



1. Compute mean rotation  $\bar{\mathbf{q}} = \frac{\sum_{h=1}^H \mathbf{q}_h}{\left\| \sum_{h=1}^H \mathbf{q}_h \right\|}$
2. Compute residuals  $\phi_h = \text{Log} \left( \mathbf{q}_h \otimes \bar{\mathbf{q}}^{-1} \right)$
3. Compute covariance as  $\Sigma = \frac{1}{H-1} \sum_{h=1}^H \phi_h \phi_h^{\top} + \Sigma_a$