This is a simulation of the simple model for active turbulence prposed by Wensink et. al. in the paper "Meso-scale turbulence in living fluids". All equations used are based on a normalized form of the model derived by Martin James, Wouter Bos and Michael Wilczek in the paper "Turbulence and turbulent pattern formation in a minimal model for active fluids". Taking the curl of the given velocity equation yields a nonlinear partial differential equation for the vorticity $\omega = \vec{\nabla} \times \vec{v}$:

$$\partial_t \omega + \lambda \left(\vec{v} \cdot \vec{\nabla} \right) \omega = -\big(1 + \Delta\big)^2 \omega - \alpha\omega - \beta \vec{\nabla} \times \left(\left| \vec{v}^2 \right| \, \vec{v} \right) \tag{1}$$

This equation is solved in Fourier space with a Runge-Kutta method of 4th order and an integrating factor. Unfortunately, the vorticity equation contains no information about the mean velocity $\langle \vec{v} \rangle$. One can derive a second partial differential equation to restore the lost information:

$$\partial_t \langle \vec{v} \rangle = -\big(1 + \alpha\big) \langle \vec{v} \rangle - \beta \left\langle |\vec{v}|^2 \, \vec{v} \right\rangle \tag{2}$$

Both are simoultaneously evaluated.