## 1 Results of Hughes, Peter - Spacecraft Attitude Dynamics

 ${\pmb M}$  is torque,  ${\pmb m}$  is commanded magnetic dipole moment vector generated by the coils, and  ${\pmb b}$  is the local geomagnetic field.

$$M = m \times b$$

 $\hat{\boldsymbol{b}} = \boldsymbol{b}/||\boldsymbol{b}||$  is the unit vector parallel to the local geomagnetic vector.

$$oldsymbol{M} = -k_{\omega} \left( \mathbb{I}_3 - \hat{oldsymbol{b}} \hat{oldsymbol{b}}^T 
ight) oldsymbol{\omega}$$

Since we can only control  $\boldsymbol{m}$  we set  $\boldsymbol{m}$  to be

$$oldsymbol{m} = rac{1}{||oldsymbol{b}||^2} (oldsymbol{b} imes oldsymbol{M})$$