Supuesto:

$$\|G(x) - G(x^*)\| \leq L\|x - x^*\|$$

$$\tilde{s_k} = G_*^{1/2} s_k, \quad \tilde{y_k} = G_*^{-1/2} y_k, \quad \tilde{B_k} = G_*^{-1/2} B_k G_*^{1/2},$$

$$cos\tilde{\theta}_k = \frac{\tilde{s_k}^T \tilde{B_k} \tilde{s_k}}{\|\tilde{s_k}\| \|\tilde{B_k}\tilde{s_k}\|}, \quad \tilde{q_k} = \frac{\tilde{s_k}^T \tilde{B_k} \tilde{s_k}}{\|\tilde{s_k}\|^2}$$

$$\tilde{M_k} = \frac{\|\tilde{y_k}\|^2}{\tilde{y_k}^T \tilde{s_k}}, \quad \tilde{m_k} = \frac{\tilde{y_k}^T \tilde{s_k}}{\tilde{s_k}^T \tilde{s_k}}.$$

$$\tilde{B_{k+1}} = \tilde{B_k} - \frac{\tilde{B_k}\tilde{s_k}\tilde{s_k}^T \tilde{B_k}}{\tilde{s_k}^T \tilde{B_k} \tilde{s_k}} + \frac{\tilde{y_k}\tilde{y_k}^T}{\tilde{y_k}^T \tilde{s_k}}.$$

$$\begin{aligned} \psi(\tilde{B_{k+1}}) = \psi(\tilde{B_k} &+ (\tilde{M_{k+1}} - \ln(\tilde{m_k}) - 1) \\ &+ \left[1 - \frac{\tilde{q_k}}{cos^2\tilde{\theta}_k} + \ln\left(\frac{\tilde{q_k}}{cos^2\tilde{\theta}_k}\right)\right] \\ &+ \ln\left(cos^2\tilde{\theta}_k\right) \end{aligned} \tag{1}$$

$$y_k - G_* s_k = (\tilde{G_k} - \tilde{G_*}) s_k,$$

$$\tilde{y_k} - \tilde{s_k} = G_*^{-1/2} (\tilde{G_k} - \tilde{G_*}) G_*^{-1/2} \tilde{s_k}.$$

$$\|\tilde{y_k} - \tilde{s_k}\| \leq \|G_*^{-1/2}\|^2 \|\tilde{s_k}\| \|\tilde{G_k} - \tilde{G_*}\| \leq \|G_*^{-1/2}\|^2 \|\tilde{s_k}\| L\epsilon_k,$$

$$\epsilon_k = max\{\|x_{k+1} - x^*\|, \|x_k - x^*\|\}.$$

$$\frac{\|\tilde{y_k} - \tilde{s_k}\|}{\|\tilde{s_k}\|} \leq \bar{c}\epsilon_k, \tag{2}$$