**Coriolis force**

Consider a vector **r** in a stationary inertial frame I, with frame R rotating about the z axis at angular velocity **Ω.** Both z and **Ω** point into the paper

In the rotating frame

**r** = (r cos θ, r sin θ)

If **r** is fixed in the inertial frame, then in the rotating frame

-**Ω**×**r**

yI

yR

Ω

θ

**r**

XR

XI

Then more generally

Applying this rule twice we get:

which gives:

 **Coriolis Centrifugal**

Then the momentum equation in a reference frame fixed at the Earth’s centre and rotating with it is:

Where **G** is the gravitational force and F friction. We conventionally combine the centrifugal and gravitational term to give g, the acceleration due to gravity, giving:

What we also find is that when we transform to a local Cartesian frame, the terms that arise because of the Earth’s curvature can be discarded through scale analysis so that this becomes the starting point for our exploration of dynamical meteorology.