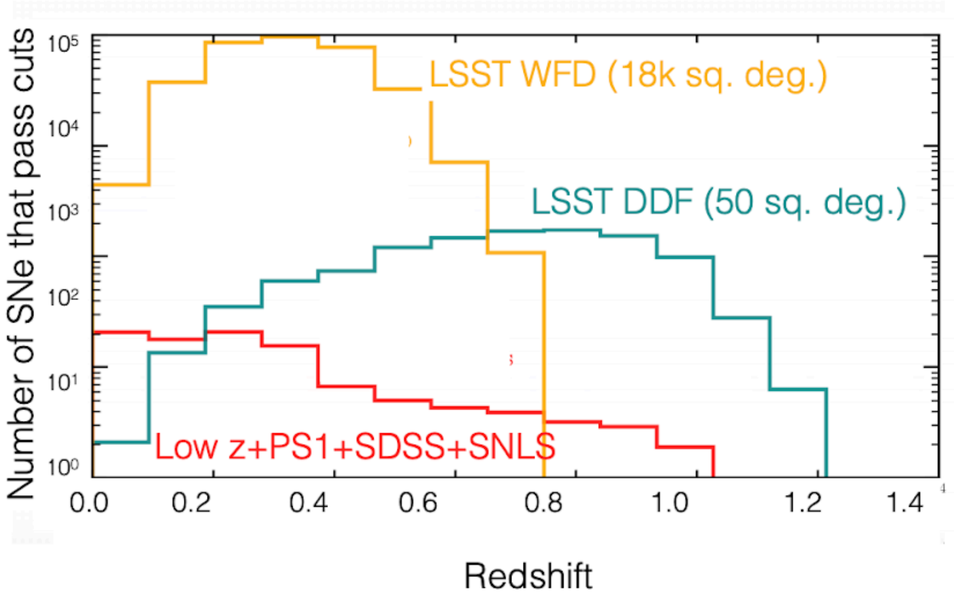
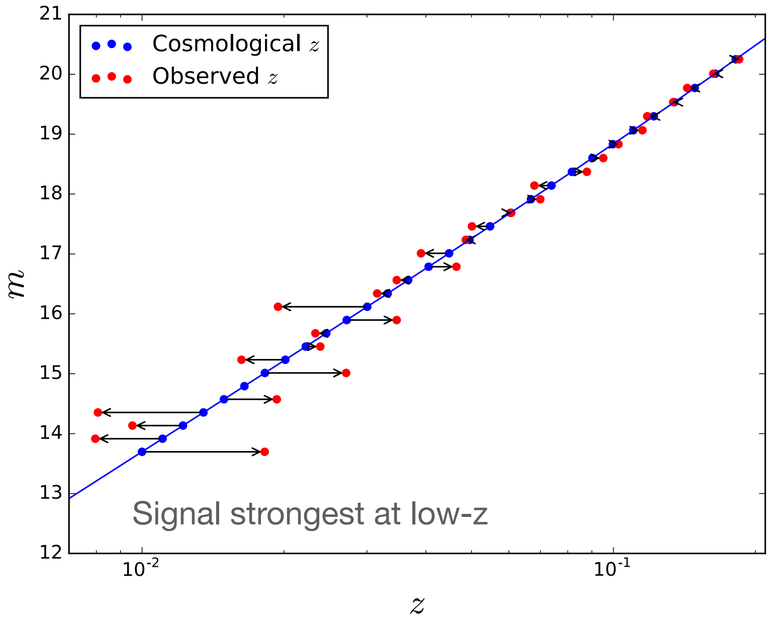
Peculiar Velocities With Type Ia Supernovae: Abundant Discoveries to a Low-z Hubble Diagram

Vera C. Rubin Observatory LSST (and other searches) a source for discovery of SNe over 10 years: ~ 50k (unclassified) SNe Ia at z<0.15 …



from Mandelbaum et al. 2019
also Blazek et al. Astro 2020 White Paper
previous slide

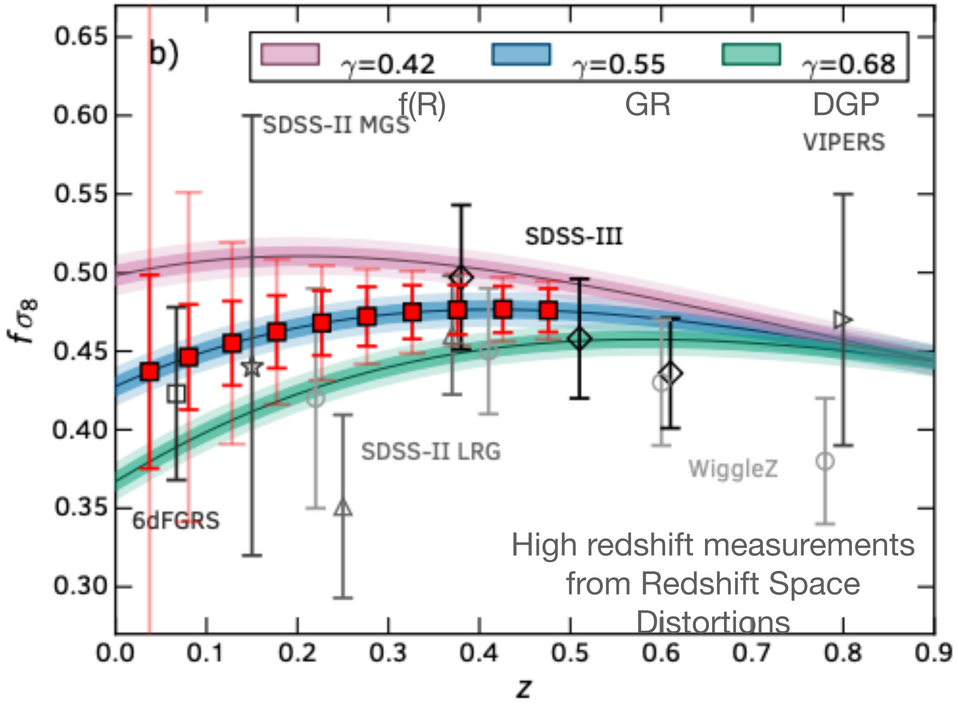
… we can put these discoveries on a Hubble Diagram with supplemental classification, redshift, and brightness…



… to measure peculiar velocities that appear as residuals away from the smooth Hubble Law

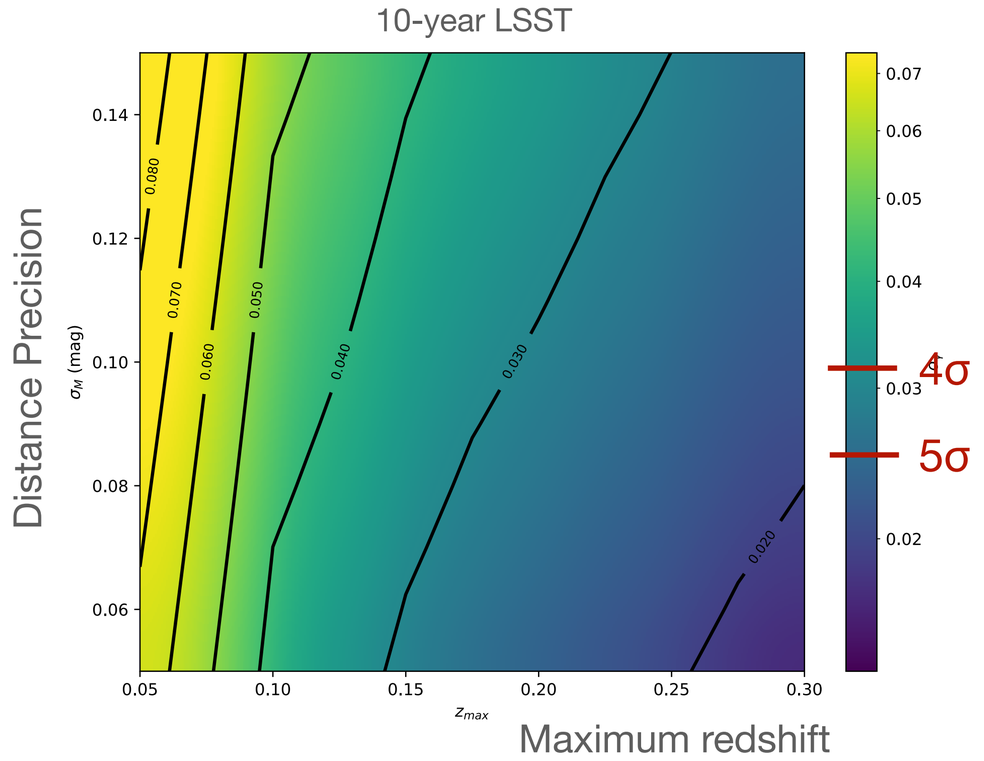
Peculiar Velocities With Type Ia Supernovae: Growth of Structure to Probe of Gravity

Spatial distribution of PV from these SNe come an unrivaled measurement of the growth of structure ($f\sigma_8$) at low redshifts …



Red LSST SN projections from Howlett et al. (2017)

… depending on the fraction of discoveries placed on the Hubble diagram, maximum redshift, and per SN distance precision …



… viable models of gravity can be distinguished by up to 5σ …

… to be continued in Session 144…

Transient (SN Ia) Follow-up Network
Alex Kim (LBNL)

- **Overall science goal:** Enable the study of Dark Energy, Gravity, and other HEP science using transients discovered by Rubin and other public searches, through supplemental optical/NIR spectral/imaging follow-up
- **Collaboration model:** Complicated. Use Snowmass to figure this out,
  - DESC has intellectual investment and scientific stake in transient and non-transient spectroscopy
  - Rubin Observatory soliciting International In-Kind Contributions, several responses to which include transient follow-up that could be part of the Network
  - Private facilities will be used for follow-up
  - Private data supplement public transient searches, e.g., ZTF-II in the north
  - Other LSST Science Collaborations want similar network elements though driven by different science goals and requirements
- **Timescale:**
  - Now and later. 2-3 sigma PV results possible current and soon-to-be-online facilities if made available.. Precision 4-5 sigma PV science would require re-instrumentation of larger telescopes.
  - Doubt transient searches will stop after 10 years of Rubin

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