d

m

$\mathbf{m}_1$

$\mathbf{m}_2$

$\alpha \mathbf{m}_1 + \beta \mathbf{m}_2$

$\mathbf{m}_1 \cdot \mathbf{m}_2$

$$\|\mathbf{m}\|^2 \equiv \mathbf{m} \cdot \underset{\sim}{\mathbf{C}}_m^{-1} \cdot \mathbf{m}$$

$$\mathbf{d} = \mathbf{f}(\mathbf{m})$$

Δm

$\mathbf{m}_0$

$\underset{\sim}{\mathbf{F}}(\mathbf{m}_0)$

$$\boldsymbol{\Delta \mathbf{d}} = \underset{\sim}{\mathbf{F}}(\mathbf{m}_0) \cdot \boldsymbol{\Delta \mathbf{m}} \approx \mathbf{f}(\mathbf{m}_0 + \boldsymbol{\Delta \mathbf{m}}) - \mathbf{f}(\mathbf{m}_0).$$

$$\underset{\sim}{\mathbf{F}}(\mathbf{m}_0) \cdot (\alpha \boldsymbol{\Delta}\mathbf{m}_1 + \beta \boldsymbol{\Delta}\mathbf{m}_2) \equiv \alpha \ \underset{\sim}{\mathbf{F}}(\mathbf{m}_0) \cdot \boldsymbol{\Delta}\mathbf{m}_1 + \beta \ \underset{\sim}{\mathbf{F}}(\mathbf{m}_0) \cdot \boldsymbol{\Delta}\mathbf{m}_2$$

for all $\alpha, \beta, \boldsymbol{\Delta}\mathbf{m}_1,$ and $\boldsymbol{\Delta}\mathbf{m}_2$.

$$\underset{\sim}{\mathbf{F}}^{T}(\mathbf{m}_0)$$

$$\boldsymbol{\Delta d} \cdot [\underset{\sim}{\mathbf{F}}(\mathbf{m}_0) \cdot \boldsymbol{\Delta m}] \equiv [\underset{\sim}{\mathbf{F}}^T(\mathbf{m}_0) \cdot \boldsymbol{\Delta d}] \cdot \boldsymbol{\Delta m} \text{ for all } \boldsymbol{\Delta d} \text{ and } \boldsymbol{\Delta m}.$$

$\mathbf{f(m)}$

n

$$\mathbf{d} = \mathbf{f}(\mathbf{m}) + \mathbf{n}.$$

$$\min_{\mathbf{m}} \ \{[\mathbf{d} - \mathbf{f}(\mathbf{m})] \cdot \underset{\sim}{\mathbf{C}}_n^{-1} \cdot [\mathbf{d} - \mathbf{f}(\mathbf{m})] + \mathbf{m} \cdot \underset{\sim}{\mathbf{C}}_m^{-1} \cdot \mathbf{m}\}.$$

$$\min_{\boldsymbol{\Delta m}} \; [\mathbf{d} - \mathbf{f}(\mathbf{m}_0) - \underset{\sim}{\mathbf{F}}(\mathbf{m}_0) \cdot \boldsymbol{\Delta m}] \cdot \underset{\sim}{\mathbf{C}}_n^{-1} \cdot [\mathbf{d} - \mathbf{f}(\mathbf{m}_0) - \underset{\sim}{\mathbf{F}}(\mathbf{m}_0) \cdot \boldsymbol{\Delta m}]$$

$$+(\mathbf{m}_0+\boldsymbol{\Delta}\mathbf{m})\cdot\underset{\sim}{\mathbf{C}}_m^{-1}\cdot(\mathbf{m}_0+\boldsymbol{\Delta}\mathbf{m}).$$

$$\mathbf{d} - \mathbf{f}(\mathbf{m}_0)$$

$$\min_{\alpha} \ [\mathbf{d} - \mathbf{f}(\mathbf{m}_0 + \alpha \mathbf{\Delta m})] \cdot \underset{\sim}{\mathbf{C}}_n^{-1} \cdot [\mathbf{d} - \mathbf{f}(\mathbf{m}_0 + \alpha \mathbf{\Delta m})]$$

$$+(\mathbf{m}_0 + \alpha\boldsymbol{\Delta}\mathbf{m}) \cdot \underset{\sim}{\mathbf{C}}_m^{-1} \cdot (\mathbf{m}_0 + \alpha\boldsymbol{\Delta}\mathbf{m}).$$

$$\underset{\sim}{\mathbf{P}} \cdot \mathbf{d} = \underset{\sim}{\mathbf{P}} \cdot \mathbf{f}(\mathbf{m})$$

$$\underset{\sim}{\mathbf{G}}(\mathbf{m}_0) \approx [\underset{\sim}{\mathbf{F}}^T(\mathbf{m}_0) \cdot \underset{\sim}{\mathbf{F}}(\mathbf{m}_0)]^{-1}, \text{ or}$$

$$\underset{\sim}{\mathbf{G}}(\mathbf{m}_0) \cdot [\underset{\sim}{\mathbf{F}}^T(\mathbf{m}_0) \cdot \underset{\sim}{\mathbf{F}}(\mathbf{m}_0)] \approx \underset{\sim}{\mathbf{I}}.$$

$$\underset{\sim}{\mathbf{G}} \cdot \underset{\sim}{\mathbf{F}}^{T} \cdot \underset{\sim}{\mathbf{F}}$$