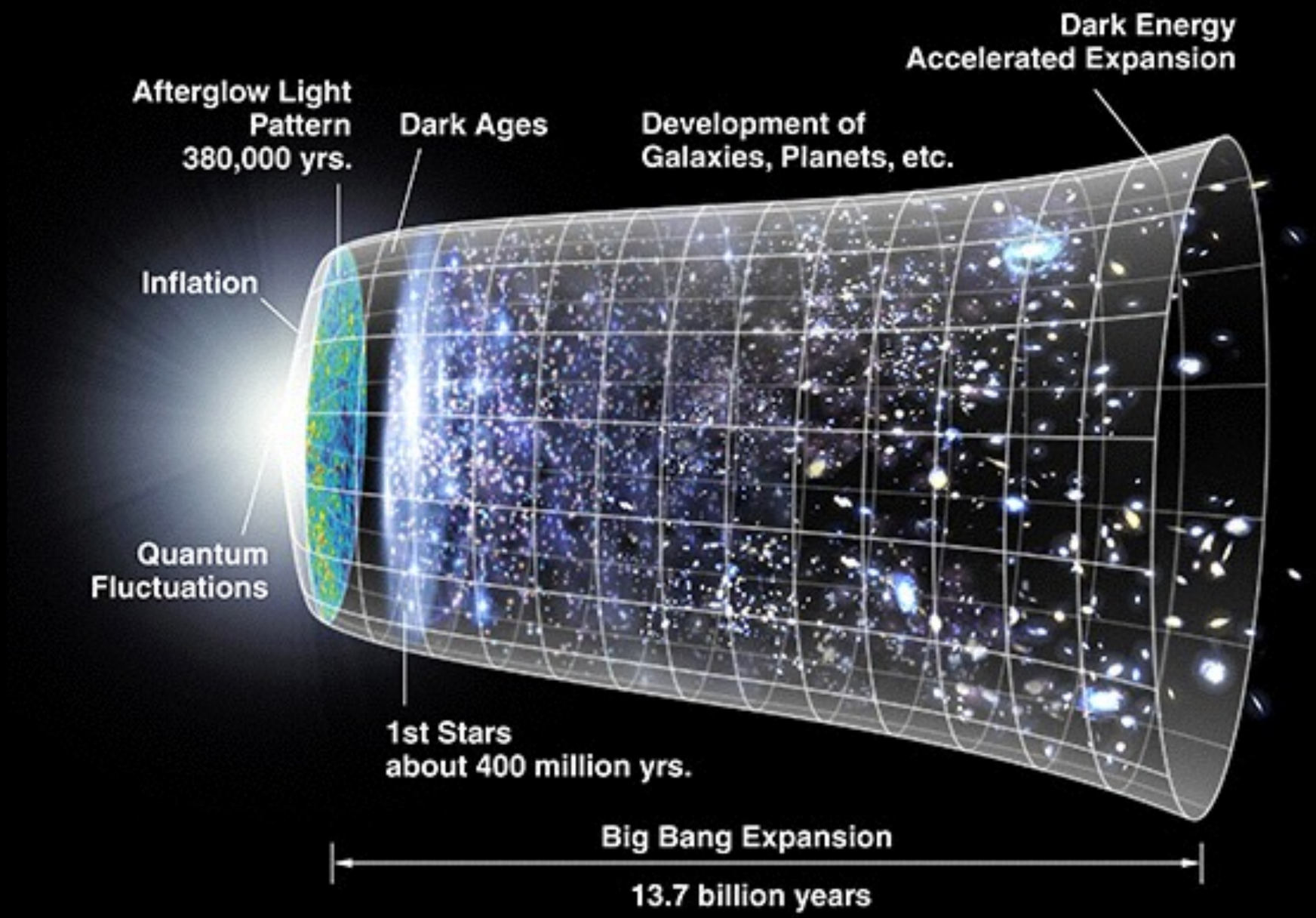
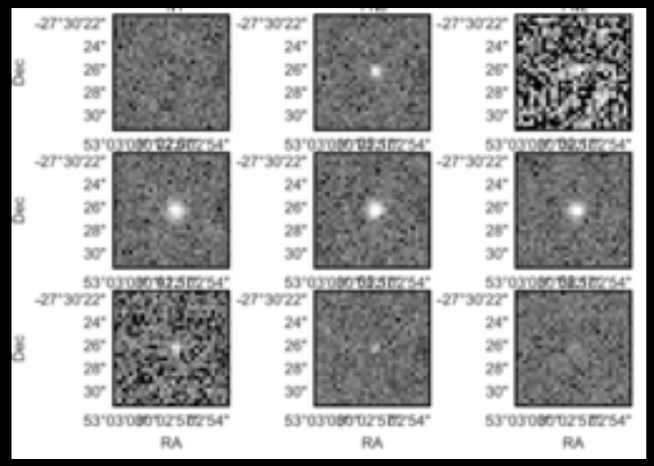
Constraining Statistical Isotropy with LSST Supernovae

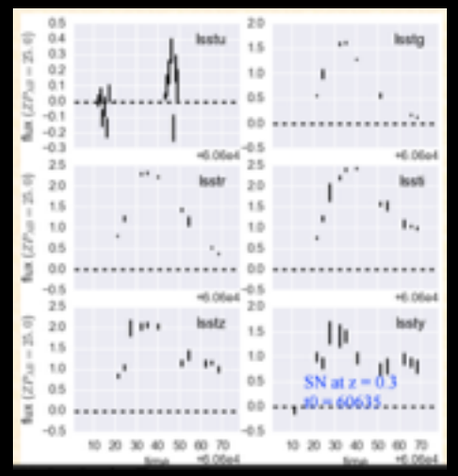
Cosmology


Dark Energy
Accelerated Expansion
Afterglow Light
Pattern
380,000 yrs.
Dark Ages
Development of
Galaxies, Planets, etc.
Inflation
Quantum
Fluctuations
1st Stars
about 400 million yrs.
Big Bang Expansion
13.7 billion years

Accelerated Expansion of the Universe: How did we learn this?

Using Type Ia Supernovae which are Standardizable Candles

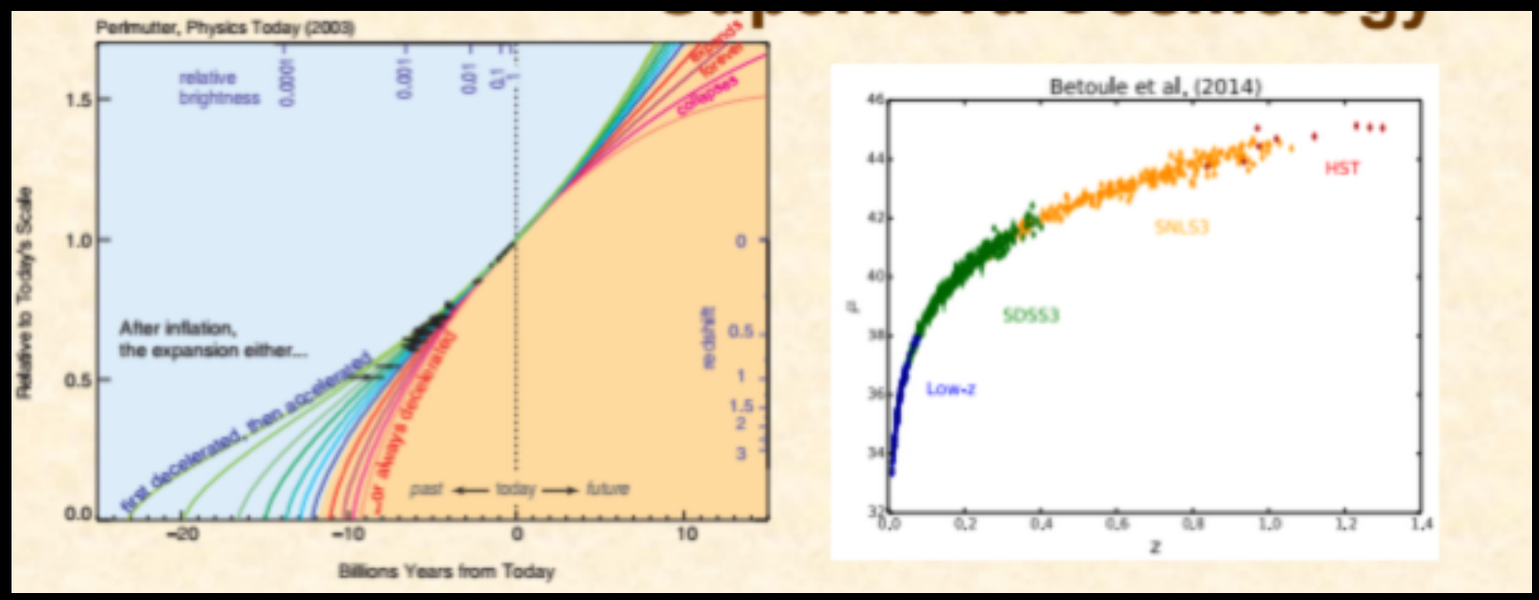




Using good light curves, we can estimate intrinsic brightness

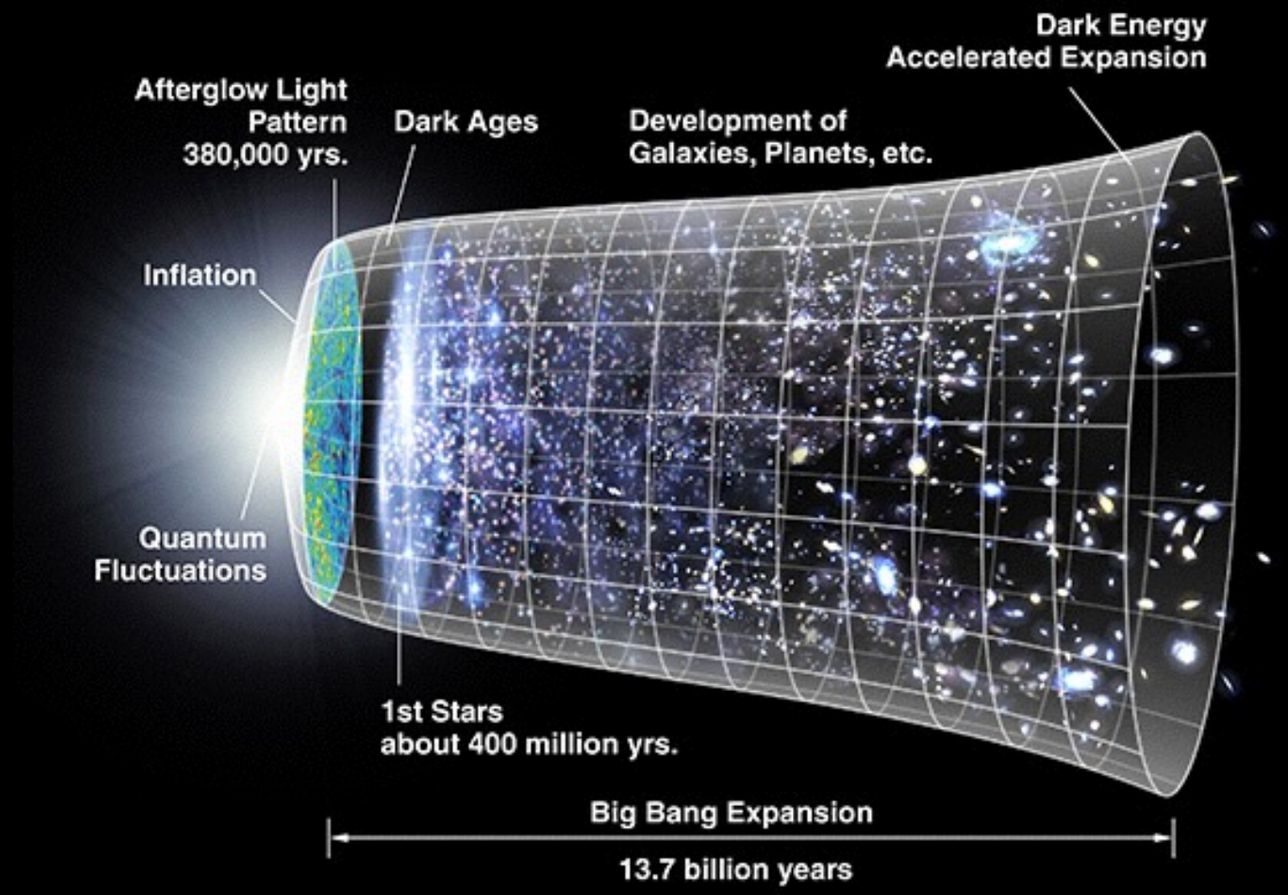
Accelerated Expansion of the Universe: How did we learn this?

Use Observed Dimness to estimate Expansion History



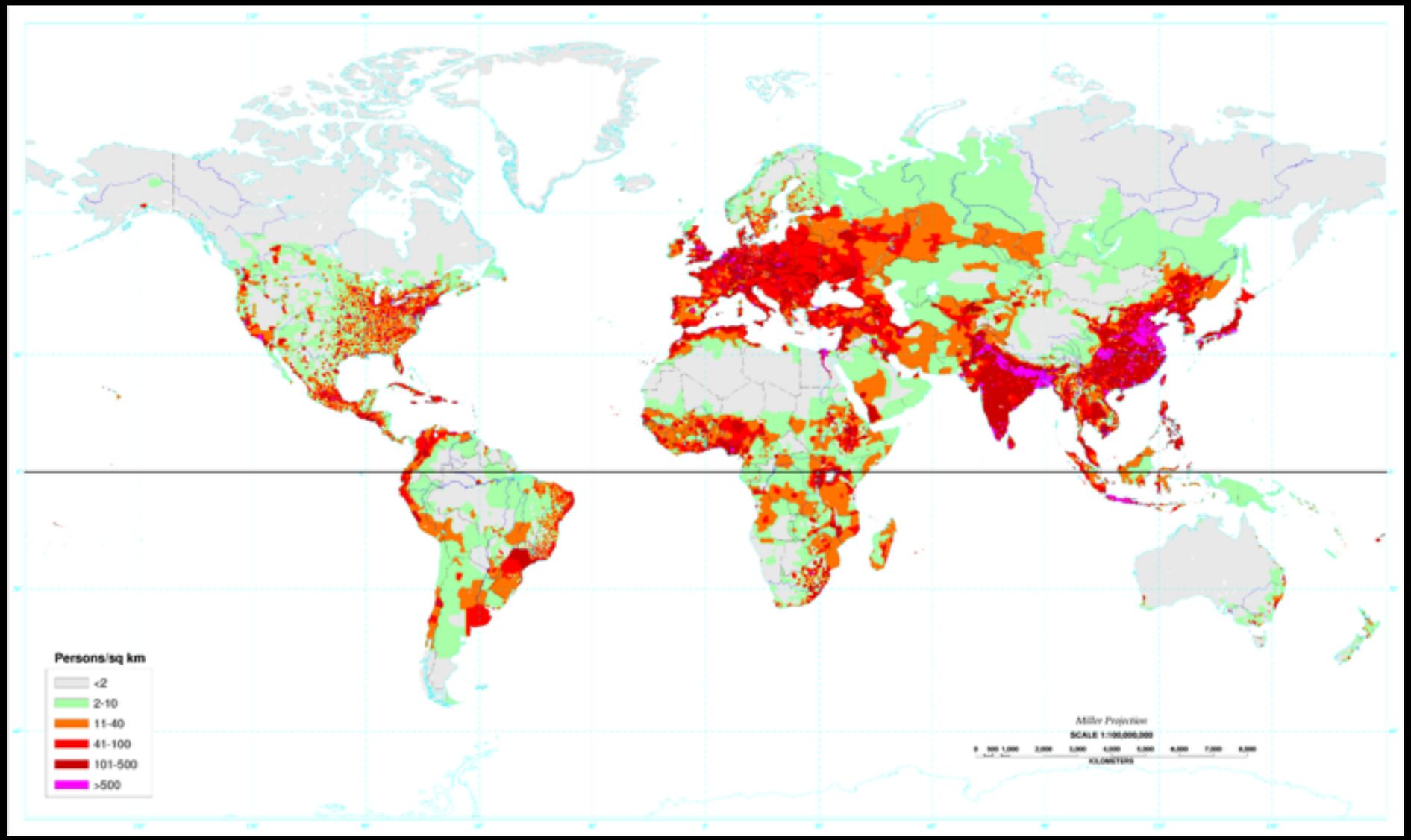
Using good light curves, we can estimate intrinsic brightness

Axioms of Underlying Symmetry



Single Distance Scale at each time ie.
Single Density Parameter in time

Axioms of Underlying Symmetry



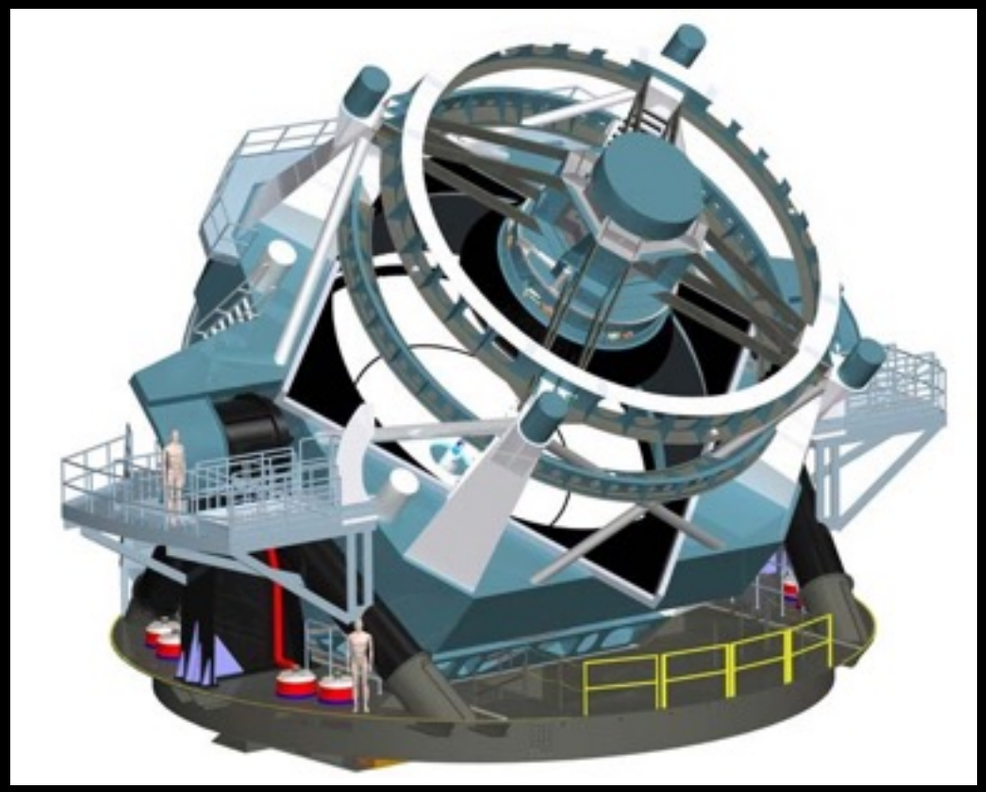
Axioms of Underlying Symmetry

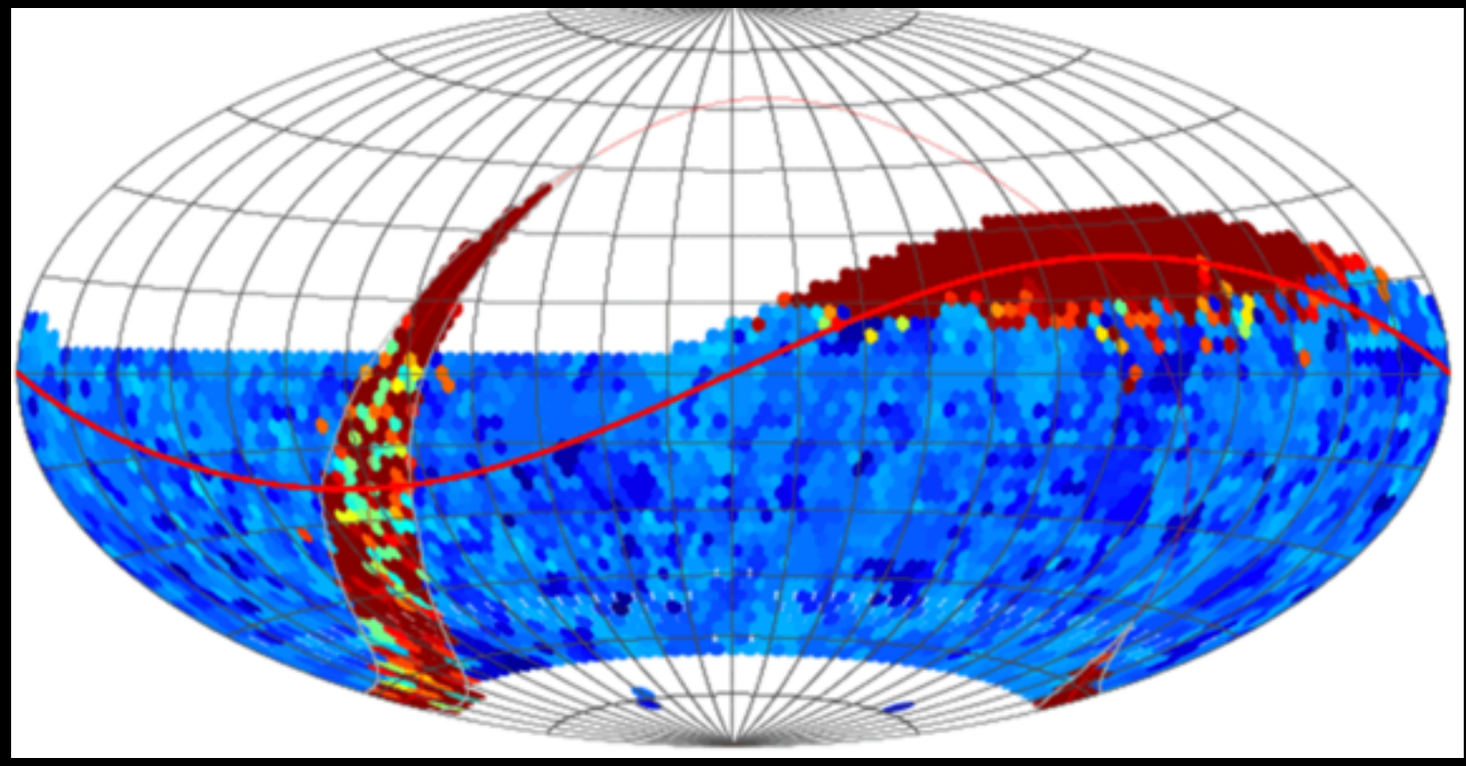
- Assumption of underlying Statistical Isotropy (Things look the same in every direction) and Homogeneity (Things look the same after you translate your position)

Is there data?

- CMB shows that isotropy of space is a very good assumption at early times
- Would be interesting to be able to confirm this at late times (during accelerating phase) and at large scales.

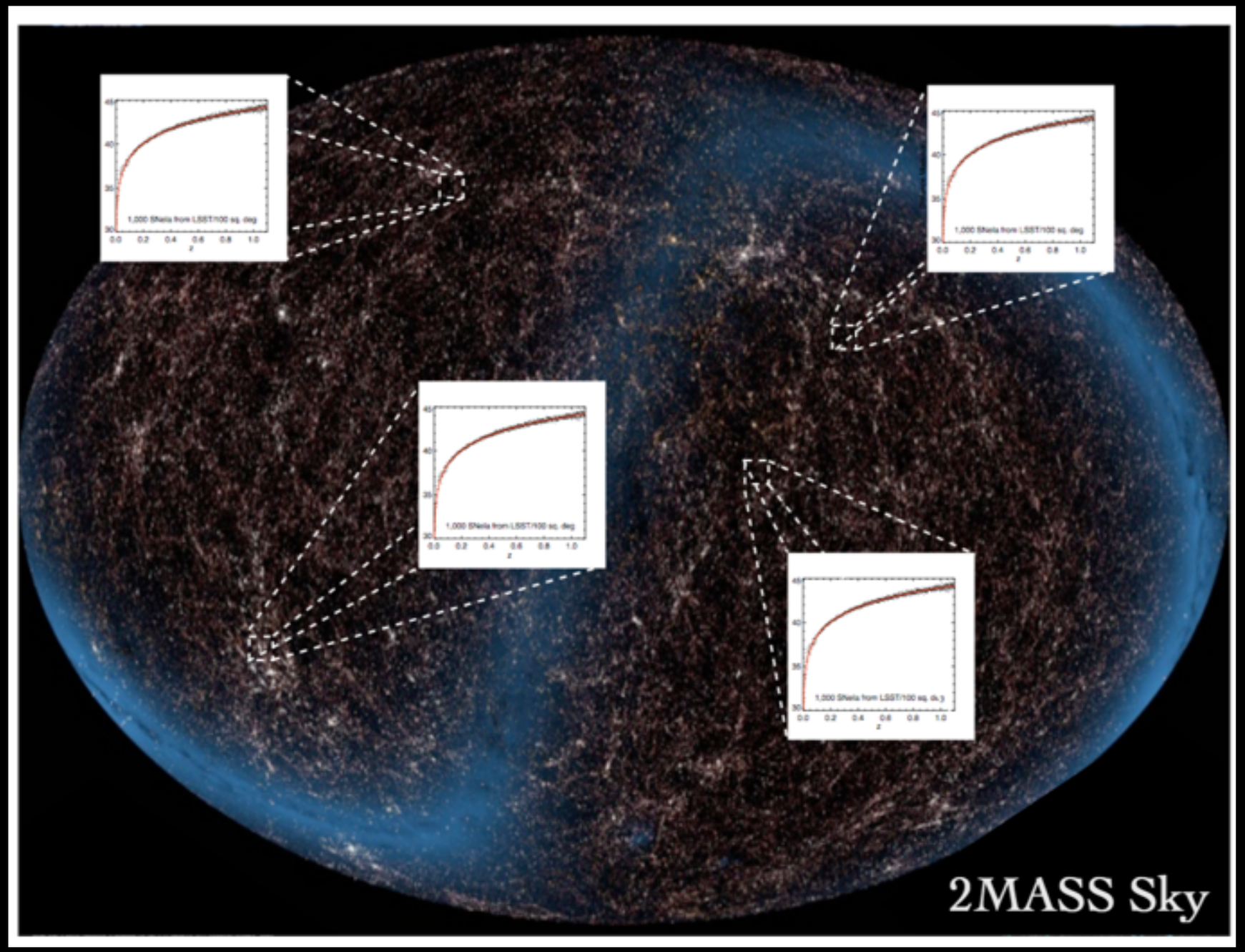
LSST





Large Synoptic Sky Survey : Will survey about 18000 square degrees (most of the Southern Sky)

Expansion History as a function of direction



LSST @ UW astro

- LSST@UW.ASTRO: One of the largest LSST groups (faculty, research scientists, postdocs, graduate students)
- Have simulations of LSST SN observations based on baseline observing strategies
- Analysis method machinery for supernova cosmology
- Observing Strategy White Paper: Understanding the scientific impact, and requirements on the observing strategy is a big, current unanswered question that needs to be answered NOW.
    - https://github.com/rbiswas4/Isotropy