Answer on Question#61574 – Physics – Mechanics – Relativity

An aeroplane flies due east along the equator with a speed of 300 ms−1. Determine the magnitude and direction of the Coriolis acceleration.

Solution. The Coriolis acceleration can be calculated by the formula $a = 2[\vec{v}, \vec{\omega}]$ (vector product). Where $v = 300\frac{m}{s}$ – the relative velocity of the point, ω – the angular velocity of rotation of the Earth. Magnitude Coriolis acceleration find as $a = v\omega \sin\alpha$. v, ω magnitude relative and velocity, α – the angle between them (in our case $\alpha = 90^0$).

The angular velocity of the Earth at the equator can be calculated as

$\omega = \frac{2\pi}{T}$, where T – the period of rotation of Earth. ($T = 24^h = 86400s$).

Hence $a = v\frac{2\pi}{T}\sin 90^0 = 300 \cdot \frac{2\pi}{86400} \cdot 1 \approx 0.022\frac{m}{s^2}$.

If the body is moving from West to East in the plane of the equator, the Coriolis acceleration directed vertically upwards.

Answer. $a = 0.022\frac{m}{s^2}$ directed vertically upwards.