THE MAGNITUDE OF THE CORIOLIS ACCELERATION

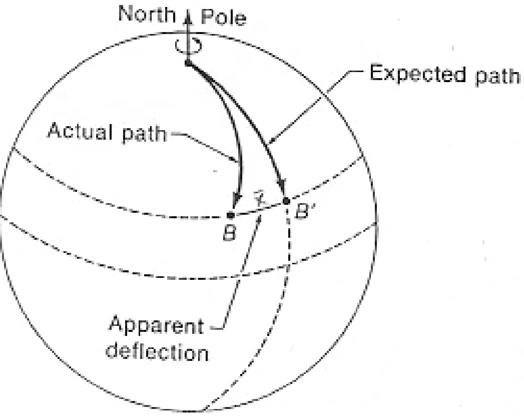

Figure 8.1 Deflection of an equatorward projectile.

Let the Coriolis acceleration be a; recall that the distance x travels is the average speed (at/2) times the travel time,t; then the distance traveled to the right is

$$x = \frac{at^2}{2}$$

which can be related to the speed of the object, V, and the distance traveled, d, such that

$$t = d/V$$

therefore,

$$\boxed{x = \frac{a(d/V)^2}{2}}$$

The sideways motion can also be calculated from the angular velocity, ω, of the object about the origin. Recall that $t = d/V$; then

$$x = \omega dt = \frac{\omega d^2}{V}$$

Equating these two expressions for x, we obtain

$$\frac{a(d/V)^2}{2} = \frac{\omega d^2}{V}$$

giving

$$\boxed{a = 2\,\omega V}$$

If ω is due to the earth's rotation about a local vertical axis, such that

$$\omega = \Omega\sin\phi$$

then

$$a = 2\Omega\sin\phi V$$

and

$$a = fV$$

where

$$f = 2\Omega\sin\phi = \text{the Coriolis parameter}$$

force per unit mass

$F_c = 2\Omega\sin\phi V$

- apparent acceleration
- $\perp$ to direction of motion
- right