angular force component as follows,

$$\mathbf{E} = \mathbf{v} \times \mathbf{B} - \partial \mathbf{A} / \partial t \quad (\text{Lorentz Force}) \quad (1)$$

Where the electric field vector  $\mathbf{E}$  represents the net tangential force. The magnetic field is caused by a sea of molecular vortices that are aligned solenoidally along their rotation axes, such that these axes trace out the magnetic lines of force. These vortices each comprise of an electron in mutual circular orbit with a positron. See figure 1 below,

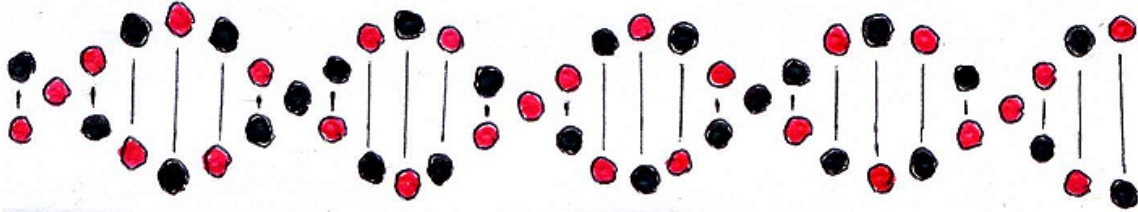


Figure 1. A close-up view of a single magnetic line of force. The electrons are shown in red and the positrons are shown in black. The double helix is rotating about its axis with a prodigious angular speed and the rotation axis represents the magnetic field vector  $\mathbf{H}$ . The diagram is not to scale as the relative dimensions remain unknown.

The magnetic field vector  $\mathbf{H}$  is the vorticity/angular momentum of a molecular vortex, and the vector  $\mathbf{B}$  is the magnetic flux density of a sea of such vortices. The magnetic permeability  $\mu$  represents the areal density of a perpendicular cross-section of the magnetic lines of force in this sea, and so the vector  $\mathbf{B}$  is equal to  $\mu\mathbf{H}$ .

If we take the curl of equation (1), we will obtain,

$$\text{curl } \mathbf{E} = -(\mathbf{v} \cdot \text{grad})\mathbf{B} - \partial\mathbf{B}/\partial t \quad (2)$$

This follows from the equation,

$$\text{curl } \mathbf{A} = \mathbf{B} \quad (3)$$

where  $\mathbf{A}$  is the aether field momentum, and also from the vector identity,

$$\text{curl } (\mathbf{v} \times \mathbf{B}) = \mathbf{B}(\text{div } \mathbf{v}) - \mathbf{v}(\text{div } \mathbf{B}) + (\mathbf{B} \cdot \text{grad})\mathbf{v} - (\mathbf{v} \cdot \text{grad})\mathbf{B} \quad (4)$$

The first and third terms on the right hand side of equation (4) vanish because  $\mathbf{v}$  represents an arbitrary particle velocity. The second term on the right hand side of equation (4) vanishes because of the relationship  $\text{curl } \mathbf{A} = \mathbf{B}$ , which means that  $\text{div } \mathbf{B} = 0$ .

If we now apply the total time derivative operator,

$$d/dt = \partial/\partial t + \mathbf{v} \cdot \text{grad} \quad (5)$$

to equation (2), we will obtain a total time derivative version of Faraday's law of electromagnetic induction in the form,

$$\text{curl } \mathbf{E} = -d\mathbf{B}/dt \quad (\text{Faraday's Law}) \quad (6)$$

Faraday's law is therefore a single principle that contains two distinct phenomena for its full understanding. It concerns the rate of change of angular momentum of the molecular vortices within which the magnetic field is embedded. The two phenomena in question are Coriolis force and angular force. The aether field momentum  $\mathbf{A}$ , at its sinks and sources, corresponds to the velocity of the electrons and positrons in the rotating electron-positron dipoles.

### **Kepler's Law of Areal Velocity**

II. Kepler's law of areal velocity represents the special case that occurs when angular momentum is conserved. In this case, the tangential force is zero and we will have,

$$0 = \mathbf{v} \times \mathbf{H} + \partial \mathbf{v} / \partial t \quad (\text{Kepler's Second Law}) \quad (7)$$

Where  $\mathbf{H}$  is vorticity and  $\mathbf{v}$  is particle velocity. (In Faraday's law, the two velocities are unconnected, and the two terms don't sum to zero in general.) When no net tangential forces are acting in a body of fluid, angular momentum will be conserved. However, when the two individual terms on the right hand side of equation (7) actually exist, they will never cancel each other out physically, even though they will cancel each other out mathematically. If there should exist a tendency for radial motion to occur within a body of fluid, we will be able to observe both the angular acceleration and the Coriolis force in action. If the radial flow is due to a sink or a region of low pressure, we will observe an angular acceleration as the fluid swirls closer to the sink or the region of low pressure. We will also observe a Coriolis force acting in the opposite direction. The inward radial

flow will be continually deflected in the tangential direction, opposite to the direction of the angular acceleration.

Coriolis force is therefore present in all vortex phenomena whether it is a large scale cyclone in the atmosphere, a tornado, or water swirling out of a kitchen sink. This is real Coriolis force and it can be viewed from any frame of reference. It is a more general example of the Coriolis force that can be viewed in a non-circular planetary orbit. In the planetary orbital case,  $\mathbf{H} = 2\boldsymbol{\omega}$ , where  $\boldsymbol{\omega}$  is the angular velocity of the planet, because the solenoidally aligned sea of molecular vortices is a rigid solid which constitutes space for large bodies. See section V of ‘The Cause of Coriolis Force’ at,

<http://www.wbabin.net/science/tombe55.pdf>

The initial angular momentum in a fluid should determine the direction of rotation of a vortex, but in some large scale vortex phenomena such as cyclones and tornadoes, the direction of rotation is cyclonic. This means that the direction of rotation will be influenced by the rotation of the Earth, and it will also depend on which hemisphere the vortex is occurring in. This is due to the fact that when an element of atmosphere undergoes a north-south motion, for example towards a region of low pressure, a Coriolis force is required to constrain that moving element to the north-south path. The atmosphere can only apply a partial Coriolis force to north-south moving elements of itself, and so these moving elements will be deflected into the east-west direction. But contrary to what modern textbooks may say, this deflection is not Coriolis force. It is pure inertia. Deflections of east-west air currents into the north-south direction will be due to a tightening up or a slackening of centrifugal force, and we already know that centrifugal force is the same thing as inertia. When any motion is viewed from a rotating frame of reference, an apparent circular motion will be superimposed upon the actual motion. This fictitious effect would not be viewable from outer space, and the pure inertia of a moving element of atmosphere, when considered in isolation, should not be viewable from outer space. But since the moving element is physically connected with the larger co-rotating body of atmosphere which has not been deflected, the interaction is such as to work against the inertia of the moving element. The combined effect will hence set the direction of the angular momentum of the ensuing vortex. In the special case of a tornado, the cyclonic effect is determined by the already existing cyclonic effect in the larger body of atmosphere within which the tornado forms. Once the spin direction has been set for cyclones and

tornadoes, the effect which follows on will be predominantly governed by conservation of angular momentum in line with Kepler's law of areal velocity, and it will involve real Coriolis force which is sourced at inter-molecular level between the air molecules. Coriolis force is a real hydrodynamical effect in the atmosphere which can be observed from outer space.

In the case of water swirling out through a kitchen sink, the effect of the Earth's rotation in determining the direction of spin of the vortex will be negligible and it will be most unlikely to overcome any already existing angular momentum in the water. This can be easily tested in one hemisphere alone. Nevertheless, real Coriolis force is easily observable in the water that swirls out through a kitchen sink even though the spin direction is not cyclonic.