Review

- Last time: found flux absorbed $\neq$ flux injected w/ ν-extrapolation, **must have reflection.**
- Hypothesis:

$$\vec{u} = A_0 \vec{u}_0 + \delta\vec{u}, \tag{1}$$

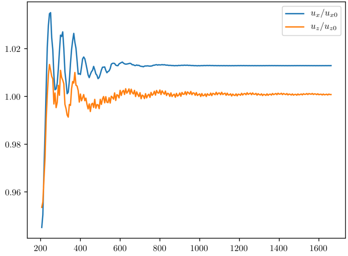
  where A_0 is set by forcing, $\delta\vec{u}$ is "turbulent."
- Since $S_{px} = \langle \rho u_x u_z \rangle_x$, decided to plot

$$\delta S_{px} = \langle \rho \delta u_x \delta u_z \rangle_x. \tag{2}$$

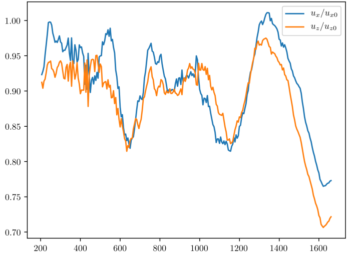
Results

Driving amplitude

- Actually, discovered $A < A_0$, **driving amplitude changes over time** (via convolution). Oscillation timescale $\sim \frac{z_0 - z_c}{v_{gz}}$ for higher order modes.
- Adjusting for this gives $\langle \rho u_{x0} \delta u_z \rangle_x, \langle \rho \delta u_x u_{z0} \rangle_x$ centered on zero, no net flux.



(a) Linear excited $\frac{u_x}{u_{x0}}, \frac{u_z}{u_{z0}}$ over time.



(b) Nonlinear excited $\frac{u_x}{u_{x0}}, \frac{u_z}{u_{z0}}$ over time.

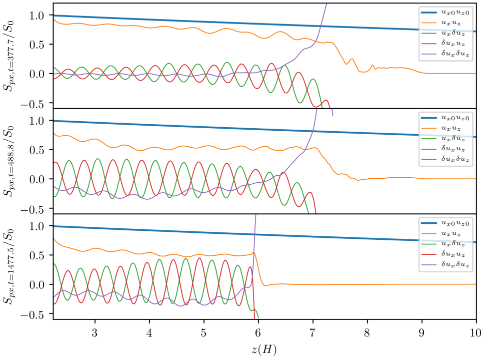


Figure: Decompositions of the flux over time. 01 means $u_{x0}\delta u_z$. Oscillating 01, 10 implies reflected $k_z \to -k_z$ mode.

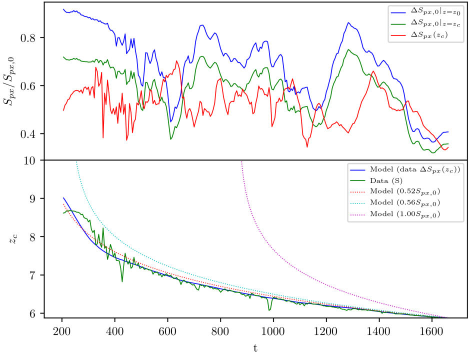


Figure: Front evolution, nonlinear.

Results

Minimum Ri

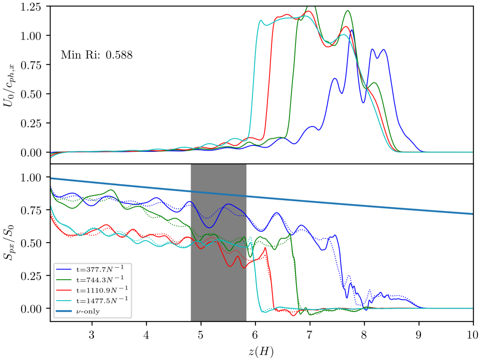


Figure: Mean flow and flux evolution, non-linear.

- Excite wave with S_{px}. Deposit some ηS_{px} in critical layer (efficiency η).
- Critical layer width δz such that $\mathrm{Ri} \gtrsim \frac{1}{4}$.
- Critical layer position obeys $\rho c_{ph,x} \frac{\partial z_c}{\partial t} = -\eta S_{px}$, or $(\tau = \frac{H\rho_0(z=0)c_{ph,x}}{\eta S_{px}})$

$$z_c(t) = -H \ln \frac{t - t_i + \tau e^{-z_i/H}}{\tau}, \tag{3}$$

- Reflect $(1-\eta)S_{px}$, some in $k_z \to k_z$ linear reflection, some in higher-order modes.
- Reflected wave causes inefficient excitation $S_{px,0} \to \alpha S_{px,0}$, $\alpha \lesssim 1$.
- Probably can't be any more exact, time delays + noisy data.