Inflaton Fluctuations

- Single field inflaton fluctuations obey the linearized Klein-Gordon equation for $u = a\delta\phi$

$$\ddot{u} + \left[k^2 - \frac{\ddot{z}}{z}\right] u = 0$$

where

$$z(\eta) = \dot{\phi}/H$$

- Oscillatory response to rapid slow down or speed up of roll $\dot{\phi}$ due to features in the potential
- Single function $z(\eta)$ controls curvature fluctuations but
  - direct PC or other functional constraints cumbersome
  - link to $V(\phi)$ obscured

Generalized Slow Roll

- Green function approach allowing slow roll parameters to be strongly time varying (Stewart 2002)
- Generalized for large features by promoting second order to non-linear in controlled fashion (Dvorkin & Hu 2009)
- Functional constraints on the source function of deviations from scale invariance

$$G'(\ln \eta) = \frac{2}{3}\left[\frac{f''}{f} - 3\frac{f'}{f} - \left(\frac{f'}{f}\right)^2\right], \qquad f = 2\pi\eta z(\eta)$$

- As long as large features are crossed on order an e-fold or less

$$G' \approx 3\left(\frac{V'}{V}\right)^2 - 2\frac{V''}{V}$$

same combination that enters into tilt n_s in slow roll