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Beyond δN-formalism for a single scalar field

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- *Next -leading order of Gradient expansion* :

  Decaying mode, Violation of slow-roll condition

Simple result !

$$\mathcal{R}_c^{\mathrm{NL}\prime\prime} + 2\frac{z'}{z}\mathcal{R}_c^{\mathrm{NL}\prime} + \frac{c_s^2}{4}K^{(2)}[\mathcal{R}_c^{\mathrm{NL}}] = O(\epsilon^4)$$

Ricci scalar of spatial metric

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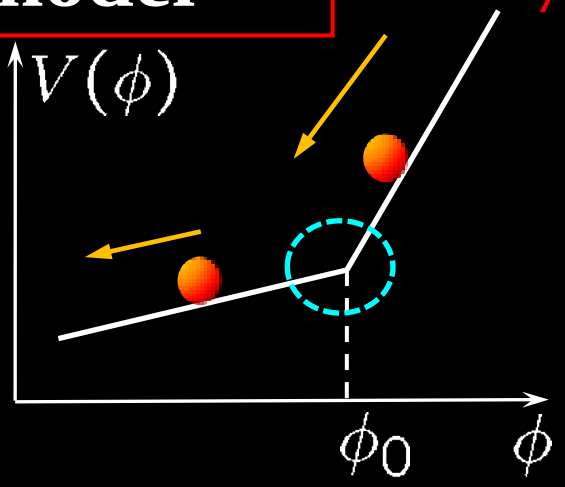
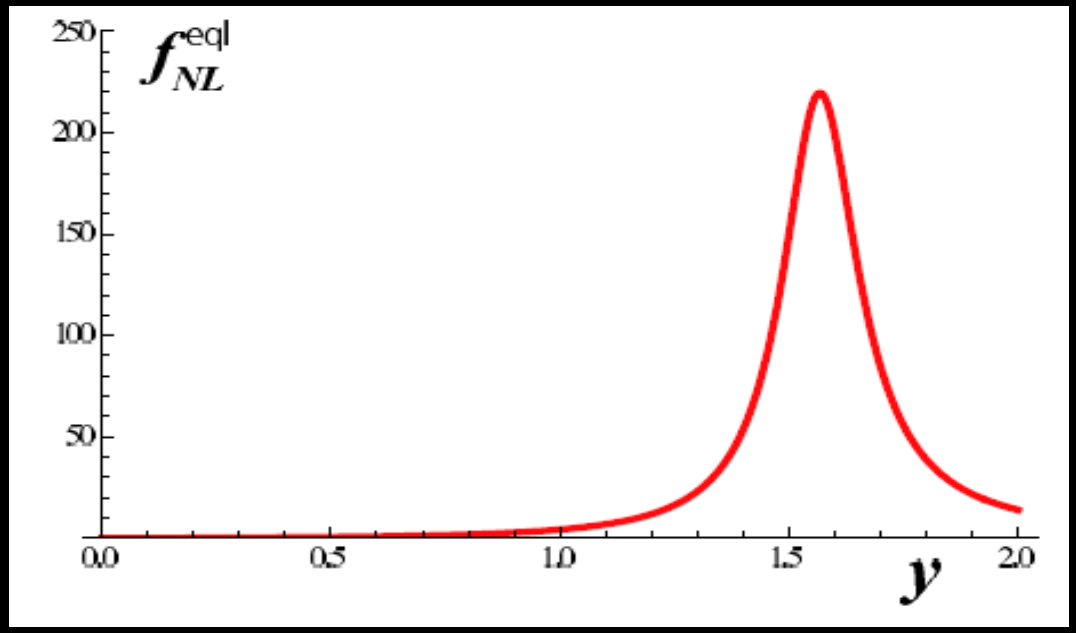
Application to Starobinsky model

- There is a stage at which slow-roll conditions are violated



Result (*Equilateral*)



$$f_{NL}^{eql} \simeq 2T$$

: Ratio of the slope of the potential

@ $y = \sqrt{T}k/k_0 \simeq 1.5$

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◆ Applications of our formula

(Temporary violating of slow-roll condition)

$$z = \frac{a}{H}\left(\frac{\rho + P}{c_s^2}\right)^{\frac{1}{2}}$$

Calculate the integrals;

$$D_k = 3\mathcal{H}(\eta_k)\int_{\eta_k}^{0} d\eta' \frac{z^2(\eta_k)}{z^2(\eta')} \quad F_k = \int_{\eta_k}^{0} \frac{d\eta'}{z^2}\int_{\eta_k}^{\eta'} z^2 c_s^2 d\eta''$$

- Non-Gaussianity in this formula matched to DBI inflation
- Apply to varying sound velocity
- Trispectrum of the feature models
- Extension to nonlinear Gravitational wave
- Extension to the models of Multi-scalar field (with Naruko,in progress)

(naturally gives temporary violating of slow-roll cond)