

Measuring the correlation time

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1 Correlation time directly

Compute

$$\tau_{\mathbf{u}^2}(t) = \int_0^t \langle \mathbf{u}(t) \cdot \mathbf{u}(t') \rangle dt' / \langle \mathbf{u}^2 \rangle. \quad (1)$$

$$\tau_{\boldsymbol{\omega} \cdot \mathbf{u}}(t) = \int_0^t \langle \boldsymbol{\omega}(t) \cdot \mathbf{u}(t') \rangle dt' / \langle \boldsymbol{\omega} \cdot \mathbf{u} \rangle. \quad (2)$$

$$\tau_{\mathbf{u} \cdot \boldsymbol{\omega}}(t) = \int_0^t \langle \mathbf{u}(t) \cdot \boldsymbol{\omega}(t') \rangle dt' / \langle \boldsymbol{\omega} \cdot \mathbf{u} \rangle. \quad (3)$$

$$\tau_{\mathbf{u} \cdot \boldsymbol{\omega}}(t) = \left\langle \mathbf{u}(t) \cdot \int_0^t \boldsymbol{\omega}(t') dt' \right\rangle / \langle \boldsymbol{\omega} \cdot \mathbf{u} \rangle. \quad (4)$$

see Figure 1 for a case where $k_f = 10$ and $u_{\text{rms}} = 0.1$.
 $\langle \mathbf{u}^2 \rangle$

$$\tau(t, k) = \int_0^t \text{Sp}_k[\mathbf{u}(t), \mathbf{u}(t')] dt' / \langle F(k) \rangle, \quad (5)$$

where $\text{Sp}(a, b) = a_k b_b^* + \text{c.c.}$ and $F(k)$ is the helicity spectrum.

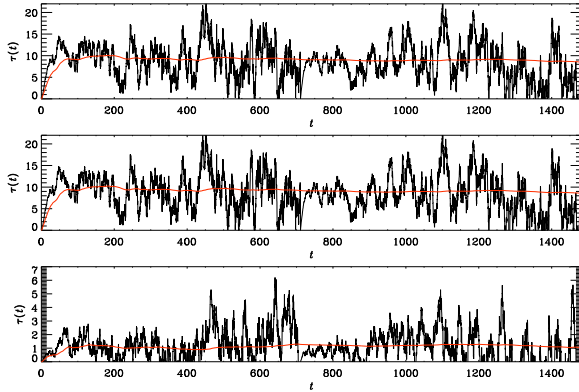


Figure 1: pcortime

2 Just the correlation function

$\langle \mathbf{u}^2 \rangle$

$$C(t, t_0) = \langle \mathbf{u}(t) \cdot \mathbf{u}(t_0) \rangle \quad (6)$$