

$$f \star g = \int \int \frac{\tilde{f}(k) \tilde{g}(k')}{(2\pi)^{2D}} \hat{\Omega}^{-1} \begin{bmatrix} \circ & e^{ik_i \hat{x}^i} & e^{ik'_i \hat{x}^i} & \circ \\ \circ & & & \circ \end{bmatrix} d^D k d^D k'$$