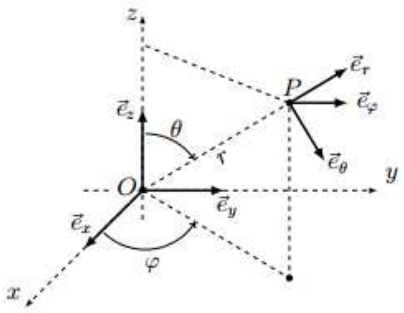
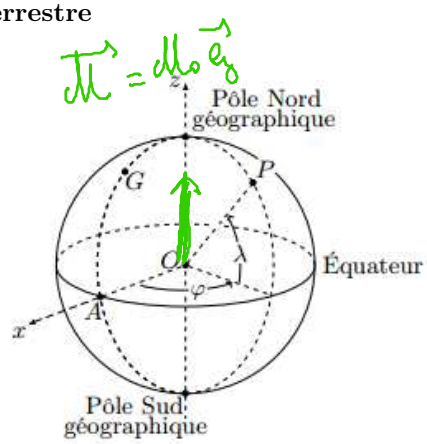
Correction champ magnétique terrestre



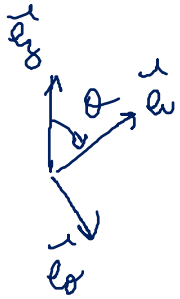


1) Le champ magnétique créé en un point M par un dipôle $\vec{\mathcal{M}}$ placé en O est: $\vec{B} = \frac{\mu_0}{4\pi}\frac{3\overrightarrow{OM}(\vec{\mathcal{M}}.\overrightarrow{OM}) - OM^2\vec{\mathcal{M}}}{OM^5}$

$\overrightarrow{OM} = r\vec{e}_r$

$\vec{\mathcal{M}} = \mathcal{M}_0 \vec{e}_z$

$= \mathcal{M}_0\left[\cos\theta \vec{e}_r - \sin\theta \vec{e}_\theta\right]$



$\vec{B} = \frac{\mu_0}{4\pi}\frac{3r\vec{e}_r(\mathcal{M}_0 r\cos\theta) - r^2\mathcal{M}_0(\cos\theta\vec{e}_r - \sin\theta\vec{e}_\theta)}{r^5}$

$\vec{B} = \frac{\mu_0\mathcal{M}_0}{4\pi r^3}\left[\vec{e}_r(3\cos\theta - \cos\theta) + \sin\theta\vec{e}_\theta\right]$

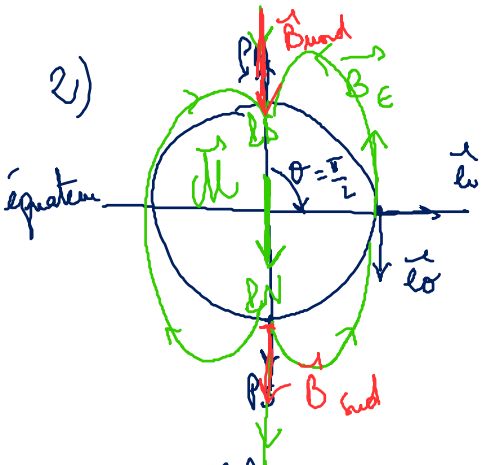
$$\boxed{\vec{B} = \frac{\mu_0\mathcal{M}_0}{4\pi r^3}\left[2\cos\theta\vec{e}_r + \sin\theta\vec{e}_\theta\right]}$$

à la surface de la Terre

$r = R_T$

$\theta = \frac{\pi}{2} - \lambda$

2)



équateur

$\vec{B}_E = \frac{\mu_0\mathcal{M}_0}{4\pi R_T^3}\vec{e}_\theta\left(\theta = \frac{\pi}{2}\right) = -\frac{\mu_0\mathcal{M}_0}{4\pi R_T^3}\vec{e}_z$ ($\vec{e}_\theta = -\vec{e}_z$)

$> 0 \Rightarrow \mathcal{M}_0 < 0$

$\|\vec{B}_E\| = \frac{\mu_0|\mathcal{M}_0|}{4\pi R_T^3} \Rightarrow \boxed{|\mathcal{M}_0| = \frac{4\pi R_T^3\|\vec{B}_E\|}{\mu_0}} = 7{,}9.10^{22}\ A.m^2$

aux pôles : nord : $\theta = 0$: $\vec{B} = \frac{\mu_0|\mathcal{M}_0|2}{4\pi R_T^3}\vec{e}_r(\theta = 0)$ ($\vec{e}_r = \vec{e}_z$)

sud : $\theta = \pi$: $\vec{B} = -\frac{\mu_0|\mathcal{M}_0|2}{4\pi R_T^3}\vec{e}_r(\theta = \pi)$ ($\vec{e}_r = -\vec{e}_z$)

$\|\vec{B}\| = \frac{\mu_0|\mathcal{M}_0|2}{4\pi R_T^3} = 2B_E$

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