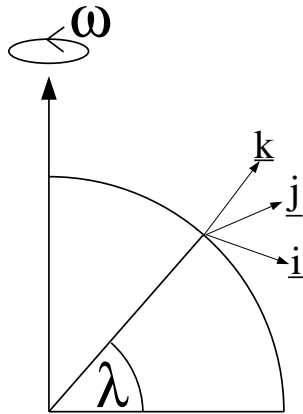


### Question

Find the Coriolis Force acting on a particle on the Earth's surface at a latitude,  $\lambda$ , that

- (a) moves horizontally due north with speed  $V$ ;
- (b) move vertically upwards with speed  $V$ .

### Answer



$$\omega = -\omega \cos \lambda \mathbf{i} + \omega \sin \lambda \mathbf{k}$$
$$\text{Coriolis Force} = -2m\omega \times \mathbf{v}$$

(i)

$$\begin{aligned} \mathbf{v} = -V\mathbf{i} \quad \text{Coriolis Force} &= -2m\omega \times -V\mathbf{i} \\ &= 2m\omega V(-\cos \lambda \mathbf{i} + \sin \lambda \mathbf{k}) \times \mathbf{i} \\ &= 2m\omega V \sin \lambda \mathbf{k} \times \mathbf{i} \\ &= 2m\omega V \sin \lambda \mathbf{j} \end{aligned}$$

(ii)

$$\begin{aligned} \mathbf{v} = -V\mathbf{k} \quad \text{Coriolis Force} &= 2m\omega V(-\cos \lambda \mathbf{i} + \sin \lambda \mathbf{k}) \times \mathbf{k} \\ &= -2m\omega V \cos \lambda \mathbf{j} \end{aligned}$$