Helicity flux in a shear flow turbulence

Run similar to Run A of Brandenburg (2018), but the density changes from 1 at $z = 0$ to about 0.002 at $z = \pi/2$. Butterfly diagram is similar to before; see Figure **??**. The frequency is now $\omega \approx 6.6\,\eta_{t0}k_1^2$ instead of $1.16\,\eta_{t0}k_1^2$ in the unstratified case. This is very surprising.

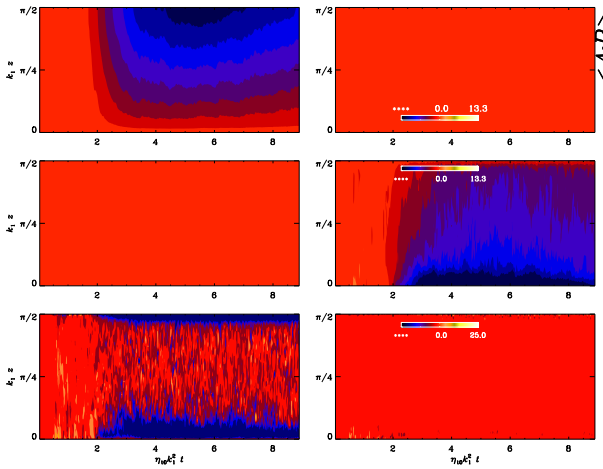

Figure 1: `ppbutter_Strat288a`

The small-scale magnetic helicty has now the same sign as the large-scale magnetic helicty; see the blue line in Figure **??** compared with $\overline{\boldsymbol{A}}\cdot\overline{\boldsymbol{B}}$ (red line). The total $\overline{\boldsymbol{A}\cdot\boldsymbol{B}}$ is shown in red.

The second panel of Figure **??** shows at $z > \pi/4$, $\overline{\boldsymbol{\omega}\cdot\rho\boldsymbol{u}}$ (green) is almost as large as $\overline{\boldsymbol{j}\cdot\boldsymbol{b}}$. The upper part is fully quenched, it seems, but the cycle still proceeds, with an even higher frequency. The small-scale magnetic helicity flux is also of the wrong sign (positive); see panels 3 and 4.

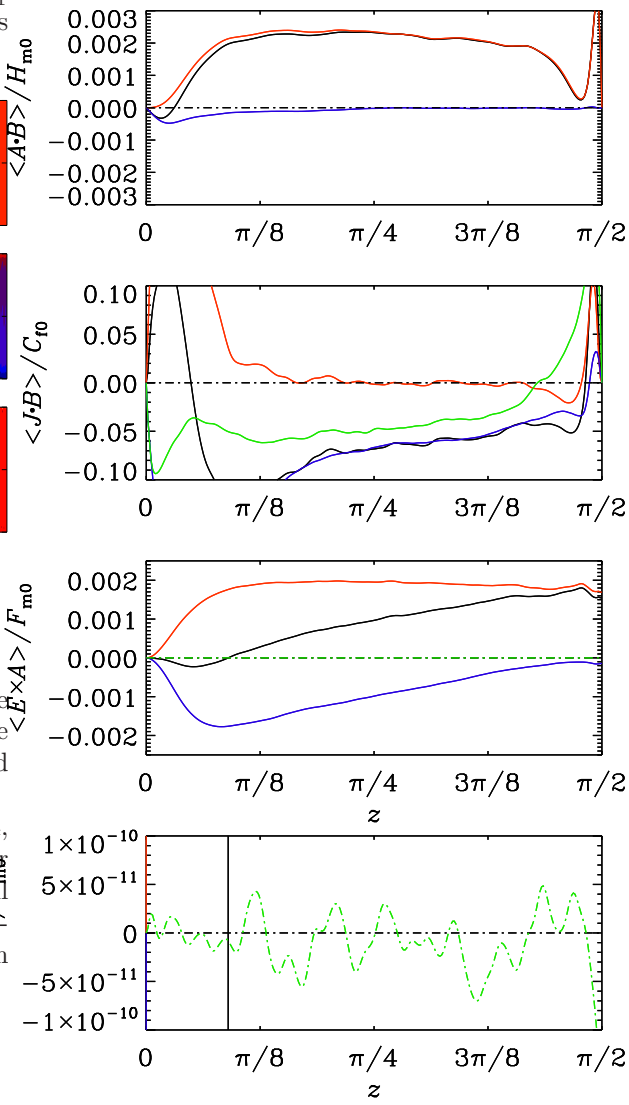

Figure 2: `pphelflux_Strat288a`

References

Brandenburg, A. 2018, Astron. Nachr., 339, 631 640Magnetic helicity and fluxes in an inhomogeneous α^2 dynamo

$Header: /var/cvs/brandenb/tex/mhd/aodynamo_helflux/notes.tex,v 1.4 2021/10/03 05:37:03 brandenb Exp $

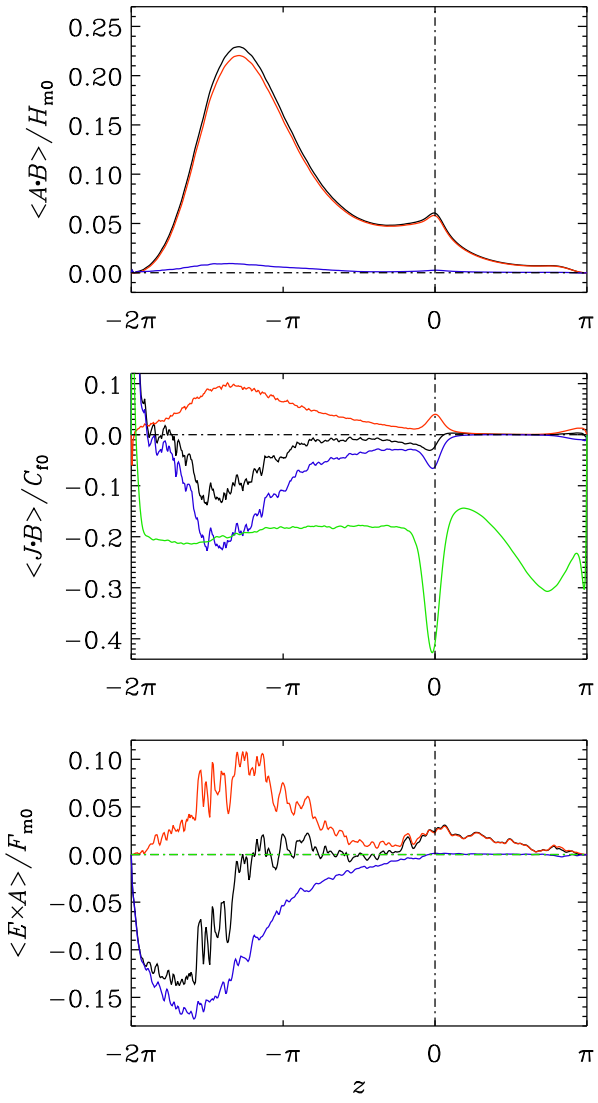

Figure 3: `pphelflux_0m2kf60a`, $k_f = 60$.

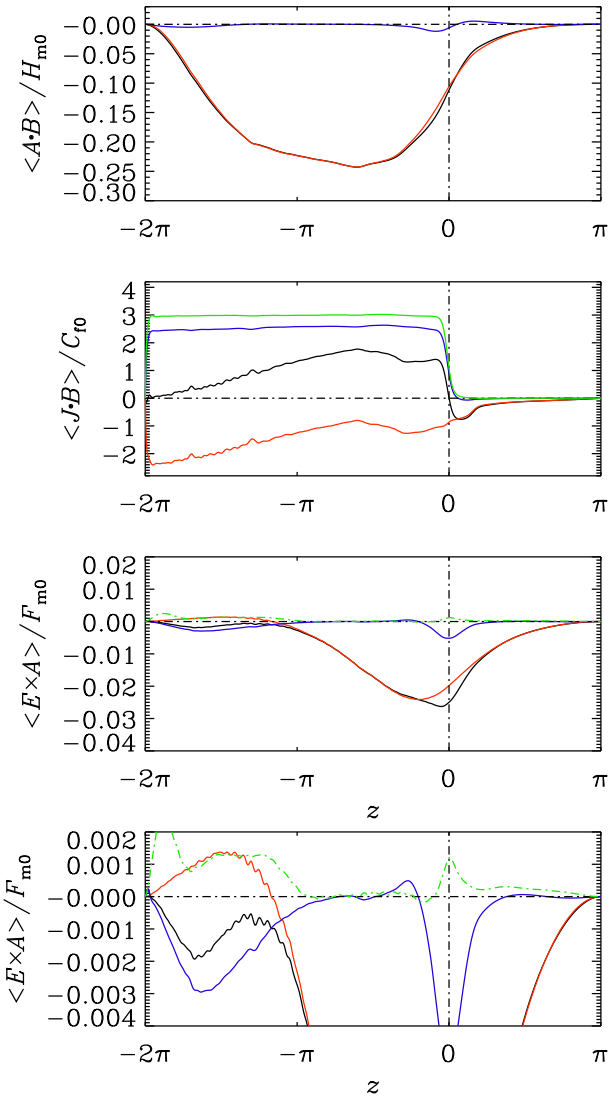

Figure 4: `pphelflux_hel_b0_Lz2b2`