2. 公式推导：

$$f_{15} = \frac{\partial \alpha_{b_i b_{k+1}}}{\partial \delta b_k^g} = \frac{\partial\left(\alpha_{b_i b_k} + \beta_{b_i b_k} t + \frac{1}{2} a\delta t^2\right)}{\partial \delta b_k^g} = \frac{1}{2}\frac{\partial a}{\partial \delta b_k^g}\delta t^2$$

$$\because \frac{\partial a \delta t}{\partial \delta b_k^g} = \frac{1}{2}\frac{\partial\left[q_{b_i b_{k+1}} \otimes \left[1, -\frac{1}{2}\delta b_k^g \delta t^2\right](a^{b_{k+1}} - b_k^a)\right]}{\partial \delta b_k^g}$$

$$= \frac{1}{2}\cdot\left[\frac{\partial R_{b_i b_{k+1}} \exp\left[-\delta b_k^g \delta t\right]_\times (a^{b_{k+1}} - b_k^a)}{\partial \delta b_k^g}\right]$$

$$= \frac{1}{2}\left[\frac{\partial R_{b_i b_{k+1}}\left[-\delta b_k^g \delta t\right]_\times (a^{b_{k+1}} - b_k^a)}{\partial \delta b_k^g}\right]$$

$$= -\frac{1}{2}\frac{\partial R_{b_i b_{k+1}} (a^{b_{k+1}} - b_k^a)_\times\left[-\delta b_k^g \delta t\right]}{\partial \delta b_k^g} = -\frac{1}{2} R_{b_i b_{k+1}} (a^{b_{k+1}} - b_k^a)_\times (-\delta t)$$

从而 $$\frac{\partial \alpha_{b_i b_{k+1}}}{\partial \delta b_k^g} = -\frac{1}{4} R_{b_i b_{k+1}}\left[(a^{b_{k+1}} - b_k^a)\delta t^2\right](-\delta t)$$

对f15 bais 对于噪声影响的系数是 $\frac{1}{2}$，而噪声的影响是 $\frac{1}{4}$ 呢，已解决

$$g_{12} = \frac{\partial \alpha_{b_i b_{k+1}}}{\partial n_k^g} = \frac{1}{2}\frac{\partial a}{\partial \delta n_k^g}\delta t^2$$

$$\because \frac{\partial a}{\partial \delta n_k^g} = \frac{1}{2}\frac{\partial\left[q_{b_i b_{k+1}} \otimes \left[1, \frac{1}{4}\delta n_k^g \delta t^2\right](a^{b_{k+1}} - b_k^a)\right]}{\partial \delta n_k^g}$$

从而 与上式同

$$\Rightarrow \frac{\partial \alpha_{b_i b_{k+1}}}{\partial \delta b_k^g} = -\frac{1}{4} R_{b_i b_{k+1}}\left[(a^{b_{k+1}} - b_k^a)\delta t^2\right]\left(-\frac{1}{2}\delta t\right)$$

3. 证明：

推导 $\Delta x_{lm} = -\sum_{j=1}^{n} \frac{v_j^T F'^T}{a_j + \mu} v_j$

$-(f^T J)^T = -(F')^T$

$\because (J^T J + \mu I)\Delta x_{lm} = -J^T f$ $\quad \mu \geq 0$

$\Rightarrow \Delta x_{lm} = (J^T J + \mu I)^{-1}(-F'^T)$

对 $J^T J$ 进行特征值分解有：$J^T J = \sum_{j=1}^{n} \lambda_j v_j v_j^T$

从而 $(J^T J + \mu I)^{-1} = \sum_{j=1}^{n} \frac{1}{\lambda_j + \mu} v_j v_j^T$

从而 $\Delta x_{lm} = -\sum_{j=1}^{n} \frac{v_j v_j^T F'^T}{\lambda_j + \mu}$

$v_j^T F'^T$ 是一个数可交换

$= F'^T v_j^T$

$$= -\sum_{j=1}^{n} \frac{v_j^T F'^T v_j}{\lambda_j + \mu}$$