

emergence

*of the **CMB** from the **7 veils** of
foregrounds/extragalactic sources*

*of the **7 pillars** of **CMB power** (-1 r)*

*of the “**standard**” **tilted deCDM** model
in perfect agreement with **Big Bang Nucleosynthesis***

*of the **driven “vacuum”,
accelerating then & now.***

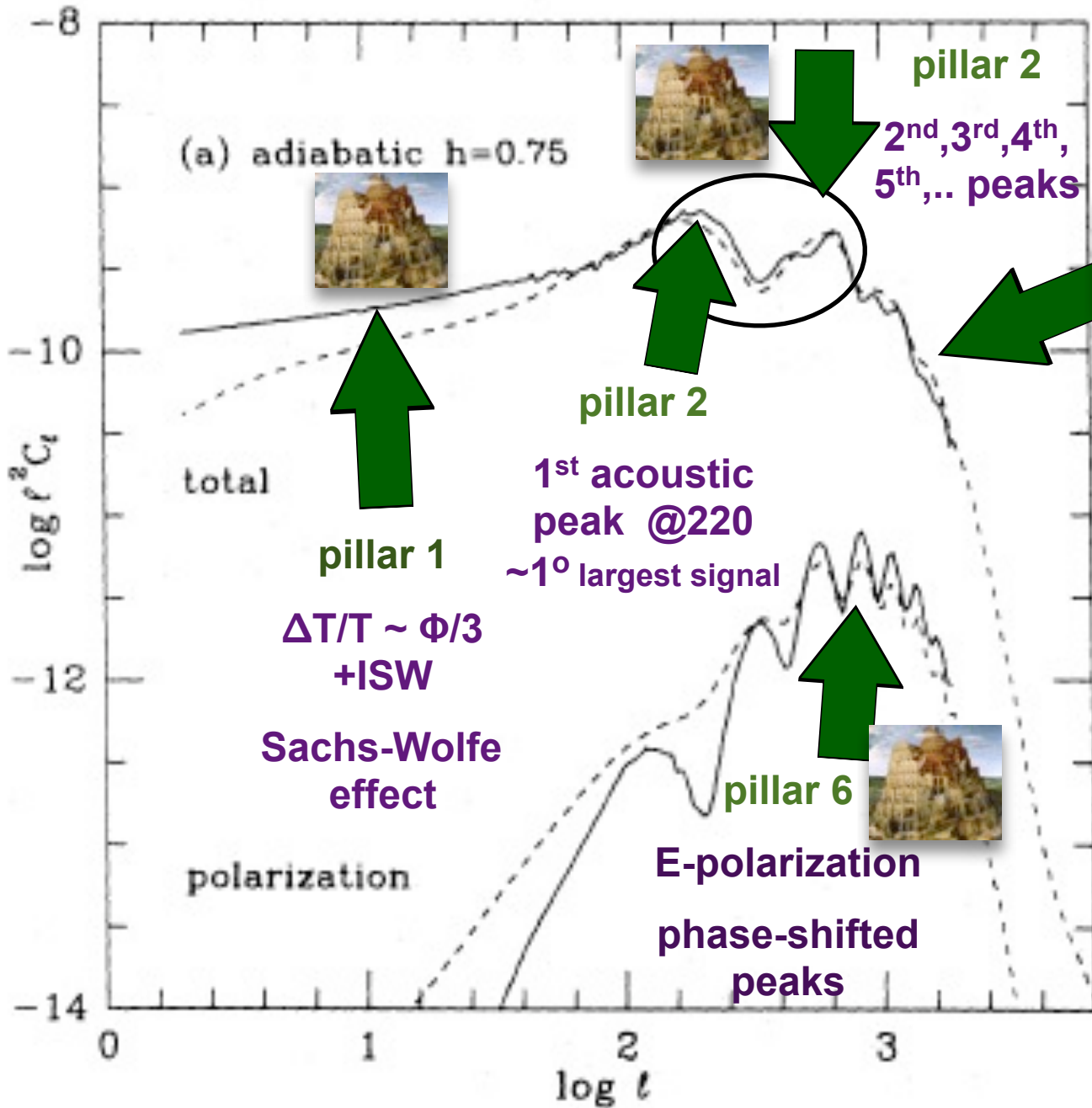
differentially? yes then & now

we may compute it, but if we think we understand

***it, think again.** yet we know more about early-
inflaton dynamics than late-inflaton dynamics*



the "Seven Pillars"



pillar 4

Gaussianity
maximal
randomness
for given CL



pillar 5

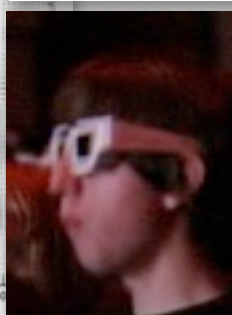
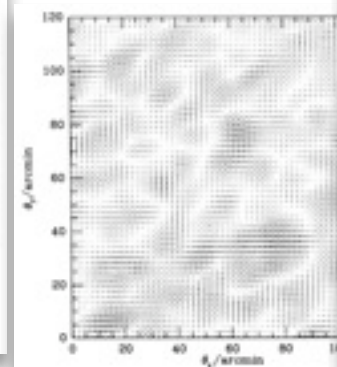
secondary ΔT
nonlinear
Compton SZ CIB
weak lensing..



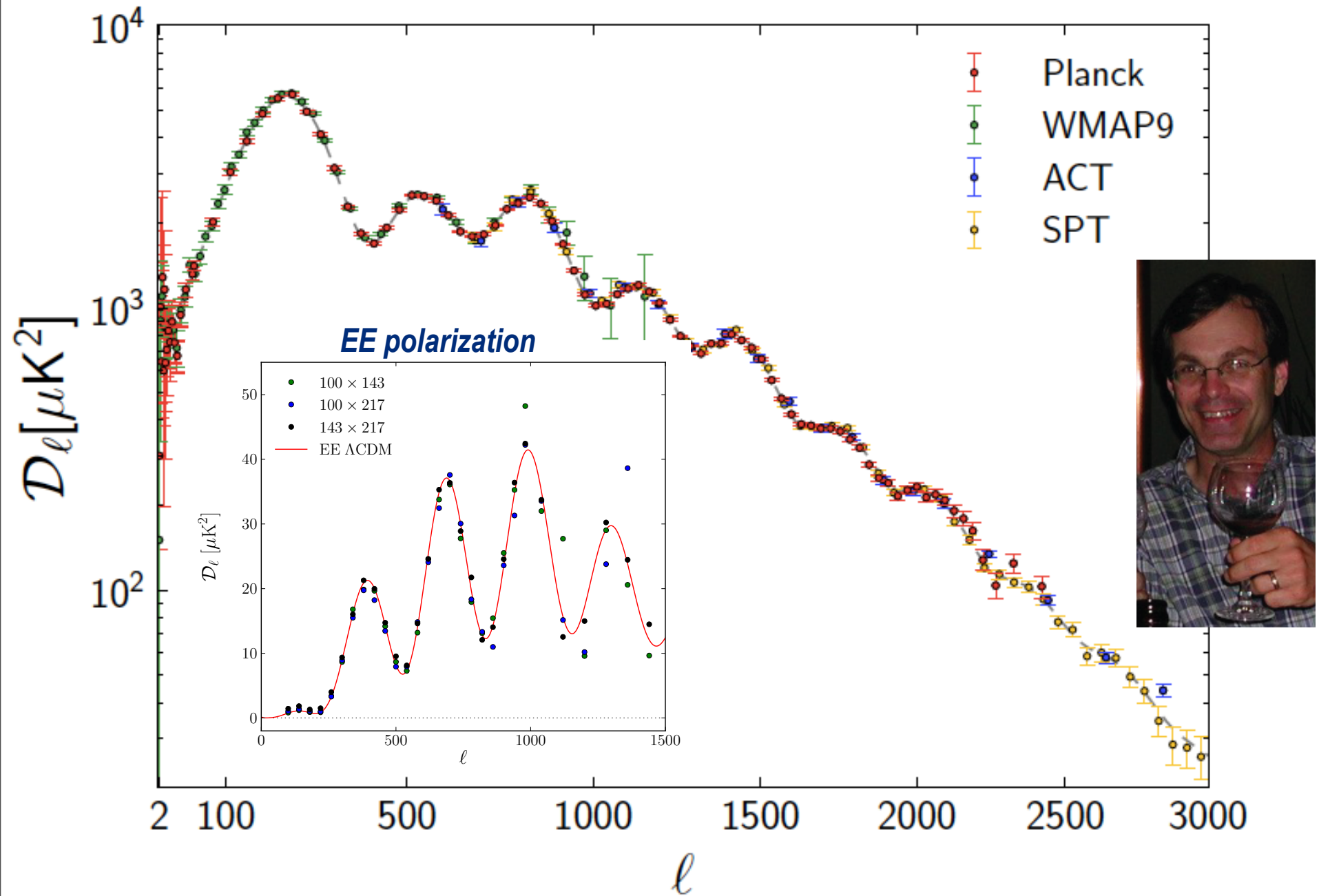
pillar 7

B-polarization
Gravity Waves

BondEfstathiou87

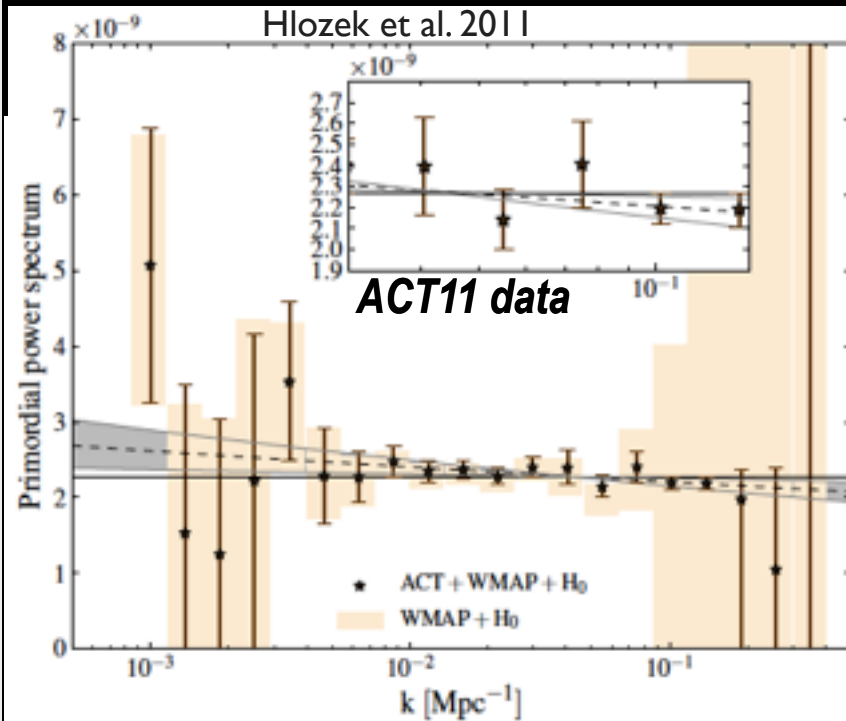
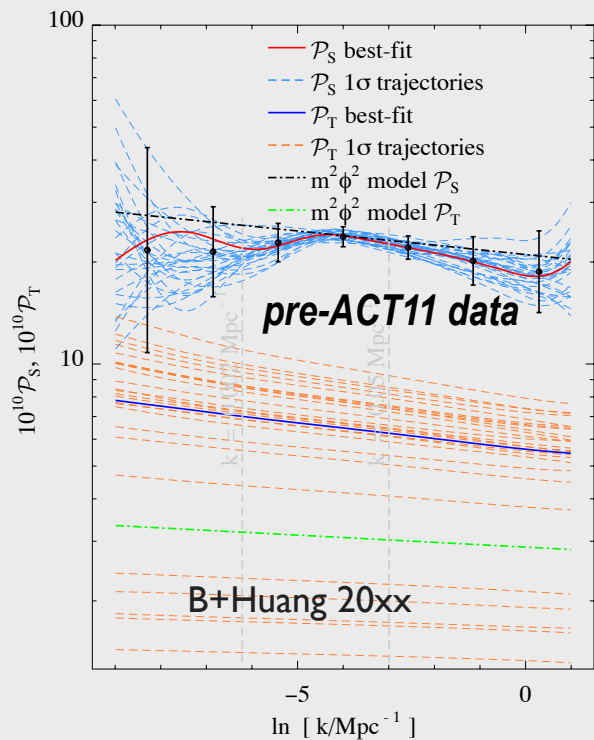


the sound of the U-machine

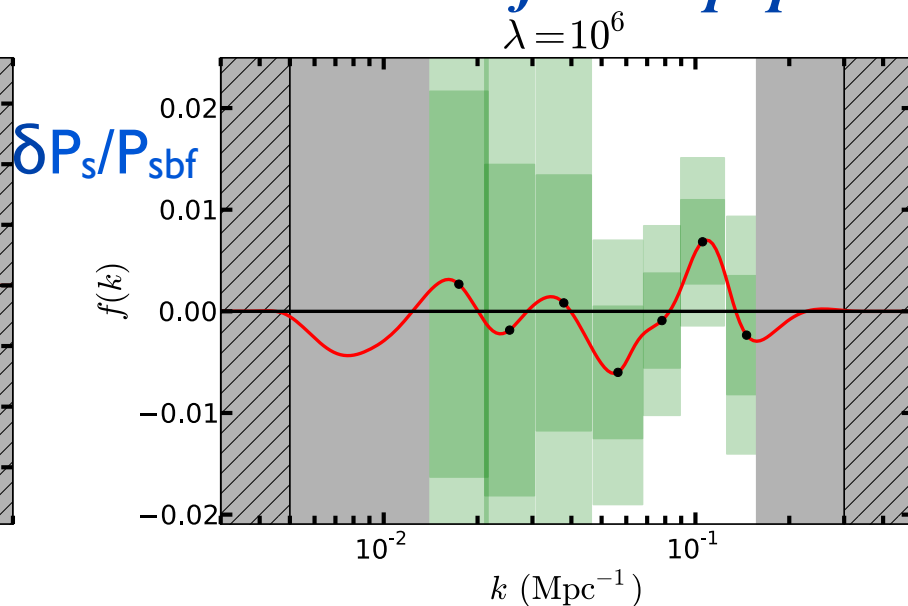
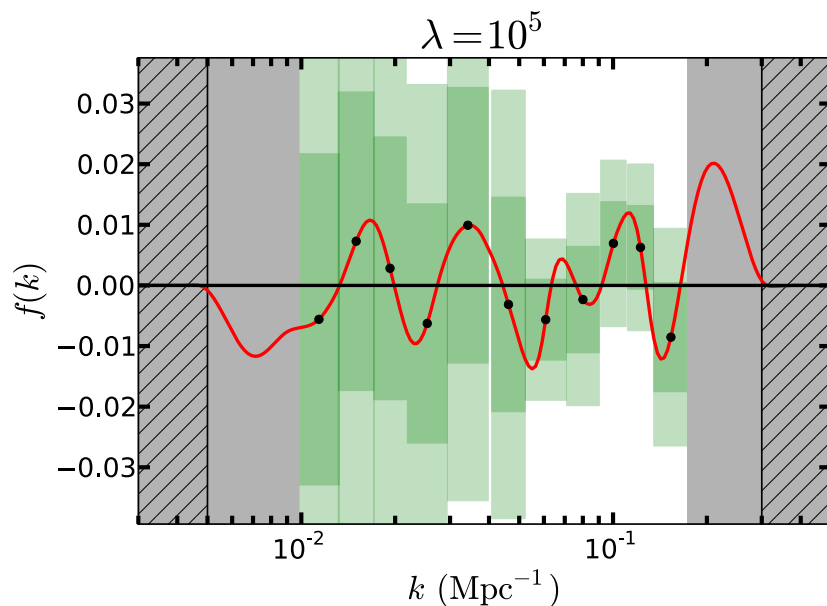


early-U, NOW

semi-blind & informed reconstruction of Scalar / Tensor power spectra, acceleration histories

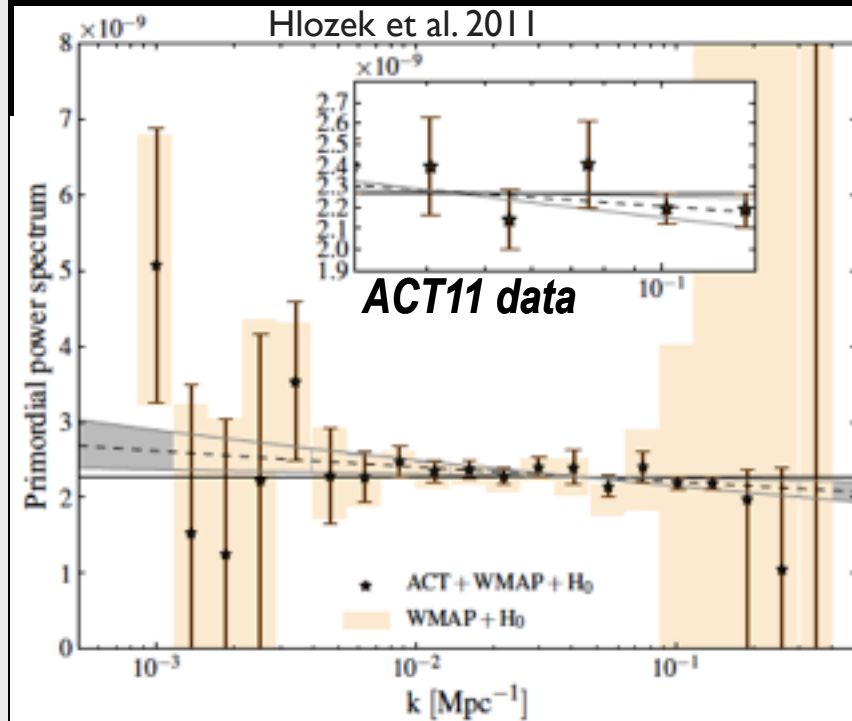
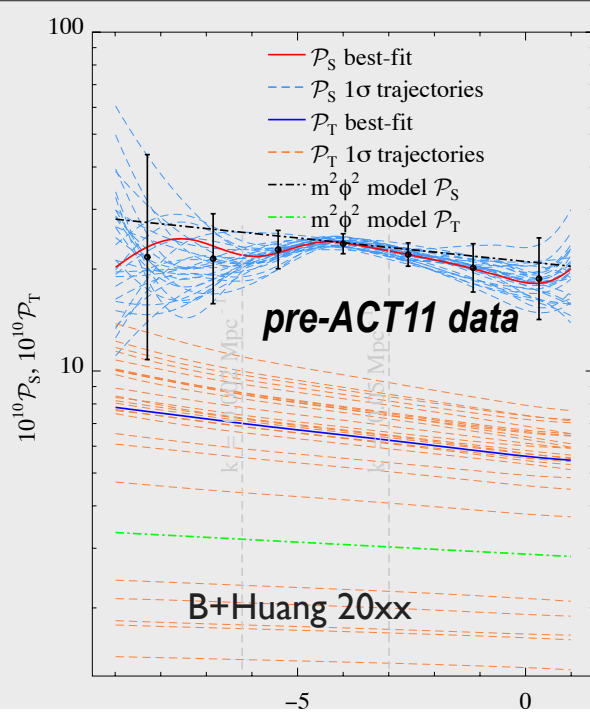


Planck1.3 inflation paper



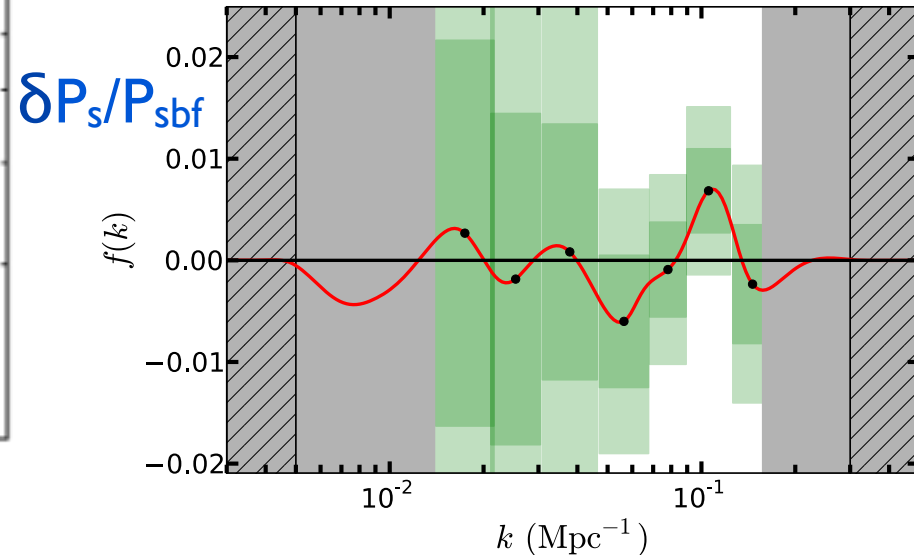
early-U, NOW

semi-blind & informed reconstruction of acceleration histories & S/T power spectra

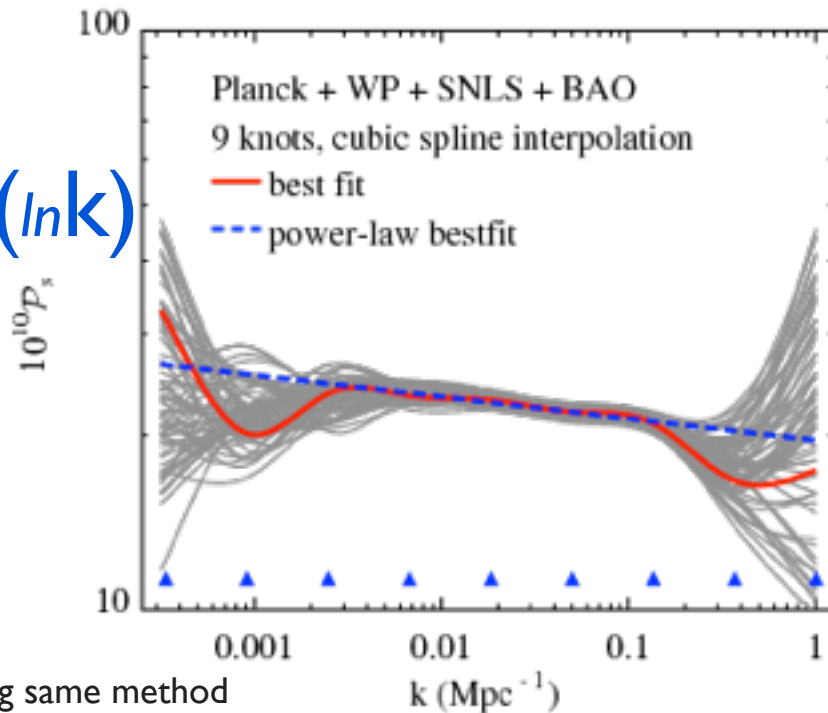


Planck1.3 inflation paper

$\lambda = 10^6$



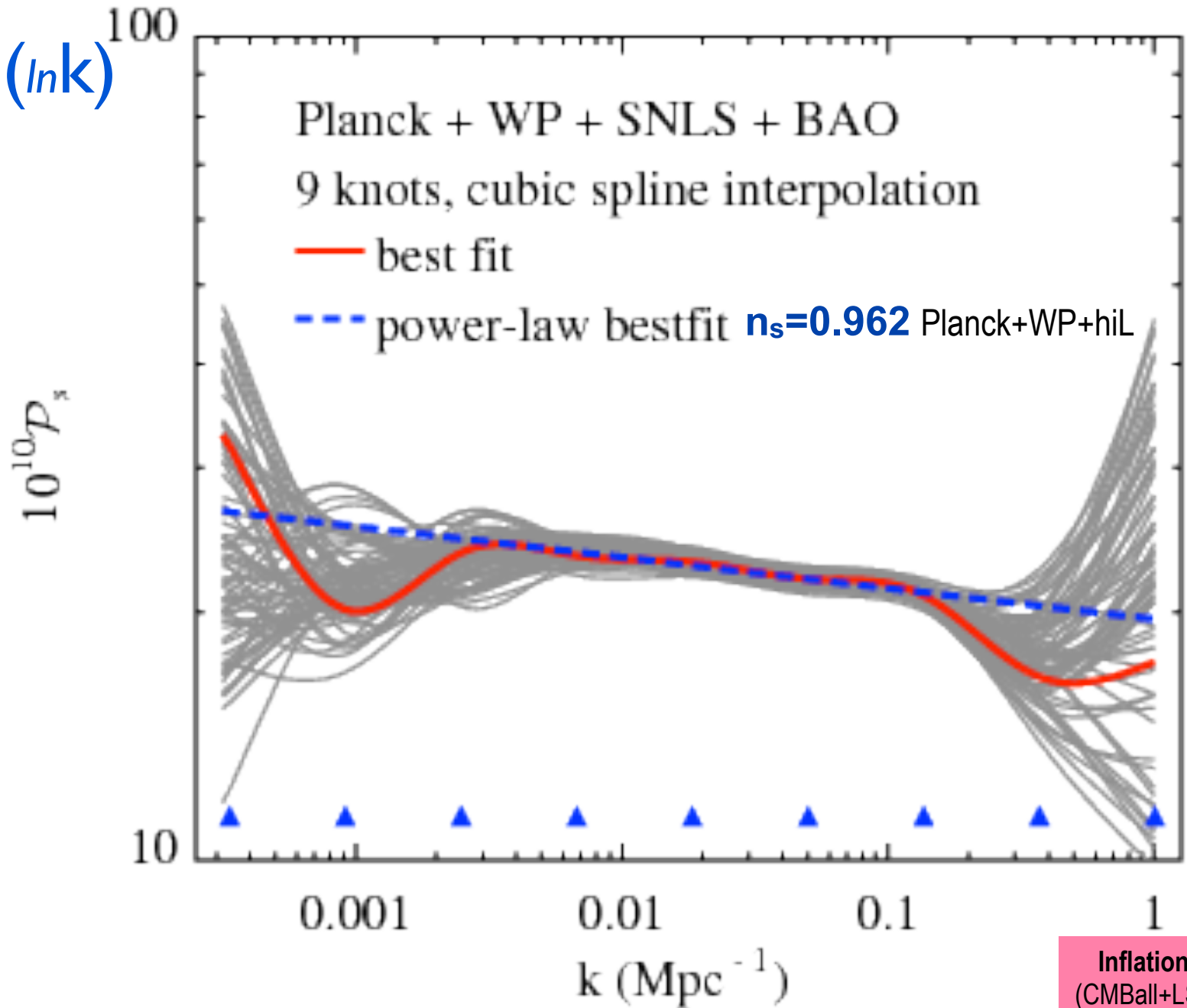
$\ln \mathcal{P}_s(\ln k)$



B+Huang same method

scan $\ln P_s(\ln k)/A_s$, $\ln A_s = \ln P_s(k_{pivot,s})$, $r(k_{pivot,t})$; consistency \Rightarrow reconstruct $\epsilon(\ln H a)$, $V(\psi)$

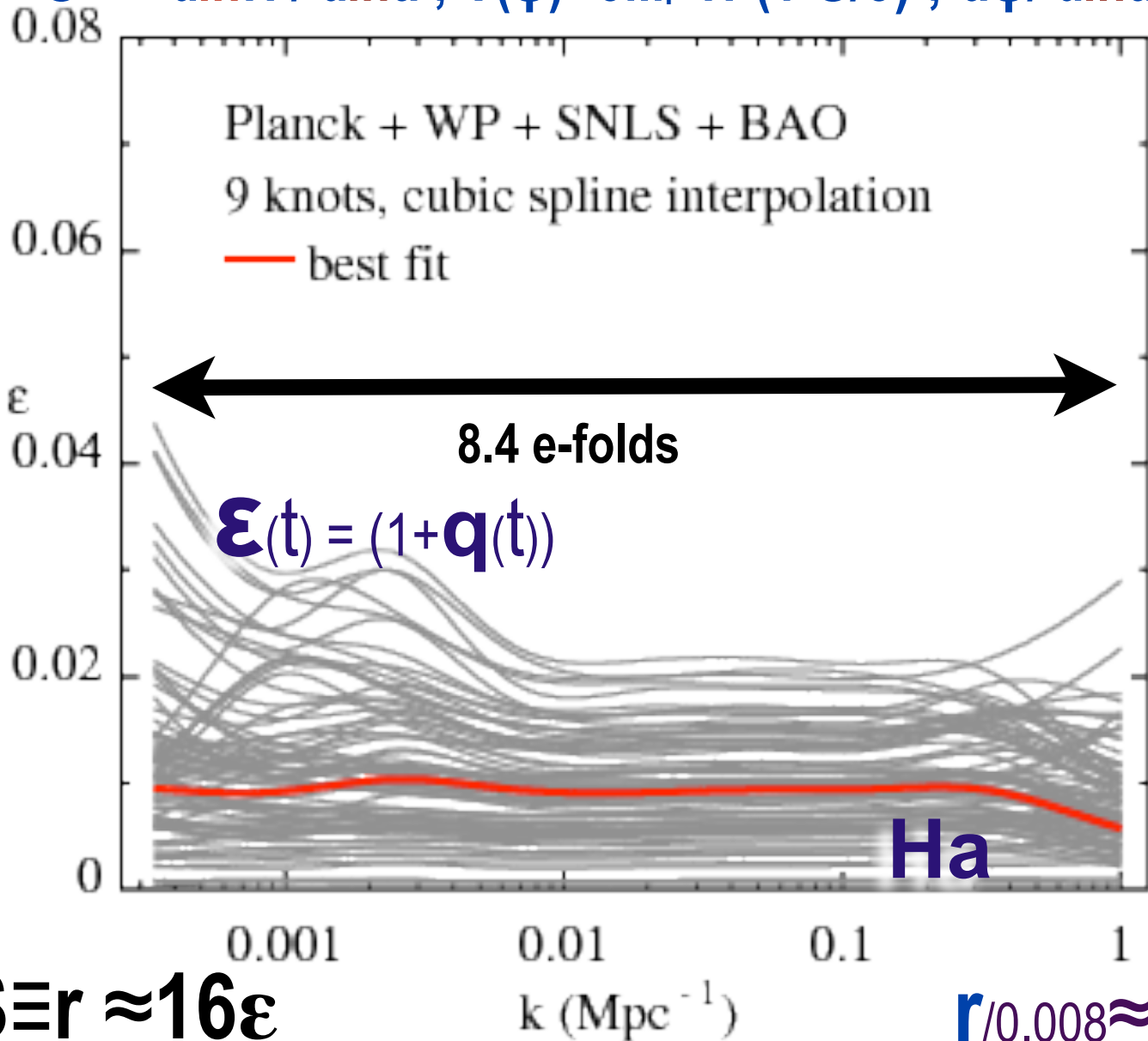
$\ln P_s(\ln k)$



Inflation Histories
(CMBall+LSS+SN+WL)

acceleration trajectories then *aka* $(1+W_{de})^{3/2}$ then

$$\boldsymbol{\varepsilon} = -d \ln H / d \ln a ; V(\psi) \approx 3M_P^2 H^2 (1 - \boldsymbol{\varepsilon}/3) ; d\psi / d \ln a = \pm \sqrt{\boldsymbol{\varepsilon}}$$



resolution
 $\ln k \sim \ln H a$
dynamics



$$GW/S \equiv r \approx 16 \boldsymbol{\varepsilon}$$

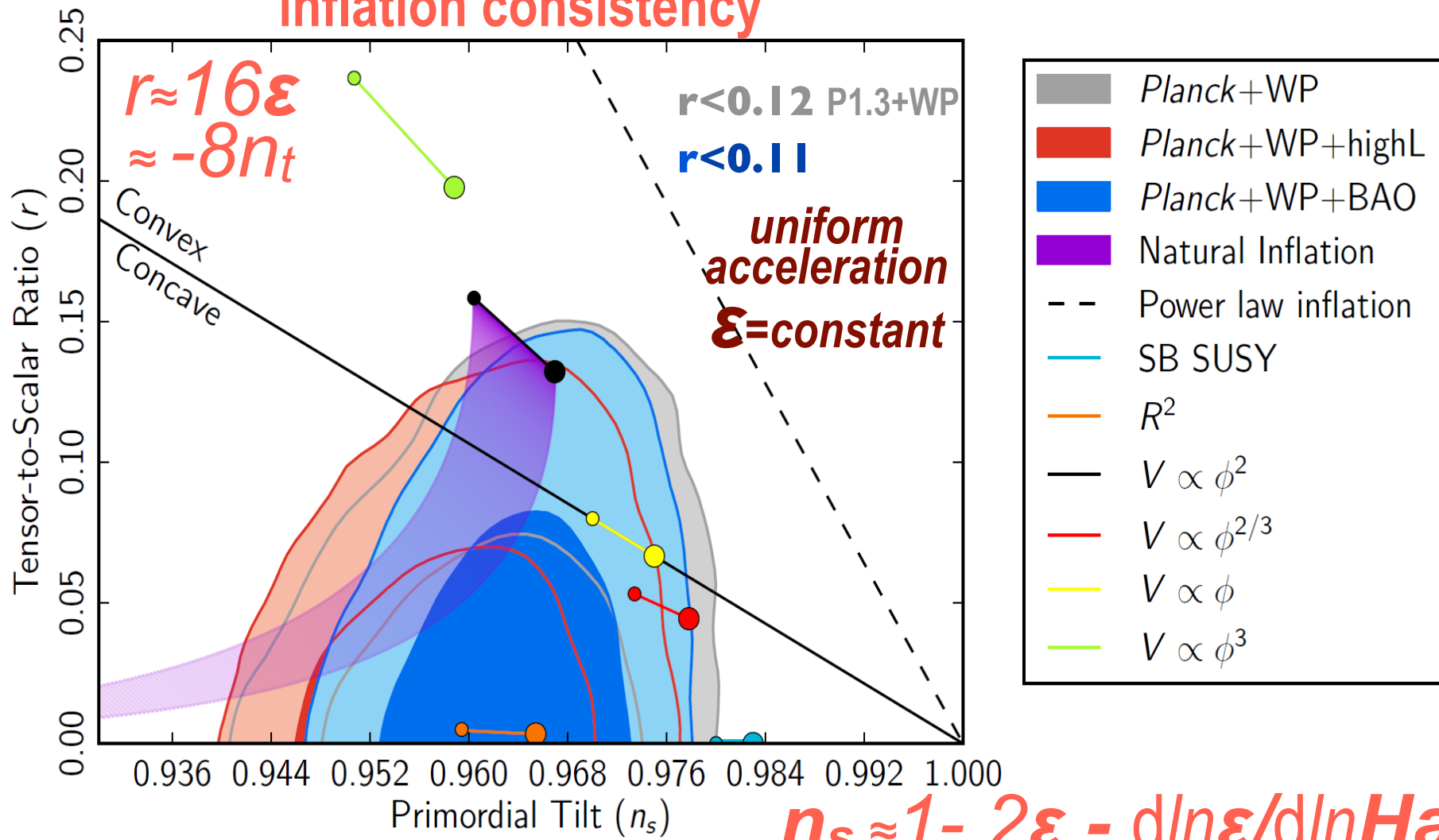
$$r/0.008 \approx V / (10^{16} \text{ GeV})^4$$

Consistent with single field slow roll, standard kinetic term & vacuum (with f_{NL} upper limits)

uniform acceleration line $\epsilon \equiv 3KE / (KE+PE) = \text{constant}$ is strongly ruled out

\Rightarrow early universe acceleration must change over observable scales (as well as to end inflation)

inflation consistency



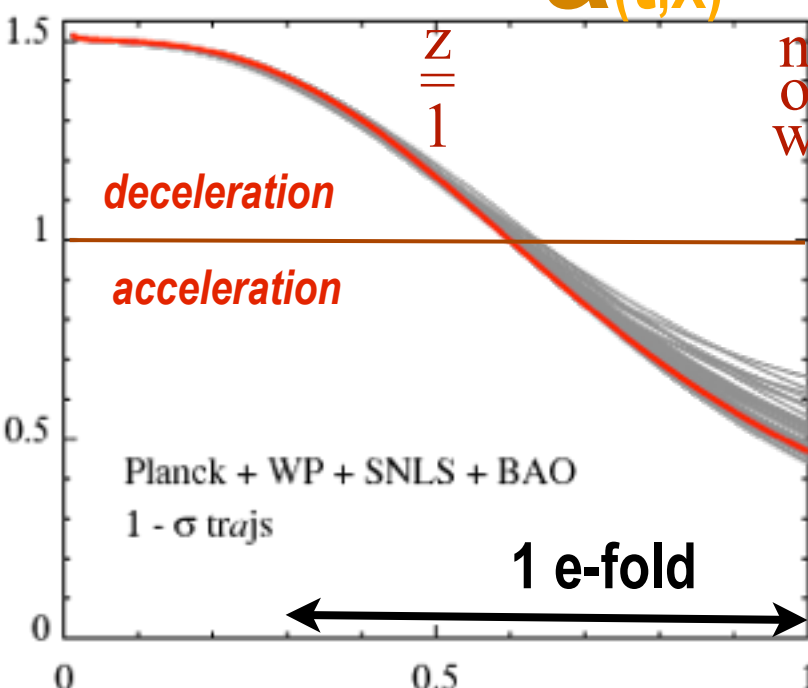
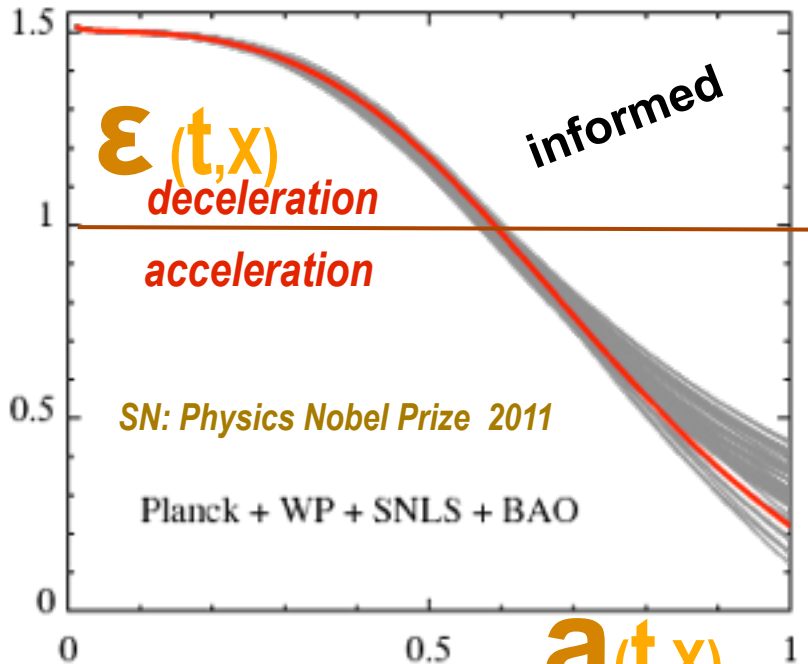
exponential potential models (power-law inf), the simplest hybrid inflationary models (Spontaneously Broken susy), and monomial potential models of degree $n > 2$ do not provide a good fit to the data. No running. no CDM isocurvature of axion $< 3.9\%$ (95% CL) & curvaton ($< 0.25\%$) types.

Natural = pNGB-Inflation, monodromy = driven pNGB-Inflation, Roulette Inflation (shrinking holes in extra-dim), brane inflation survive.

$$1+W_t = -d \ln p_t / d \ln a^3 = 2/3 \epsilon(t) \\ = 2/3 (1+q(t))$$

late-inflaton **DE trajectories**
 informed 1+3 parameters,
 physically motivated

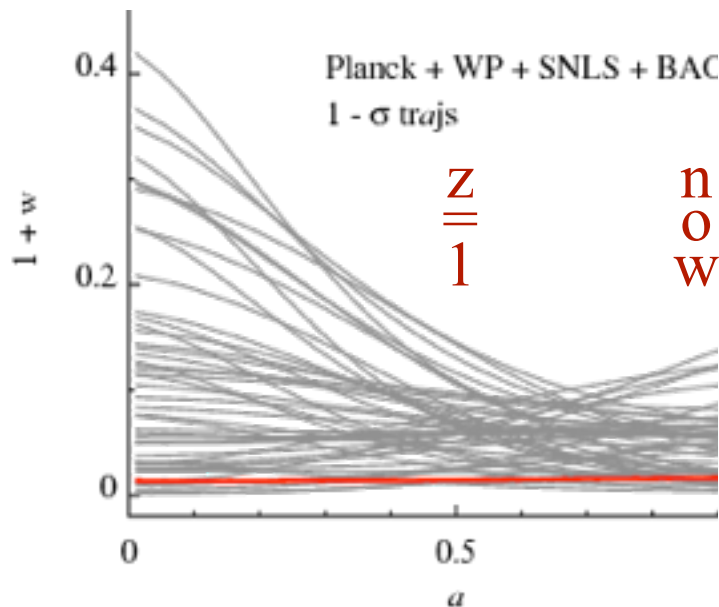
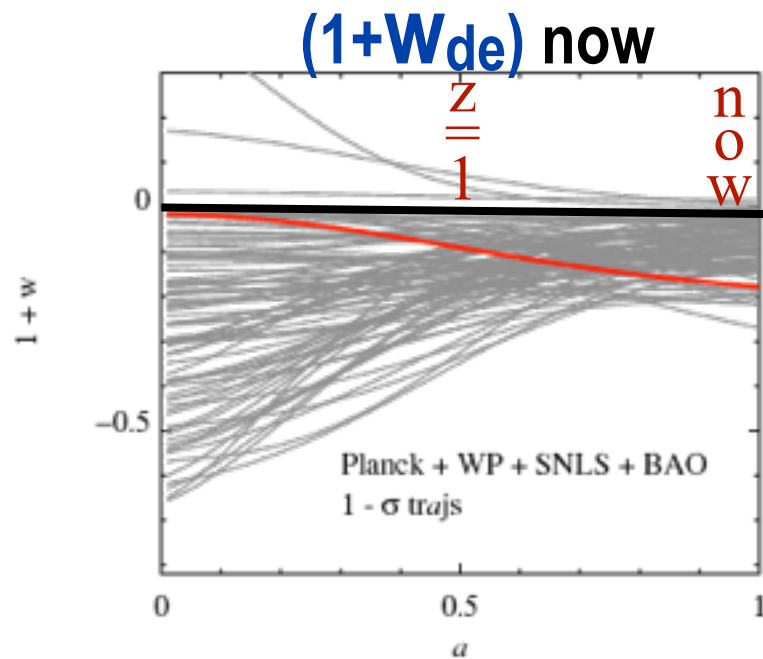
$$V_{de}, \epsilon_S = (d \ln V / d \psi)^2 / 4, \dots$$



is the **dark energy**
pure “vacuum potential
energy” or is there
“vacuum kinetic energy”?

late-inflaton **DE trajectories**

$$(1+W_{de}) = - d \ln p_{de} / d \ln a^3$$



is the **dark energy**
pure “vacuum potential
 energy” or is there
 “vacuum kinetic energy”?

late-inflaton **DE trajectories**

$$(1+W_{de}) = - d \ln p_{de} / d \ln a^3$$

