emergence

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

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

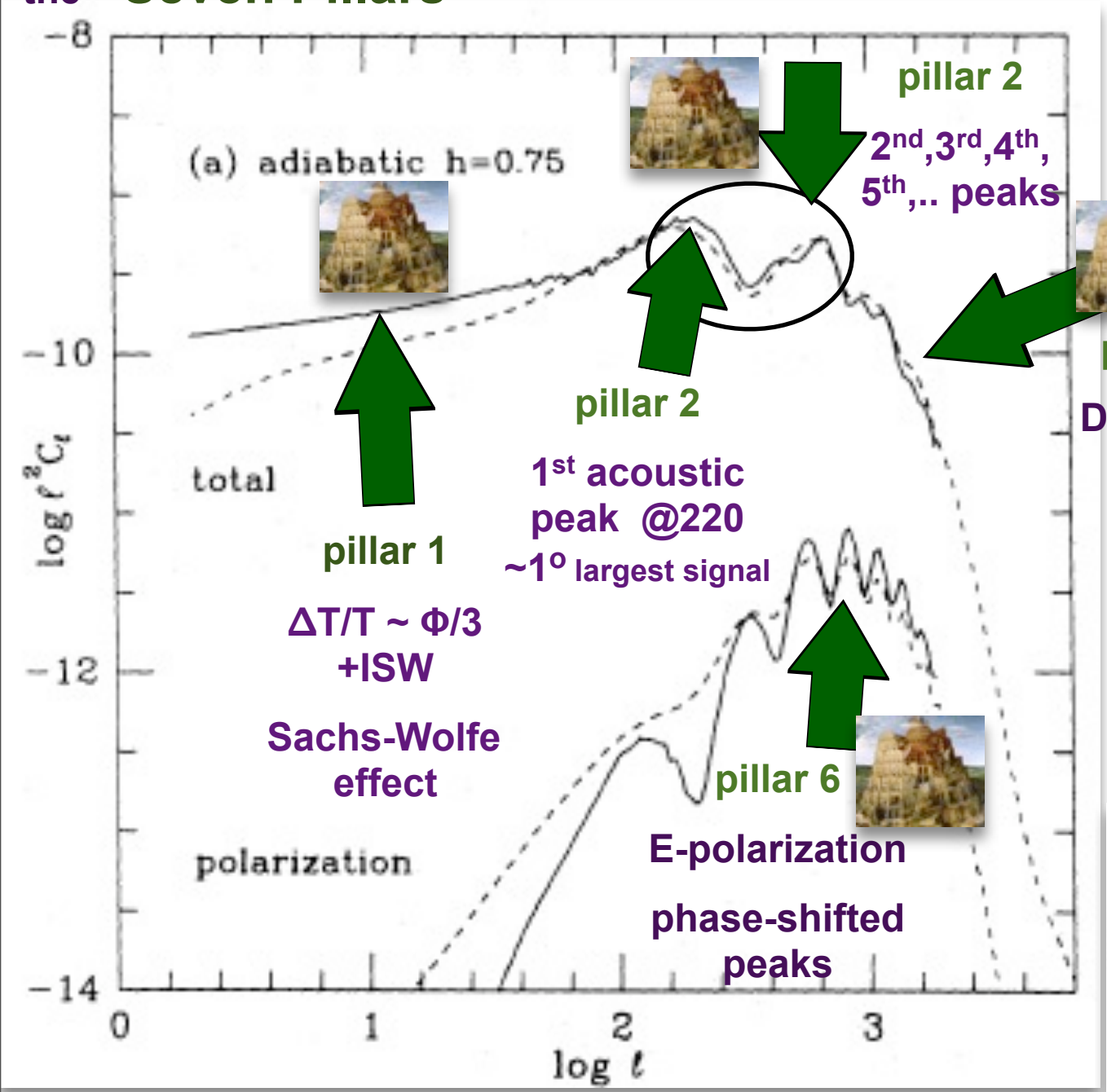
of the ***"standard" tilted deCDM*** *model in perfect agreement with* ***Big Bang Nucleosythesis***

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 1

ΔT/T ~ Φ/3
+ISW

Sachs-Wolfe effect

pillar 2

1st acoustic peak @220
~1° largest signal

pillar 2

2nd,3rd,4th, 5th,.. peaks

pillar 3

Damping tail

pillar 4

Gaussianity *maximal randomness for given C_L*

pillar 5

secondary ΔT
nonlinear
Compton SZ CIB weak lensing..

pillar 7

B-polarization

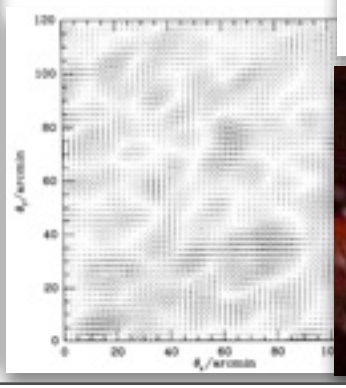
Gravity Waves

pillar 6

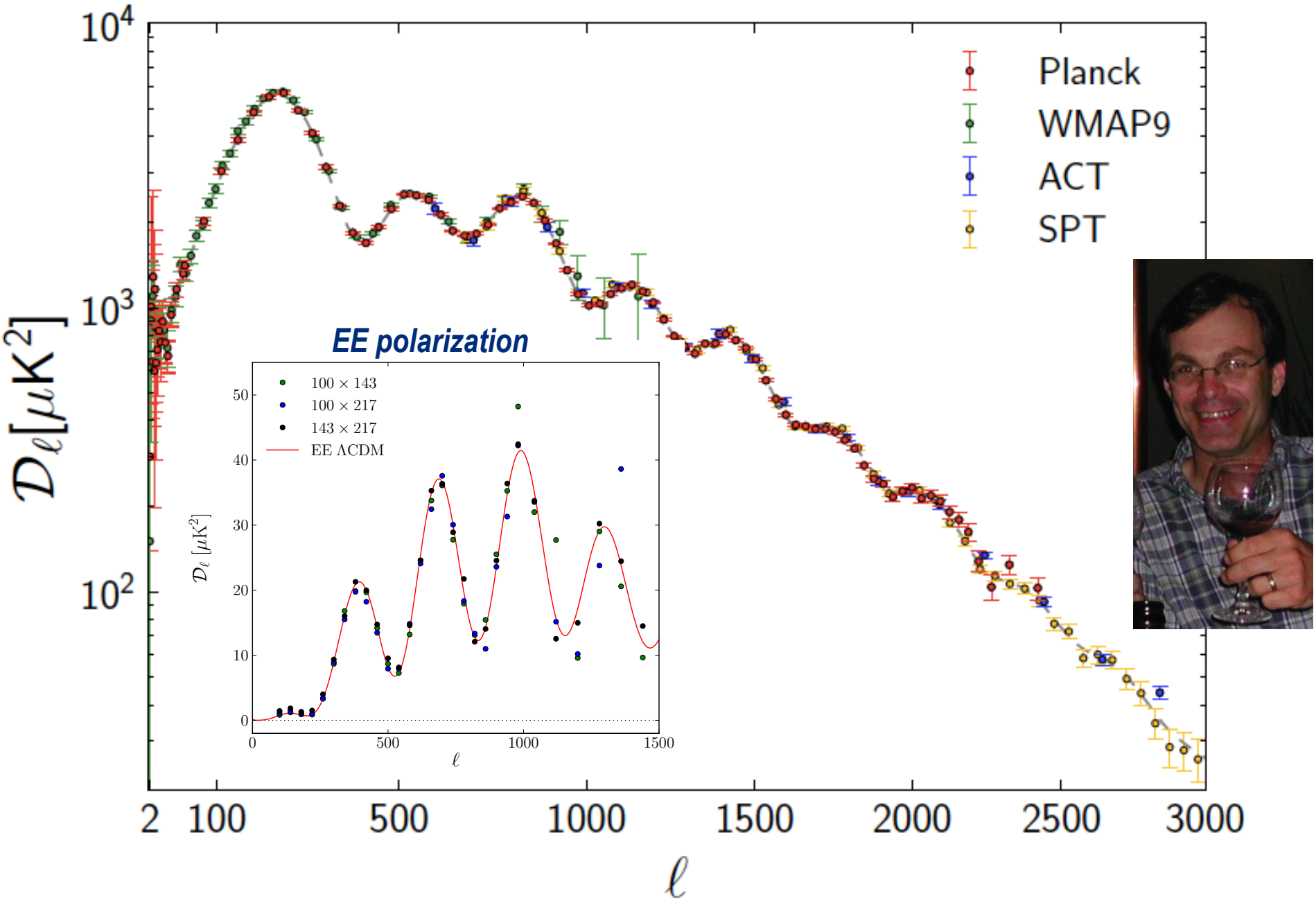
E-polarization

phase-shifted peaks

BondEfstathiou87

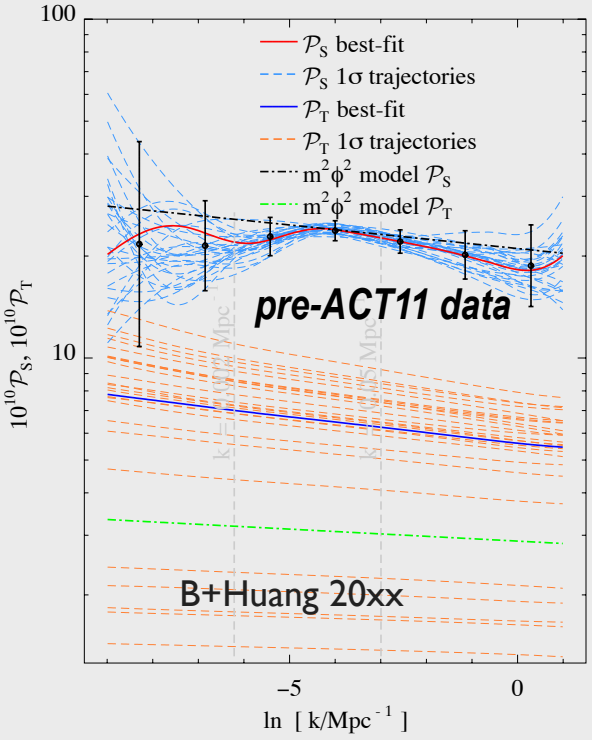


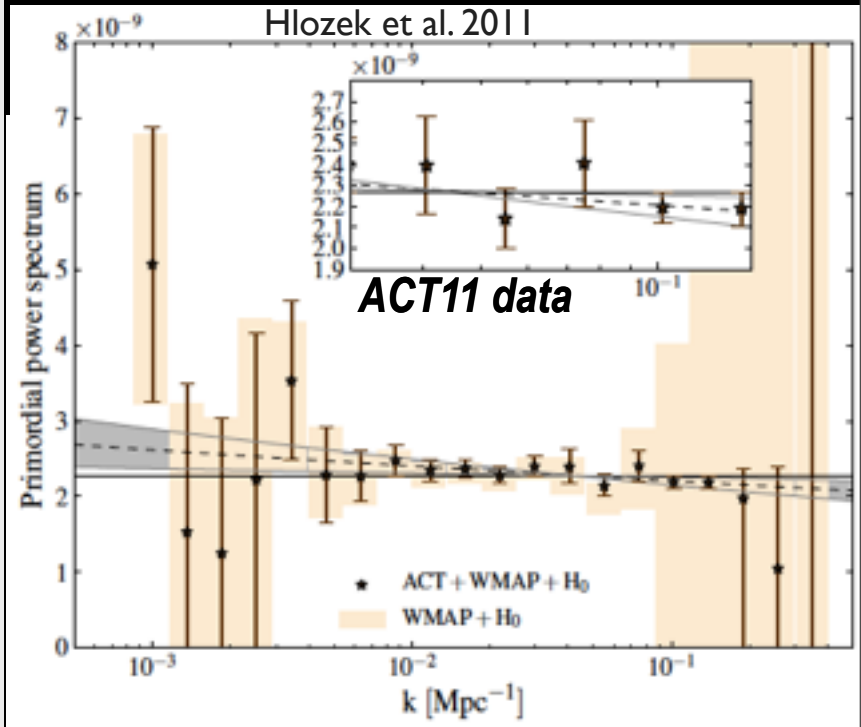
the **sound** of the U-**machine**



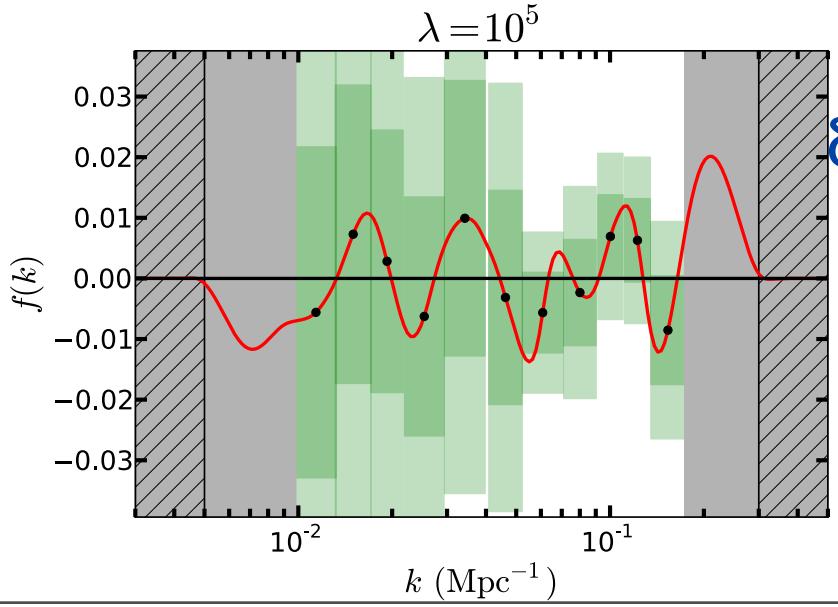
early-U, NOW

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

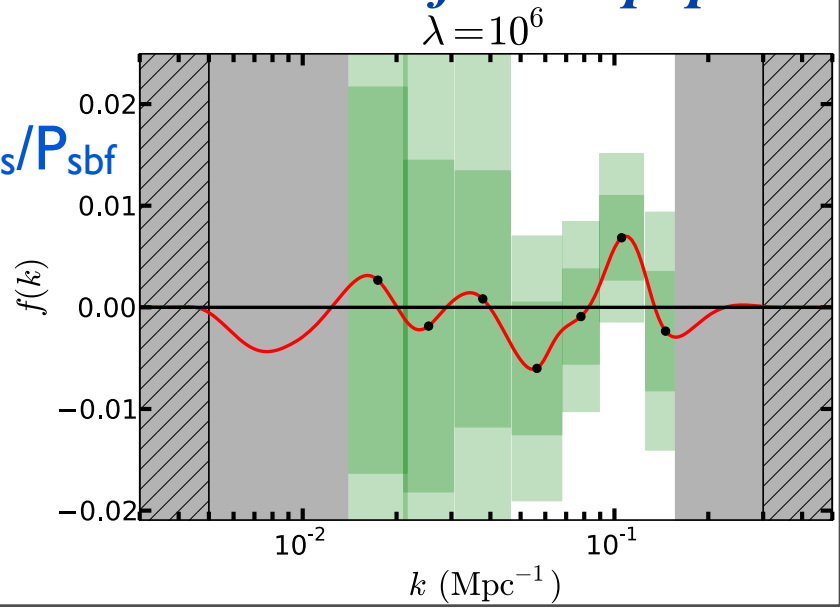




Planck1.3 inflation paper

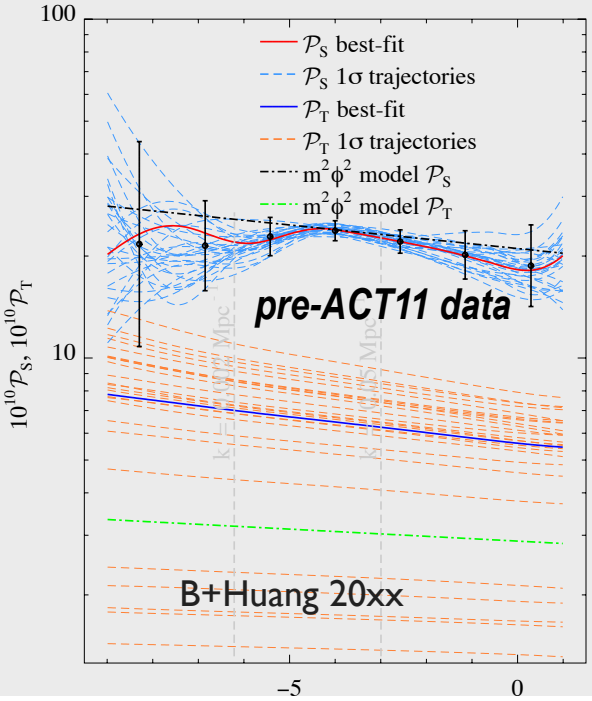


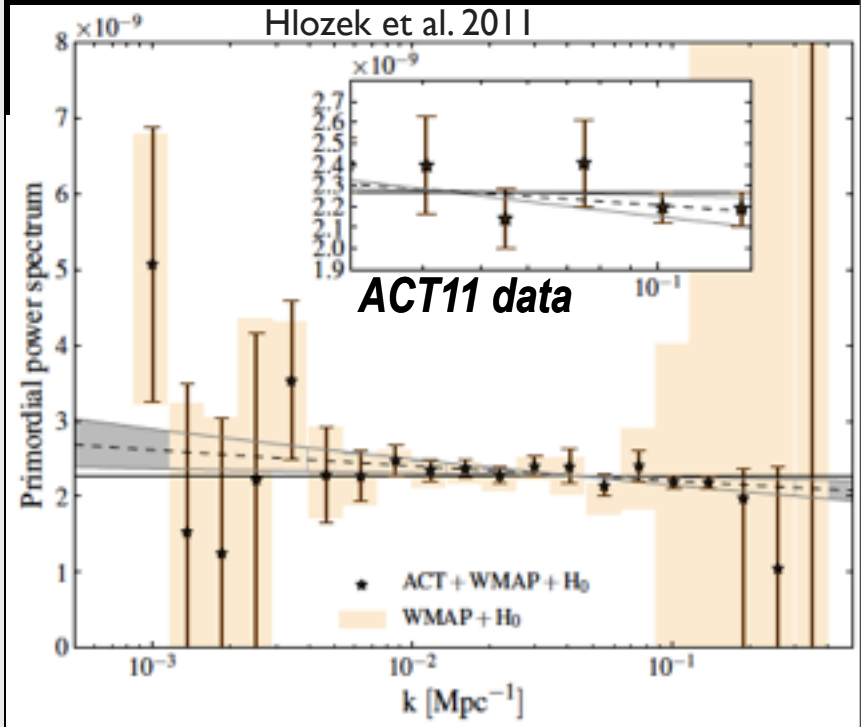
$\delta P_s/P_{sbf}$



early-U, NOW

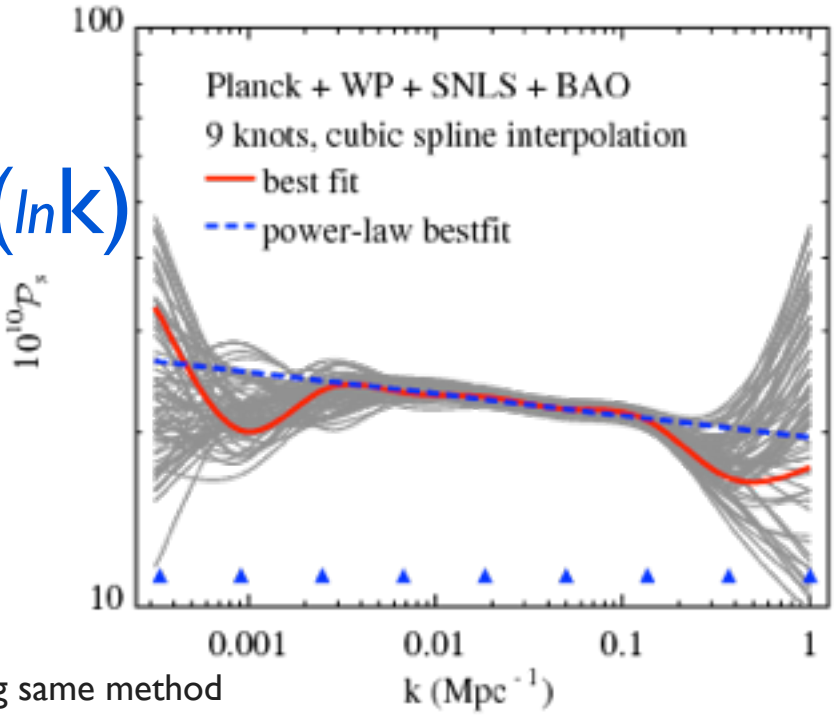
semi-blind & informed reconstruction of acceleration histories & S/T power spectra





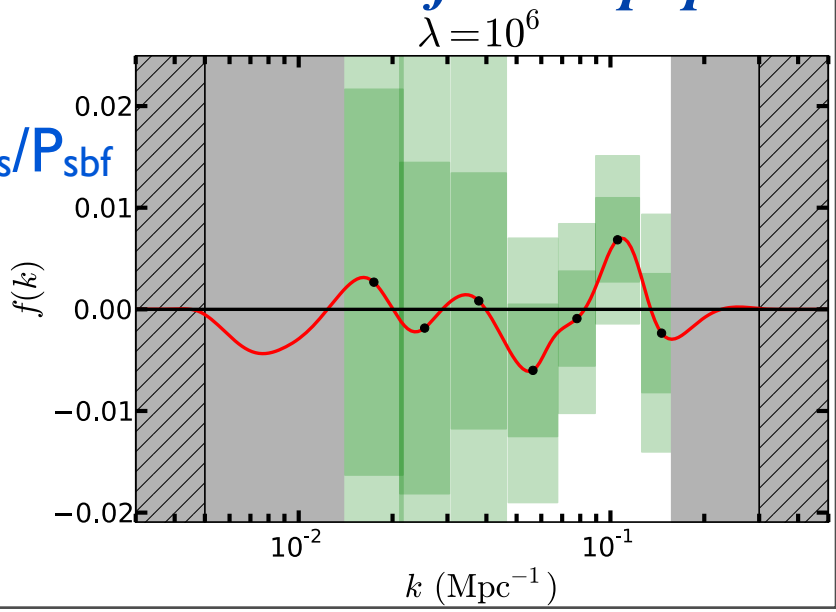
Planck1.3 inflation paper

$\ln P_s(\ln k)$



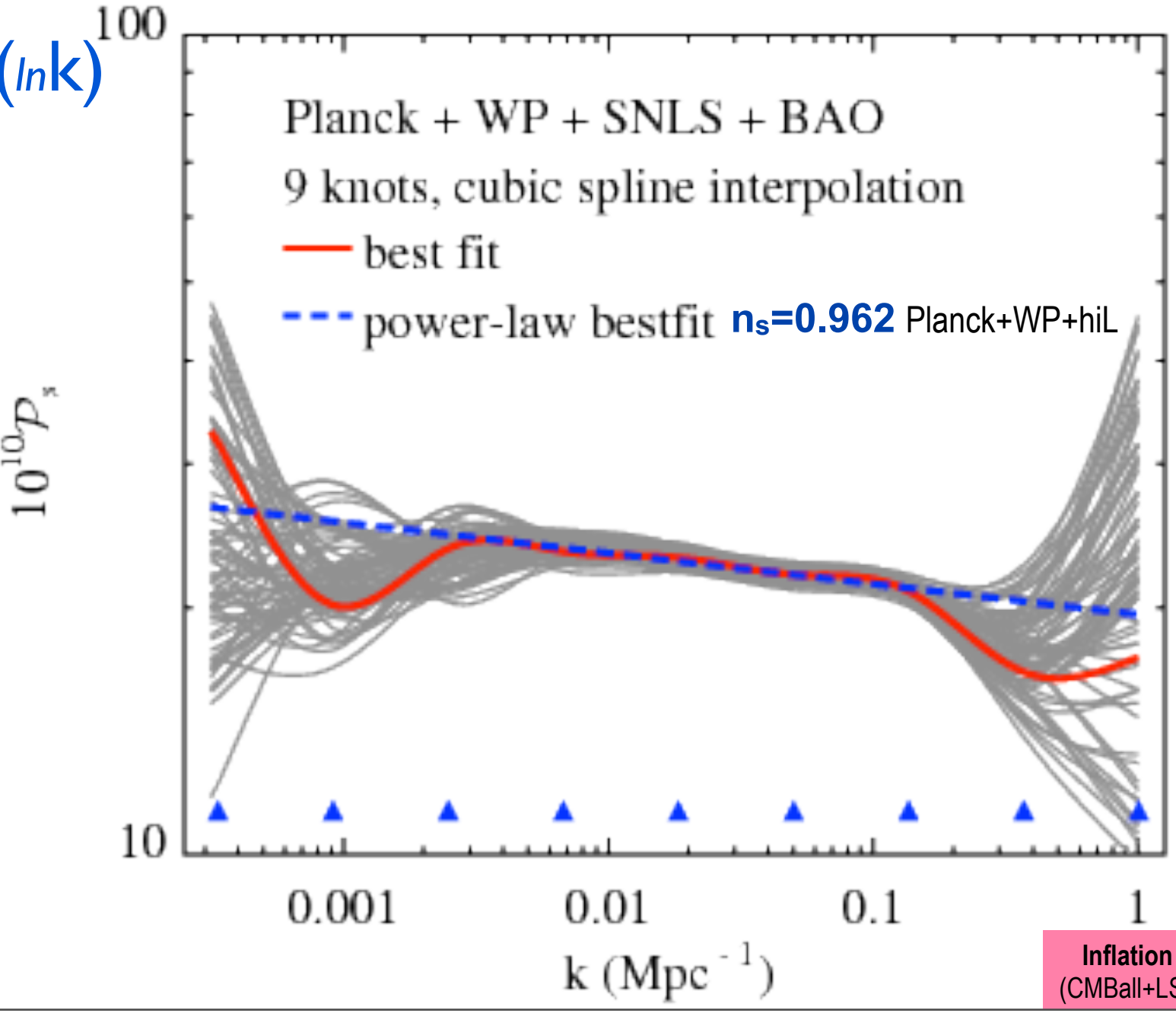
B+Huang same method

$\delta P_s/P_{sbf}$



scan $ln\mathbf{P_s}(ln k)/A_s$, $ln\mathbf{A_s}=ln P_s(k_{pivot,s})$, $\mathbf{r}(k_{pivot,t})$; *consistency => reconstruct* $\boldsymbol{\varepsilon}(ln\mathbf{Ha})$, $\mathbf{V(\psi)}$

$ln P_s(ln k)$

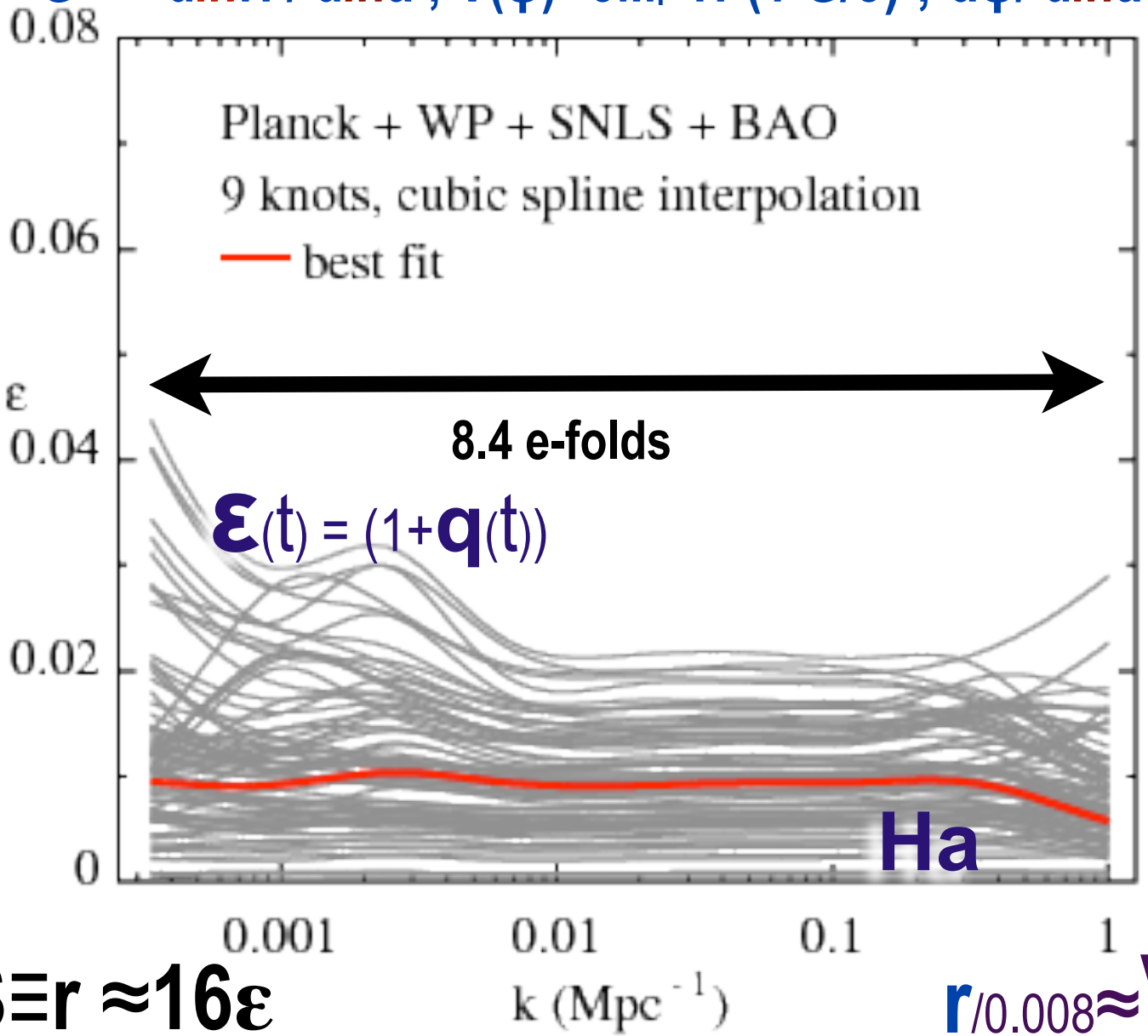


Inflation Histories
(CMBall+LSS+SN+WL)

acceleration trajectories then

aka $(1+w_{de})3/2$ then

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



resolution
lnk ~ lnHa
dynamics

GW/S≡$r \approx 16\varepsilon$

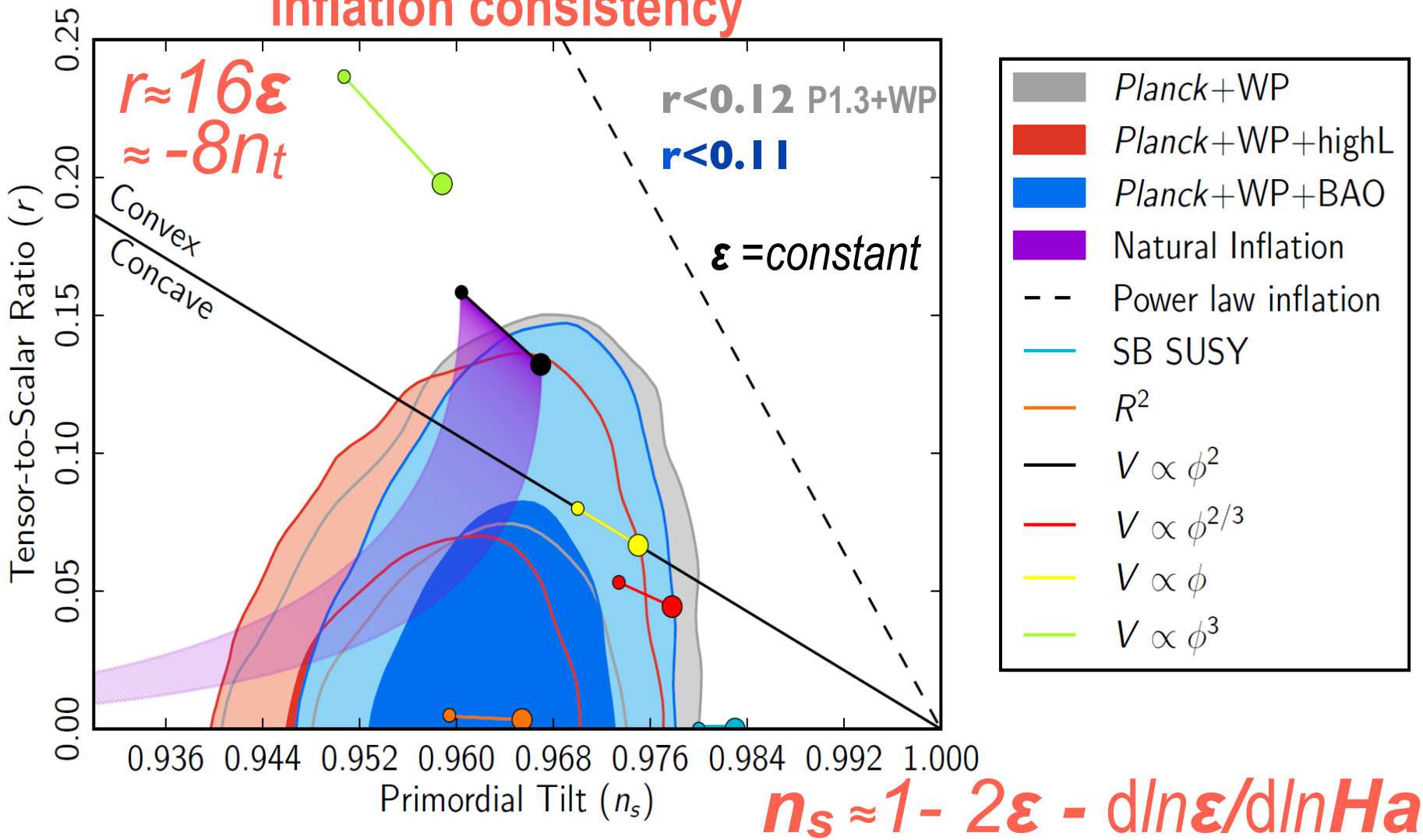
$r/0.008 \approx V/(10^{16}\text{Gev})^4$

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

uniform acceleration *line* ***ε ≡3KE /(KE+PE)*** *= constant is* ***strongly ruled out***

=> early universe acceleration must change over observable scales (as well as to end inflation)

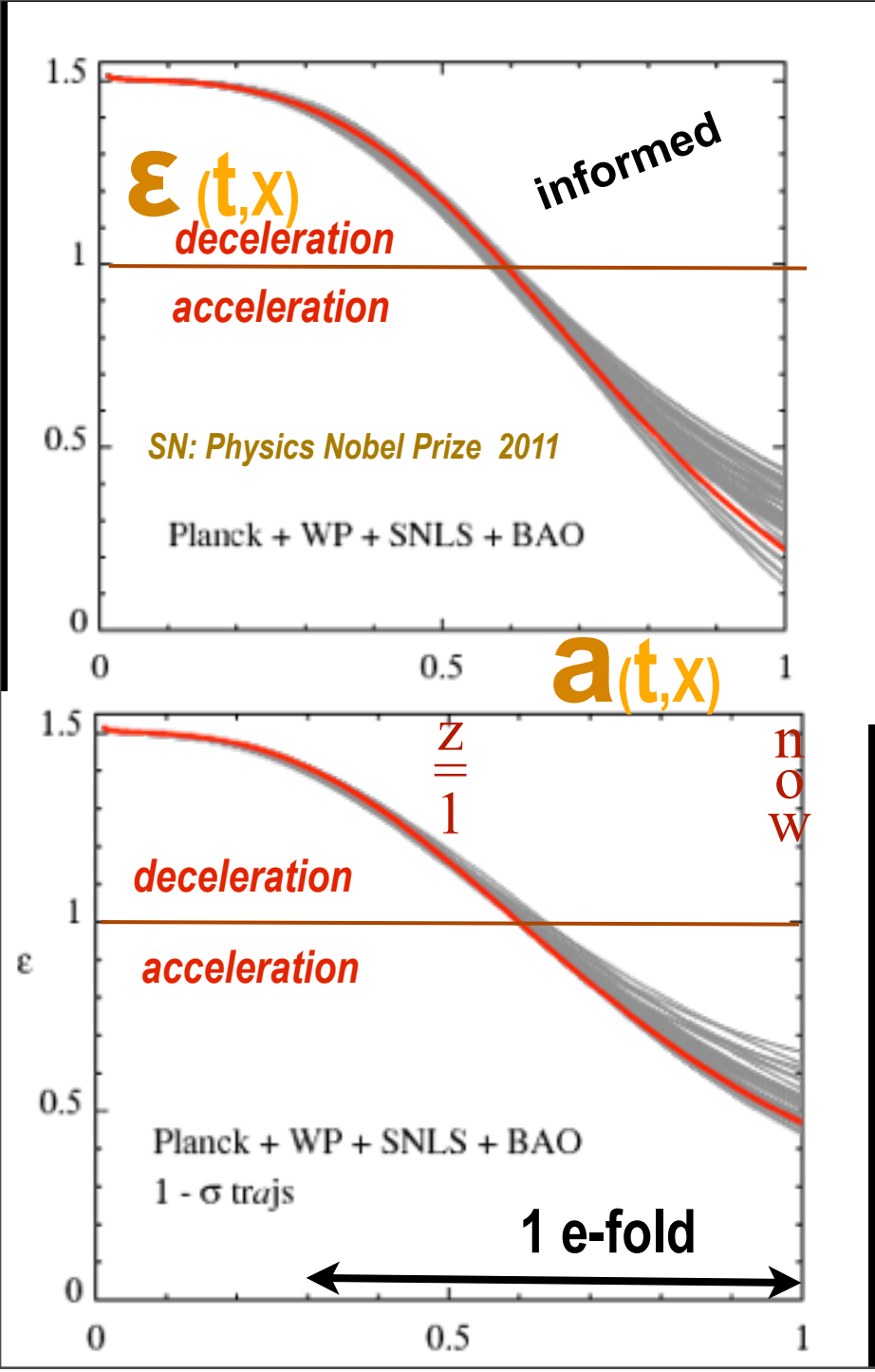
inflation consistency



$n_s \approx 1 - 2\varepsilon - d\ln\varepsilon/d\ln Ha$

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.



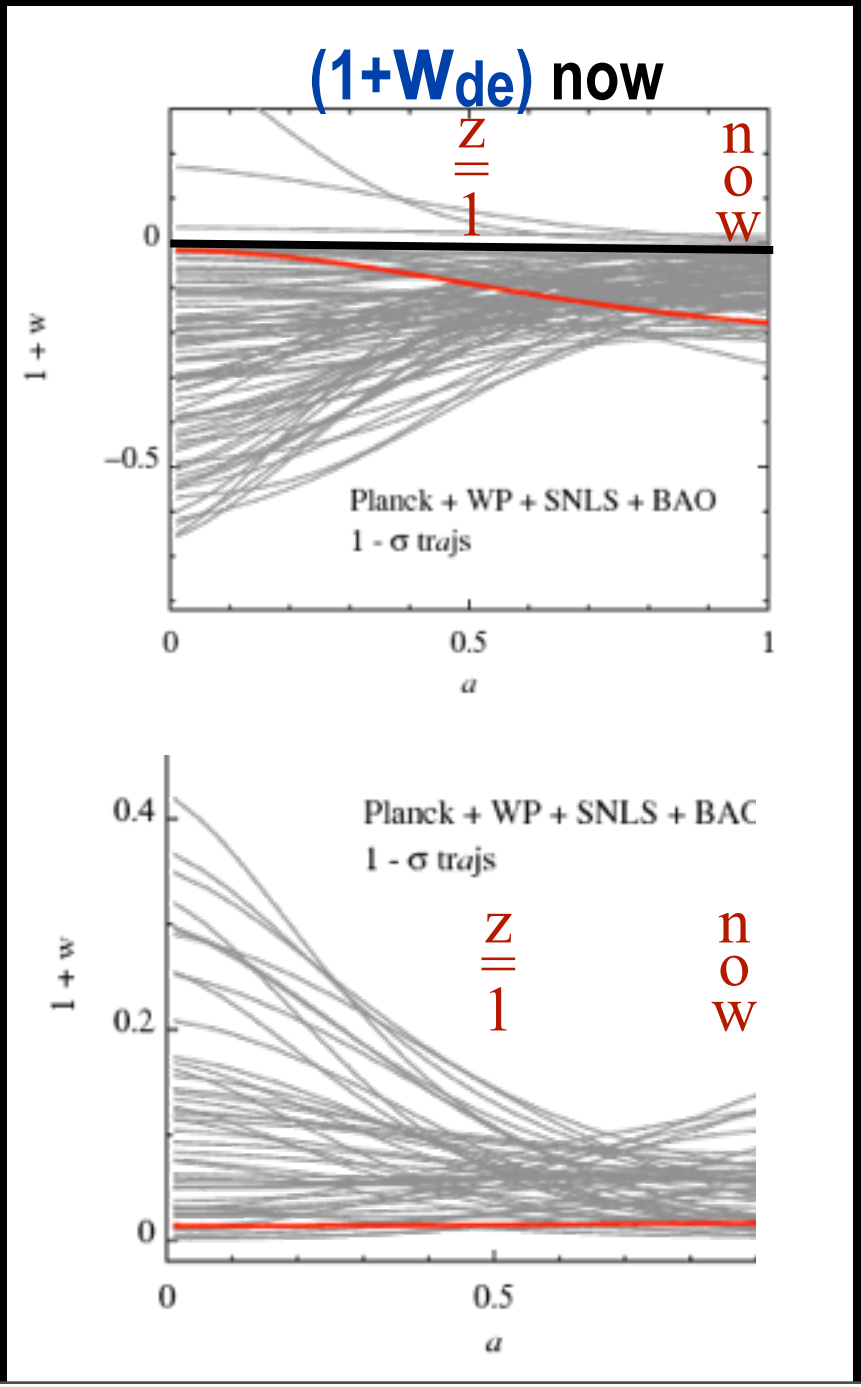
$1+W_t = -d\ln\rho_t / d\ln a^3 = 2/3\ \varepsilon(t)$

$= 2/3\ (1+q(t))$

late-inflaton **DE trajectories**

informed 1+3 parameters, physically motivated

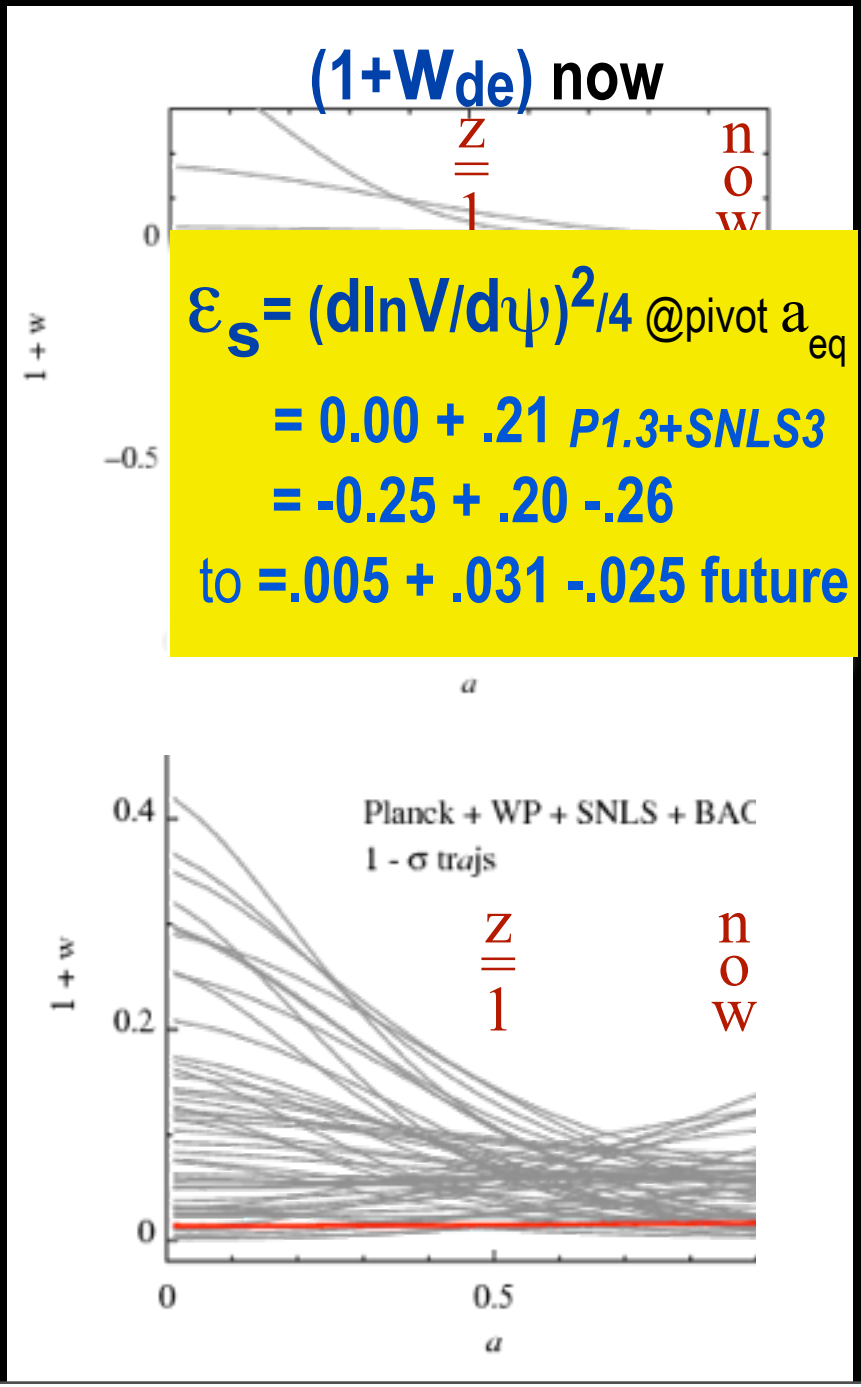
$V_{de},\ \varepsilon_s = (d\ln V/d\psi)^2/4$, ..



is the dark energy pure "vacuum potential energy" or is there "vacuum kinetic energy"?

late-inflaton **DE trajectories**

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



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

late-inflaton DE trajectories

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