

Taylor Green vortex

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Intro

The Taylor Green vortex problem is a problem in fluid mechanics which details a cube with starting vortices, turning into turbulent flow and then decaying. To solve this problem I use the incompressible Navier-Stokes equations, and calculate the kinetic energy and compare with previous known results.

Problem definition

I calculated the flow using a cube with sides 2π .

We have an initial distribution of velocity $\vec{u} = (u, v, w)$:

$$u(x, y, z) = V_0 \sin(x) \cos(y) \cos(z)$$

$$v(x, y, z) = -V_0 \cos(x) \sin(y) \cos(z)$$

$$w(x, y, z) = 0$$

The Reynolds number is defined as: $Re = \frac{V_0 L}{\nu}$ where we set $V_0 = 1$

1 Results

These plots are of the kinetic energy and the negative time derivative of the kinetic energy. With $N = 20$, $\Delta t = 0.01$, $\nu = 5 * 10^{-3}$, giving $Re = 1256$.

