FTCS 2D growth rate

$$U_{pq}^{n} = G^{n} \cdot e^{ikp\Delta x} \cdot e^{ikq\Delta x}$$

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

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

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

$$G^{n+1} = G^{n}\left(1 + \frac{\alpha \Delta t}{\Delta x^{2}}\left(4\cos(k\Delta x) - 4\right)\right)$$

$$\frac{G^{n+1}}{G^{n}} = 1 + 4C\left(\cos(k\Delta x) - 1\right).$$ Extreme @ $\cos(k\Delta x) = -1$:

$$1 \geq \left|\frac{G^{n+1}}{G^{n}}\right| = \left|1 + 4C(-2)\right| = \left|1 - 8C\right|$$

C is positive, so $1 - 8C < 1$. Constrain $(1-8C) > -1$:

$$\boxed{0 < C \leq \frac{1}{4}}.$$