

WMAP results:

- 1.the flatness of space
 - 2.the near scale-invariance
 - 3.adiabaticity
 - 4.Gaussian distribution of the density perturbations
 - 5.the density of baryons
 - 6.the age of the universe
 - 7.the early formation of the first stars
- ALL these are based on WMAP alone and are consistent with the standard model

WMAP data alone are consistent with the simplest inflationary models():
⇒ $n=0.99\pm 0.04$

But when the data are combined with:

- 1 the two degree field galaxy redshift survey;
 - 2 quasar absorption line measurements.
- ⇒ n runs from 1.1 (on the largest scales) < 0.9 (on the smallest scales probed)

the inflationary Big Bang model

the universe began in a state of nearly infinite temperature and density and almost immediately entered a phase of rapid, accelerated expansion ("inflation"). This expansion smoothed out the distribution of energy, flattened any initial warp or curvature in space, and created tiny variations in density

Need two dark things:

1.dark matter:

To transform these density variations into the gravitationally collapsed, complex structures we see today
but the nature of dark matter is unsettled

2.dark energy:

To account for the measured total energy density and to explain the current cosmic acceleration.

two candidates:

vacuum energy or quintessence:depends on w , the ratio of pressure to energy density

IF WMAP combined analysis→vacuum energy

IF WMAP results at large angular scales→quintessence (because the enhanced fluctuations expected for vacuum energy are missing)

ANYWAY,the inflationary Big Bang model is incomplete:

- 1.The initial conditions that led to inflation
- 2.The identity of the "inflaton" field (the cosmic field that causes inflationary expansion)

WMAP data alone \rightarrow 2 uncertainties:

1. the density of dark matter, Ω_m

2. the amplitude of density fluctuations labeled by σ_8

(they describe the amount and distribution of the matter that clusters to form all of the structure in the universe.)

\rightarrow combination of Ω_m and σ_8