CN 2D growth rate

$$\left(G^{n+1} \cdot e^{ikp\Delta x} \cdot e^{ikq\Delta x} - G^{n} e^{ikp\Delta x} \cdot e^{ikq\Delta x}\right)/\Delta t$$

$$= \frac{\alpha}{2\Delta x^2} G^{n+1}\Big[e^{ik(p-1)\Delta x} \cdot e^{ikq\Delta x} + e^{ik(p+1)\Delta x} \cdot e^{ikq\Delta x} + e^{ikp\Delta x} \cdot e^{ik(q-1)\Delta x} + e^{ikp\Delta x} \cdot e^{ik(q+1)\Delta x} - 4 \cdot e^{ikp\Delta x} \cdot e^{ikq\Delta x}\Big]$$

$$+ \frac{\alpha}{2\Delta x^2} G^{n}\Big[\quad " \quad " \quad " \quad \Big]$$

$$G^{n+1} - G^{n} = \frac{\alpha\Delta t}{2\Delta x^2} G^{n+1}\left[e^{-ik\Delta x} + e^{ik\Delta x} + e^{-ik\Delta x} + e^{ik\Delta x} - 4\right]$$

$$+ \frac{\alpha\Delta t}{2\Delta x^2} G^{n}\left[2e^{-ik\Delta x} + 2e^{ik\Delta x} - 4\right]$$

$$G^{n+1} - G^{n} = \frac{C}{2} G^{n+1}\left(2(2\cos(k\Delta x) - 2)\right)$$

$$+ \frac{C}{2} G^{n}\left(2(2\cos(k\Delta x) - 2)\right)$$

$$G^{n+1}\left(1 - 2C(\cos(k\Delta x) - 1)\right) = G^{n}\left(1 + 2C(\cos(k\Delta x) - 1)\right)$$

$$\frac{G^{n+1}}{G^{n}} = \frac{1 + 2C(\cos(k\Delta x) - 1)}{1 - 2C(\cos(k\Delta x) - 1)}.$$ Again, cos term = 1 means rate = 1.

cos term = −1 means rate = $\boxed{\frac{1-4C}{1+4C}}$. This scales the graph of C vs growth rate compared to 1D version