AH PS3Q. 7 Kolmogorov scaling & cup of Tea When you stir a cup of tea how does the energy of the flow become spread over as pectrum of wave numbers? Kolmogorov scaling Hypothesis

Kolmogorov scaling Hypothesis

The Rinetic energy density of agiven wavelength wave number, k E(k) is proportional to k-5/3

 $E(R) \sim R^{-5/3}$

When you stir a cup of tea

you introduce kinetic energy in the

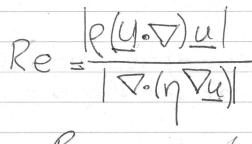
form of circular motion of the water. Fig. I- stimme apope
The motion of the water has a scale about equal
to the size of the eup.

When you stop stiming the shear of the velocity of the water introduces a Kelnin-Helmholtz instability which creates smaller vortices. These lesser vortices drive lesser vortices fand so on) whoch drive lesser vortices still (and so on) at smaller & smaller & smaller & Thus the energy becomes distributed over a range of length seales.

The meximum length scale is the size of the cup.
The smallest is determined by the viscosity of the tea.
Since viscosity introduces dampine shich opposes the circular motion.

We describe the amount of spreading across length sealed in terms of the ratio of the inetia term stree viscosity turn in the Rayleigh-Taylor equation Ref To (450)

Navier-Stokes.



Large Re - viscosity interferer less & smaller voticer tormed