

$$\begin{aligned}
 I_j(x, y) &= k \rho(x, y) (\mathbf{N}(x, y) \cdot \mathbf{S}_j) \\
 &= (\rho(x, y) \mathbf{N}(x, y)) \cdot (k \mathbf{S}_j) \\
 &= \mathbf{g}(x, y) \cdot \mathbf{V}_j
 \end{aligned}$$