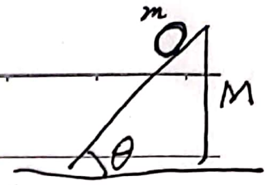


小球(m)，斜木块(M)及地面三者均无滑，求(对地)a_m，a_M

对M选地面作为参考系，对m选斜面做参考系(非惯性系)

对：M：N，mg　　$N\sin\theta = Ma_M$ ①

对m：a_m，N，a_M，mg

(设向右为正)　　惯性力

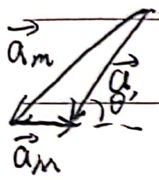
水平方向：$-N\sin\theta - ma_M = -ma_m\cos\theta$ ②

竖直方向(设向上为正)：$N\cos\theta - mg = -ma_m\sin\theta$ ③

联立①②③得：

$$\begin{cases} a_M = \dfrac{m\sin\theta\cos\theta}{M+m\sin^2\theta}g \\ a_m = \dfrac{(M+m)\sin\theta}{M+m\sin^2\theta}g \end{cases}$$

(☆此为对斜面加速度)



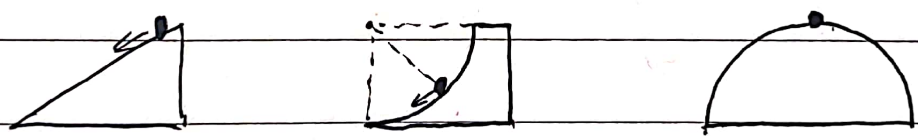
$\vec{a} = \vec{a}_m + \vec{a}_M$

$a_x = a_m\cos\theta - a_M = \dfrac{M\sin\theta\cos\theta}{M+m\sin^2\theta}g$

$a_y = a_m\sin\theta = \dfrac{(M+m)\sin^2\theta}{M+m\sin^2\theta}g$

$\tan\theta' = \dfrac{a_y}{a_x} = \dfrac{(M+m)\sin\theta}{M\cos\theta} = \dfrac{M+m}{M}\tan\theta > \tan\theta$

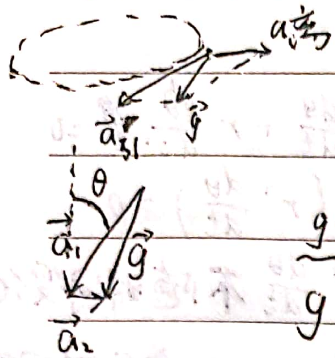
$\therefore \theta'$ 比 θ 陡.



最简单　　角度会变

▲ $\vec{v} = \vec{v}_{mB} + \vec{v}_B$

例：地球自转对地球作为惯性系的影响



$$\vec{a}_{离} = r\omega^2$$

$$\vec{a}_{引} \gg a_{离}\text{，} g \approx a_{引}$$

$g = a_1 - a_2\sin\theta$ 推导：

$$g = \left[a_1^2 + a_2^2 - 2a_1a_2\sin\theta\right]^{\frac{1}{2}}$$

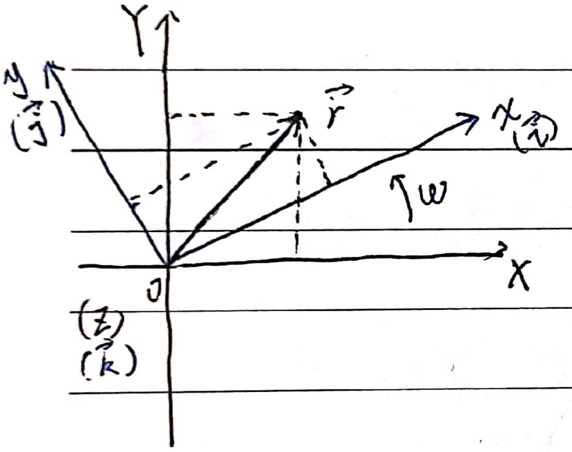
$$\approx \sqrt{a_1^2 - 2a_1a_2\sin\theta}$$

$$= a_1\sqrt{1 - 2\frac{a_2}{a_1}\sin\theta}$$

↓ Taylor展开

$$\approx a_1\left(1 - \frac{a_2}{a_1}\sin\theta\right)$$

科里奥利力在具体问题中的应用.



$$\vec{r} = x\vec{i} + y\vec{j}$$

$$\vec{v} = \left(\frac{dx}{dt}\vec{i} + \frac{dy}{dt}\vec{j}\right) + \left(x\frac{d\theta}{dt}\vec{j} + y\frac{-d\theta}{dt}\vec{i}\right)$$

$$对XOY = \underbrace{\vec{v}_r}_{\substack{对xoy\\(相对速度)}} + \underbrace{\vec{\omega}\times\vec{r}}_{\substack{xoy对XOY\\(牵连速度)}}$$

$$\begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 0 & 0 & \omega \\ x & y & 0 \end{vmatrix}$$

$$\vec{a} = \frac{d^2x}{dt^2}\vec{i} + \frac{d^2y}{dt^2}\vec{j} + \frac{dx}{dt}\frac{d\theta}{dt}\vec{j} - \frac{dy}{dt}\cdot\frac{d\theta}{dt}\vec{i}$$

$$+ \frac{dx}{dt}\frac{d\theta}{dt}\vec{j} - \frac{dy}{dt}\cdot\frac{d\theta}{dt}\vec{i} + x\frac{d^2\theta}{dt}\vec{j} - y\frac{d^2\theta}{dt}\vec{i}$$

$$- x\left(\frac{d\theta}{dt}\right)^2\vec{i} - y\left(\frac{d\theta}{dt}\right)^2\vec{j}$$

$$= \underbrace{\vec{a}_r}_{a对xoy} + \underbrace{2\vec{\omega}\times\vec{v}_r}_{科里奥利加速度} + \underbrace{\underbrace{\vec{\beta}\times\vec{r}}_{\vec{a}_\tau} \underbrace{- \omega^2\vec{r}}_{\vec{a}_n}}_{xoy对XOY}$$

（β是角加速度）

科里奥利加速度.

牛二：$\vec{F} + \vec{F}_i = m\vec{a}_r$

$$\vec{F}_i = -m\left[\vec{\beta}\times\vec{r} \underbrace{- \omega^2\vec{r}}_{\substack{m\omega^2 r\\(离心力)}} + \underbrace{2\vec{\omega}\times\vec{v}_r}_{+2m\vec{v}_r\times\vec{\omega}}\right]$$